CAST Professional Learning

UDL and Inclusive Practices in IB Schools Worldwide

January 2016

Research study conducted by
CAST

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[1] K-12, a term used in education and educational technology in the United States, Canada, and possibly other countries, is a short form for the publicly-supported school grades prior to college. These grades are kindergarten (K) and the 1st through the 12th grade (1-12).

Abstract

The International Baccalaureate Organization (IBO) is committed to ensuring that inclusive education is practiced in International Baccalaureate (IB) schools worldwide. IBO's guidelines include references to Universal Design for Learning (UDL) as a framework that can be used for inclusive education. This exploratory study examined how IB educators are implementing inclusive practices and UDL in their classroom and school settings. Data was collected using an online survey and participant interviews to gather information on how inclusive practices are being implemented by teachers and administrators in all three IB regions (Africa, Europe, and the Middle East; Asia-Pacific; and the Americas).

There were 127 responses to the survey, and ten participants were interviewed, which enabled us to develop in-depth case stories of three or four schools in each IB region. The results indicate that IB educators are implementing inclusive practices at high levels although their degree of knowledge about the UDL framework itself varies. IB teachers and administrators are familiar with various strategies to differentiate instruction, integrate flexible options during instruction, and implement instructional strategies to engage and motivate all learners. The strategies these educators use are consistent with IB approaches to teaching and learning and align with UDL guidelines. This report presents information on the various ways IB teachers and administrators implement inclusive practices, provides examples of instructional strategies the educators use, and how they align with the UDL guidelines. The report also discusses factors that either facilitate or pose barriers to the implementation of inclusive practices. It concludes with recommendations for ways to support and extend the implementation of inclusive practices in IB schools.

Study Design

Purpose of the Study

This study examined how inclusive practices and UDL are used in IB schools worldwide, focusing on the following areas: (a) how UDL and inclusive practices are currently being implemented at the classroom and schoolwide level in IB schools worldwide and what specific factors impact this implementation, and (b) how the inclusive practices IB educators are using align with the UDL framework.

Research Questions

The study was guided by three research questions and their related sub-questions:

1. What are the key findings in the literature base about UDL implementation in K-12 settings?
   a) According to published studies and reports, how has UDL been implemented in K-12 settings around the world? What are some of the challenges and successes of UDL implementation?
   b) How do UDL-based interventions support inclusive education?
   c) According to IB documentation, how does UDL align with current practices in IB schools worldwide?

2. How is UDL currently implemented in IB schools?
   a) How do teachers in IB schools understand and use UDL?
   b) To what extent do teachers report implementing UDL-related practices in their IB classrooms?
   c) What factors (e.g., teacher and administration characteristics, classroom climate, professional learning opportunities, etc.) impact UDL implementation in IB schools? What are the barriers to UDL implementation in IB schools?

3. How does UDL support the IB goal of promoting inclusive education?
   a) How do UDL-based practices used by IB teachers support academic achievement by all learners?
   b) What role do UDL-based practices play in promoting inclusive education in IB schools?

Methods

This exploratory study utilized a qualitative research design, including document analysis and a literature review, a large-scale survey, and interviews of selected participants in order to develop case stories on a set of schools. Before collecting data, CAST obtained Institutional Review Board approval to conduct social and behavioral research with human subjects.

The research questions were addressed through three tasks:

1. The literature review (including IB documentation) addressed Research Question #1.
2. A large-scale survey of IB teachers and administrators addressed Research Questions #2 and #3.
3. Case stories addressed Research Questions #2 and #3

1. Literature Review

The literature review summarized information from these sources:

- Published peer-reviewed research studies on UDL-based interventions
- Published articles and reports on UDL implementation
- IB curriculum documents provided by IBO

To identify published studies and reports, we conducted a systematic review of the literature base. We used EBSCO databases, including Academic Search Premier, ERIC, PsycINFO, and Professional Development Collection to search for articles. Keywords used for Boolean searches were *Universal Design for Learning* and *UDL*, along with the following terms: *inclusion*, *application*, *implementation*, *efficacy*, *student outcomes*, *teacher training/education*, *curriculum*.

Articles that met the following inclusion criteria were selected for the review:

- Published in refereed journals and/or authored by experts in the field of UDL
- Published between 2000 and 2015
- Described UDL interventions and/or implementation at the K-12 level

We also examined published reviews of the UDL literature base to ensure that we had identified key articles.

The IBO provided documents related to IB curriculum and practices, including the *IB Guide to Inclusive Education.* Based on a review of these documents, we analyzed how existing IB curriculum and practices mapped onto the principles, guidelines, and checkpoints of the UDL framework.

2. Large-Scale Survey

A 60-item survey that included multiple-choice, Likert scale, and open-ended items (see Appendix B) was developed for this study and disseminated to IB coordinators, teachers, and administrators. The survey was designed to elicit information on IB educators' knowledge and implementation of UDL and inclusive practices. The survey questions elicited information on their knowledge of inclusive practices in general, as well as specific knowledge and implementation of the UDL guidelines. The survey included questions for teachers and administrators, as well as sections relevant to specific groups (e.g., the section on teaching practices was required for teachers but not for administrators).

The IBO research department reviewed and validated the survey prior to dissemination. The survey was administered via the online Key Survey system and disseminated by the IBO to constituent schools worldwide.

Analysis of data. The survey questions were designed to address Research Questions #2 and #3 and their respective sub-questions. Multiple-choice and Likert scale items on the survey were summarized, and basic descriptive statistics were calculated to provide a snapshot of participants' knowledge and implementation of UDL and inclusive practices. To analyze open-ended items, we identified key words and phrases, tallied the frequency of responses, derived categories to organize the data, and aligned response categories and keywords to UDL guidelines.

3. Case Stories

We conducted interviews with selected participants in order to develop case stories of inclusive practices and UDL implementation at IB schools in each region. The original plan was to develop case stories of three schools in each region by interviewing IB educators who were willing to be interviewed. However, during the interview phase of the study, we added one interview to the set to broaden the range of countries. Ten interviews were conducted in all: four case stories were developed for the IB Africa, Europe and Middle East region, three for the Asia-Pacific region, and three for the Americas region. The introduction of the Case Story section of this report provides an overview of the ten stories and presents each in-depth case story.

The interviews, which were conducted via telephone and Skype, delved deeply into the implementation of UDL and inclusive practices by each individual and at his or her school. Although the case stories focused on the experience of the individual interviewed, we asked questions to solicit information about their knowledge of schoolwide inclusive practices. An interview protocol was used for the case story interviews (see Appendix C).

Analysis of data. The case stories developed from the interviews addressed Research Questions #2 and #3 and their related sub-questions. The information provided by each interview participant was written into a case story format, with sections focusing on the interviewee's knowledge of UDL and inclusive practices, implementation of inclusive practices/UDL, and schoolwide implementation issues. We conducted a cross-case analysis of the case stories to gain insights into the ways teachers use UDL to support inclusive education, in alignment with Research Question #3. During our analysis, we identified the common factors that either facilitated or created barriers to the implementation of UDL/inclusive practices at IB schools. The Discussion section of this report presents key findings and emerging themes from the case stories.

Data coding procedures. We used a narrative analysis method to identify key themes and issues from the case stories. Two raters coded the data separately, using a narrative analysis method. Each rater coded the data individually, then verified and converged the codes. The coding relied on a two-step process—initial coding and focused coding (Charmaz, 2010; Saldana, 2009).

Initial coding. During the initial coding phase, we used an *open coding* process to assign short labels that categorized, summarized, and accounted for each piece of data. These initial codes highlighted processes, actions, events, contexts, relationships, viewpoints, explanations, dilemmas, and defining moments.

Focused coding. In the second phase, focused coding, we developed categories based on the results of the initial coding. Using *axial codes,* we clustered and synthesized information to develop conceptual codes. Using this focused coding process, we derived themes related to various facets of inclusive practice and UDL implementation (e.g., current levels of implementation, successes, challenges, needs).

Timeline

The study was conducted between June and December 2015, as noted below:

Activity	**Dates of Completion**
Study design	June 5
Institutional Review Board application approved	June 30
Literature review	June 30 (First draft sent to IBO) July 9 (Feedback received from IBO) July 30 (Final draft completed)
Survey and interview protocol developed	June 30
Survey validated by IBO team	Sept. 26
Survey administered online	Oct. 1-Oct. 15
Survey data analyzed Potential interviewees identified and contacted	Oct. 16-30
Interviews conducted via phone/Skype Transcriptions completed Additional interviewees solicited, as needed in each IB region.	Nov. 1-Nov. 30
Case stories developed based on interview data	Nov. 1-Nov. 30
Data analysis (Cross-case analysis, analysis of survey and case study data)	Dec. 1-30
Final report	Jan. 30

Literature Review

This literature review addresses Research Question (RQ) #1 and its sub-questions:

What are the key findings in the literature base about UDL implementation in K-12 settings?

a) According to published studies and reports, how has UDL been implemented in K-12 settings around the world? What are the challenges and successes of UDL implementation?
b) How do UDL-based interventions support inclusive education?
c) According to existing IB documentation, how does UDL align with current practices in IB schools worldwide?

Structure of This Review

This review is organized in three sections with the following themes:

- Section 1 addresses **the implementation** of UDL in K-12 settings (RQ#1a).
- Section 2 addresses **inclusion and inclusive practices** with UDL (RQ#1b)
- Section 3 addresses **the alignment of selected IBO documents** with UDL (RQ#1c)

A bibliography at the end of this literature review provides a comprehensive list of resources; relevant items were summarized to address the themes of each section. The resources in the bibliography are categorized as follows:

1. UDL-Related Books and Book Chapters
2. Reports/White Papers on UDL Policy and Implementation
3. Large-Scale Implementation Websites
4. Pre-Service and In-Service Teacher Training
5. Descriptive Articles about Applying UDL to Classroom Practices
6. Articles about UDL and Assessment
7. Articles about UDL and Culturally and Linguistically Diverse students
8. Reviews of Research on UDL in K-12 Settings
9. Research Studies of UDL Application in K-12 settings

Definition of UDL Implementation

UDL implementation occurs at various levels. This review summarizes articles that describe the various levels of UDL implementation, including large-scale efforts at the province, state, and district levels; schoolwide implementation; and classroom implementation of UDL-based instructional practices.

The literature on UDL implementation includes descriptive articles about how educators are applying UDL in the classroom and about the professional development required to train educators about UDL, and an emerging body of research studies on UDL-based interventions.

Several articles address UDL implementation at a conceptual level and describe how UDL can be applied in relation to educational initiatives, such as Response to Intervention (RTI) and standards-based education. Some articles examine UDL in relation to assessment and instructional technology. In Section 1 and Section 2 of this literature review, we summarize and provide a synthesis of the existing literature on UDL implementation at various levels, and on the ways UDL supports inclusion.

Development of the UDL Framework

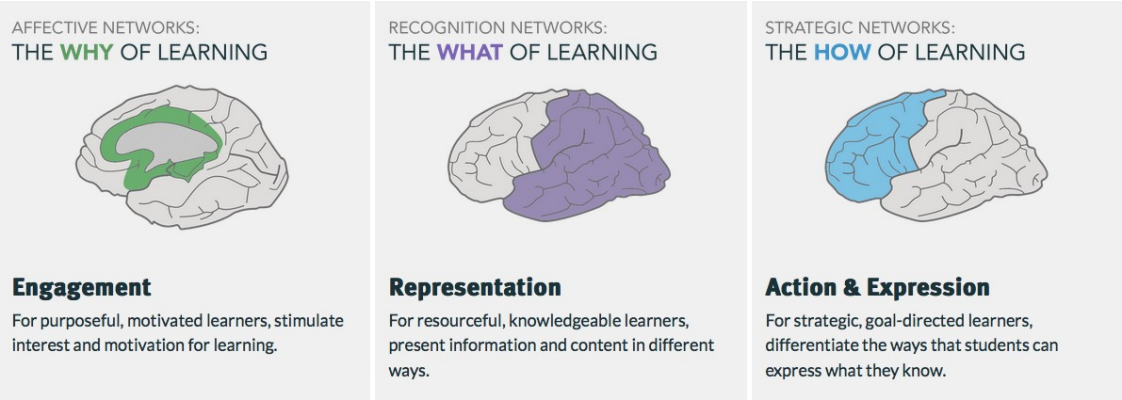
UDL was first defined in the literature in the late 1990s and early 2000s. Several seminal articles and papers provided a conceptual definition of UDL (Rose & Meyer, 2000, 2002). In an early article entitled *The Future Is in the Margins: The Role of Technology and Disability in Educational Reform,* Rose and Meyer (2002) described how computer-driven technologies (e.g., PET scans, fMRIs) revolutionized the way researchers were able to study learning as it takes place in the brain. These technologies revealed that different parts of the brain showed activity specific to the activity/task being done, and that brain activity varied across individuals. The research also revealed that brain activity changes as we learn; for example, a novice learner and a more experienced learner use different parts of the brain. Based on this research on how individuals learn, researchers at CAST defined three "learning networks" in the brain:

- **Affective networks** that monitor the internal and external environment to set priorities, to motivate, and to engage learning and behavior
- **Recognition networks** that sense and perceive information in the environment and transform it into usable knowledge
- **Strategic networks** that plan, organize, and initiate purposeful actions in the environment

The UDL guidelines were formulated to address these learning networks, and the three main principles of UDL correspond to them:

- **Multiple Means of Engagement** addresses the **affective networks**
- **Multiple Means of Representation** addresses the **recognition networks**
- **Multiple Means of Action and Expression** addresses the **strategic networks**

The figures below depict the three networks and related principles:



UDL is based on the concept of universal design (UD), which was developed in the 1980s by a group of architects and engineers. The original UD model focused on providing physical access to the environment, the premise being that environments could be made more accessible to all when they are designed with people with disabilities in mind. UDL extended this concept to the learning environment, with a focus on increasing access to curriculum and instruction.

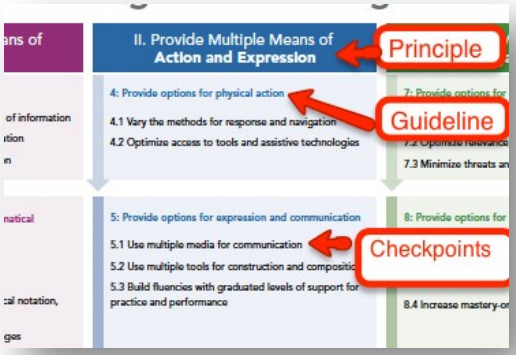
Rose and Meyer (2002) described the transformational nature of digital media, which can create flexible environments for all learners. Digital media and personal technology devices have been transformative, as they provide learning environments that build in flexibility. For example, text that was previously limited to a paper-based format is transformed in a digital environment. The same text on a computer screen can be modified with ease to accommodate individual needs (by changing fonts, colors, spacing, contrast, etc.), can be accessed in multimodal formats (using read-aloud through text-to-speech technology), and can include features that enhance comprehension (hyperlinked vocabulary definitions, highlighting key concepts). Digital text redefined "reading" and opened up possibilities for addressing individual special needs. For example, an individual with a print-related disability or vision impairment can benefit from the text-to-speech features, while an individual who is not yet fluent in the language of instruction can benefit from comprehension supports. No longer bound to a rigid format, the text becomes accessible to a wider range of users. This is one example of how a flexible instructional environment can accommodate various learners.

UDL is based on the premise that variability among learners is the norm. As Rose and Gravel (2010) state,

> UDL helps meet the challenge of diversity by suggesting flexible instructional materials, techniques, and strategies that empower educators to meet these varied needs. A universally designed curriculum is designed from the outset to meet the needs of the greatest number of users, reducing the need for costly, time-consuming, and after-the-fact changes. (p. 6)

By designing for learner variability from the outset, educators can create environments that are inclusive and accessible for all. The ultimate goal of UDL is to support the design of high-quality learning environments that allow students to become "expert learners." The guidelines and expert learner goals are delineated in the one-page overview of UDL in Appendix A.

The UDL framework is comprised of three main principles—representation, action and expression, and engagement. Each principle has three guidelines that define it further. These nine UDL guidelines define how flexibility, choice, and scaffolds can be provided when designing instruction. Each guideline has a set of "checkpoints" that describe how the guideline can be applied to pedagogical practices. There are a total of 31 UDL checkpoints.



A web-based version of the guidelines, which contains detailed information and examples of resources and ideas related to each checkpoint, is available at *http://www.udlcenter.org/aboutudl/udlguidelines.*

Hehir (2009) highlights a key tenet of UDL—the shift in emphasis from access to learning environments to access to *learning itself*. An essential question when designing UDL-based instruction is to consider the goals of the lesson. After stating clear goals, teachers can consider two things: (a) what the barriers are to achieving the goals, and (b) what supports and scaffolds

students will need to master the goals. By designing instruction with these factors in mind, teachers can design instruction from the outset for a broader range of learners. As such, UDL provides a bridge between special education and general education by focusing on high-quality education for all learners. UDL focuses on designing flexible environments proactively, rather than modifying instruction for specific students after the fact.

Section I: Implementing UDL in K-12 Settings

This section synthesizes information related to issues of UDL implementation, including large-scale implementation, teacher training, and UDL-based instructional design and classroom practices. The resources summarized in this section include books, conceptual and descriptive articles, and websites that address UDL implementation in K-12 settings. We also include a section with links to web-based resources that teachers can use to learn about UDL and to implement UDL in their classrooms.

Large-Scale Implementation

Researchers note that the UDL implementation taking place over the past decade has involved various stakeholders at the state, district, and school level: state legislators, state education agencies, and state higher education institutions that train teachers; district-level administrators; and school principals, teachers, parents, and students. The UDL Implementation and Research Network (UDL-IRN) has published a Blueprint for UDL (Nelson & Basham, 2014) that outlines considerations for states and districts that want to undertake systematic implementation.

In North America and Europe, there are various initiatives and legislative mandates to use UDL to create inclusive learning environments. Reports of large-scale implementation of UDL in K-12 settings in other areas of the world were not found in our database search, or in a search of Internet-based resources (using Google search tools). Large-scale UDL implementation is a relatively recent phenomenon, and many states and districts are in the process of determining whether and how to implement it. An empirical research base on large-scale UDL implementation does not yet exist, but current information can be found in reports and on a few websites, as summarized below.

In the U.S., the Higher Education Opportunity Act (HEOA, 2008) specifically mentions UDL as an important component of teacher training. In Canada, inclusion is the recommended teaching practice and it is supported by provincial education policy (British Columbia Ministry of Education, 2015; McGhie & Sung, 2013). In Europe, the UDL-Net project (n.d.) brings together researchers and practitioners from European Union nations to discuss UDL implementation.

In the U.S., Maryland has been at the forefront of statewide UDL implementation. In 2010, the governor supported a bill to establish a Statewide Task Force to Explore the Incorporation of UDL Principles into Maryland's Education Systems (Maryland State Department of Education, 2011). This plan addresses UDL implementation and provides recommendations for stakeholders at all levels—the state education system, local school systems, individual schools, and Maryland's higher education institutions—to ensure that state and local policies support school-based efforts to adopt UDL-based practices.

A 2011 report by the UDL Task Force for the Maryland State Department of Education highlights the effective framework UDL provides for curriculum design and instruction. UDL enabled teachers to (a) proactively "frontload" instruction more efficiently to reach all learners, (b) use funds more efficiently, (c) give more students access to the general curriculum, (d) create a positive learning environment, and (e) reduce the need for accommodations and modifications. Challenges the task force identified included the paradigm shift required to implement UDL. For example, educators may be resistant to UDL implementation if it is perceived to be "one more thing" or a special education initiative that benefits only certain students. To address these challenges, the task force recommended having an awareness campaign to counter common misperceptions and explain how UDL can be relevant to all learners, including students who are gifted and talented, English language learners (ELLs), students with physical, cognitive, and sensory disabilities, learners who may be more than one type of learner, and students without disabilities.

UDL implementation is explored in depth through case stories and videos on the website Tale of Four Districts (Ganley & Ralabate, 2013). Nicole Norris, a Baltimore County school principal, highlights the importance of using professional learning communities to foster ownership in integrating changes and of allowing time for these changes to occur. She also recommends having a facilitator who supports teachers as they implement UDL in the classroom. William Burke, director of professional development at Baltimore County Public Schools, similarly recommends having a coach or facilitator who can work with teams as they implement UDL. Michael Hodnicki, the instructional coordinator for professional development at Cecil County Public Schools, recommends involving all stakeholders and providing opportunities for collaboration.

The British Columbia Ministry of Education (2015) has undertaken an effort to implement UDL in K-12 schools across the province. The ministry has developed a website with resources that illustrate how they undertook the UDL implementation and how teachers have transformed their teaching as a result. They suggest a year-long timeline for implementation and provide a month-by-month breakdown of the processes that can be adopted during a school year; see *http://www.udlresource.ca/?p=2967*.

Pre-Service and In-Service Teacher Training

Several researchers have examined effective ways to train pre-service and in-service teachers to implement UDL (McGhie-Richmond & Sung, 2013; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007). Spooner et al. (2007) conducted a study with undergraduate and graduate education students to investigate the effect training in UDL had on participants' ability to plan lessons that addressed learner variability. Participants in an intervention group received an intensive one-hour workshop in UDL. Participants in both groups then drafted lesson plans, which were scored on a rubric to assess the level of UDL that was integrated into their lessons to address student needs. Participants who had received the UDL training were able to design lessons that supported learner variability, which demonstrates that even a short workshop can help teachers use UDL principles in their lesson planning.

McGhie-Richmond and Sung (2013) examined a similar question with pre-service and in-service teachers. The participants learned about UDL as part of their college-level coursework. After

learning about UDL, the participants revised their lesson plans, identified how they used UDL principles in their lessons, and reflected on what changes they made. Two main themes emerged from the qualitative data collected in this study. One theme was "learning for all," which illustrated teachers' efforts to reduce barriers to student learning, to focus on students' strengths, and to consider learners' preferences and characteristics. Participants demonstrated an ability to design for all learners, and not only to modify their lessons for students with disabilities.

The Collaboration for Effective Educator, Development, Accountability, and Reform Center has published an innovation configuration document called *Universal Design for Learning: Recommendations for Teacher Preparation and Professional Development* (Israel, Ribuffo, & Smith, 2014), which provides a comprehensive blueprint for possible teacher training. This document provides an innovation configuration matrix or rubric to quantify these pre-service and in-service teachers' understanding of UDL and of the instructional planning they received. The document highlights the importance of training general and special education teachers about UDL:

> A mature understanding of the UDL principles enables teachers to appreciate the complexity of the UDL framework while comprehending the complexity and significant barriers associated with typical content, instruction, and the environmental constraints of the K-12 classroom. Standards-based content often assumes that there is a typical student who is the primary audience for the content and subsequent instruction. Furthermore, the primary pathway for learning and assessment is often the foundation for most instructional planning. By embedding the UDL principles into teacher education course work and ongoing PD, the fallacy of the single pathway, the barriers that content and instruction often present to struggling learners and those with disabilities, and the critical elements of the derived solutions can be thoroughly understood by teachers. (p.18)

The authors recommend using a step-by-step process to help teachers new to implementing UDL. One such process, planning for all learners or PAL, was developed by Meo (2008), who describes four steps teachers can use to integrate UDL into their curriculum and instruction. Meo illustrates how teachers using the PAL process can consider using UDL to determine instructional goals, methods, materials, and assessments. Meo gives the example of a pair of teachers who used the PAL process to develop co-taught lessons that supported general and special education students in a high school social studies class. Using this process, the teachers were able to identify barriers in the curriculum and alter the design to make it comprehensible to all students. Another process is a five-step framework published by the Universal Design for Learning-Implementation and Research Network (UDL-IRN, 2011), which is available on the UDL-IRN website at *https://james-basham.squarespace.com/instructional-process.*

Classroom-Based Implementation

In the decade since the development and conceptualization of the UDL framework, many books and descriptive articles have been published that describe how UDL is being applied to instruction in various K-12 settings. Many explain how UDL can be applied to pedagogy in early childhood education, and in elementary, middle, and high school classrooms (Basham & Marino, 2013; Bryant, Rao, & Ok, 2014; Glass, Meyer, & Rose, 2013). CAST has also published several web-based resources that teachers can use to integrate UDL into their classroom practices.

The book *UDL in the Classroom: Practical Applications* (Hall, Meyer, & Rose, 2012) describes how UDL can be applied to instruction across the content areas. The authors define how UDL guidelines can be applied to designing instruction and provide examples of how UDL has been applied in reading, writing, science, mathematics, history, and the arts. This book also addresses ways that instructional technologies and digital media can support UDL, and ways UDL can be implemented in contexts that have limited or no access to technology. Researchers also describe the features of instructional and assistive technologies that can support UDL-based instruction (Bryant, Rao, & Ok, 2014; Rose & Meyer, 2002; Rose, Meyer, & Hitchcock, 2005). Software such as digital graphic organizers, web-based tools such as UDL Book Builder, and various mobile apps are some of the tools that can help teachers address the UDL principle of providing multiple means of representation, action and expression, and engagement.

Edyburn (2010) posits that the essence of UDL lies in instructional design, and he highlights the role technology plays in providing access and engaging learners. He notes that UDL implementation is about taking an intentional and proactive approach that is grounded in curriculum and instruction design. He points out the misconception that UDL is achieved simply by using technology or that it is just "good teaching," noting that UDL is a learned skill that requires thoughtful and deliberate designing and takes into account the diversity and variability of the learning environment.

Several authors provide models of UDL-based instruction and delineate how UDL can be applied to goals, materials, methods, and assessments. In *UDL Now: A Teacher's Monday Morning Guide to Implementing Common Core Standards Using Universal Design for Learning*, a book geared toward practitioners, Novak (2014) describes various barriers in the instructional environment and provides specific strategies to help reduce them. For example, Novak describes several barriers that arise among students listening to lectures, such as hearing impairment, attention issues, poor memory, lack of background knowledge, problems understanding vocabulary, or being a new language learner. These barriers can create challenges for a range of students, and Novak suggests various ways teachers can get around them, including providing digital copies of texts or other visual supports, pre-teaching vocabulary, helping students attend to key concepts, and providing simplified directions. Novak also provides various examples of instructional strategies for addressing each UDL guideline, as well as alternative ideas for how to engage students and enable teachers to assess their understanding of content more accurately.

Johnson-Harris and Mundschenk (2014) describe how UDL can be integrated into the design of lessons to mitigate the challenges faced by students with chronic behavioral disorders. They emphasize the importance of building in academic and behavioral supports to create a more effective environment for these students and provide examples of ways to plan lessons that take into account both their academic and behavioral needs. They link these examples to critical features of UDL and outline four questions teachers can ask when designing instruction that incorporates UDL:

1. What are my desired results?
2. What is acceptable evidence of student understanding?
3. What learning experiences will address our goal(s) and consider learner strengths, interests, and preferences?

4. How can technology be incorporated into the presentation of content, student learning experiences, and assessments in order to increase accessibility and engagement for all students? (p. 171)

Johnson-Harris and Mundschenk (2014) describe how teachers can integrate UDL into lessons based on these questions. They also highlight some common challenges teachers face when implementing UDL. One challenge is the lack of control that can occur in the classroom when students are engaged in varied tasks instead of all students doing the same thing—the more traditional format. They note that some teachers are uncomfortable with a more student-centric environment, and that UDL-based lesson design takes extra time and effort. However, the additional time required pays off, because teachers have to make fewer modifications after the fact and they can reuse their flexibly designed lessons in the future.

UDL and Technology

As noted earlier, digital media and technology are a natural fit with UDL, as they provide environments that are inherently flexible and easily modified. Teachers can integrate instructional technologies in the classroom to provide scaffolds and supports that are consistent with UDL. Digital tools offer a range of flexible options (e.g., digital texts can be modified by the individual as desired) and readily engage students (e.g., they allow students to create projects based on their interests and motivations). Digital tools also are multimodal and offer various options for representation, action, and expression.

Consistent with UDL's core philosophy of building flexible supports into learning environments, instructional technologies include features and affordances that can be helpful and engaging for all students. These days, many of the commonplace technologies we use daily include features that can help students who need specific accommodations, but they are also useful for students who do not need specific supports. For example, teachers can use digital graphic organizers to model how to brainstorm content for a paper, and individual students can use the graphic organizer's multimodal features to get help with the writing process. Thus technology can be used by all students while also providing specialized supports for some. Bryant, Rao, and Ok (2014) explain that computers and mobile devices are flexible multimodal tools that teachers can use to give students various ways to learn, practice, and express what they know in the context of a lesson. They align each classroom example with the UDL checkpoints, noting how graphic organizers, interactive web-based tools, and apps on mobile devices can be integrated into lessons to support students with and without disabilities.

Smith and Basham (2014) address the accessibility of online K-12 learning environments and note the distinctions between their accessibility and usability. Accessibility often refers to the functional and technical features that allow a user to access a web-based or digital environment. Usability goes further, taking into consideration the functional accessibility and the effectiveness of the content. They describe the UDL Scan Tool, which examines the accessibility and usability of online learning environments, including cognitive access and other forms of access. The UDL Scan Tool evaluates whether online content and curriculum address learner variability.

Applying UDL to Assessment

Several descriptive articles and a few research studies address ways UDL can be applied to assessment (Almond et al., 2009; Dolan, Bannerjee, Chun, & Strangman, 2005; Fletcher,

Francis, Boudousquie, Copeland, Young, Kalinowski, & Vaughn, 2006; Salend, 2009). Researchers have examined how formative and summative assessments can be universally designed. Universal design features are often provided in computer-based test environments. The paper titled *Technology-Enabled and Universally Designed Assessment: Considering Access in Measuring the Achievement of Students with Disabilities—A Foundation for Research* (Almond et al., 2009) describes outcomes from a symposium that brought together researchers to examine the use of UD in assessment. The paper describes the importance of measuring constructs through an evidence-centered design, and of using universal design to consider barriers and provide flexible options to ensure that students are being assessed fairly and equitably. The authors highlight the fact that "the application of the principles of universal design during test design and development produces tests and administration procedures that provide flexibility and access for all students, including students with disabilities" (p. 19). This distinguishes UD-based assessments from tests created to accommodate specific student needs.

Dolan, Hall, Banerjee, Chun, and Strangman (2005) conducted a large-scale assessment of UDL features. They examined how read-aloud test accommodations affected the performance of high school students with learning disabilities on a computer-based test. These researchers sought to determine whether students with equivalent construct-relevant knowledge and ability in the content area (social studies) performed differently during the administration of a standardized test because of construct-irrelevant differences. Their computer-based assessment prototype was consistent with UDL, providing multiple, flexible means of representing information (text and audio) and opportunities for simultaneous presentation (synchronized highlighting.) The system let students make choices, such as proceeding through the test in any order, reviewing questions before reading passages, and adjusting font size and voice parameters. The study found that students performed slightly better on the computer based system with text to speech (CBT-TTS) version of the tests than on the traditional paper and pencil test (PPT) version. Although the difference in scores represented an effect size of 0.49, it was not statistically significant (t = 1.71; p = 0.12). The study found that students' scores did show a statistically significant difference in the computer-based condition for long reading passages (t = 2.26; p = 0.05). Analysis of the qualitative data suggested that students endorsed the text-to-speech features, and that their preference for these features was linked to others that promoted independence and flexibility. These researchers highlighted the importance of UDL-based testing accommodations in helping individual students make appropriate choices. They concluded that UDL-based test accommodations should benefit all users, not only students with disabilities, and noted the need to use assessment techniques that give students the best opportunity to demonstrate their knowledge and skills.

Salend (2009) describes how teachers can create and administer technology-based tests to create more equitable testing environments for all students. Highlighting the fact that technology tools are often integrated during instruction but not for assessment, Salend provides information and resources that teachers can use to align assessments to UDL principles. In contrast to studies that examine large-scale computer-based assessments, Salend focuses on teacher-made tests that describe the affordances technology can provide for formative assessments (such as quizzes) and for summative assessments. The article describes features related to functional access and perception (text size, fonts, colors), as well as comprehension supports (providing bilingual resources), executive function (testing strategies), and engagement (motivating students by

providing frequent feedback.) Acrey, Johnstone, and Milligan (2005) also provide details on teacher-created assessments aligned with UDL principles. They illustrate their points with samples of UD-aligned study guides created by teachers at one school.

Web-Based Resources for Classroom-Based UDL Implementation

CAST and others have published free resources for teachers interested in implementing UDL in the classroom. Teachers can use these resources to learn more about UDL and integrate UDL-aligned resources into lessons. In the table below, we provide information on several free resources for teachers interested in learning more about UDL. Teachers may also benefit from watching videos of UDL experts and master teachers describing ways it can be put into practice. These videos can be accessed at the National Center on UDL website and the UDL Theory and Practice online book listed below.

Resource/Link	Description
Center on Applied Special Technology http://www.cast.org	CAST's website includes numerous links to information and resources about Universal Design for Learning.
National Center on UDL http://www.udlcenter.org	A clearinghouse of resources related to UDL, the National Center website includes links to UDL resources, including videos, articles, and reports.
UDL Theory and Practice http://udltheorypractice.cast.org/login	This book, available both online and in hard copy, provides a comprehensive look at UDL. The online version of this book can be accessed by anyone who creates a free account. The online version includes multimodal features, including videos of educators describing how they apply UDL to curriculum and instruction.
UDL BookBuilder http://bookbuilder.cast.org	This site allows you to create interactive books with your students, by uploading pictures and audio and using built-in assistive technology supports.
UDL Editions http://udleditions.cast.org	This digital reading environment has six online books that provide various tools to help students read, listen to, and comprehend stories. The Text Help features include several supports, such as text-to-speech, scanning, highlighting, and a glossary. Interactive agents present comprehension questions during reading.
CAST Science Writer http://sciencewriter.cast.org	This interactive website supports students in writing lab and class reports. The website includes multimodal tools that support the writing process (drafting, revising, editing). This website is geared toward middle and high school students.
Accessible Educational Materials (AEM) http://aem.cast.org	This site provides resources for educators, parents, students, publishers, and accessible media producers interested in learning more about accessible materials. The site provides access to the AIM Navigator and AEM Explorer, two tools that help determine what digital text tools are most useful for students.
iSolveIt Math Puzzles	iSolveIt is a mobile digital learning environment that supports

http://isolveit.cast.org/home	the development of logical thinking and reasoning skills, which are essential competencies of algebra and mathematics. The environment includes a collection of tablet-based puzzles that were designed using the principles of UDL.
Parent's Guide to UDL www.cpacinc.org/wp-content/uploads/2009/12/ParentsGuidetoUDL.pdf	This 14-page parent's guide to UDL provides an overview of the topic. It includes examples of how educators can create instructional environments using UDL principles.

Challenges and Recommendations for Implementation

Many articles on UDL describe how to apply the framework, focusing largely on how educators can apply it. In the conclusion of this section, we summarize some common challenges noted in the literature and provide recommendations for UDL implementation, both on a large scale and in the classroom.

A challenge identified by Israel, Ribuffo, and Smith (2014) and echoed by other researchers is how overwhelmed teachers feel when implementing new practices. Israel et al. note that "pre- and in-service teachers are often overwhelmed when introduced to a UDL planning framework because unlike rigid curricula and benchmarks, the UDL framework is broad and offers many instructional choices. It is important, therefore, to offer concrete strategies for implementation" (p. 21). They highlight an essential aspect of UDL that teachers should understand: the framework is not prescriptive, and it gives teachers many ideas they can opt to use, or not. The open-ended nature of UDL makes it flexible enough for anyone to use, but this also makes it overwhelming for some because there is no clearly defined path for its use. As Israel and colleagues note, this challenge can be addressed by giving teachers concrete ideas and strategies for how to operationalize UDL in the classroom. This can be done through professional development workshops, online courses on UDL, and professional learning communities.

Teachers benefit from learning these instructional strategies within the larger context and philosophy of UDL. As noted earlier, integrating UDL into the curriculum can be time-consuming. Planning with UDL and integrating flexible options takes time and is often an iterative process. When educators understand the philosophy behind UDL, they are more likely to buy into the process of proactive design. In schools, it is not uncommon for a distinction to be made between special educators and general educators, with the assumption that the special educator is responsible for making modifications and accommodations for students with disabilities. Although it is the purview of the special educator to ensure that students with disabilities have access to all necessary modifications and accommodations, all teachers can support all students when they have an understanding of UDL. By providing professional development on the concept of learner variability and on the ways UDL supports a range of student needs, teachers are more likely to understand the value of redesigning lessons to align with UDL guidelines (Meo, 2008).

Another challenge teachers face is a lack of time to prepare or collaborate on designing lessons and learning environments using UDL guidelines. For schoolwide implementation of UDL, it is important for administrators to create the conditions needed to implement UDL by giving

teachers space and time for collaborative activities. Teachers benefit from planning lessons together and reflecting on their practice with others. These supports can be put in place by providing opportunities for shared preparation time, grade-level articulation meetings, lesson studies, and professional learning communities. As noted by several administrators involved in large-scale UDL implementation (Ganley & Ralabate, 2013), having coaches who assist with the process can be key to the sustainable implementation of UDL.

Dymond et al. (2006) noted that team planning was highly valued by the teachers in their study. Teachers involved in collaborative UDL-based lesson redesign appreciated the opportunity to develop formal written lesson plans, which enabled them to think about various lesson components and plan supports deliberately. These researchers made the following recommendations for undertaking UDL-based redesign: (a) create a realistic timeframe—start small and give stakeholders time to adjust; (b) involve all stakeholders in the process; (c) use lesson plans to develop and communicate UDL changes; (d) ensure that appropriate supports are available; (e) provide structure to support students—they may need to be taught how to work in the more student-centric UDL classroom; and (f) evaluate the impact of the redesign, collect data, and refine the process of UDL-based design.

Section II: Supporting Inclusion with UDL

In this section, we synthesize information from research studies and articles that describe UDL-based practices that support inclusion. The section includes information from reviews of UDL research studies, intervention studies, and conceptual articles about how UDL is relevant for inclusion-related initiatives (e.g., Response to Intervention) and diverse student groups (e.g., culturally and linguistically diverse students). We describe how UDL was applied to instructional practices that support inclusion and provide information on the outcomes of empirical research studies on UDL.

Recent reviews of the UDL literature demonstrate that UDL has been applied to curriculum and instruction at all levels of K-12 education to support the academic inclusion of all students (Crevecouer, Sorenson, Mayorga, & Gonzalez, 2014; Rao, Ok, & Bryant, 2014). Intervention studies examining the efficacy of UDL-based curriculum and instruction first emerged after 2005, and the rate of studies published about UDL-based interventions has accelerated in the past three years, with several articles published between 2012 and 2015.

Two recently published reviews of empirical research on UDL provide an overview of this emerging field of research (Crevecouer et al., 2014; Rao et al., 2014). Researchers note that the research base on UDL's efficacy is currently emerging and that the standards for research in this field are only now being established. As Rao, Ok, and Bryant (2014) stated:

> One of the reasons for the scarcity of quantitative intervention studies in the field may be that the discipline currently is at a more nascent stage of defining and describing what UD educational models are and how they can be applied. Certainly the current literature is starting to give definition and shape to what a UD educational model-based project or intervention looks like, but eventually researchers will need to address whether instruction incorporating UDL actually causes better results than conventional lessons

> and courses by conducting high quality experimental studies, including true experimental, quasi-experimental, and single subject designs. (p. 164)

Below we provide an overview of articles related to inclusion and UDL, including information from conceptual and descriptive articles and from research studies that involved diverse populations.

Response to Intervention

The RTI framework calls for tiered levels of student support, starting with whole-class instruction and progressing to more intensive and individualized supports for students, as needed. Basham, Israel, Graden, Poth, and Winston (2010) describe the relationship between the UDL framework and RTI, noting how key components of UDL-based instruction can support the RTI tiers. Both frameworks are based on a preventative approach that integrates supports for students instead of reactively providing accommodations for those who are not succeeding in the classroom. RTI Tier 1 instruction calls for whole-class instruction that includes differentiated student supports. UDL-based instruction, which proactively provides supports for all learners in the classroom by addressing their varied needs, aligns with Tier 1 instruction. RTI Tier 2 and Tier 3 supports consist of small group, individualized, and customized strategies for students, with embedded progress monitoring. With its focus on providing appropriate and proactive supports for specific students, UDL can be applied to Tier 2 and Tier 3 instruction. For example, teachers can use various assistive technology tools in Tier 1 environments, and in Tier 2 and Tier 3 instruction. By referring to the UDL framework, teachers can intentionally select how they use technology to meet the needs of all learners and of specific students.

Culturally and Linguistically Diverse Students

UDL-based strategies provide key instructional supports for students who are culturally and linguistically diverse. In the U.S., culturally and linguistically diverse students are often referred to as English language learners (ELLs) or English learners (ELs). Worldwide, school systems integrate students whose home or first language is different than the language of instruction at school. UDL is consistent with various language support/language acquisition frameworks, such as the Sheltered Instruction Observation Protocol, and with the theories of seminal researchers in the field of second-language acquisition, such as Cummins and Krashen (Rao, 2015).

Lopes-Murphy (2013) describes how secondary school teachers can use UDL to design lessons and assessments that are appropriate for high school ELs. She recommends that UDL be infused into the teacher education curriculum at the secondary level. She notes that, because high school teaching is driven by content, the language learning needs of high school ELs is not fully understood or addressed by teachers. Lopes-Murphy emphasizes the importance of teachers using classroom routines that address vocabulary and comprehension using multisensory approaches.

Chita-Tegmark, Gravel, Serpa, Domings, and Rose (2012) address the role culture plays in learner variability. Cultures are social contexts that provide different experiences, and culturally diverse students bring variability to the classroom that is related to their backgrounds and experiences. Chita-Tegmark et al. posit that

> the UDL framework may not only reduce barriers for culturally diverse learners, but also increase culturally informed learning opportunities for *all* learners—helping them to develop proficiency in a broader range of expressive, analytic, and cognitive styles that are crucial to success in the twenty-first century. (p. 17)

These researchers provide examples of how specific UDL guidelines can be used to support cultural variability in the classroom. One example highlights the ways different cultural groups organize and categorize information. To avoid misunderstanding the rationale for categorizing information in a particular way, the researchers suggest using tools such as digital graphic organizers that allow students to show how and why they categorize information the way they do. This is consistent with UDL Guideline 3 (checkpoint 3.2). The Chita and colleagues (2012) article provides additional examples and a discussion of the way UDL can be used as the basis for a culturally informed curriculum.

Research Studies on UDL and Classroom Practices

In the following subsections, we summarize studies that examined the efficacy of UDL-based interventions in various content areas and across grade levels. These studies examined how UDL can support inclusive educational practices, thereby supporting struggling learners, those who receive special education services, and students from culturally and linguistically diverse backgrounds.

In the current UDL intervention research, researchers provide varying levels of detail about their instructional practices and their alignment with UDL. The research designs are also widely varied, and researchers report results in numerous ways. In their review of the empirical literature on UDL, Rao, Ok, and Bryant (2014) comment on the lack of standardized reporting on UDL-based studies:

> Based on this review of literature, we posit that establishing standards for reporting how UD principles are applied in studies can strengthen future research on UD in education. Detailed reporting of UD components within a study will assist researchers as they design future experimental research that replicates and expands upon extant research examining the efficacy of UD-based practices. Future research will need to answer the questions of whether and how the use of UD in curriculum and instruction provides access to information for students with disabilities and to define what an effective UD-based practices looks like. (p.164)

There is greatly varied information on how researchers applied UDL, their data analysis methods, and the outcomes of studies. In this section, we include information on the outcomes of quantitative and qualitative studies conducted on UDL, as reported by the study authors.

Descriptive articles and research studies on UDL in K-12 settings describe how UDL has been applied in various content areas, including English language arts (i.e., reading and writing), social studies, mathematics, and science. Researchers also address the utility of UDL with various types of learners, including ELLs and culturally and linguistically diverse students. Below we summarize a set of research studies on using UDL in the classroom, organized by content and curriculum area.

Literacy/Reading

Researchers have looked at UDL-based tools that can be used to support reading (Coyne, Pisha, Dalton, Zeph, & Smith, 2012; Dalton, Proctor, Uccelli, Mo, & Snow, 2011; Hall, Cohen, Vue, & Ganley, 2014; Rappolt-Schlichtmann et al., 2013). Studies also have been done on how teacher-created materials can support students with disabilities using literacy activities (Brownder, Mims, Spooner, Ahlgrim-Delzell, & Lee, 2009).

Coyne et al. (2012) investigated effects of the Literacy by Design (LBD) program, a universally designed literacy instruction process supported by scaffolded e-books and software programs. They examined effects on the reading achievement of young students with intellectual disabilities. LBD was designed to enhance the five domains of literacy (phonemic awareness, phonics, comprehension, fluency, and vocabulary) recommended by the National Reading Panel in 2000. The features of LBD include:

- digitized voice reading sentences with synchronized highlighting, word and phrase, animation, and pronunciation of onset-rhyme for phonetically regular words, hyperlinked glossary items, story illustration enhancements, video and photo essays to build background information (multiple means of representation)
- prompts to apply reading comprehension strategies and personal response, think-aloud and models, varied response options, partner read and read independently guided by pedagogical agents who demonstrate the process (multiple means of expression)
- use of popular children's stories, student's choice of clicking on a support option and control of navigation, students listen to their oral reading recordings, opportunity to reflect on a progress and identify what they like or don't like (multiple means of expression)

Sixteen students in grades K-2 with severe intellectual disabilities participated in this study. The LBD group significantly outperformed the control group on comprehension on measures using the Woodcock-Johnson (WJ) III passage comprehension subset (ES = 1. 61, p = .02). The LBD group also showed marginal but significant improvement in other literacy areas, such as word attack (ES = 1.00 p = .05) and listening comprehension (ES = 1.25, p = .08). Teachers reported that students enjoyed using and were engaged by the LBD program.

Dalton et al. (2011) examined the effects a web-based reading environment known as Improving Comprehension Online (ICON) had on reading achievement. Study participants were fifth-grade students, including English monolinguals, Spanish-English bilinguals, and other bilinguals. ICON provided a scaffolded digital text environment with vocabulary and comprehension supports embedded. Its UDL-related features included

- text-to-speech, highlighting, Spanish text translation, vocabulary, hyperlinked glossary, illustration, customizable font size/screen contrast (multiple means of representation)
- response options, modeling, and feedback provided by pedagogical agents, graphic organizers, option to add words to the glossary (multiple means of expression)
- age-appropriate engaging stories, easy navigation, various challenge levels, options for choice and customization, emphasis on thinking rather than on correct answers (multiple means of engagement)

Teachers used ICON during their literacy block, and students participated in approximately 24 sessions of ICON-based reading. The study illustrated that the UDL-based environment was beneficial for both monolingual and bilingual students, as it supported the students' varied languages and literacy levels.

Hall, Cohen, Vue, and Ganley (2014) examined the outcomes of using Strategic Reader Tool, a technology-based reading environment that blends UDL and curriculum-based measurement (CBM) tools. They examined whether an online CBM tool used along with Strategic Reader was more efficient and effective for teachers and students than a more traditional offline implementation of CBM in a UDL-aligned reading environment. They conducted this study with 284 students in grades 6-8 in inclusive school settings. Participants in their study included students with and without disabilities (learning disabilities, attention deficit hyperactivity disorder, and hearing impairment). They used a mixed methods study design with a quasi-experimental quantitative component and a qualitative component (teacher interviews); it was conducted in an inclusive language arts classroom.

The Strategic Reader tool is a digital reading environment that integrates reading strategy instruction into age-appropriate texts that address English language arts standards. The environment integrates UDL-based support features such as text-to-speech, a dictionary and multimedia glossary, the flexibility to change font size and contrast, text highlighting, and bookmarking. During reading, students engage with embedded reading prompts, based on the reciprocal teaching strategy. The embedded CBM monitors students' progress as they read, measuring their oral reading fluency and reading comprehension. Results from the CBM are delivered to teachers for interpretation and analysis.

Students and teachers in both treatment conditions read the same novels online, using identical UDL-based support features. The difference between treatment conditions was the way the teachers and students accessed the CBM. In the Treatment 1 condition (T1-Strategic Reader with online CBM), all progress monitoring, administration, scoring, and graphing were available online. In Treatment 2 (T2-Strategic Reader with offline CBM), available supports included progress monitoring in a traditional offline paper-and-pencil structure requiring teacher administration, scoring, and graphing.

Gates-MacGinitie standardized reading measures (GMRT) were administered as the pre- and post-test for all subjects in both treatment conditions. CBM reading measures (oral reading fluency, maze, and reciprocal teaching reading comprehension strategies) were administered regularly throughout the study to monitor progress. Surveys and interviews were conducted with the participating students and teachers. Students in four groups showed improvement from their pre- to post-test scores on GMRT (vocabulary and comprehension subtests) that was nominally and statistically significantly, as depicted in the table below.

Participants and condition	*n*	*M* pre Gates	*M* post Gates	Change	% Change	*t* stat	*p* value
All students							
T1 (online)	105	47.71	50.05	2.33	4.89	2.59	.011
T2 (offline)	98	68.01	70.94	2.93	4.31	2.62	.01
Students with learning disabilities							
T1 (online)	33	38.18	42.15	3.97	10.40	2.36	.025
T2 (offline)	22	53.91	57.45	3.55	6.58	1.32	.2

Hall, Cohen, Vue, and Ganley (2014) summarized the quantitative results, noting that:

> students, particularly those with disabilities, who had online progress monitoring in the Strategic Reader (in the Treatment 1 condition) showed greater growth on reading measures than those who used the same tool without online measures. Moreover, this difference between students' performance online versus offline was larger and statistically significant for students with disabilities. (p. 9)

The results demonstrated the effectiveness of using technology to combine UDL and CBMs for students with learning disabilities, and the potential of both to improve reading comprehension for all students. The built-in flexibility of the Strategic Reader environment allowed teachers to create tailored interventions that suited the needs of the students in their classrooms. They noted that the real innovation in the Strategic Reader was not the technology per se but how teachers used it to spark effective interactive and meaningful learning.

Browder, Mims, Spooner, Ahlgrim-Delzell, and Lee (2009) conducted a mixed methods study to examine how teachers can design and implement stories to share with students with multiple disabilities. The intervention incorporated both task analytic instruction and team planning using principles of UDL. Their participants were three elementary school students with intellectual disabilities. The research was conducted in a special education classroom setting. Teachers adapted three popular elementary schoolbooks, using the principles of UDL to redesign the story experience. As a team, they considered key questions related to the UDL guidelines, such as "How can this response be prompted so student learns the desired response? How can the prompt be faded so the student responds without teacher assistance? Are there other ways to get the student actively engaged? Is there an alternative and easier way the student could make the response?" Based on this team planning process, teachers designed story reading experiences for the three participants.

All three students increased their independent responses during the story-based lessons. The researchers reported the following outcomes from the single-subject phase of the study:

> Student 1 completed a mean of 7.3 steps of the 16-step task analysis independently, with a range from 6 to 8 steps. After intervention, the responses increased (M = 13.09, range from 12 to 15). During baseline, Student 2 completed a mean of 3 steps of the 16-step task analysis independently, with a range from 1 to 4 steps. After intervention, the responses increased (M = 10.2, range from 7 to 13). During baseline, Student 3 completed a mean of 2 steps of the 16-step task analysis independently, with a range from 0 to 5 steps. After intervention, the responses increased (M = 8.5, range from 6 to 11). (p. Browder, Mims, Spooner, Alghrim-Delzell & Lee, 2009, p.9)

The researchers followed up to determine the social validity of this study, looking at factors of transfer and generalization. The teacher reported using strategies from the planning meeting in her ongoing literacy lessons. The teacher also reported that the three participants were included in more classroom read-alouds and seemed to enjoy them more. She also reported that two students participated more in classroom literacy activities, and one student improved in consistency of communication as a result of the UDL intervention.

Science

Rappolt-Schlichtmann et al. (2011) examined the efficacy of the Universally Designed for Learning Science Notebook (UDSN) with fourth-grade students. The participants in this study included students with disabilities, and culturally and linguistically diverse students. The researchers compared students' acquisition of science content knowledge in two conditions—the UDSN environment, and the traditional science notebooks. They also examined the students' experience using the UDSN environment. The study utilized a randomized controlled trial, focus groups, and interviews.

The UDSN environment was based on accessibility guidelines that enhanced students' access to tools and materials. These features provided support to a variety of students, including those who struggled with learning content due to poor literacy skills, ESL students, and students with sensory or physical disabilities. UDSN features that aligned with UDL included the following:

- Text-to-speech, English-to-Spanish translation, alternative text, a glossary, and navigation features that could help students use UDSN effectively
- Options for students to select multimedia response options to express their thoughts (i.e., typing, drawing, audio recording, uploading a picture)
- Facilitation tools for teachers to promote active learning

The students in the UDSN group showed a more significant gain in science content knowledge (ES = .46, $p < .01$) than the control group. Students and teachers reported having a positive experience with UDSN, including a high level of interest, feelings of competence, and a sense of autonomy.

Marino (2009) examined how middle school students with reading difficulties utilized cognitive tools embedded in Alien Rescue, a web-based scientific-inquiry curriculum published by the Center for Innovative Learning and Assessment Technologies. The study examined the relationship between students' reading ability, their use of cognitive tools, and the acquisition of scientific concepts, processes, and vocabulary. Participants included 1,153 students enrolled in grades 6-8. Although students' specific disability categories were not provided in the article, 822 participants were rated as proficient readers, 205 were poor readers, and 126 had severe reading difficulties on the Degrees of Reading Power assessment. According to the data collected, Alien Rescue helped participants with severe reading difficulties access the curriculum and enhanced their scientific learning. These students performed comparably to the poor readers. Although participants with lower reading ability appeared to benefit from using cognitive support tools, they did not use the tools as often as the participants with proficient reading ability. Researchers noted that students may need instruction on how and when to use support tools, as well as immediate corrective feedback to help them understand how the tools can be helpful to them.

Dymond, Renzaglia Rosenstein, Chun, Banks, Niswander, and Gilson (2006) conducted a qualitative action study on the outcomes of a universally designed inclusive science course. Participants in the study included 101 high school students, 68 without disabilities, 25 with mild disabilities, and 8 with severe cognitive disabilities. These students were part of a course that was redesigned to align with UDL principles by a team of university researchers, a special education teacher, a general education teacher, and a co-teacher. The UDL-based course included adaptations to instructional delivery, materials, curriculum, and assessments. The course also provided flexible options for student participation. UDL was applied to these course components as follows:

- Use of flexible materials (e.g., an overhead projector, large print, highlighted info, laptop/computers with Internet) to help students to locate information, develop projects, and express their learning to teachers and peers
- Flexible modes of student participation, including options for interaction and student leadership (e.g., hands-on activities, working on team projects, students teaching other students), various formats (e.g., working individually or with others, choice of roles in team projects)
- Varied options for providing information, with various instructional delivery modes (e.g., teacher-directed, student-directed, technology-driven)
- Options for assessment accommodations and support for students for assessing the accuracy of their answers (e.g., checklists, rubrics)

The researchers collected data from participant interviews and a focus group, and analyzed artifacts such as teacher journals and lesson plans. They used a constant comparative method to develop categories and derive themes. Results from the study indicated that the redesigned course was beneficial for students with and without disabilities. A primary benefit was the participation of all students in the class. Students enjoyed using the varied instructional materials available for activities, such as the digital graphic organizer. The materials were beneficial for many students because they provided adaptations and organizational supports to complete assignments. The flexible and strategic student grouping formats were effective for improving work completion, student engagement, and interactions amongst students. The researchers reported that students without severe cognitive disabilities demonstrated improved classroom participation, personal responsibility, work completion, grades, and end-of-year test scores; students with severe cognitive disabilities showed improved social interaction with peers, enjoyed attending classes, and made progress on their individualized education plan goals.

Social Studies

Basham, Meyer, and Perry (2010) described how the digital backpack project was developed as an accessible and flexible means of providing instruction to diverse high school students. The digital backpack included flexible features and scaffolds that aligned with UDL principles. This project-based approach was intended to support student engagement and foster successful learning experiences. The digital backpack was comprised of mobile and portable hardware and software, as well as instructional support materials. Thirty-five high school students in grades 9-11 participated in this project, including 11 with learning disabilities. Students produced media projects on the topic “What is freedom?” using the resources in their digital backpack.

The researchers collected data through observations, surveys, field notes, and student-generated artifacts. They conducted interviews to determine students' understanding of the main topic (freedom) and to gain insights into their experiences using the digital backpack technology. Researchers concluded that the project-based digital backpack approach enabled diverse students to overcome learning barriers and access key concepts in the curriculum.

Schoolwide Curriculum Initiatives

A few researchers have examined how UDL can be implemented across grade levels and content areas (Katz, 2013; Lieber, Horn, Palmer, & Fleming, 2008). These studies examined applications of UDL to schoolwide practices and curricula.

Katz described the implementation of a schoolwide Three-Block Model of UDL, which consisted of (a) social and emotional learning, (b) inclusive instructional practice, and (c) system and structure. Although the author does not describe the specific alignment of UDL within the three blocks, the intervention described includes several instructional models, methodologies, and strategies that are designed to increase access and engagement consistent with UDL. The intervention was conducted in ten schools in a Canadian province. Katz used a quasi-experimental method, including observations and surveys to measure academic and social engagement. The measures used included observations of types of tasks, groups, and student behaviors. Surveys of social and academic inclusion/exclusion, students' attitudes and behaviors, self-concept, classroom climate, a sense of belonging, and student autonomy were also used.

The study reported an overall increase in academic behavior and engagement with the following data:

- Overall engaged behavior (ES = 1.96, p <. 001): the UDL group reported higher scores on overall engaged behavior and active engagement (ES = 2.49, p < .001), and lower scores on passive (ES = 1.64, p < .001) and non-engagement (ES = 1.61, p <.001).
- Type of task: this did not differ significantly, but the UDL group had a slightly higher level of differentiated tasks and lower level of pencil and paper tasks. The control group had more time with no task and transition time (ES = .39, p < .001).
- Grouping structure (ES = .59, p < .001): the UDL group had higher level of small group/partner (ES = 1.28, p < .001) and independent (ES = .57, p < .001) work structures, and a lower level of whole-class instruction (ES = -.94, p < .001) than the control group.
- Student Autonomy: the UDL group reported higher levels of student autonomy than the control group (ES = .25, p < .001).
- Classroom climate/belonging: the UDL group interacted more with adults (ES = 0.17, p < .001) and peers (ES = 1.71, p < .001) than the control group.

Lieber, Horn, Palmer, and Fleming (2008) described the development and implementation of the Children's School Success (CSS) curriculum, which was designed to benefit students at risk of failure and incorporated the UDL principles. The mixed methods study included 58 preschool students. The purpose of the study was to find ways to increase access to the general curriculum for preschool children with special needs, with a specific focus on ensuring that students made meaningful progress.

The CSS had three components: (a) academic competence, (b) social competence, and (c) individualization. Academic competence was based on research on young children's learning of language and literacy, mathematics, and science concepts. Social competence included self-regulation, prosocial interaction with peers, and the prevention of challenging behaviors. Individualization focused on providing modifications for children who were not actively participating in classroom activities or were unable to master the curriculum content. The researchers described how they aligned their curriculum with UDL principles, ensuring that multiple means of representation, action and expression, and engagement were included in lessons.

The measures used to collect data on student progress were the Peabody Picture Vocabulary Test, selected subtests of the Woodcock Johnson Tests of Achievement, and Individual Growth and Development Indicators: Picture Naming, Rhyming and Alliteration, Letter Naming, and Emergent Writing. The following results were reported:

> The children experienced significant gains in literacy, as indicated by their Rhyming Score t (40) = - 3:03, p = .004; Woodcock-Johnson Letter-Word Identification score t (54) = 6:55, p < .001; Woodcock-Johnson Word Attack score t (52) = -5:56, p < .001; Emergent Writing score t (54) = -5:68, p < .001; Letter Naming Task score t (41) = -6:80, p < .001; Picture Naming Score t (48) = -3:07, p < .005; and PPVT-III standardized score t (48) = -3:30, p < .005.
>
> The children also made significant gains in their math skills, as indicated by their Woodcock-Johnson Applied Problems score t .51/ = -8:13, p < :001; Woodcock-Johnson Quantitative Concepts score t .52/ = -7:21, p < :001; and Woodcock-Johnson Quantitative Concepts Number Series score t .52/ = -5:02, p < :001.
>
> The children experienced marginally significant changes in their social skills, as indicated by their standardized Social Skills Rating System scores t .55/ = -1:87, p = :07. Means on all tests were significantly higher at the post-test, as shown in Table 2. Thus, the learning outcomes of preschoolers with disabilities who had access to the CSS curriculum improved in both academic and social areas. (Lieber, Horn, Palmer & Fleming, 2008, p. 27)

The researchers looked more closely at the experience of two students to determine how UDL and individualization could be used together to enhance access for specific students. The researchers concluded that preschool educators can examine their curricula to determine how the principles of UDL and individualization can be used to increase access. They noted that teachers can determine what already exists in the published curricula and make adjustments relative to UDL and individualization as needed.

Future Directions for Research

The current literature on how UDL can support inclusive practices is comprised of conceptual, descriptive, and research-based articles. Descriptive and conceptual articles define how UDL supports inclusive educational practices, and thus creates accessible and welcoming learning

environments for students. UDL supports inclusion, not only in the classic definition of the term (inclusion of students with disabilities in least restrictive environments) but also in the broader sense of including all learners. By addressing learner variability, UDL's promise is not limited to any specific type of student; the guidelines provide supports and scaffolds that can be useful for all students, including those who are learning the language of instruction and/or come from diverse backgrounds.

Although the underlying premise of UDL as a means to create inclusive environments is inherently appealing to many and is generally valued by educators, it is important to establish the efficacy of UDL-based practices. The currently emerging empirical research base on UDL is growing in quantity and scope. As described above in the summary of recent research studies, researchers have applied UDL principles to the curriculum at various levels—technology-based learning environments, classroom practices that support academic outcomes in various content areas, and adaptations of published curriculum. The results of existing research studies support the efficacy of UDL-based practices, but additional research is needed to continue to build a robust base of evidence on how UDL can be implemented on a large scale (in districts and schools) and at the classroom level.

Section III: Alignment of UDL and IB Documentation

In this section, we reviewed four guidance documents provided by IBO and describe their alignment with UDL. We examined how their language aligns with the wording of UDL, looking for philosophical, conceptual, and literal alignments between IB's guiding documents and the UDL framework.

The four documents we reviewed in June 2015 were:

1. The IB Guide to Inclusive Education (13 pages)
2. Programme Practices and Standards, 2014 (44 pages)
3. The Self-Review Form (24 pages)
4. The IB Learner Profile (1-page)

Prior Evaluation of Selected IB documents

In 2013, CAST conducted a review of two IB documents to assess their alignment with UDL principles and described it in the report titled, *UDL Audit and Report on the International Baccalaureate* (CAST, 2013). CAST reviewed two documents for the report, *International Baccalaureate Diploma Programme Group 1: Literature and Performance*, and *Language A: Language and Literature Guides.*

The report concluded that "in many ways…the International Baccalaureate Organization (IBO) and the UDL framework are closely aligned philosophically" (CAST, 2013). Based on an analysis of instructional practices and assessment guidelines in these documents, the report concluded that the aims and objectives of IB courses are broad enough that teachers had the opportunity to provide options that challenged a range of learners. Some external assessments were defined more narrowly, leaving less flexibility for all students to achieve goals and objectives.

The 2013 report provided a set of recommendations to further align IB practices with UDL, including (a) an examination of the concept of "rigor" to ensure that it does not result in inflexible practices, focusing instead on maintaining high standards by providing challenging learning experiences that build in flexible ways for students to learn and to demonstrate their knowledge and skills; (b) the skills required for success in IB courses should be articulated and teachers given guidance on how to assess and prepare students to ensure access for all learners.

The four documents examined for this current review employed the same criteria to determine their alignment with UDL. We analyzed the IB guidance documents in respect to the foundations and language of the UDL guidelines and checkpoints defined in CAST's publications and compiled in *UDL Theory and Practice* (Meyer, Rose, & Gordon, 2013).

Definition of Inclusion

The *IB Guide to Inclusive Education* (2015) defines the terms "inclusion" and "inclusive education" as "a broad understanding that embraces the diversity of learners and all minority groups" (pp. 1-2). The *IB Guide* highlights two key concepts IBO focuses on to achieve inclusion:

- increasing access and engagement
- removing barriers to learning

These two key concepts from the *IB Guide* are consistent with the central premise of UDL, which is grounded in removing barriers and providing access to the curriculum and instruction by offering flexible options. The UDL principles of Multiple Means of Representation and Multiple Means of Action and Expression provide guidelines for reducing barriers. The third UDL principle, Multiple Means of Engagement, focuses on ways to increase student motivation and engagement.

The four ways equal access should be achieved, according to the *IB Guide to Inclusive Education,* are "affirming identity and building self-esteem, valuing prior knowledge, scaffolding and extending learning" (p. 2). These four tenets are consistent with the UDL guidelines. The table below denotes how the four concepts relate to specific UDL guidelines and their checkpoints (see Appendix A for a one-page overview of the UDL guidelines).

Four tenets from *IBO Guide*	UDL guideline and checkpoint
Affirming identity and building self-esteem	UDL Guideline 8. Provide options for sustaining effort and persistence 8.1 Heighten salience of goals and objectives 8.4 Increase mastery-oriented feedback UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
Valuing prior knowledge	UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation

	3.4 Maximize transfer and generalization UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity 7.3 Minimize threats and distractions
Scaffolding	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.2 Clarify syntax and structure 2.3 Support decoding of text, mathematical notation, and symbols 2.4 Promote understanding across languages 2.5 Illustrate through multiple media UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation 3.4 Maximize transfer and generalization UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation 4.2 Optimize access to tools and assistive technologies UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress
Extending learning	UDL Guideline 3. Provide options for comprehension 3.3 Guide information processing, visualization, and manipulation 3.4 Maximize transfer and generalization UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection

IB Learner Profile

The IB Learner Profile defines the ten attributes of an IB learner. These characteristics are consistent with UDL's focus on developing "expert learners" in the areas of engagement,

representation, and action and expression. The table below illustrates the alignment between the IB Learner Profile and the development of expert learners with UDL. The alignment does not represent mutually exclusive categories; characteristics may fit in more than one category, but we selected a best fit to illustrate the similar underpinnings between UDL and IB philosophies related to learner profiles and development.

UDL Principles and related Expert Learner characteristics	IB Learner Profile IB Characteristics
To develop resourceful, knowledgeable learners (UDL Principle 1: Representation)	Inquirers Knowledgeable Thinkers
To develop strategic, goal-directed learners (UDL Principle 2: Action and Expression)	Communicators Reflective Open-minded
UDL Principle 3: Engagement To develop purposeful, motivated learners (UDL Principle 2: Action and Expression)	Principled Caring Balanced Risk-takers

IB Guidelines for Educational Practices

The 2010 *Programme Standards and Practices* guide lists five practices in the section on "meeting student learning diversity." The table below aligns those practices with the stages of UDL implementation. Although the updated 2014 policy document does not include this specific section, the five program standards and practices remain the same.

Program standards and practices related to student diversity	Related UDL concepts
A9—The school supports access for students to the IB program (s) and philosophy.	Access for all learners is a key concept of UDL.
B1:5—The school develops and implements policies and procedures that support the programs. 5b—The school has developed and implements an inclusion/special educational needs policy that is consistent with IB expectations and with the school's admissions policy.	To ensure schoolwide UDL implementation that includes stakeholders, it is important for schools to articulate policies and procedures that support teachers, students, related personnel, and parents.
B2:8—The school provides support for its students with learning and/or special educational needs and support for their	Although UDL-based approaches ensure inclusion and reduced barriers for all students, it is important to consider the specific needs of students with disabilities

teachers.	and provide additional accommodations and modifications as needed.
C1:6—Collaborative planning and reflection incorporates differentiation for students' learning needs and styles.	Teachers benefit from time to work collaboratively to design instruction for all learners. For example, the PALS process (Meo, 2008) can provide a framework for teachers to plan together to develop UDL-based lessons to meet the needs of general and special education students.
C3:10—Teaching and learning differentiates instruction to meet students' learning needs and styles.	UDL can be used proactively and intentionally as teachers design lessons. UDL "builds in" flexible strategies for differentiation from the outset, taking into consideration systematic and predictable learner variability.

Self-Review Resources

The *IB Guide to Inclusive Education* (2015) provides guidelines for schools to conduct a self-review of their inclusive practices. The guidelines state clearly that schools can reframe and rewrite questions for their own contexts. This flexible approach aligns well with UDL's tenet that context is an important consideration for all levels of instructional design. The guide also includes three case scenarios as models to help schools develop inclusion plans.

The statements on the self-review form provide detailed and specific criteria that school teams can use to assess their current levels of inclusive practice and, consequently, to define goals for the further development of inclusive communities. IB schools are encouraged to review their (a) philosophy, (b) organization, and (c) curriculum. Below we note how the statements listed within each of these three areas aligns with UDL.

Philosophy (P). The criteria for inclusive philosophies align with UDL in several ways. P5 promotes access for **all learners,** which is consistent with the UDL philosophy that instructional access should not be limited to certain defined groups of students. The other categories, P1-P8, define philosophical values about planning for inclusion that are consistent with the underlying philosophy of UDL. P2 emphasizes that the program is aligned to standards and practices, and that the school supports student access to the IB program and philosophy. P3 states that human rights, diversity, quality, and equity need to be taken into account. P7 highlights an important aspect of inclusion by stating that **all teachers** are teachers of **all students**. UDL supports all teachers (general and special educators) to design lessons for all students in inclusive settings.

Organization—Leadership and Structure (OLS). The six criteria in the OLS section articulate clear goals for schoolwide understanding and implementation of inclusive practices. Having a schoolwide policy and collaborative effort is supported by recommendations made by districts and schools that have implemented UDL (Ganley & Ralabate, 2013). For example, OLS 3 notes that the leadership team should be involved in developing inclusion efforts, and OLS 4 states that structures need to be in place to support this development. OLS 5 states that policies need to be in place to support the inclusive nature of schools. All of these criteria align with UDL's focus on having clear goals and objectives for all stakeholders.

Organization—Resources and Support (ORS). The four criteria in this category focus on schoolwide support and the provision of resources. As with OLS, this schoolwide approach is an essential component of UDL implementation. ORS 1 notes that supports for students with learning and/or special educational needs and supports for the teacher should be implemented. ORS 2, ORS 3, and ORS 4 note the need to have accessible environments, resources, and human resources to support inclusion. These standards align with the levels of access addressed by UDL, which support functional, physical, and cognitive access to the learning environment.

Curriculum—Collaborative Planning (CCP). The four criteria for collaborative planning emphasize development from planning for individual students to team-based planning for inclusion. CCP 4 notes that all teachers are responsible for students' language development. This progression is well-aligned with the UDL philosophy of moving from individual difference to learner variability (Meyer, Rose, & Gordon, 2013) and recognizing that variability is the rule in the classroom. If all teachers recognize the need to design instruction with learner variability in mind, properly supporting students will not be limited to special education teachers and other resource teachers.

Curriculum—Written Curriculum (CWC). The six criteria for CWC address a variety of areas, from inclusive practices to cultural and international awareness. The wording of CWC 1—"the written curriculum incorporates inclusive practices and procedures"—is broad. CWC 2 specifies that curriculum builds on students' previous learning experiences. From a UDL viewpoint, it is important for teachers to assess previous learning experiences and not make assumptions about the prior knowledge and experiences students bring to the classroom. UDL Guideline 3 and Guideline 7 recommend addressing students' backgrounds and experiences to enhance their comprehension and engagement.

Curriculum—Teaching and Learning (CTL). The 12 CTL criteria address a broad spectrum of pedagogy, from the conceptual to the practical. CTL 4 is consistent with UDL in its focus on "all" learners. CTL 5 specifically mentions using UDL principles. CTL 6 refers to using technology to "release talent." Technology can be used in various ways to support UDL—as a means to provide access, as a way for students to create and express themselves, and as an engaging way to learn. UDL Guidelines 1, 4, and 5 include checkpoints related to the use of digital tools and media to provide multiple options for perception, action, and expression. The CTL criteria also clearly define schoolwide values and expectations (academic honesty and integrity) and reiterate the CCP 4 criteria that all teachers are responsible for language development. UDL Guidelines 2 and 3 support language development in terms of clarifying vocabulary and comprehension.

Curriculum—Assessment (CA). The three CA criteria broadly address inclusive assessment values. The criteria do not address how UDL can be applied to assessment, such as flexible formats and methods that allow all learners to demonstrate their knowledge and skills. For example, UDL focuses on reducing/removing construct-irrelevant barriers in assessments. (To assess a student's content knowledge, a teacher can ask students to write or orally explain the concepts. If an assessment is limited to one format, such as a written test, this can be a barrier for a student who has a learning disability or one who is learning the language of instruction.) To make assessments more accessible, IB can also define more explicitly how formative assessments, in addition to summative, can help students by providing mastery-oriented feedback, reducing threats to learning, and providing scaffolds to achieve mastery.

Summary

This review of the UDL literature illustrates how the construct of Universal Design for Learning is defined, operationalized, and implemented. Researchers and practitioners use the principles and guidelines to inform policy and practice when considering inclusive learning environments. UDL focuses on creating accessible learning environments for all learners, including students with disabilities, students from culturally and linguistically diverse backgrounds, and students who are gifted and talented. Moving away from the one-size-fits-all approach for the classroom, UDL-aligned instruction includes multiple pathways and flexible options for students to engage with curriculum and instruction and become expert learners.

The existing literature on UDL includes numerous conceptual and descriptive articles on how UDL can be applied in educational settings. In recent years, researchers have started to conduct empirical studies to examine the outcomes of UDL-based instruction. This body of research on UDL implementation at various levels—large scale, school-based, and classroom level—is growing and will continue to shape and inform UDL implementation efforts in the future.

A review of IB documents on the standards for curriculum and practice illustrates that IB philosophy and practices are well-aligned with the guiding tenets of UDL. IB guidelines emphasize the need to consider student diversity at various levels, from school philosophy to organization to instructional practices. The IB focus on reducing barriers and providing teaching and learning approaches that support and engage all learners is consistent with UDL's central premise of addressing learner variability by proactively designing instruction for all learners.

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The bibliography lists the key articles used in this literature review. We have organized the articles into the following categories and synthesized relevant resources to address the research questions:

1. UDL-Related Books and Book Chapters
2. Reports/White Papers on UDL Policy and Implementation
3. Large-Scale Implementation Websites
4. Pre-Service and In-Service Teacher Training
5. Descriptive Articles about Applying UDL to Classroom Practices
6. Articles about UDL and Assessment
7. Articles about UDL and Culturally and Linguistically Diverse Students
8. Reviews of Research on UDL in K-12 Settings
9. Research Studies of UDL Application in K-12 Settings

1.UDL-Related Books and Book Chapters

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Survey Results

The survey was comprised of 60 items in four sections (see Appendix B):

Section I: Demographic Information (Multiple Choice)
Section II: Knowledge and Understanding (Likert Scale)
Section III: Teaching Practices (Likert Scale and Open-Ended)
Section IV: UDL Implementation (Open-Ended)

The survey was administered using the Key Survey system. The online survey link was sent to 153 IB coordinators in IB Asia, Europe, Middle East (IBAEM), 78 in IB Asia-Pacific (IBAP), and 258 in IB Americas (IBA). IB coordinators were asked to distribute the survey link to teachers and administrators at their schools; 127 individuals consented to participate in the study and completed the survey.

Section 1: Demographic Information

Section 1 of the survey included items on the locations, settings, and demographics of the individuals who participated. This section summarizes information on the regions represented by survey participants, the type of IB programs and age levels at their schools, student diversity characteristics, participants' educational backgrounds, and respondents' current roles at their schools. The data presented in the tables in Section 1 are based on a total of 127 responses. Some items allowed respondents to select more than one item, as noted under the table when applicable.

Location. Table 1 shows the participants' locations by region and country. There were 43 participants from 17 countries in IBAEM, 63 participants from 9 countries in IBA, and 21 participants from 8 countries in IBAP.

Table 1. Participants by Country and Region

IBAEM	*n*	IBA	*n*	IBAP	*n*
Austria	1	Brazil	1	Australia	2
Bahrain	1	Canada	8	China	2
Germany	2	Costa Rica	1	India	7
Iran	1	Dominican Republic	3	Japan	2
Jordan	1	Ecuador	8	Philippines	4
Lebanon	2	Mexico	3	Singapore	2
Lesotho	15	Nicaragua	1	Thailand	1
Malta	1	Peru	4	Vietnam	1
Netherlands	2	USA	34	**R3 Total**	**21**
Poland	2	**R2 Total**	**63**		
Qatar	1				
Russian Federation	1				
Spain	5				
Switzerland	1				
Turkey	5				
Uganda	1				
United Arab Emirates	1				
R1 Total	**43**				

IB programs and age levels. Almost all of the schools had IB Diploma Programs (DP) and a few had IB Primary Year Programs (PYP), Middle Years Programs (MYP) and a Career-related Certificate (CC; see Table 2).

Table 2. IB Programmes at Participants' Schools

Programs	Response percentage (*n*)
PYP	14% (18)
MYP	12% (15)
DP	98% (125)
CC	6% (8)

Note: Multiple responses could be selected by the 127 participants

Due to variations in the way grade levels are denoted at schools internationally, the survey queried participants about the age level of the students at their schools. Most participants taught students at the secondary level, a large majority of them age 17-19, followed by students age 13-16 (see Table 3).

Table 3. Age Levels Taught by Participants

Age spans	Response percentage (*n*)
3-4	1% (1)
5-8	0% (0)
9-12	6% (8)
13-16	43% (55)
17-19	88% (112)

Note: Multiple responses could be selected by the 127 participants

Educational licensure and roles. Most participants were trained as general educators, with a few having earned special education or inclusion training (see Table 4). The participants who selected "other" as their response wrote in the following educational credentials: business and economics, business education, counseling, didactics of languages, doctoral degree, educational technology, foreign language instruction, IB Language A: Literature, IBDP coordination, MBA, and visual arts.

Table 4. Educational Training

Training	Response percentage (*n*)
General education	84% (107)
Special education	7% (9)
Inclusion	6% (8)
Other	22% (28)

Note: Multiple responses could be selected by the 127 participants

Thirty-three percent of the participants were teachers, 21% were IB coordinators, and 31% were both teachers and IB coordinators (see Table 5). Those who selected "administrator" or "administrator and IB coordinator" as their response included four vice principals, a curriculum coordinator, a director of studies, a school administrator, and an assistant head of school. Those who selected the "other" category included Creativity Action Service (CAS) coordinators and individuals who had multiple roles, such as teacher/CAS coordinator, teacher/college counselor, and teacher/department head.

Table 5. Participant Role(s)

Role	Response percentage (n)

Teacher	33% (42)
IB coordinator	21% (27)
Administrator	1% (1)
Both teacher and IB coordinator	31% (39)
Both administrator and IB coordinator	6% (8)
Other (Please specify)	8% (10)

Student characteristics. To gain an understanding of students' diverse characteristics, participants were asked about disability categories and language learners who received instruction in general education settings at their schools (see Table 6). The most prevalent category in the participants' school settings was non-native speakers of the language of instruction. Eighty-two percent of the participants had non-native speakers of the language of instruction at their schools. The most prevalent disability categories were learning disabilities and emotional behavioral disabilities, at 72% and 74%, respectively. The schools also had students with physical disabilities, cognitive disabilities, autism spectrum disorders, and general learning challenges.

Table 6. Student Diversity Categories

General education classrooms include	Response (n)
Students with physical disabilities	57% (72)
Students with learning disabilities	72% (92)
Students with emotional/behavioral disabilities	74% (94)
Students with cognitive disabilities (intellectual disabilities)	54% (69)
Children on the autism spectrum	42% (53)
Children with learning challenges	69% (88)
Non-native speakers of the language of instruction	83% (105)

Note: Multiple responses could be selected by the 127 participants

Section II: Knowledge and Understanding

UDL training. Most participants had not learned about UDL through formal professional development opportunities or in their teacher training programs (see Table 7). Twenty-seven percent had learned about UDL through professional development workshops or courses, and 17% had learned about UDL in their teacher preparation programs. Fifty percent had learned about UDL through self-study (e.g., reading articles, visiting websites), and 34% had used UDL resources published in articles and books, and on websites.

Table 7. UDL Training

I learned about UDL through...	Yes (n)	No (n)
Professional development workshops/courses	27% (34)	73% (93)
Teacher preparation program	17% (22)	83% (105)
Self-study (reading articles, visiting websites)	50% (63)	50% (64)
Using UDL resources published in articles, books, or on the web	34% (43)	66% (84)

Knowledge of UDL concepts. The survey included ten questions about participants' knowledge and understanding of key UDL terms and concepts (see Table 8). Items 1-6 referred to specific UDL-related terminology and concepts. Items 7-10 referred to constructs related to inclusive practices that are closely aligned to the UDL guidelines. These items were worded in more general terms, without the specific UDL terminology.

A visual inspection of the data revealed considerable differences between these two subsets of items (1-6 and 7-10). To quantify this difference, we summed up the percentages of participants who reported being "moderately familiar" (Likert scale rating 4) and "extremely familiar" (Likert scale rating 5) with each item, and took an average of those percentages across items 1-6 and 7-10. We also took an average of those who rated themselves as "not at all familiar" (Likert scale rating 1) across these two subsets.

For items 1-6, which related to knowledge of specific UDL concepts, an average of 16% rated themselves as moderately or extremely familiar with the items. Almost half of the participants (45%) rated themselves as not at all familiar with these specific UDL concepts (Likert scale rating 1).

Participants were considerably more familiar with broader inclusive practice constructs (items 7-10) than they were with specific UDL concepts (items 1-6). An average of 40% rated themselves as moderately or extremely familiar with concepts related to inclusive practices (items 7-10); only 9% were not at all familiar (Likert scale rating 1) with these constructs.

Table 8. Knowledge of UDL-Related Terminology and Concepts

	1- I am not at all familiar with this topic	2- I am slightly familiar with this topic	3- I am somewhat familiar with this topic	4- I am moderately familiar with this topic	5- I am extremely familiar with this topic	Response totals (n)
1. The three principles of Universal Design for Learning (UDL)	45% (57)	24% (31)	14% (18)	14% (18)	2% (3)	127
2. How to apply the UDL principles and guidelines to instruction	46% (58)	23% (29)	13% (17)	13% (17)	4% (5)	126
3. The three learning networks of the brain (recognition, strategic, affective networks) that are associated with UDL	40% (51)	25% (32)	18% (23)	13% (17)	3% (4)	127
4. How UDL can be used to reduce barriers in the learning environment	46% (58)	20% (25)	16% (20)	14% (18)	4% (5)	126
5. How to use UDL during the lesson planning process	46% (58)	19% (24)	19% (24)	13% (17)	2% (3)	126
6. How UDL can be used to create inclusive learning environments	48% (60)	20% (25)	17% (22)	12% (15)	3% (4)	126
7. How to design instruction to address learner variability during the lesson planning process	20% (25)	20% (26)	26% (33)	26% (33)	8% (10)	127
8. How to include flexible options and instructional scaffolds for students with disabilities	21% (27)	15% (19)	28% (35)	27% (34)	9% (12)	127
9. How to include flexible options and instructional scaffolds for students from diverse cultural/ethnic/linguistic backgrounds	19% (24)	17% (22)	22% (28)	29% (37)	12% (15)	126
10. How to use digital media and technology tools to create accessible instructional environments	14% (17)	18% (23)	21% (26)	30% (37)	18% (22)	125

Note: Percentages are rounded and therefore may not add up to 100

Section III: Teaching Practices

Those who selected "teacher" as their role in the demographic information section of the survey were asked to complete Section III, which included 31 Likert scale items and three open-ended items that examined participants' use of UDL during lesson planning and classroom teaching.

- Lesson planning (items 11-16)
- UDL Principle I: Multiple Means of Representation (items 17-24)
- UDL Principles II: Multiple Means of Action and Expression (items 24-34)
- UDL Principle III: Multiple Means of Engagement (items 33-44)

Items 17-44 were all derived from the wording of the nine UDL guidelines. The guideline related to each item is listed beside it in Tables 10, 11, and 12. Each section also includes a reverse worded item, denoted by "reverse item" in parenthesis in the table.

Lesson planning. When designing inclusive UDL-based lessons, teachers are encouraged to consider UDL during the lesson planning process. The UDL lesson design cycle includes identifying and stating instructional goals and developing flexible methods, materials, and assessments that take learner variability into account. The UDL guidelines provide flexible scaffolds and supports that teachers can use in the lesson planning process. Items 11-16 were designed to elicit information on teachers' lesson planning practices.

The participants reported using these inclusive/UDL-based lesson design practices at a high level (Likert scale rating 4 and 5) (see Table 9). For items 11-15,* an average one-third (34%) of participants responded that they consider these inclusive/UDL-based lessons when they design instruction "almost always/always" (80%-100% of the time). An additional 45% stated that they use these practices "often" (50%-80% of the time).

*NOTE: In this set of questions, items 11-15 were designed to provide information about lesson planning practices and item 16 was intended to be a reverse worded item. For analysis purposes in all other sections, we flipped the scale for reverse worded items and include the reverse item in the calculation of means. However, in this section we eliminated item 16 from the calculation due to a possible weakness in the item's wording. During the interviews, it became apparent that IB teachers focused on preparing students for DP assessments in one format, so they likely responded to item 16 to describe an instructional practice they were held to. As a result, item 16 did not serve as the reverse item it was intended to be, and we eliminated it from the analysis for this section.

Table 9. Lesson Planning Practices

	Never	Rarely (<20% of the time)	Occasionally (20-50% of the time)	Often (50-80% of the time)	Almost Always or Always (80-100% of the time)	Response totals (n)
11. I plan lessons with learner variability in mind	0% (0)	5% (4)	24% (21)	41% (36)	31% (27)	88
12. When I design a lesson, I clearly define instructional goal(s) for each lesson	0% (0)	1% (1)	7% (6)	42% (37)	51% (45)	89
13. When I design a lesson, I consider how I can include flexible instructional strategies that provide options and choices and engage students	0% (0)	3% (3)	16% (14)	49% (43)	32% (28)	88

14. When I design a lesson, I consider how to use flexible materials that provide options and choices and engage students	0% (0)	3% (3)	16% (14)	55% (49)	26% (23)	89
15. When I design a lesson, I consider flexible assessments that give students varied ways to demonstrate mastery of lesson goal(s)	1% (1)	7% (6)	21% (19)	40% (36)	30% (27)	89
16. I use the same assessments for all students. (Reverse Item)	2% (2)	10% (9)	21% (19)	43% (38)	24% (21)	89

Note: Percentages are rounded, and therefore may not add up to 100

UDL Principle I: Multiple Means of Representation. Items 17-23 relate to UDL Principle I: Multiple Means of Representation (see Table 10). This principle is further defined by UDL Guidelines 1, 2, and 3 and their related checkpoints (see Appendix A). Guideline 1 addresses the provision of multiple options for perception. Guideline 2 addresses options for language, mathematical expressions, and symbols for vocabulary and language. Guideline 3 addresses options for comprehension. Table 10 denotes how often participants included multiple means of representation in their instructional practice. Item 18 was reverse worded, and for analysis purposes the responses were flipped and included in the calculation of means.

To examine what percentage of participants use these practices frequently, we took an average across items 17-23 for those who use the practices "often" (Likert scale rating 4) and "almost always/always" (Likert scale rating 5). Data revealed that a high percentage of participants use instructional practices consistent with Multiple Means of Representation. Thirty-two percent provide options related to multiple means of representation "almost always/always" (80%-100% of the time). An additional 43% provided these options "often" (50%-80% of the time).

To examine which UDL guidelines related to Multiple Means of Representation were addressed most often in teachers' instructional practices, we summed by responses on the high end (Likert scale ratings 4 and 5). The practices most often used by participants were keyed to UDL Guideline 3 (Items 21-23), which relates to the provision of options for comprehension. An average of 85% of teachers used those three practices to enhance comprehension 50%-100% of the time. Teachers also reported using practices related to clarifying vocabulary and symbols (Guideline 2, Item 19) at a high level, with 83% of participants using these practices 50%-100% of the time.

Table 10. Practices Related to UDL Principle I: Multiple Means of Representation

	1-Never	2-Rarely (<20% of the time)	3-Occasionally (20-50% of the time)	4-Often (50-80% of the time)	5-Almost Always or Always (80-100% of the time)	Response Totals (n)
17. As appropriate, I provide options for perception by presenting information in more than one format (e.g., text, oral, multimedia). (Guideline 1)	1% (1)	5% (4)	17% (14)	47% (39)	30% (25)	83
18. I present information in only one format to all students (Reverse Item)	10% (8)	33% (27)	36% (30)	12% (10)	10% (8)	83

19.	I use instructional strategies to clarify key terms, vocabulary and symbols related to the content that I am teaching (Guideline 2)	1% (1)	1% (1)	15% (12)	49% (40)	34% (28)	82
20.	I use strategies to promote understanding across languages (Guideline 2)	5% (4)	8% (7)	22% (18)	45% (37)	20% (17)	83
21.	I use instructional strategies to make new information comprehensible for students (Guideline 3)	0% (0)	0% (0)	14% (12)	42% (35)	43% (36)	83
22.	I use instructional strategies that provide scaffolds for comprehension (e.g., highlighting key concepts, connecting to background knowledge) (Guideline 3)	0% (0)	0% (0)	13% (11)	40% (33)	46% (38)	82
23.	I use instructional strategies that help students transfer knowledge and generalize what they are learning (Guideline 3)	0% (0)	0% (0)	17% (14)	43% (36)	40% (33)	83

Note: Percentages are rounded, and therefore may not add up to 100

Summary of open-ended responses. Participants were asked to make one selection from items 17-23 and describe the instructional strategies they implement in relation to that item. Table 11 provides an overview of the strategies participants described. Thirty-four people described how they provide options for perception (UDL Guideline 1), 11 participants described how they provide options for language, mathematical expressions, and symbols (UDL Guideline 2), and 38 people described how they provide options for comprehension (UDL Guideline 3). Table 11 summarizes the participants' key comments and presents a few selected quotes to illustrate how they described their instructional practices. For key comments that were mentioned multiple times, the number of mentions is presented in brackets.

Table 11. Key Comments and Selected Quotes Related to UDL Guidelines 1, 2, and 3

UDL Guideline 1. Provide options for perception (n=34)

- Present information in multimodal formats [21]
  (for example, videos, presentations, animations, simulations, demonstrations, illustrations, audio files, blog posts, graphics)
- Divide students into groups to discuss concepts [4]
- Make info relevant and practical [4]

"I have students with different native languages in the classroom and always present information in various formats to accommodate background and learning styles."

"New material/information is presented orally, in written form, and as a multimedia presentation, depending on the specific needs of the class."

"I use picture presentations, make illustrations on the board, download YouTube videos to present the same concepts and give the learners an opportunity to discuss the concepts among themselves. This is done with an understanding that learners have different abilities; what works for one may not necessarily work for others. This enables all the learners to understand the concepts."

UDL Guideline 2. Provide options for language, mathematical expressions, and symbols (n=11)

- Start with language that students know; translate terms [4]
- Use diagrams, pictures, visuals, videos with text [4]
- Allow students to use bilingual and electronic dictionary [2]
- Clarify key terms and vocabulary in mathematics

- Paraphrase key vocabulary
- Provide vocabulary lists
- Provide examples of key terms

"Provide vocab lists ahead of lessons to allow candidates to translate key words, command term definitions and labels on diagrams prior to teaching them. Accompany tasks with images where possible to support interpretation of nouns. Support learners of the same mother tongue to clarify tasks and knowledge together rather than always requiring them to use the language of instruction."

"Once I describe the aim of a lesson, I always display on the board the key terms related to the topic at hand, as well as the new vocabulary to be developed. The new words and concepts are crossed out once we encounter them during the delivery of instruction, and the way these new terms are related to old ones is spelled out. Concrete examples (for instance, the concepts of Least Common Multiple and Least Common Denominator are equivalent, but in different applications) are used as basis for the development and discussion of new words. New words are highlighted, framed, and placed on board, along with explanatory examples(s)."

UDL Guideline 3. Provide options for comprehension (n=38)

- Use varied materials/resources (flip cards, diagram/summaries, graphic organizers, concept maps, KWL chart, illustrated PowerPoint [9]
- Connect topics to info that is familiar/relevant for students [8]
- Connect new information to prior knowledge [8]
- Use methods to highlight critical features (e.g., color coding) [5]
- Ask students to explore cultures they are familiar with [4]
- Providing various examples related to topic [3]
- Outline key concepts and vocabulary that will be addressed in unit [2]
- Students have choices of responses; students generate questions [2]
- Discuss topics and reflect [2]
- Provide multiple points of entry into a unit

"I try to give as much background contextual information as possible. As a literature or drama teacher, understanding historical and contextual background gives relevance to the subject matter, gives reason for why it matters and also helps students to empathise not only with the 'characters' but also with a range of people who think in diverse and multiple ways. This allows students from all levels to gain a sense of connection with the subject matter. I also break down the stages needed for a particular student or level of students to reach a particular outcome. I have multiple ways of entry for key words and definitions of things they need to know."

"I use various Cultures of Thinking routines in my classroom that help students to think about the material. Although students may be at different learning levels, they can all participate to the extent that they are able. A specific example would be using the explanation game when introducing a new grammar concept. The students have to look at examples and come up with common features that they see as well as questions that they have about the concept."

UDL Principle II: Multiple Means of Action and Expression. Items 25-33 relate to UDL Principle II: Multiple Means of Action and Expression. This principle is further defined by UDL Guidelines 4, 5, and 6 and their related checkpoints (see Appendix A). Guideline 4 addresses the provision of options for physical action. Guideline 5 addresses options for expression and communication. Guideline 6 addresses options for executive functions. Table 12 denotes how often participants included multiple means of action and expression in their

instructional practice. Item 29 was reverse worded and, for purposes of analysis, the responses were flipped and included in the calculation of means.

To examine what percentage of the participants use these practices frequently, we took an average across the items for those who use the practices "often" (Likert scale rating 4) and "almost always/always" (Likert scale rating 5). On average, slightly less than one-third of the participants (29%) provided multiple means of action and expression "almost always/always" (80%-100% of the time). An additional 43% provided these options "often" (50%-80% of the time).

To examine which UDL guidelines related to Multiple Means of Action and Expression were addressed most often in teachers' instructional practices, we summed by responses on the higher end (Likert scale ratings 4 and 5). Teachers gave students the opportunity to practice skills (UDL Guideline 5, Item 30), with 88% of teachers using these strategies 50%-100% of the time. Teachers also reported that they provided options for executive function, such as goal-setting and monitoring one's own progress (UDL Guideline 6, Items 31 and 33) at a high level, with an average of 78% responding that they used these practices 50%-100% of the time.

Table 12. Practices Related to UDL Principle II: Multiple Means of Action and Expression

	1-Never	2-Rarely (<20% of the time)	3-Occasionally (20-50% of the time)	4-Often (50-80% of the time)	5-Almost Always or Always (80-100% of the time)	Response Totals (n)
25. My students have varied ways to respond and navigate information within a lesson. (Guideline 4)	1% (1)	4% (3)	20% (16)	53% (43)	22% (18)	81
26. My students have access to instructional and assistive technologies as needed (e.g., digital text for students with literacy-related disabilities, technology tools to communicate) (Guideline 4)	7% (6)	12% (10)	25% (20)	33% (27)	22% (18)	81
27. I provide opportunities for my students to use multiple media to express their knowledge (e.g. constructing/creating knowledge with digital tools, various materials and media) (Guideline 5)	1% (1)	5% (4)	23% (18)	47% (37)	24% (19)	79
28. I provide opportunities for my students to express their knowledge in varied formats (e.g. verbal, written, drawing, through physical demonstration) (Guideline 5)	0% (0)	6% (5)	21% (17)	37% (30)	36% (29)	81
29. I present my students with only one way to express their knowledge (Reverse Item)	24% (19)	33% (26)	21% (17)	18% (14)	5% (4)	80
30. During the instructional process, I include opportunities for my students to practice skills that they are expected to master (Guideline 5)	0% (0)	0% (0)	13% (10)	38% (30)	50% (40)	80
31. I guide my students to set goals for themselves during the learning process.	0% (0)	1% (1)	20% (16)	56% (45)	23% (18)	80

	1-Never	2-Rarely (<20% of the time)	3-Occasionally (20-50% of the time)	4-Often (50-80% of the time)	5-Almost Always or Always (80-100% of the time)	Response Totals (n)
(Guideline 6)						
32. I use instructional strategies that help my students organize and plan out their work during a lesson (Guideline 6)	0% (0)	6% (5)	22% (18)	41% (33)	31% (25)	81
33. I provide ways for my students to monitor their own progress (Guideline 6)	1% (1)	5% (4)	17% (14)	51% (41)	26 % (21)	81

Note: Percentages are rounded, and therefore may not add up to 100

Summary of open-ended responses. Participants were asked to make one selection from items 25-33 and describe the instructional strategies they implement relative to that item. Table 13 provides an overview of the strategies participants described, relative to the UDL guidelines the selected items represented. Fifteen participants described how they provide options for physical action (UDL Guideline 4), 41 described how they provide options for expression and communication (UDL Guideline 5), and 38 described how they provide options for executive functions (UDL Guideline 6). Table 13 summarizes the participants' key comments, and a few selected quotes illustrate how participants described their instructional practices. For key comments that were mentioned multiple times, the number of mentions is presented in brackets.

Table 13. Key Comments and Selected Quotes related to UDL Guidelines 4, 5, 6

UDL Guideline 4. Provide options for physical action (n=15) • Use a variety of digital tools and formats for expression (e.g., journal, blogs, wikis, tablets, laptops, smartboards) [4] • Utilize course management systems/websites to upload homework/worksheets (e.g., Moodle, ManageBac, Schoolology) [4] • Use collaborative documents [2] • Provide access to digital text • Students can access internet to do research on topics anytime • Graphing calculator "Blogs, wikis, tablets, laptops, smartboards are all in use in the classroom." "Resource material is shared through ManageBac with written text or video links available for review and pre-learning before class. Presentations can take the form of oral Q&A responses or PowerPoints on key learning objectives. Often assessments tend to focus on the DP final exam style written questions, data responses or extended responses to build skills necessary for DP external exams."
UDL Guideline 5. Provide options for expression and communication (n=41) Students demonstrate and express their knowledge in varied ways: • Using a variety of formats (e.g., oral, written, play, acting, drawing, mock trials, seminars) [11] • Work in groups to discuss and present information in various formats (demos, labs, presentations, skits) [8] • Oral presentations along with use digital media (e.g. PowerPoint, posters, podcasts) [4] • Demonstrate different ways of reaching solutions [3] Teachers employ strategies such as: • Give students opportunities to practice skills (e.g., guided practice, independent practice, practice with peers)

[4]
- IB practice questions given in varied formats (e.g., class discussions, formative seat work, group brainstorming, individual homework and summative assessments) [2]
- Students can choose format for assessment; rewarded for risk-taking

"To prepare students for their IB tests, I require that they express their learning in various formats."

"Students present in groups, review materials for peers, PowerPoints, symbols, role play. However, ultimately, students are essentially assessed externally in writing so we have to ensure we prepare them accordingly"

"In our poetry unit, students demonstrate their understanding of selected poems and their construction through colour marking, illustrating poems, writing commentary, doing a pastiche of a poem, reciting a poem from memory and presenting an oral response to the poem."

"In a lesson on writing effective paragraphs, I provide opportunities for students to practice finding and integrating quotations. This is part of a scaffolded approach to developing essay writing skills."

"I include numerous 'low risk' activities to practice with a skill and provide peer and teacher feedback and re-teaching as necessary before the skill is evaluated."

UDL Guideline 6. Provide options for executive functions (n=22)
- Students set targets/goals for themselves and monitor their own progress [7]
- Self-evaluation and reflection; students analyze their performance, self-assess to see where errors are being made, and set future goals [6]
- Teachers provide rubrics, models, and exemplars [4]
- Teachers chunk down large tasks and monitor progress [2]
- Opportunities for feedback conferences with teacher

"Students are asked to use a variety of self-assessment tools for reviewing exam performance. These include categorising types of error and setting action plans for future goals."

"I usually break down the entire syllabus into various concepts or topics. Then I give them [students] an estimate of how long each project is supposed to take. They then fill in the dates and deadlines of when they will finish or produce the said works."

"I help students develop strategies to master larger, long-term assignments. I work with students to break larger tasks into manageable chunks, set deadlines, check progress, etc. I spend a part of each period updating their agendas, planning weekly and daily goals, and monitoring progress."

"At the start of each topic students are given progress forms on which they tick concepts they are familiar with or they would be more interested in learning about. From that, they set a target for themselves, the score they are anticipating after assessment like a test. The ticking process continues throughout the entire topic."

UDL Principle III: Multiple Means of Engagement. Items 35-43 relate to UDL Principle III: Multiple Means of Engagement (see Table 14). This principle is further defined by UDL Guidelines 7, 8, and 9 and their related checkpoints (see Appendix A). Guideline 7 addresses options for recruiting interest. Guideline 8 addresses options for sustaining effort and persistence. Guideline 9 addresses options for self-regulation. Table 14 denotes how often participants included multiple means of engagement as part of their instructional practice. Item 39 was reverse worded, and for purposes of analysis the responses were flipped and included in the calculation of means.

To examine what percentage of participants use these practices frequently, we took an average across the items for those who use the practices "often" (Likert scale rating 4) and "almost always/always" (Likert scale rating 5). On average, just over one-fifth (21%) provided multiple means of engagement "almost always/always" (80%-100% of the time). An additional 43% (on average) provided these options "often" (50%-80% of the time).

To examine which UDL guidelines related to Multiple Means of Engagement were addressed most often in teachers' instructional practices, we summed by responses on the higher end (Likert scale ratings 4 and 5). Teachers used strategies to make instruction relevant and authentic (UDL Guideline 7, Item 36) at a high level, with 83% of teachers using these strategies 50%-100% of the time. Teachers also reported using instructional strategies that foster student self-belief and confidence (UDL Guideline 9, Item 42) at a high level, with 80% responding that they used these practices 50%-100% of the time.

Table 14. Practices Related to UDL Principle III: Multiple Means of Engagement

	1-Never	2-Rarely (<20% of the time)	3-Occasionally (20-50% of the time)	4-Often (50-80% of the time)	5-Almost Always or Always (80-100% of the time)	Response total (n)
35. I include options that let students make choices during a lesson. (Guideline 7)	0% (0)	8% (6)	36% (27)	43% (33)	13% (10)	76
36. I include instructional strategies to make lessons relevant and authentic to my students. (Guideline 7)	0% (0)	1% (1)	16% (12)	51% (39)	32% (24)	76
37. I use instructional strategies to minimize threats and distractions for students. (Guideline 7)	1% (1)	4% (3)	19% (14)	52% (39)	24% (18)	75
38. I include options to give students a range of challenge they can choose from within a lesson. (Guideline 8)	1% (1)	14% (10)	36% (27)	39% (29)	9% (7)	74
39. I give all students the same challenges within a lesson. (Reverse Item)	5% (4)	16% (12)	35% (26)	32% (24)	11% (8)	74
40. I use collaborative grouping strategies with the goal of supporting students with persistence and effort. (Guideline 8)	0% (0)	8% (6)	21% (16)	47% (35)	24% (18)	75
41. I provide mastery-oriented feedback to students during lessons (mastery-oriented feedback includes feedback on progress toward the goal and emphasizes effort and practice) (Guideline 8)	0% (0)	4% (3)	28% (21)	47% (35)	21% (16)	75
42. I use instructional strategies that foster student self-belief and confidence. (Guideline 9)	0% (0)	3% (2)	17% (13)	51% (38)	29% (22)	75
43. I provide opportunities for my students to assess their own progress and self-reflect on their learning. (Guideline 9)	0% (0)	7% (5)	17% (13)	45% (34)	32% (24)	76

Summary of open-ended responses. Participants were asked to make one selection from items 35-43 and describe the instructional strategies they use relative to that item. Table 15 provides an overview of the strategies participants described, relative to the UDL guidelines the selected items represented. Nineteen participants described how they provide options for recruiting interest (UDL Guideline 7), 23 described how they provide options for sustaining effort and persistence (UDL Guideline 8), and 28 described how they provide options for self-regulation (UDL Guideline 9). Table 15 presents a summary of the participants' key comments, and a few selected quotes that illustrate how participants described their instructional practices. For key comments that were mentioned multiple times, the number of mentions is presented in brackets.

Table 15. Key Comments and Selected Quotes Related to UDL Guidelines 4, 5, 6

UDL Guideline 7. Provide options for recruiting interest (n=19)

- Real word applications and connections; authentic sources [7]
- Give students choice in selected the topic to study [3]
- Connect literary texts to topics of current relevance [2]
- Allow students to maintain creative control
- Make cultural connections

"Where possible, case studies are learner-generated rather than teacher-directed to allow individual interests and personal experience, to determine the location and scale of it. This increases learner motivation and allows the learner to make the theory appear more relevant to them."

"Students are able to choose their own scenes as well as the direction they wish to go with their characters and performances. I give guidance, but students maintain all creative control. I only offer advice or ask questions to direct student thinking."

"All literary texts are introduced and read with a view to current relevance to make the texts reader-friendly rather than off-putting."

UDL Guideline 8. Provide options for sustaining effort and persistence (n=23)

- Group work with various purposes:
    - Group work to foster discussion collaboration skills and respect for each other [8]
    - Group work for students to solve problems, share opinions, and assist each other [7]
    - Group work in which students generate a presentation to teach to the class
- One-to-one consultations with students, provide feedback on drafts, and emphasize progress towards goals [3]
- Immediate constructive feedback [2]
- Opportunities to redo work to mastery
- Select tasks at their challenge level

"All students belong to a family of 4 and a shoulder partner that they work with daily. This has helped to fill in the blanks with skills or abilities that were missed at lower levels and I might not otherwise know exist."

"I put up their group members' names on 3-4 different soft boards in the close vicinity of the classroom and they find that out and sit in the class. Each group may be given the same task (and sometimes different tasks) that they need to complete within a stipulated period of time and one of them (I choose it normally) present to whole class and answers to the questions posed by remaining groups. Thus, a child in a group consciously takes part during discussion because it never knows that he/she might need to face the rest of the class to answer their queries. This strategy helps me to keep every child in group engaged and also learn. I have observed student's confidence boosts up after couple of such opportunities, especially after they respond to best of their abilities to rest of the class."

"One-to-one consultations on student writing in progress and on feedback provided on drafts emphasizes progress toward a specific goal and encourages effort, practice, and a willingness to experiment."

UDL Guideline 9. Provide options for self-regulation (n=28)

- Reflection on goals and performance [8]
- Peer evaluation and reflection [4]
- Self-assessment opportunities [4]
- Checklists, rubrics for self-evaluation [4]
- Students have the opportunity to repeat and improve performance [2]
- Students identify strengths and abilities [2]
- Peer teaching [2]
- Methods to boost student self-confidence, motivation, self-esteem [2]
- Keeping a journal of what was challenging, impressions they have [2]

"Using a variety of questioning techniques with individual students, which will allow them to be successful and demonstrate some mastery according to their needs and ability."

"We use what I call 'peer assessment.' When students do projects as an individual or a group, I let students rank their classmates' projects using the rubric I provide. I also have them make three positive things about the project and three things that they feel would make the project better. I put all the responses together and I then sit down with the student(s) and discuss what their peers thought as well as my own feelings. They are with time permitted allowed to make changes to help increase their grade as well as be more satisfied with what they did. Some of my highly motivated students are also perfectionist so this helps them get closer to perfection and not feel down."

"At the end of each topic I provide a self-test before an actual test on the topic. My students are also given a chance to compile their own revision check lists and make their own flash cards. After...work [is] done, students evaluate themselves looking at how they have to improve, and where to improve. Most of the time students recognize their weakness [more] than strengths."

Section IV: UDL Implementation

This section provides a summary of the responses to the three open-ended items that concluded the survey:

- Item 45: What is your definition of Universal Design for Learning (UDL)?
- Item 46. What are the challenges you face with implementing UDL in your school or classroom setting?
- Item 47. If you have any other comments in relation to UDL use in your IB school setting, please note them below.

The sections and tables below summarize key comments and direct quotes from the responses to these three open-ended questions. The complete set of responses can be found in Appendix D. Although a response was required for each item, some participants chose to respond with "not applicable" or "no comment."

Definition of UDL. Forty-three participants provided a definition of UDL in their own words, 43 wrote "no comment" or "not applicable," and 12 wrote "no idea" or "not sure." The definitions of the 43 who provided a response varied from broad conceptions of what UDL might be to more specific definitions. Table 16 provides a summary the responses provided, along with key quotes from participants who included specific and accurate definitions.

Table 16. Key Comments and Quotes Related to the Definition of UDL

Item 45: What is your definition of Universal Design for Learning (UDL)?

Broad responses:

- Teaching well
- Fulfilling learners' potential
- Promoting diversity and inclusion
- Fostering 21st century global education
- Eliminating educational barriers for all students

More specific responses:

- Creating an environment where all students can learn
- Accommodating students with different learning abilities, levels, styles, needs, interests
- Designing differentiated, flexible, inclusive, accessible, achievable instructions, lessons, teaching strategies, content material, assignments, assessments
- Incorporating in the curriculum learning outcomes and best practices
- Addressing all learners
- Fostering mastery by helping students to become expert learners
- Encouraging teacher-student interaction
- Reaching out and involving all students
- Understanding what and how students are learning
- Considering all of the factors that can make it possible for a child to learn
- Providing students what they need and different access points for learning

"UDL applies the principles of Universal Design to educational settings in order to identify and eliminate barriers to learning. The goal of UDL is to provide access to curriculum and to help students become expert learners."

"Ensuring that lessons are systematically planned to ensure that they are accessible and achievable for all learners regardless of their personal barriers to learning."

"An approach that tries to address differentiated instruction and assessment methods. It seems designed to address different learning styles so that students can both learn and demonstrate their learning using the strategies that best suit them."

"A strategy to be used by the teacher to make learning takes place in all students in the classroom; this strategy should have a goal, a method, and means to carry it out, and that education is not a limitation for each student but an opportunity for personal fulfillment learning."

"Creating lessons and units that are inclusive of all learners, and then following inclusion/differentiation strategies for implementation and assessment."

"I would call it differentiation, which means that teachers are providing different access points for learners based on how they learn and prior knowledge of the student."

Challenges for UDL implementation. Fifty-six participants provided information on challenges to UDL implementation at their school (see Table 17). The responses included issues at the school, teacher, and student level. Table 17 summarizes key comments and selected quotes at each level. A frequently mentioned challenge was the lack of time to implement varied strategies, due to the amount of content that needed to be covered and the standardized final assessments students had to be prepared for. Some other frequent comments were that participants had a lack of knowledge and training about UDL. Table 17 denotes phrases used by participants, with the number of times a response was selected provided in brackets.

Table 17. Key Comments and Quotes Related to Challenges for UDL Implementation

Item 46. What are the challenges you face with implementing UDL in your school or classroom setting?

School level:

- External evaluation; standardized test [7]
- Insufficient resources, materials [3]
- Large class sizes [2]
- New approaches have to be approved by district
- High turnover of students

Teacher level

- No time for preparation [12]
- Lack of training [7]
- Lack of knowledge [6]
- Lack of access to technology and/or Internet [6]
- Pressure to cover content [4]
- Not enough time in class period [3]
- Reluctance to try new methods [2]
- Cultural bias against differentiation
- Additional support needed to accommodate students with severe disabilities
- Inability to properly identify challenges
- Need support to use new practices

Student level:

- Personal variations (varied pace, needs, levels of learners) [4]
- Behavior, lack of motivation, lack of commitment from students [3]
- Lack of time for struggling students to keep up [2]

"In our school, there is not a lot of time allotted for planning and preparation of classes, which results in instruction and products with less variation. In many subject areas, there is pressure to cover the content of the IB curriculum, which results in more of a teacher-centered approach in the classroom and again, fewer access points for student engagement."

"Main challenges are often having time to plan effectively. While we do not use 'UDL' specifically, from my limited knowledge of UDL, I think it is not incompatible with our school philosophy; achieving such aims is always a work in progress. One specific challenge is that eventually all students will be assessed in writing (for the most part), this can be very frustrating, as some students may be able to show good understanding in other ways. How do we address this?"

"Time constraint. There's always a pressure of completing syllabus for DP students and therefore, I tend to get into structured teaching towards the mid of second year of diploma programme."

"We are not focused on UDL but we do have a strong policy toward effective differentiation. One major challenge is that we have teachers from all over the world with various degrees of understanding about differentiation. There are some cultural biases, especially among DP teachers against differentiation."

"We face the final DP Diploma assessments and set external syllabus requirements, so a clear common final assessment process dictates the skills needed for expressing learning. I cannot offer oral commentaries as a type of assessment of learning outcome, because all assessment tasks are written in nature under timed exam conditions for the majority of the assessment. I can use UDL strategies along the way, but ultimately all students sit a standardized test."

Other comments. Thirty participants responded to the final question asking for additional comments on UDL use in their IB school settings. The participants provided information on their needs in relation to UDL, reiterated their understanding of UDL, and most frequently mentioned the need for training about UDL and inclusive practices, as noted in Table 18. The table also includes key quotes from participants, and the number of times a response was selected is provided in brackets.

Table 18. Other Comments

Item 47. If you have any other comments in relation to UDL use in your IB school setting, please note them below.

- Use differentiation practices that are related to UDL (3)
- Relevant for ESL/ELL [2]
- UDL is aligned with IB philosophy
- UDL is helping students learn

Needs:

- Training [8]
- More info/knowledge about UDL [5]
- Resources/teaching materials
- Time
- Change in attitudes among administrators
- Acceptance among teachers of new methods
- Adjustment in compliance with broader school strategies
- Shift focus from content and rigid curriculum/pedagogy

"There is a fear among many at our school that by making education more accessible, we are 'dumbing down' the curriculum. I have heard from many that 'students in higher level classes shouldn't get accommodations.' I strongly disagree with this statement and I feel that additional teacher education in needed in this area."

"I would like to know what Universal Design for Learning is. It is not a framework with which I am familiar."

"It would be very important to receive guidelines or training on what is and the use of Universal Design for Learning."

"IB is the idea that we are a culture that can assume responsibility for the future citizens of the world—they must have a wealth of knowledge, experience, understanding, respect. UDL is helping students to build learning, to apply knowledge in real life, and to understand that what they learn will contribute to better lives in the future too, instead of useless learning."

Case Stories

In this section, we present ten case stories based on interviews with staff in IB schools worldwide. We interviewed four educators in the IB Africa, Europe, and the Middle East region, three in the IB Asia-Pacific region, and three in the IB Americas region. The majority of interviewees were teachers, and some had multiple roles as teachers, IB coordinators, department heads, and/or resource/support teachers. Two were school administrators. Six females and four males were interviewed. Their years of experience as educators ranged from 12 to 35 years, with a mean of 22.1 years.

The table below provides information on the interview participants.

Region	Case Story No.	Continent	Pseudonym	Gender	Role(s)	Years of Experience as an Educator
IB Africa, Europe, and Middle East	1	Africa	Alice	Female	Teacher, IB Coordinator	25
	2	Africa	Tina	Female	Head of Student Services	20
	3	Europe	Thomas	Male	Teacher, College Counselor	21
	4	Europe	Anne	Female	Principal of Primary School	35
IB Asia-Pacific	5	Pacific	Jaclyn	Female	Teacher, IB Coordinator	12
	6	Asia	Ramesh	Male	Teacher, Dept. Head	21
	7	Pacific	Edwin	Male	Teacher	19
IB Americas	8	N. America	Luis	Male	Director of School	26
	9	N. America	Becca	Female	Academic Resource Teacher	24
	10	N. America	Sara	Female	Teacher, Dept. Head	18

Participant Selection

Participants for the interviews were solicited in three ways. The primary method was from responses to the UDL survey administered in October 2015. Twenty-four survey participants indicated a willingness to be interviewed and provided their email addresses for further contact. With a goal of developing three case stories in each IB region, we identified three to five people in each region for an initial solicitation. To ensure a breadth of perspectives and to include participants from schools in a range of countries, we ranked candidates based on the information they provided about their knowledge of UDL and inclusive practices, their roles at their schools, and their locations. We sent emails to three to five individuals in each region and asked if they were available for an interview via phone or Skype. Three people responded to the initial inquiry within a week; we sent out a second email reminder to those who had not yet responded the following week. In total, six people responded to this inquiry and agreed to be interviewed for the case stories.

To develop at least three case stories per region, we needed a few additional participants. Another solicitation was sent out via the IB school services team and the research team. Four people responded to these inquiries and indicated a willingness to participate. The interviews were conducted via Skype or phone. The interviews took place in November 2015 and lasted from 28 to 54 minutes.

(Although the plan was to develop three case stories per region, we added one more story in the IB Africa, Europe, and the Middle East region to increase the range of countries represented. A total of ten case stories are presented in this report.)

Case Story Structure

We used a semi-structured interview protocol (see Appendix C) for the interviews. We transcribed each interview and drafted a case story based on the information provided by each interviewee. Each case story maintains the integrity of the individual interviewees' perspectives, viewpoints, and voices. The case stories include the terminology used by the interviewees, represent their experiences using inclusive practices/UDL at their schools, and reflect their perceptions of schoolwide implementation issues. The interviewees had varying degrees of knowledge in specific areas (e.g., demographic information about their school population), and the case stories relate the information they were able to provide.

Each case story is organized in the format outlined below. Although the interviewees addressed similar concepts and constructs in response to the interview questions, the ways they described their school environments and inclusive practices varied considerably. Their perspectives depended largely on their roles at their schools. For example, teachers provided more information on classroom practices, while administrators and resource teachers provided a broader picture of schoolwide inclusive practices. The information provided was categorized in the subsections outlined below, with a focus on presenting the participants' unique individual narratives.

Sections I-IV present information provided by the interviewees. Section V includes our analysis and interpretation of information provided, and we have added information on how the interviewees' practices align with the UDL guidelines.

I. Information about the Interviewee
- Pseudonym, role(s), educational background

II. School Information
- Type of school and information about setting, population, background
- Demographic information
- Information about diverse populations at the school
- Information about learning support services provided by the school

III. Knowledge and Implementation of Inclusive Practices/UDL
- Interviewee's knowledge about inclusive practices and/or UDL
- Inclusive/UDL-based instructional practices implemented by the interviewee
- Inclusive/UDL-based instructional practices used in the classroom by other teachers at the school
- Instructional supports at the classroom level (e.g., use of technology, learning support team assistance, etc.)

IV. Schoolwide Implementation Issues
- School philosophy in relation to inclusive education
- Administrative support for inclusion
- Teacher attitudes toward inclusion
- Facilitators and barriers to implementing inclusive practices

- Professional development provided in relation to inclusive practices/UDL
- Other comments related to attitudes/philosophies toward inclusion (at an interviewee, faculty, and/or schoolwide level)

V. UDL Connections

- Mapping of inclusive instructional practices mentioned by interviewees, during the interview or in survey responses, to the UDL guidelines and checkpoints (see Appendix A for an overview of the UDL guidelines). Note: Some instructional practices can align with more than one guideline; we selected the guideline or checkpoint most closely aligned in the context of the interviewees' practices.

Case Story #1:Africa

Educator: Alice
Role: Teacher, IB Coordinator
Region: IB Africa, Europe, and the Middle East (Africa)
School: International school, ages 10-19 (7-year program)
IB Programs: DP

I. Information about the Interviewee

Alice works as the IB coordinator and senior teacher in drama and arts for students who are 12-13 and 15-16 years old. As a senior teacher, she also holds an administrative job that is a rank below the deputy headmaster. Alice has been an educator for 25 years, has a bachelor's degree in education from a university in Kenya, is trained in general education, and is certified to teach students in grades 6-8 and 9-12. She is currently enrolled in a master's degree program.

II. School Information

The school enrolls about 560 students who range in age from 10 to 19 years. The school has a 7-year IB program. It is considered a public school because it receives some funding from the government, and as a result it provides subsidized tuition to students as needed. However, the school operates as an independent school that runs according to IB regulations.

Ninety percent of the students are natives of this country, and the remaining 10% represent 32 different nationalities. Most students speak the major language of this country, but the school's language of instruction is English. Supports are provided to students who need language assistance, including those who speak English as a third language. An English additional language (EAL) teacher works with groups of no more than three students to provide extra support.

The school enrolls students with high-incidence disabilities, such as learning disabilities and attention deficit hyperactivity disorder (ADHD). No formal data on students' disabilities were collected in the past, but the school is putting a system in place to assess students and to collect and document information on disabilities. Alice estimated that, on average, 10%-20% of students in each level have high-incidence mild/moderate disabilities. There currently are no students with physical disabilities, but there previously was a student in a wheelchair and the school built ramps to create a more accessible environment.

III. Knowledge and Implementation of Inclusive Practices/UDL

Alice said she learned about UDL and inclusive practices out of self-interest and curiosity: "Originally, I didn't even know I was using UDL; I became adventurous and tried out things to see what works and what doesn't work." She became more aware that these strategies were part of the UDL framework when she took professional development (PD) workshops in which trainers alluded to UDL. Alice noted that UDL-based instruction is a natural fit for the subject areas she teaches (drama and art):

> My luck is that my subject is...integrateable [sic]. Different learning methods are a natural fit for teaching drama and art. When I was doing my degree no one was telling you the real impact it [inclusive practices] has. They are alluding to it, but not seriously.

Alice began using inclusive learning strategies when she started working at an international school. The government schools where she previously taught limited teachers to more traditional practices. Alice appreciated the fact that IB schools actively promote inclusion and support the use of differentiated and inclusive practices.

Alice described how she integrated UDL-based strategies into her classes by sharing an example of a recent lesson she taught about pantomime in an IB CSC class with a group of 15 students. She first introduced the concept by showing students examples of pantomimes. To actively engage the group, she designed an activity that allowed them to develop their understanding in varied ways. She noted several choices of activities on slips of paper and then allowed students to choose one they would like to do. For example, they could choose to conduct research, generate ideas, and work independently or with a partner. She told her students she was aware that some of them were panicking at the thought of doing these activities, then asked them to reflect on how they would like to undertake the tasks and what would make them feel comfortable. Alice said she wanted each student to feel, "I'll own this, this is my own work":

> I talk with each child, one on one, to make sure they are all comfortable. To the ones who are not comfortable, I ask "how would you like to modify, in what direction would you like to go?" to give them the option so they feel valued.

Once they completed their activities, the students presented their work to each other. Having students present information and encourage one other was a key component of the learning process in Alice's classroom.

Alice believes in creating a sense of trust and community before moving onto the day's instruction. For example, as a warm-up activity, she starts a discussion about weakness and strength and shares her own fears with her students. Through these activities the students begin to relate to one other, form bonds, and reflect on who they are. Then she introduces a script and asks students to decide what they would like to work on. The students are better able to make choices and collaborate because of the activities that allowed them to reflect and feel safe in their learning community. Alice noted that "there is a feeling of family, a homey feeling" in her classroom. Students appreciate the fact that a class has to have rules, and Alice allows them to come up with their own.

As Alice plans lessons, she considers her students' abilities and their openness to learning. She prefers to be flexible and let students choose their own direction when doing assignments. She emphasized that her "aim is to make the child well rounded, not just academically." She realizes that she can also learn from her students when she gives them the opportunity to come up with ideas. She maintains a balance between structure and flexibility, providing some scaffolds but leaving some of her instruction open to student input and choice.

IV. Schoolwide Implementation Issues

The headmaster, who has been at Alice's school for two years, has led the way for teachers to adopt more inclusive practices. When he first came to the school, lots of teachers were using written assessments, and he has encouraged them to consider various alternatives to traditional instructional methods. The headmaster has focused on engaging students with a hands-on approach that fosters inquisitiveness. He emphasizes the need to consider ways to evaluate what students know other than through written assessments.

Although teachers had mixed reactions to these changes when they were first introduced, they have started to appreciate them, and most have embraced the new approaches. There has been a sense of excitement as teachers discover the possibilities these new instructional approaches provide. To illustrate this point, Alice provided an anecdote of how teachers have changed their classroom strategies. The headmaster has encouraged teachers to lecture for no more than 20 minutes at a stretch (classes typically last 80 minutes) and to incorporate active learning strategies along with lectures. Alice noted that teachers previously would stand up and start lecturing if an administrator dropped in observe their classroom, because more traditional administrators considered this good teaching; now teachers are comfortable letting their students continue to do hands-on activities even if an administrator drops by to observe them.

The administration has been proactive and supportive by providing access to PD for all teachers. Their location makes it difficult to have face-to-face trainings, so the school provides funding for teachers to take online courses and workshops. Teachers are required to complete at least one online course/workshop per year and are encouraged to do more. Many teachers take IB-related workshops. They are also encouraged to study for their master's and doctoral degrees, and the school covers some of the costs.

Another way the school has supported integrating inclusive practices is by giving faculty time to talk about students who are having problems in their classes. Students are considered the school's clients, and faculty members are expected to deliver to them. This orientation inspires teachers to look for new approaches to reaching students, including those that are universally designed. Although some teachers are not aware of what UDL is, they have learned practical strategies through PD and are learning how to differentiate. They regularly read and talk about the IB philosophy and inclusive educational system.

Alice noted that the greatest challenge to establishing inclusive practices is a lack of facilities for students who need specialized accommodations. Another barrier is the written format of some external IB exams. She explained that teachers can differentiate during classroom instruction, but the exam format is out of their control. She gave the example of a student who can present information orally but panics when asked to write things down. Although he passed the practical portion of his exams because he was able to use his verbal skills, he earned 10/40 on his written exams. She suggested that the exam council consider alternative assessment formats, which would provide a more inclusive environment. She described some alternative formats, such as allowing students to record their responses or make a video to demonstrate what they know.

V. UDL Connections

Alice described a lesson she gives in her drama class, which reveals a deep knowledge and use of UDL-aligned strategies. She was aware that the supports she provides can help all learners, those

with and without disabilities. Alice espoused a philosophy of supporting learner variability in various ways, and her practices drew from all three UDL principles—supporting multiple means of representation, expression and action, and engagement—as noted in the table below.

Instructional strategies Alice used	**UDL guidelines and checkpoints addressed**
To teach about a genre, Alice provides learners with a play extract from the drama genre, shows a video of a sample play from this genre, and then has students do their own research. They are encouraged to relate what they are doing in class to plays/movies they may have watched.	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.5 Illustrate through multiple media UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.4 Maximize transfer and generalization UDL Guideline 7. Provide options for recruiting interest 7.2 Optimize relevance, value, and authenticity
Students practice with a scripted piece and then write their own piece, rehearse, give constructive criticism, work in groups, and finally perform for the class. The students discuss outcomes, present to the rest of the class for discussion, and they also write their reflections.	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance UDL Guideline 8. Provide options for sustaining effort and persistence 8.1 Heighten salience of goals and objectives 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community 8.4 Increase mastery-oriented feedback
Various assessment formats provided, e.g., peer assessment, self-assessment, teacher oral evaluation, practical observation assessments, and written assignments. The aim is to differentiate for each child's strengths and weaknesses.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.4 Increase mastery-oriented feedback UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
Students work in groups and each group has a set of instructions. The first is to comprehend the terminology, watch a video, and analyze what they see. They take various roles (e.g., actor, director etc.). At intervals as they work, they discuss their progress and write	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress

reflections. They present to the rest of the class and other students give them feedback.	
Throughout the process, Alice encourages students to assess their work and engage in peer assessment of classmates. She meets with the students one on one and asks questions to help them reflect on what they are doing. At times she gives suggestions and examples to help them move forward. She encourages them to draw on their personal experiences to help shape their work and to record their performance, watch and reflect on it. Another way is to record their voice then close their eyes and listen to their use of voice to act convincingly.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress UDL Guideline 7. Provide options for recruiting interest 7.2 Optimize relevance, value, and authenticity 7.3 Minimize threats and distractions UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
Creating classroom community is important for Alice. She includes warm-up exercises that help students discuss commonalities and strengthen bonds. This helps students work well together on activities and to self-reflect on their strengths and weaknesses in relation to their peers.	UDL Guideline 7. Provide options for recruiting interest 7.3 Minimize threats and distractions UDL Guideline 8. Provide options for sustaining effort and persistence 8.3 Foster collaboration and community UDL Guideline 9. Provide options for self-regulation 9.3 Develop self-assessment and reflection

Case Story #2: Africa

Educator: Tina
Role: Head of Secondary School Student Services
Region: IB Africa, Europe, and the Middle East (Africa)
School: International school, early childhood-grade 12
IB Programs: PYP, MYP, DP

I. Information about the Interviewee

Tina is the head of school services for the secondary grades of an international school. She also teaches classes for EAL students. Tina has been an educator for 20 years. She has a bachelor's degree in education and is currently working on a graduate diploma online, both from institutions in Australia.

II. School Information

Tina works at an urban international school in Tanzania that enrolls approximately 1,000 students. About 20% are local students, the rest are from Europe, Asia, and other countries in Africa. The student body is very diverse, both in terms of language learners and disabilities. The school enrolls students with learning disabilities, dyslexia/dysgraphia, ADHD, autism, and hearing impairments. The school does not have many students with physical disabilities or mobility impairments because the layout of the campus and the 50-year-old buildings are not fully accessible.

Tina is the head of the student services team for the secondary school. The team is made up of seven full-time and one part-time staff member. Tina reads all admission applications and creates learner profiles by highlighting students' need for learning support, language support, social and emotional support, counseling support, and/or transitional support if they have just moved to Tanzania. The learner profile includes three sections: (a) information about the student and what their needs are, (b) inclusive access accommodations and modifications, and (c) a list of teaching strategies the teachers can use to help that child in the class. The profile is uploaded to a Google Doc, and all teachers have access to it. Students are continually reassessed, and the profiles are updated as needed. For students who need intensive support, the team provides "push-in services," which involves assigning a case manager to the student to help the classroom teacher with any necessary curriculum modifications and redesign.

The student services team helps teachers by reviewing their designs for the curriculum and assessments and suggesting ways to include scaffolds and supports for diverse learners. For example, they will add a glossary or picture prompt to clarify meaning and vocabulary for EAL students or for those who need literacy-related supports.

III. Knowledge and Implementation of Inclusive Practices/UDL

Tina was familiar with UDL because she had read about it in the *IB Guide.* She had done some self-study on the UDL framework by reading about it, using resources on websites, and watching videos. Tina was very familiar with differentiation strategies and inclusive practices in general. The bachelor's in education program she completed included many units on the inclusion of

children with special needs. Tina noted that the Australian education system had moved to full inclusion and mainstreaming, so these values and related strategies were emphasized throughout her degree program. Tina had stayed up-to-date on inclusive strategies through PD courses such as Teaching ESL Students in the Mainstream Classroom and other differentiation workshops.

Tina described some inclusive practices she uses in her EAL classes. To help students access text-heavy curriculum, in a science unit for example, Tina provides various vocabulary supports. She described her understanding of construct relevance while assessing students. She explained how she enables students to demonstrate their knowledge of the science-related concepts they are learning without vocabulary being a barrier:

> One of the lessons beforehand would be to pre-teach the vocab so they are able to access the vocab. They are able to show what they can do and what they know rather than it being a test on knowing what the words mean.

Tina uses various other scaffolds to assist students with comprehension and expression. For example, she uses writing frames and highlights words and concepts to help students focus on key aspects of the lesson. To support comprehension and processing, she breaks down the tasks during a lesson. As she designs lessons, Tina considers how to provide different appropriate entry points for different learners.

The students have access to technology, which many teachers are comfortable integrating into their instructional practices. Each department shares a bank of computers, and there is also a computer lab that teachers can reserve for technology-based instruction. Tina noted that a number of students use adaptive technologies, such as digital text and optical character recognition tools to convert documents that can be accessed through text-to-speech software.

Many EAL students face challenges in communicating and some have to spend a lot of time translating during their lessons. Teachers are aware of this and try to find ways to support these students. Tina gave the example of a grade 6 teacher who has started to translate MYP command terms into her students' first languages. Tina also described the importance placed on decoding mathematical terms, stating that "math is something that everybody should be able to do; for some of our EAL kids the barrier is the words." Teachers are aware of strategies that help students access mathematics-related vocabulary and reduce barriers to learning math.

When DP students are preparing for exams, Tina's team ensures that their teachers are aware of any accommodations, modifications, and instructional strategies they may need. The team ensures that they are registered for all appropriate accommodations, such as additional time, having a scribe, or taking the exam in a separate room.

IV. Schoolwide Implementation Issues

The administration emphasizes the importance of inclusion and provides ample PD opportunities. Each teacher is allotted an annual budget for PD activities, and they are encouraged to take IB courses on inclusion. The school is actively focused on increasing their teachers' ability to learn new differentiation methods. For example, four of Tina's fellow

teachers were attending a workshop on how to differentiate for gifted students, and they were expected to conduct workshops for the rest of the staff once they returned.

Tina explained that most of the teachers in the school are open to using inclusive practices and there is no resistance to inclusion. A majority of the teachers have the skills to differentiate instruction and are able to integrate inclusive practices into their teaching, instead of relying on traditional lecture-based methods. This is largely because the school focuses on hiring teachers who have experience with differentiation. Tina gave an example of a situation that arose the previous year that teachers were readily able to adapt to. One student enrolled at the school had an educational assistant who accompanied him to every class (paid for by his parents). Tina noted, "The teachers were pretty receptive of this type of thing. I think that it's just something that has happened over the years and it's common practice and they're quite positive about inclusion."

V. UDL Connections

As the head of student services, Tina was familiar with the concept of addressing barriers in the curriculum and differentiating instruction. She was not as familiar with UDL, but during the interview she described various strategies that are consistent with the UDL guidelines, as noted below. Tina was especially articulate about ensuring that students have appropriate assessments that measure the construct being evaluated, and about helping students with the construct-irrelevant factors (e.g., pre-teaching math vocabulary so that students can demonstrate their math skills.)

Instructional strategies used by Tina (and student support team)	**UDL guidelines and checkpoints addressed**
Tina's student services team develops a learning profile and lists appropriate strategies for each student's needs. The team evaluates curriculum and assessments to help teachers modify them.	Considering strategies and scaffolds for students proactively is consistent with UDL-based methods for lesson planning.
Considers construct relevance when designing assessments and remove barriers to measuring that construct.	Considering construct relevance is part of applying UDL to goals, methods, materials, and assessments
Pre-teaches vocabulary to help students access content.	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.2 Clarify syntax and structure 2.3 Support decoding of text, mathematical notation, and symbols 2.4 Promote understanding across languages 2.5 Illustrate through multiple media
Provides translations of key	UDL Guideline 2. Provide options for language,

vocabulary to EAL students so they can focus on accessing content (for example, in mathematics.)	mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.2 Clarify syntax and structure 2.3 Support decoding of text, mathematical notation, and symbols 2.4 Promote understanding across languages 2.5 Illustrate through multiple media
Provides various supports for comprehension, such as highlighting key words and concepts.	UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation 3.4 Maximize transfer and generalization
Provides scaffolds for completing tasks, such as sentence starters and writing frames.	UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.4 Maximize transfer and generalization UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance
Breaks down tasks to help students complete activities.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress
Uses assistive and adaptive technologies as appropriate; provides digital text to students.	UDL Guideline 1. Provide options for perception 1.1 Offer ways of customizing the display of information 1.2 Offer alternatives for auditory information 1.3 Offer alternatives for visual information UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation 4.2 Optimize access to tools and assistive technologies

Case Story #3:Europe

Educator: Thomas
Role: Teacher and College Counselor
Region: IB Africa, Europe, and the Middle East (Europe)
School: Independent international school, grades preK-12
IB Programs: PYP, DP

I. Information about the Interviewee

Thomas teaches economics and business management to students in grades 11-12 and also serves as the school's college counselor. He has been an educator for 21 years and has taught at international schools around the world for the past 18 years. He has a bachelor's degree in business and a master's degree in sustainable development, as well as a postgraduate certificate in teaching from universities in the United Kingdom. Thomas is licensed as a general educator with grade 9-12 credentials and has had principal leadership training.

II. School Information

The international school is located just outside a main town in Germany and has been in operation for ten years. The school enrolls about 320 students from preK (3 years old) to grade 12. Approximately 60% are of German background, and 40% are international students whose parents are not German nationals; the families of some of these students are working in Germany on short-term contracts. The majority of the students are German first-language speakers with varied levels of English proficiency.

Because the multilevel buildings do not have lifts, the school is unable to accommodate students with physical disabilities. A small percentage of students are identified as having learning disabilities, such as dyslexia and autism. The school has no specific process for assessing disabilities, but if information about a student's assessed disability is available from external sources (e.g., prior reports, a psychologist's report), it is shared with the classroom teachers so they can provide accommodations.

The school does not yet have a distinct support program for students with disabilities, although it plans to develop one as the school expands. A psychologist has come into the school to speak about identifying learning difficulties and the supports students might need. Teachers are aware of the importance of providing accommodations, such as extra time on exams or preferential seating in the classroom. The primary school has an assistant who works with students individually as needed and does pull-out sessions for math and language.

The main focus of differentiation at the school is for language acquisition. The early education school has an ESL teacher who works specifically with children who need language support. There is also a teacher who supports German language acquisition for international students for whom German is a second language.

III. Knowledge and Implementation of Inclusive Practices/UDL

Thomas was not familiar with the UDL framework, but he was very aware of inclusive practices and understood how they supported a range of students. Thomas had learned various inclusive teaching strategies over the years from PD workshops, from watching colleagues, and from developing his own practice over time. When Thomas described his practices in the classroom, it was apparent that he was proficient in considering learner variability from the outset and designing flexible strategies. He noted that he was interested in participating in the interview to learn more about UDL, because he was interested in the topic when he took the UDL survey.

Thomas described a carousel activity he uses in his classes when there is a lot of information to cover. He provided an example of how he teaches motivation theories in his business class. For this activity, he forms five mixed-ability groups. He breaks each theory down into simple text and assigns one theory to each group. Group members teach their assigned theory to all the other groups, and as a result they practice repeating the theory three or four times. This supports students at all ability levels. The stronger students have the opportunity to clarify and paraphrase. The students who need more supports hear the concept more than once and get the opportunity to teach it themselves. At the end of the class, he adds a review or assessment to gauge whether students truly understood the concepts and provides support material to the students who still do not accurately understand or seem to be struggling with a concept. Thomas prefers using this carousel strategy over lecturing to give students a peer support network and enable them to learn from one another. He noted that this strategy can be used for different content, and it allows him to reduce his reliance on worksheets and other text-based formats for teaching and learning.

Thomas uses a four-part lesson plan model to design his lessons. The four parts are “connect, activate, demonstrate, and consolidate.” Thomas learned this model when he was an administrator at another international school and someone on the management team there had used the model as part of the lesson observation process. The essence of the four-part process was to connect lessons to what was taught previously, to give students a progression of where the lesson would go, to activate student interest through an engaging activity (e.g., video, discussion), and then to give students the opportunity to demonstrate what they learned through debates, group work, quizzes, and other formal types of assessment. Although Thomas did not use the language of the UDL framework to describe these practices, they were consistent with UDL’s premise of proactively considering flexible methods, materials, and assessments and focusing on developing expert learners.

The school had just implemented a one-to-one laptop policy that gave students from grade 9 on their own laptops. Thomas uses the ManageBac system—an online course management tool in the Diploma Program. Students can submit assignments online and check their grades via the system. The school also employs Google Docs and SmartBoards to engage students with visual information and alternative and multimodal formats.

IV. Schoolwide Implementation Issues

Thomas noted that he has served as both teacher and administrator in various international school settings during his career. He felt that being a teacher again after having been in administration for five years gave him good perspective. He noted that in the 20 years he has been in education, the thinking about issues of inclusion and differentiation has changed. In his current school, he finds himself in a supportive educational environment with a strong staff who are interested in

thinking about practical educational issues. The management staff are supportive and the collegiality among teachers allows them to adapt and use new practices.

Thomas noted that "the administration is very keen on trying to get the latest and the best PD that they can afford...they are really putting money towards it to make sure we are up to date." For example, they bring in leading experts to work with teachers. Three years ago, the school invited William and Ochan Powell (of Education Across Frontiers) to do PD on differentiation in the classroom. In a more recent PD session, Dylan Wiliam discussed formative assessments that included a focus on differentiation and inclusion. Although UDL has not been explicitly introduced at his school, Thomas described how these various PD opportunities are consistent with UDL guidelines. He noted that the constraints of time and workload were challenges that teachers faced when implementing new and inclusive practices.

Thomas noted that, as a private school, they do tend to be selective with admissions and have a certain demographic as a result. Students are expected to come in at a certain academic level, especially for the DP program. Upon acceptance, the school takes full responsibility for supporting each student and ensuring that they thrive. Thomas stated that teachers make every effort to provide differentiated strategies for learners who can benefit from varied methods.

The school does not currently have a learning support team. Teachers are faced with situations where students are struggling in the classroom and they are not quite sure what the problem is, nor do they have the experience to identify what strategy might work. Although teachers receive PD to integrate inclusive and differentiated strategies into the classroom, some students would benefit from additional one-on-one support and pull-out services from a dedicated team. The administration is aware that having a learning support team will enhance services and inclusion. The administration is supportive of teachers' and students' needs and plans are in place to add a learning support team in the next few years. The school is also looking into how to implement individualized education plans for students and has included this in their accreditation plans. Thomas noted that a strong support team can be instrumental in making sure that the school continues to focus on individual learning and educational plans, and in helping teachers and students identify where supports are needed.

Thomas described some challenges related to differentiating learning while concurrently preparing students for the DP exam. He recognized that, although he can provide differentiated opportunities as scaffolds for learning along the way, he ultimately has to prepare students for the common paper. In his words, "Ultimately, I am tied, I do not have much flexibility...At the end of the day, it is a 15-year old exam, it has not changed." As a result, he tries to build students' skills through his courses and provide the appropriate critique along the way to prepare students for these standard-format assessments. This can be a disadvantage for students who are better at presenting information in different formats. He commented that the "diploma is a rite of passage" and noted that, despite all the classroom support that can be given, at the end students "all sit on the same exam and we are judged on it." He summed up the conundrum as such:

> We know what the problems are, we know that we are dealing with individuals, but we then do the same thing at the end. We believe we can assess kids equally by using

different formats, that cannot be the case especially when you are sitting formal hand-written exam when most kids type, use the internet and information technology.

V. UDL Connections

Thomas uses a variety of strategies to differentiate instruction in his classes. He designs lessons using a four-part lesson plan that provides a context for using various scaffolds and supports that align with UDL. Thomas provides supports for comprehension, uses technology effectively to provide multimodal tools for students, and supports their motivation and engagement through collaboration and peer teaching. The table below denotes specific strategies and related UDL guidelines.

Instructional strategies Thomas used	**UDL guidelines and checkpoints addressed**
Uses the four-part lesson part "connect, activate, demonstrate, and consolidate" model for lesson planning. Connects lessons to prior knowledge, activates student interest during learning, and gives students varied ways to demonstrate understanding.	This four-part lesson planning process addresses all nine UDL guidelines and their checkpoints. While he explained how he uses this model to plan lessons, Richard described the essence of UDL, which is to design proactively to include flexible and engaging options for students, taking into account various scaffolds they need to access learning.
Varies ways to demonstrate knowledge, e.g., videos, discussions, quizzes, debates, group work.	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition
Uses introductory videos, supported with vocab lists and missing word activities to support language development	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.2 Clarify syntax and structure 2.3 Support decoding of text, mathematical notation, and symbols 2.4 Promote understanding across languages 2.5 Illustrate through multiple media
Uses reading comprehension strategies to access stimulus materials and scaffold key ideas and theory in economics, uses economic diagrams to express written text information.	UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation 3.4 Maximize transfer and generalization
Presentations can take the form of oral Q&A responses or PowerPoints on key learning objectives.	UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation 4.2 Optimize access to tools and assistive technologies

Assessments often tend to focus on the DP final exam-style written questions, data responses, or extended responses to build skills necessary for DP external exams.	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance
Resource material is shared through ManageBac with written text or video links available for review and pre-learning before class.	UDL Guideline 4. Provide options for physical action 4.2 Optimize access to tools and assistive technologies
Students undertake group research activities to share and peer teach key concepts.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.1 Heighten salience of goals and objectives 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community
Students get a chance to clarify and paraphrase, team teach, and review and assess whether they truly understand.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress UDL Guideline 8. Provide options for sustaining effort and persistence 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community 8.4 Increase mastery-oriented feedback UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
Integrates technology (Google Docs, Smartboards) to provide a more interactive and multimodal learning environment.	UDL Guideline 4. Provide options for physical action 4.2 Optimize access to tools and assistive technologies UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity 7.3 Minimize threats and distractions

Case Story #4: Europe

Educator: Anne
Role: Principal of Primary School
Region: IB Africa, Europe, and the Middle East (Europe)
School: International school, ages 3-18
IB Programs: PYP, MYP, DP, CP

I. Information about the Interviewee

Anne is the principal of a primary school (one section of a school that includes primary, middle, and high school). Anne has a background in special education and inclusion. She has a bachelor's degree in special education from an institution in the United Kingdom and a master's in education from an institution Australia. In her 35-year career as an educator, Anne has worked at various international schools and has supported various inclusion and special education efforts at these schools. She set up the learning support department at one school, ran an inclusion unit at another, and served as a director at yet another school.

II. School Information

Anne works at an international school located close to an urban area in Germany. There are 200 students in the primary school and 500 in the secondary school. The student body represents 63 nationalities, including quite a few German children. Many children are from other European countries, and some are from countries in Asia and the Middle East, such as China, Korea, Oman, and the UAE. Many students do not speak English as a first language, and the school has a strong EAL support system for these students.

The school enrolls students with a range of disabilities, including learning disabilities (such as dyslexia), ADHD, and autism. Children with disabilities have one-on-one learning assistance. The school has a strong learning support team, which includes a full-time learning support teacher, a full-time learning support assistant, and a part-time assistant. The primary school currently enrolls three children with autism, and all three receive support from the learning support assistant. Anne noted that they were fortunate that the learning support assistant has expertise in strategies for children with autism and is therefore able to help classroom teachers develop strategies to include the three children in the classroom, and to help the children one-on-one as needed.

III. Knowledge and Implementation of Inclusive Practices/UDL

Anne was not familiar with the UDL framework or terminology, but she was very familiar with inclusive practices. Trained as a special educator, she noted that inclusion was the focus of her first degree. While the head of an inclusion unit at another school, Anne implemented supports to facilitate the mainstreaming of children with various special needs. As an administrator in her current position, Anne provides leadership to ensure that appropriate learning supports are in place to create a truly inclusive learning environment, and that teachers in the school are supported in these efforts.

Anne described some of the ways teachers are supported in implementing inclusive practices. There are clear lines of communication between the learning support teacher and the classroom teacher at the primary school, and the two meet to discuss how to serve each child in the mainstream class who has a disability. Because it is a small primary school, teachers are able to have regular meetings and flag problems quickly. Teachers have a learning support plan for each child and are able to adjust it as needed with assistance from the learning support teacher.

Teachers are aware of how to adapt and use different types of instructional strategies for the EAL children, depending on each child's specific needs. In addition to having support from the learning support team, teachers have been trained in the Teaching ESL Students in the Mainstream Classroom (TESMC) program. Anne noted:

> They differentiate, all our teachers now have been trained on ESL in the Mainstream so they know about tactics: they would put children in groups, they would adapt lesson content, they would have different expectations for different students, they would speak about the content fully with the assistant prior to the lesson so that the assistant can work closely with the child to adapt content. So there is a lot of collaboration and discussion among the staff.

Teachers are also given training to deal with students' specific needs, such as adaptations and strategies to support students with dyslexia. Technology is incorporated into the curriculum to adapt, develop, and consolidate learning. Anne explained that teachers are aware of how to design lessons to include students with varied needs for three reasons: (a) inclusion is emphasized at the school and is part of the mission statement; (b) the school has included children with special needs for a long time; and (c) the learning support team is in place to help teachers adapt their lessons. As a result, all the teachers are able to design lessons from the outset to align with students' needs.

IV. Schoolwide Implementation Issues

Anne is currently in the process of streamlining how inclusion is done at her primary school. She is setting up a system in which the learning support teachers work with the classroom teacher in ways that will empower the teacher to support the children. Anne stated:

> I am changing it so that the classroom teacher is actually the one mainly dealing with the child rather than the learning support team, for a lot of reasons. One being that if you become very specialized, you are not doing the inclusion anymore; the classroom teacher is taking responsibility and communicating with parents. The learning support person is the support and advising and working.

Another new practice Anne is currently implementing is meeting with parents every six weeks. The learning support team, case manager, classroom teacher, and parents will work together to establish new goals for each child. Everyone who works with a child describes how the student is progressing, thus giving the parents a regular progress report. These meetings are incorporated into the child's individualized learning plan, and are used to revisit various goals—social, emotional, behavioral, academic—and discuss new objectives/outcomes.

The teams also have a special provisions map to ensure that every child who needs support has specific goals that are revisited every six weeks. Anne noted that the other school levels (middle and high school) have similar individualized learning plans, but their systems are not as refined as the primary level's. The primary school is working hard to formulate a blueprint for inclusion at this very foundational level.

One factor that facilitates inclusion is that the children tend to attend the school for a while, so teachers get to know them and understand how to support them. Moreover, the intensive method of referring children for services provides a comprehensive support system. The supporting teams get input from all teachers, including those who teach academic subjects as well as music, art, and PE. The learning support team looks at the data on each child and examines what teachers are saying, then they ask themselves, "What does this mean every day, in the classroom? How does the data support how we would have to change lessons to achieve maximum learning?" As Anne explains, "There is a lot of discussion and it's very much at the forefront of all our teaching. Because it's part of our mission statement, we are actually actively saying that we adapt to our students' needs.**"**

Teachers are encouraged to seek PD opportunities to build their knowledge base. Some have taken online courses on autism and other specific disabilities. The school pays for professional development in the area of special education for both the learning support team and the general education teachers.

The biggest barrier to inclusive practices is the attitude of some parents. The school is known to accept all children regardless of whether they have a disability or other learning challenges, which can perpetuate the notion that the school caters to special needs children. Some parents feel there is a stigma related to a "special needs school." Others may send their one child who has learning difficulties to this school and another child without any learning difficulties to another international school. Anna noted that the school is fortunately very academic and has good diploma results to counter any negative perception parents might have. On the flip side, Anna noted:

> An international inclusive school is an ideal way for every child to develop and understand that we are all different yet we are all the same. Our children are very much aware that other children behave very differently because of the way they are. It is accepted from our children. For me, it is part of the rich culture of an international school. Children learn across languages, but across needs as well. That, for me, is a positive way of looking at it.

Anne concluded by saying that the school had recently enrolled a child who is deaf and hired someone who knows American Sign Language to support her needs. Another child with cerebral palsy is able to participate fully in his classes despite his physical impairments. Anne stated, "As I said before, for me inclusivity is very much the ethos of our school; if you accept this, it's not a big deal, it's just the way things are."

NOTE: Because Anne was a head of school she did not describe specific teaching practices, so this case study does not include a UDL connections section. As an administrator, Anne provides leadership for inclusion at the school, as described in the sections above.

Case Story #5: Pacific

Educator: Jaclyn
Role: Teacher, IB Coordinator
Region: IB Asia-Pacific (Pacific)
School: International school, preK-12
IB Programs: PYP, DP

I. Information about the Interviewee

Jaclyn is a teacher and IB coordinator at an international school. She teaches environmental systems in society for students in grades 10-12. She is trained as a general educator with licensure to teach grades 6-12, and also has administrative licensure. She has been an educator for 12 years. She received a bachelor's degree in geography and a master's degree in teaching in the United Kingdom.

II. School Information

Jaclyn works at a relatively new and rapidly growing urban international school in Singapore that previously operated for 40 years under a different system and leadership. The new school was formed just four years ago and is administered by an education corporation based in Malaysia. The new school retained the existing students and members of the teaching staff who chose to stay. It has experienced rapid growth since its inception. From 320 students in August 2012, the student population has grown to 850 and is slated to reach 1,000 by September 2016.

The school enrolls about 850 students in grades K-12 who represent 51 nationalities: 22% are British, 14% Chinese, 10% Australian, and 5% South Korean; the next biggest groups are Americans and New Zealanders. The school also enrolls some local Singaporean students. The low proportion of local students is due to the fact that they have to get permission from the government to leave their local system and enroll in an international school, and must cite the reason their educational needs are unmet by the local schools. As a result, the school enrolls local students who need extra supports, including those who cannot deal with the high pressure in the local school system, have disabilities, do not get the support they need in large classes, or are actively looking for an international education.

The school's population includes a large number of third culture children who may or may not speak their home language, but are assumed to be from their family's country of origin. Jaclyn noted that it is important for staff to understand these cultural nuances and not make assumptions about students' background based only on their ethnic backgrounds. Moreover, because this is one of the few international schools that does not give students an English language assessment, many students speak English as a second or third language. There are students who speak enough English to pass the interview process but do not have the depth of knowledge, fluency, and confidence to use English academically. In Jaclyn's words, "this makes the ability to access day-to-day life quite challenging for a number of our students."

The population includes students with disabilities, including learning disabilities, ADHD, and autism. Some students, mainly at the primary level, have physical disabilities such as cerebral

palsy. The school does not have lifts, therefore it cannot accommodate students with physical disabilities that limit their mobility. Students with severe needs who require one-to-one support tend "to leave once the curriculum reaches the point where they are not able to flourish anymore." A number of schools in Singapore have a very low teaching ratio and thus they can offer physical support to anyone with limited mobility. They also have a greater ability to support students with complex learning difficulties.

The philosophy of Jaclyn's school is that "every teacher is a learning support teacher." In other words, the classroom teacher is responsible for supporting each learner in the classroom, regardless of what his or her needs are—physical, mental, or language-based. It is the teacher's responsibility to gain the knowledge and skills to support diverse students appropriately. Teachers know how to provide scaffolds for learning in their classrooms to support students with disabilities.

The school has a two-person learning support team who serve as advisors and pedagogical leaders in supporting inclusive education efforts at the school. Rather than working with students directly or giving one-to-one support, the team provides assistance to the classroom teachers and helps them determine how to differentiate. For example, if a student is underperforming and the teacher does not know what to try next, the learning support team conducts an observation and suggests ways to integrate different strategies, or offers ideas from teachers who do not have the same problem with the child. The learning support team also handles the exam arrangements and works with students' health care providers to make sure they have the specific special arrangements they need.

Once a student is admitted, the learning support team assesses the educational psychologist's reports from previous schools and becomes involved in providing support. They put together a profile that is sent out to all teachers and is reviewed every 15-16 weeks. The team periodically checks with all the student's teachers to make sure that the plans in the profile are working, evaluates the impact changes in stress and hormone levels have on the student's performance, examines whether any new issues have arisen for the student, and decides whether any modifications need to be made to the profile.

There is also a language support team to help the students learning English. The school offers a track for students who are not fluent enough in English in lower high school to be able to access the class curriculum. Students have up to three years to improve their English skills, pass the external exams, and join the main classes. The language support team advises the teacher on how to approach ESL support, rather than directly giving this support themselves.

III. Knowledge and Implementation of Inclusive Practices/UDL

Jaclyn learned about inclusive practices during her master's program, although the practices were not called UDL at the time. She learned about making education accessible to all and about teaching practices that reach everyone. During her teacher training program, she learned and practiced how to design instruction using differentiated strategies in the planning phase. Having done her teacher training in a low socioeconomic inner-city area in the UK, Jaclyn had experience working with diverse student populations who came from challenging circumstances, including disaffected youth, immigrant students, and students who were refugees. She noted that,

although the focus at her current school was differentiating for students who needed language supports, she had experience differentiating and supporting students with various other needs as well.

Jaclyn was comfortable and proficient in using various inclusive strategies to plan lessons. She provided an example of how she supports vocabulary as a precursor to all learning. Jaclyn puts her units up on a website, making them available to students at any time. When they are halfway through a lesson, Jaclyn encourages students to look up vocabulary related to the next unit. For homework, they translate words if they need to, ask questions if they do not understand a word, and identify images to go with the word to help them memorize the meaning. This strategy gives the students confidence to use subject-specific terminology and provides vocabulary support for both students who are learning English and those who speak it as a first language. Jaclyn noted that this strategy makes the lessons inclusive for all by providing appropriate supports for students who struggle and for students who are high achievers. The high achievers use the website to read ahead, and the students who need extra support come to class with some background knowledge and awareness that allows them to stay engaged in the lesson. Jaclyn emphasized that she designs her lessons with an awareness of making them inclusive for all learners. In short, Jaclyn considers the needs of students who are struggling learners and those who are high achievers.

Teachers at the school are generally aware of how to plan lessons that provide supports and scaffolds for students with learning disabilities. They understand that technology can be a tool for learning and regularly use it to support their students. Jaclyn gave the example of using computers to support students who struggle with writing for various reasons, such as having dyslexia or fine motor issues. She noted that typing rather than hand writing helps some students overcome challenges by allowing them to customize the visual display of information (e.g., font sizes, colors) and use assistive features (e.g., spell check). Technology is also used to give students varied formats for expression that provide alternatives to written assessments. Jaclyn provided the example of a student with processing delays who prefers to express knowledge verbally. The student can be supported by doing structured projects and working in a group to plan his/her response to an activity. For instance, one group member writes the script and they all record the video, and the student who has processing delays gets support from peers. Students are given other appropriate accommodations, such as having extra time for tests and using computers for some assessments.

Jaclyn stated that she awards marks based on the degree of risk-taking involved in decision-making. She explained that this is consistent with the IB philosophy and IB learner profile characteristics. She described how students who opt for environmental science are often the ones who do not think of themselves as scientists and switch off when they see lab equipment or experiments. They automatically assume they will not be interested in those topics. Jaclyn emphasizes that giving things a try is an important part of experiments and that the outcome is not the only goal. She encourages students to think logically, see what happens, and to realize that it is okay if an experiment does not work. This is consistent with the school philosophy of encouraging students to take risks as a part of learning. Jaclyn felt that focusing on students doing their individual best is a strong facet of the school philosophy. They emphasize that it is important to get the best grade one is capable of, rather than the highest grade overall. Some

teachers who do not embrace this philosophy and prefer to teach highly academic students leave the school.

Jaclyn also provided an example of how seamlessly teachers use technology to support inclusion. Recently, a student in her final year was unable to attend school for some months due to having two slipped discs. She was able to participate in the class via Skype, and teachers provided information by sharing their PowerPoint files and making annotations on the whiteboard. Jaclyn emphasized that this girl's learning did not have to stop just because of a physical ailment. Another student had a fractured spine and was told by another school that he could not complete an IB diploma because he could not complete his CAS project. At Jaclyn's school he was told, "Of course you can do it!" He was able to complete the project and graduate. Jaclyn noted that the key to the boy's success was focusing on what he was capable of rather than on seeing his physical disability as a hindrance.

IV. Schoolwide Implementation Issues

The school has a proactive philosophy toward inclusion, and teachers are given ample professional learning opportunities that emphasize inclusive practices. Every teacher takes the seven-month TESMC course to learn about language challenges in the classroom. This course is a useful starting point on inclusion for most people, particularly if they have not taught in an international school environment.

The school actively supports the philosophy that their teachers are lifelong learners. Staff professional learning is mandatory for the whole school, and it focuses on topics like inclusive education, lesson design, setting up success criteria, and many other pedagogical practices that support teaching and learning. They also have sessions on inclusive practices in content areas and ESL-related trainings about language. Staff are encouraged to present what they have learned when they go to conferences or to present their graduate-level research if they are earning advanced degrees. Outside speakers are brought in via webinars and Skype. In addition to providing PD opportunities that can reinvigorate and support their teaching staff, the school encourages teachers to pursue master's degrees in education. The school funds official professional learning activities, such as advanced degree programs, IB workshops, and observation visits to other schools.

Addressing the challenges of implementing inclusive practices, Jaclyn said that "knowing and doing are sometimes different things." Because implementing the new practices they learn in PD sessions can take time, teachers are sometimes unable to change their practices and may not put into place everything they have learned. Some staff who have been teaching for a long time are reluctant to change practices. The pedagogical leaders at the school work on changing attitudes and helping teachers incorporate new practices, taking it one step at a time.

Teachers tend to differentiate at a higher level at the end of a school year because they know their students well and have received assistance from the learning support team. Some students at the school have attended five or six different schools before enrolling here, and some who have attended several secondary schools have not had the stability to learn needed skills, particularly if they have not been given the necessary supports in their earlier schooling. This requires teachers to face the challenge of teaching both curriculum and skills to students who did not receive sufficient support at their prior schools. The school does not provide one-on-one

remedial support, and some teachers feel they could do better if somebody were sitting next to them to help keep them on task and prompt them to the next stage.

Jaclyn emphasized that the school has a very positive environment overall. A number of students arrive at the school disillusioned with education because of being told at other schools that they could not get good grades. When they arrive at this school, although their attitude at first is "Well, I've got to be here so I might as well be here," they find themselves in an environment where they flourish. The school relieves the pressure to get top grades and focuses on children being happy and enjoying education. Jaclyn noted that "a lot of places say it but do not necessarily live it." Because it is a relatively small school at the moment, it can maintain a more welcoming and family-like feeling. The corporation that runs the school hired a professional learning director who is leading the school to become very inclusive.

V. UDL Connections

Jaclyn was knowledgeable about teaching students from diverse backgrounds and supporting students with disabilities. She uses various strategies to provide flexible learning environments and instructional scaffolds for students. Jaclyn described several ways she addresses learner variability in her classroom to support a range of students. The table below denotes practices Jaclyn described and their connections to the UDL guidelines and checkpoints.

Instructional strategies Jaclyn used	**UDL guidelines and checkpoints addressed**
Uses digital text to provide flexibility and modification, giving students an alternative to hand writing.	UDL Guideline 1. Provide options for perception 1.1 Offer ways of customizing the display of information 1.2 Offer alternatives for auditory information 1.3 Offer alternatives for visual information UDL Guideline 4. Provide options for physical action 4.2 Optimize access to tools and assistive technologies
Clarifies vocabulary through pre-learning strategies. Students are asked to look at vocabulary from lesson coming up next and define them. Provides vocab lists ahead of lessons to allow students to translate key words, command term definitions, and labels on diagrams prior to teaching them.	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.2 Clarify syntax and structure 2.3 Support decoding of text, mathematical notation, and symbols 2.4 Promote understanding across languages 2.5 Illustrate through multiple media
Accompanies tasks with images, where possible, to support interpretation of nouns. Supports learners of the same mother tongue to clarify tasks and knowledge together rather than always requiring them to use the language	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.4 Promote understanding across languages 2.5 Illustrate through multiple media

of instruction.	
Presents materials online and provides access to students prior to each unit; provides supports for all ability levels to access information ahead of time.	UDL Guideline 4. Provide options for physical action 4.2 Optimize access to tools and assistive technologies UDL Guideline 6. Provide options for executive functions 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress
Uses technology to give students varied formats for expression that provide alternatives to written assessments. For example, student with processing delays can be supported by a video project in which students work in groups, plan out a movie together, and record the video.	UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation 4.2 Optimize access to tools and assistive technologies UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance UDL Guideline 6. Provide options for executive functions 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources
Varies the level of challenge for students.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.2 Vary demands and resources to optimize challenge
Provides options for assessments; summative assessments allow learners to select a format that they are most confident in or challenge them to try a less familiar approach. Marks are awarded depending on the degree of risk-taking involved in the decision-making.	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.3 Minimize threats and distractions UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
Where possible, case studies are learner-generated rather than teacher-directed to allow individual	UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity

interests and personal experience to determine the location and scale of it. This increases learner motivation and allows the learner to make the theory appear more relevant to them.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.1 Heighten salience of goals and objectives 8.2 Vary demands and resources to optimize challenge

Case Story #6: Asia

Educator: Ramesh
Role: Teacher, Department Head
Region: IB Asia-Pacific (Asia)
School: International school, nursery-12
IB Programs: PYP, MYP, DP

I. Information about the Interviewee

Ramesh is a teacher at a private school. He primarily teaches chemistry to students in DP1 and DP2 and is the head of the science department. His students range in age from 17 to 19. He also works with tenth-graders in preparation for the upper level chemistry courses. Ramesh earned his bachelor's and master's degrees in chemistry from universities in India and is licensed in secondary-level general education. He has been a teacher for 21 years.

II. School Information

This private school is located in an urban area in India. About 90% of the students are from the main city where the school is located, and the remaining 10% are from other parts of the state. The school also has a few Korean students. Most students speak Hindi as their first language. According to school policy, teachers deliver instruction mostly in English but permit students to speak in Hindi in the classroom.

The students are largely from upper-middle-class families. About half the parents are business owners, and they send their children to this private school with the specific aim of educating them to take over the family business in the future. The other half of the student population comes from highly educated professional families. The school also enrolls children of non-resident Indians who have moved back home from the U.S., the UK, and other countries. The children who have returned to India after spending substantial time abroad tend to have good communication skills, and are clear about and focused on their goals.

The school does not have many students who receive special education services. There are a few special needs students who have been identified as slower learners who have issues with attention and concentration. These students are provided with modifications in the classroom and attend some different classes than the rest of the student population.

III. Knowledge and Implementation of Inclusive Practices/UDL

Ramesh stated that he was unfamiliar with UDL until a recent IB workshop on inclusive practices that took place at the school. The workshop facilitator talked about the importance of inclusive education and what IB is doing to support inclusive instructional practices. Ramesh noted that he and his colleagues had a lot of questions about the challenges of implementing inclusive education in schools. Shortly after attending this workshop, Ramesh received the CAST UDL survey link and recognized that the practices introduced at the workshop had many commonalities with UDL. Ramesh stated:

> I was glad to receive that [survey] and found it very interesting because I have followed different techniques to get across to my students and also ensure that they understand

> what I teach in class. It was easy for me to understand those [survey] questions very spontaneously. The next day, I found out more about UDL, I came across some sites that talked a lot about UDL, one of them is the CAST site. I have discovered that I have been following it in my classes for years. I came up with differentiation on my own teaching.

Ramesh is systematic in planning his classes and takes variability into consideration. He analyzes both content and learner in order to design appropriate instructional strategies. He starts by considering his students' strengths and weaknesses; as he teaches, he takes notes of what challenges each student has. He explained:

> I keep taking notes, time to time, as I go through my class. If I notice anything different or special that is worth taking note of, I just write a couple of words, "this child has this kind of problem or this subtopic is hard to understand or this topic is challenging." I go through that list that I have on my own, and looking at these two things, I decide on group activities.

Ramesh often uses collaborative grouping strategies to provide a support structure for students during the learning process. He is deliberate and thoughtful about grouping students to help them persist and succeed with the task at hand. He gave the example of a particularly dominant student in his class who speaks extensively and loudly, which makes it difficult for other students to contribute their ideas. When grouping students, Ramesh is careful to put him with other outspoken students. By grouping students thoughtfully, Ramesh seeks to create a learning environment in which "everybody understands the importance of being heard, to give respect to each other, to listen to each other, not to dominate." He also uses heterogeneous groupings so that students with basic knowledge can learn from students with advanced knowledge

Ramesh is also thoughtful about ways to foster student engagement by integrating various instructional strategies. He encourages students to generate their own knowledge about topics during group work. He provides open-ended questions and asks each group to discuss a question and summarize important points for presentation to the whole class. He takes into account that groups work at varied paces and that some finish a task more quickly than others. If a few groups finish quickly, instead of sitting around talking, he asks them to look at each other's work and reflect on how another group's discussion was similar to or different from theirs. Ramesh chooses the students who will present for each group to ensure that quiet students get the opportunity to speak. At the same time, he provides an opportunity for outspoken group members to contribute by asking questions or elaborating on what the speaker says. Ramesh noted that in this way "everyone gets a chance to say something to the rest of the class." Ramesh extends the group work and presentations to give students the opportunity to learn from each other. He stated:

> I tell them to consolidate the overall view of the whole class—the best thing that everybody has done together and put on the soft board for everybody's reference. The best of every group is put up on the board; everyone finds that their contribution is reflected in the consolidated piece of work.

Ramesh is keenly aware of making learning relevant and engaging for his students, based on their own lives and interests. He gave an example of how he teaches the concept of solubility, noting that although it is a simple concept, it can be challenging for some students to grasp. To have students reflect on what makes a compound soluble or insoluble, he relates the concept to situations the students are familiar with. He presents the scenario of going to a party and draws an analogy of how people choose to interact or not. He said this is one way he helps students make connections with concepts: "It's about the use of emotions and basic understanding of relationships among human beings, experiences in life every day, that they can easily see."

Ramesh recognizes the importance of fostering relevance. He stated, "I connect with my personal experiences and take them to my classroom teaching." If students seem uninterested in the topic, Ramesh's strategy is to make connections to personal situations that can draw them in. He gave a recent example of how students were anxious and dejected as exam results were being passed back to them. Ramesh stopped handing out the exams and told them an anecdote about how he lost his bicycle key that morning and how he came up with a solution to unlock his bike. He wanted to make the point that setbacks are okay and that it's important to persist and come up with one's own solutions for setbacks. In this way, Ramesh is very aware of supporting the social-emotional needs of students as a precursor to learning.

Ramesh is also thoughtful about ways to support academic content by connecting to students' background knowledge and interests. Noting that chemistry requires mastering a lot of specific content knowledge, he tries to find ways to increase its relevance for students. He gave an example of teaching the properties of transition metals (alloy formation) by asking students to guess the characteristics of an alloy known as Smart Memory Alloy. He shows students videos to provide information about the alloy and asks them to figure out why this alloy is used in angioplasty procedures. Students are able to consider information presented to them in varied ways (e.g., videos, discussions, reflections) and come up with answers. Ramesh notes, "This lesson, I believe, was not taught by me, rather studied by my students themselves. They learnt how to use different media, structures, and properly framed questions to help them to reach to the correct answers."

The school encourages the use of technology as part of instruction. Teachers are encouraged to use Google Classroom. Students bring their own laptops to access technological resources during class. As a result, many teachers integrate such resources as simulations, apps, and collaborative documents into their instruction.

IV. Schoolwide Implementation Issues

The school principal has emphasized the need to use differentiated practices to make sure that every child benefits from instruction, understands concepts, and comprehends the core content. The school's philosophy is that teachers need to ensure that every child's needs are met in the classroom. Teachers are expected to attend professional development sessions on two Saturdays per month. Ramesh explained:

> The school always wants us to show that we develop professionally and reflect in the form of student performance and understanding of subjects. Indeed, they do promote us, they give us a lot of liberty to practice different teaching methodologies, they want us to share different teaching practices.

As head of the science department, Ramesh conducts observations in other science classes. He has observed that, although teachers are expected to use inclusive practices, each teacher approaches it differently. Realizing that some teachers are not differentiating instruction, Ramesh has become interested in providing professional development on this topic. He talked to the IB coordinator at his school after taking the UDL survey and has started planning some Saturday PD sessions to introduce teachers at his school to UDL and differentiated strategies. He has gone to the local university to learn more about inclusive practices and has done some self-study on the Internet to get resources he can use to teach his colleagues. For these Saturday PD sessions, Ramesh has also tried to instate a "learning by sharing" model to encourage his colleagues to their share their best practices with each other.

Ramesh described how limited time and exam preparation posed challenges to implementing inclusive practices. He stated:

> A base challenge that we have—when we actually meet the requirements of all students through different activities—there is no doubt it helps the students understand these particular topics to depth. The problem comes to the time constraint: we have five days per week, we have a complete syllabus, DP is exam oriented, and more so results-oriented for school and parents. At the end of three years, parents and school want to see results in the subject.

Ramesh explained that once DP2 begins teachers feel pressure to be more structured and subject-oriented, and are less able to include flexible instructional strategies. Ramesh understands this dilemma, and if he is unable to differentiate enough in his own classes, he offers one-on-one tutoring to students in DP2 who need extra help.

Another challenge Ramesh noted was that some students are focused on acquiring subject-specific knowledge. These students think of themselves as good learners, grasp things very quickly, and have less patience to wait for others to understand. They pressure teachers to go faster and are less understanding of the IB way of teaching or the use of differentiated practices. Parents are also unfamiliar with flexible methods and some do not support teachers using too many non-traditional teaching practices.

Ramesh concluded the interview by saying that he is very interested in understanding his students and their backgrounds and helping them succeed through an awareness of them as individuals. He stated, "I have gotten a passion towards teaching and sharing my ideas. UDL and inclusive practices—it's something that creatively engages your students in class."

V. UDL Connections

Ramesh had an innate passion and drive to differentiate instruction for his students. Although he did not formally learn about the inclusive practices of UDL until recently, he stated that "knowingly or unknowingly, we have been following these inclusive practices." In his descriptions of his lesson planning and implementation, Ramesh clearly had a natural proclivity for using flexible and varied methods to reach all learners. The table below denotes the inclusive practices he described and connects them to the UDL guidelines.

Instructional strategies Ramesh used	UDL guidelines and checkpoints addressed
Uses various flexible methods to help students develop their own knowledge. Lets "learners teach themselves the lesson" through a sequence of activities where they explore concepts with carefully designed scaffolds provided by the teacher.	Considers learner variability during the lesson design process, which is at the core of all UDL guidelines.
Designs lessons with consideration of students' strengths and weaknesses; while teaching, he makes notes of things that individual students find challenging and refers to these notes as he decides how to group students.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources
Uses various collaborative grouping modes to support students' needs; uses homogenous groups and heterogeneous groups appropriately to ensure that all students have a voice and can be respected.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community
Uses mnemonics to support development of vocabulary and help students remember academic vocabulary in the sciences.	UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.3 Support decoding of text, mathematical notation, and symbols UDL Guideline 3. Provide options for comprehension 3.2 Highlight patterns, critical features, big ideas, and relationships
Connects concepts to things that teenagers are interested in; focuses on personal relevance for students.	UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity
Considers students' emotional needs and developmental stages; tries to support their social-emotional needs to create an engaging space for learning.	UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies
Ensures that all students have varied ways to express what they know during a lesson; seamlessly integrates	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication

opportunities for students to present information while considering the supports that quieter students need and giving more talkative students the opportunity to contribute as well.	5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance
In more structured, subject-area related DP2 courses, provides additional one-to-one support for students as needed.	UDL Guideline 6. Provide options for executive functions 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources UDL Guideline 8. Provide options for sustaining effort and persistence 8.4 Increase mastery-oriented feedback
Uses technology to support learning; uses videos as part of background building.	UDL Guideline1. Provide options for perception 1.2 Offer alternatives for auditory information 1.3 Offer alternatives for visual information UDL Guideline 4. Provide options for physical action 4.2 Optimize access to tools and assistive technologies

Case Story #7: Pacific

Educator: Edwin Role: Teacher
Region: IB Asia-Pacific (Pacific)
School: International IB school, preK-12
IB Programs: DP

I. Information about the Interviewee

Edwin teaches IB business and IB economics to students in grades 10-12. He has bachelor's degrees in business and economics and an MBA from the Philippines. He also earned a teaching license from a university in the Philippines and has additional training in IB approaches. Edwin has been an educator for 19 years and is in his fifth year at this school.

II. School Information

Edwin teaches at an international private school in the Philippines that enrolls about 255 students in preK-12. The school has been in operation for eight years. Fifty percent to 60 percent of the student population are Filipino dual citizens (e.g., Filipino-American, Filipino-Italian, Filipino-Canadian). The other 40%-50% of the students are from Europe, Australia, and other countries in Asia. Most of the students are fluent in English, and very few students enroll in the school's ESL program. Edwin estimated that 15% of the students have disabilities, such as ADHD, emotional/behavioral disabilities, and learning disabilities. The school is not equipped to handle the needs of students who have highly specialized needs.

The school has one learning specialist who supports students up to eighth grade by helping teachers implement differentiated practices. Some students are pulled out of the class to work on math and English, but the specialist's main goal is to integrate students into the classroom. There is a shortage of learning specialists in the Philippines, and DP teachers are expected to do the differentiation themselves.

III. Knowledge and Implementation of Inclusive Practices/UDL

Edwin previously worked at a university that advocated for the inclusion of students with disabilities and thus became familiar with these issues. His current school is seeking international school accreditation and therefore has started providing supports for diverse students by scaffolding learning and differentiated instruction. Although Edwin was not familiar with the UDL framework itself, he was familiar with differentiated practices and inclusive educational practices, which he learned in his teacher licensure courses.

Edwin described his implementation of various inclusive practices. He was familiar with the concept and language of multiple intelligences, and had some awareness of how to support psychomotor and linguistic skills. For example, students in his business classes are asked to incorporate diagrams and write about them. For students with strong psychomotor skills who prefer not to write, Edwin offers the option of drawing diagrams on the white table and working with their hands. For visual learners, he integrates visual supports such as PowerPoint, interactive slides, economic diagrams, visuals of an X/Y axis for business, and fishbone

diagrams. The school has adopted digital technologies to support students, and all teachers are required to use Edmodo so parents can see what their children are learning and follow their lessons and progress.

Edwin described using multiple means of representation by providing clarifying terms, diagrams, and graphs, and highlighting key concepts. He engages students by making connections to real-life examples and to the personal experiences of students and their families. He builds in various instructional scaffolds during the learning process to help students engage with the content and learn from and with each other. For example, he provides various collaborative and independent learning opportunities. Student practice for IB exams through class discussions, seat work, group work, and individual homework. He fosters collaborative learning by having students complete shared tasks, such as researching terms, considering examples, reflecting on case studies, and examining real-world phenomena. All students are encouraged to work on these activities.

Edwin engages students in varied ways and fosters their confidence by giving them the freedom to ask questions and inquire about real-life and hypothetical scenarios. Students are assessed through both formative assessments, which allow Edwin to give immediate feedback, and traditional summative assessments. In this way, Edwin gives students the opportunity to practice the skills they need to take exams and get feedback during the process.

Teachers at the school have access to technology that they integrate into classroom instruction. For example, teachers and students use research tools, manipulatives, simulation games, and hands-on activities that are facilitated by technology. In the DP program, teachers try to present things in different ways to provide multimodal representations of information that address learners' varied preferences. Edwin stated that "it is not a perfect practice, but it complements each class, teachers see the results." Teachers use the Council of International School indicators to guide teaching and learning processes and to integrate differentiated instruction and multiple intelligence approaches in the classroom.

IV. Schoolwide Implementation Issues

The school administration acknowledges that the teaching staff needs professional development opportunities and is actively working to ensure that they receive necessary training. The school has arranged teacher workshops and PD about inclusion that are run by local experts.

The school is in the second year of implementing inclusive practices. Edwin noted that this is a systematic process that will take time. He stated that inclusive instructional strategies and differentiation are currently more prevalent in the lower school, which implements differentiated learning strategies regularly because their students come from varied backgrounds, including from rural areas. The school also aims to identify students' disabilities earlier and to understand how to help students as they progress in school. The teachers in the lower school have specializations in early education and are familiar with using assistive and instructional technology tools, such as text readers and Kindles.

Although teachers in the upper school are aware of the need to support diverse learners, time is a constraint when planning differentiated instruction. At the upper school and DP level, the material is content-heavy and teachers tend to rely on traditional teaching practices to address the content that needs to be covered. Teachers feel they cannot modify the lessons as they prepare

students for exams, and this can reduce the quality of the teaching. Teachers also tend to cater to the majority of students in the class, so when only one or two need learning supports, they are unable to put in the preparation time to differentiate. Edwin described some local issues that impacted teaching time, such as the number of typhoon threats they face each year and the many local holidays. Teaching time gets eroded in some months, leaving teachers with even less time to cover the required content.

V. UDL Connections

Edwin described the various ways he engages students, and the multiple ways he allows them to present information and thus to express what they know. Although he was not familiar with the UDL framework specifically, he was knowledgeable about the need to differentiate in order to reach varied students. The table below denotes the practices Edwin described and maps his practices to key UDL guidelines and checkpoints.

Instructional strategies Edwin used	**UDL guidelines and checkpoints addressed**
Highlights terms, diagrams, graphs, key concepts.	UDL Guideline 2: Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.2 Clarify syntax and structure 2.4 Promote understanding across languages UDL Guideline 3. Provide options for comprehension 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation
Students are provided with options for written expression; for example, students can draw diagrams or do hands-on work to demonstrate knowledge.	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition
Provides real-life examples, including personal experiences of students and their families.	UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge UDL Guideline 7. Provide options for recruiting interest 7.2 Optimize relevance, value, and authenticity
Lower order and higher order thinking skills are incorporated into the weekly teaching on specific topics.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy
IB practice questions are given as class discussions,	UDL Guideline 6. Provide options for executive functions 6.2 Support planning and strategy development

formative seat work, group brainstorming, individual homework, and summative assessments.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community
Group and class brainstorming with interactive class discussions are used to tackle units of study. Group learning and shared tasks such as researching terms, examples, case studies, real-world phenomena are encouraged for all students.	UDL Guideline 7. Provide options for recruiting interest 7.2 Optimize relevance, value, and authenticity UDL Guideline 8. Provide options for sustaining effort and persistence 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community
Students have the confidence and freedom to ask questions and inquire about real-life or hypothetical scenarios.	UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
Uses multimodal tools (like PowerPoint) and Edmodo.	UDL Guideline 4. Provide options for physical action 4.2 Optimize access to tools and assistive technologies

Case Story #8: North America

Educator: Luis
Role: Director of School
Region: IB Americas (North America)
School: Private School, preK-12
IB Programs: PYP, MYP, DP

I. Information about the Interviewee

Luis is the director of the school and teaches classes in ethics (individuals and societies) at the secondary school. He has been an educator for 26 years. He has earned bachelor's and master's degrees in pedagogy from universities in Mexico.

II. School Information

Luis is the director of a K-12 school located in an urban area in Mexico. The school has an early childhood unit and serves students ranging in age from 1 to 19. The school has an enrollment of 800 students. Approximately 95% of the students are from Mexico, and the remaining 5% are international students. Spanish is the primary language of instruction, but some classes are taught in English.

The school has a diverse student body, including students with various disabilities, including learning disabilities, autism, visual impairments, ADHD, emotional behavior disorders, and physical disabilities. Luis explained that the school used to be very selective in terms of academic performance, but in 1999 they revised their mission statement and added the word "inclusive." As a result, the school has become far more diverse over the past 15 years in terms of cognitive, physical, social, and economic diversity. Staff members are also open to and accepting of varied family structures and sexual orientations. He noted that, "overall, people are more aware that human beings all learn things and express differently."

The learning support services team has a strong presence at the school, and they work with Luis as part of the leadership team. These inclusive teams support students who have special learning needs. Luis stated:

> It is very simple but it is very effective because we work collaboratively, we put the student right in the center. We usually invite people who are near the student, it can be people in the school or in the family, it can be the specialist.

The inclusive team meetings are called "Pro-[Name of Student]," with "pro" used to emphasize that, for example, the meetings are "in favor of Alex." The inclusive team meets three times a year to review each student's individualized learning profile. They look at the student's progress, and set goals to ensure that everyone is committed to and focused on the student's learning goals for the following three months. Luis emphasized the communication and collaboration that takes place, which involves everyone who supports the student:

> This is basically a very powerful tool because we talk to the parents about leadership and

> we tell them that they are to be very involved with all the things we do here. The simple thing is listening to each other as we talk—you see the psychologist listening to the teacher, and the teacher listens to the psychologist and the grandmother. It is amazingly powerful. That has been the main tool we use, the inclusive teams.

III. Knowledge and Implementation of Inclusive Practices/UDL

Luis described himself as passionate about inclusion. He is knowledgeable about UDL as a framework based on brain research. He described how UDL helps us understand that we are all diverse and provides the rationale for differentiation. Luis learned about UDL while conducting workshops about inclusive practices; workshop participants mentioned UDL to him and noted its similarities with what Luis was teaching. Since hearing about UDL, Luis has done his own self-study, read about the framework, and gained a further appreciation and understanding of UDL as a framework for inclusion.

The school uses inquiry as its main teaching strategy. The teachers are aware of the need to engage students, and they begin each unit with a lot of questioning techniques and stimuli to engage their learners, such as videos, discussions, and textual artifacts. Students are given choices and know that they can advocate for themselves. If a student suggests that they would like to use a particular tool or method as part of their learning, the teacher is open to letting them do so, as long as the learning objectives are being met.

Luis described the GRASP performance assessment that he was currently using in his class.[1] GRASP offers flexibility and choice, thus situating student learning in authentic contexts. This method focuses on having students define goals and choose relevant and authentic roles, on considering audience and context, and on demonstrating and expressing knowledge in various formats.

Technology is used extensively at the school to support students with special learning needs, and to support the inquiry-based learning that takes place for all students. iPads are used as assistive technologies for students who need specific supports. For example, some students use apps that can assist with "scaffolding for executive functions, social skills, and understanding things related to social norms." The school also has iPad carts that teachers use in the classroom to integrate technology-based strategies during lessons for all students. Luis noted that having greater availability of laptops/iPads and more training on technology are priorities for the school.

Luis described the importance of educating children with disabilities in the most inclusive environment possible, and of providing the necessary scaffolds to allow the child to participate in class with his peers:

> There was a teacher who wanted to create an alternative program with a student with autism, because there was such a gap in between his performance and the rest of the class performance. She tried to develop another program and we said, "No, no, that's not inclusion. Inclusion is about belonging, it's about sharing context." It is amazing to see what we can do if we prepare the student to share with the rest of the group. Even if they have deep gaps, they can always make meaning, if we give them the scaffolding they

[1] The Goal, Role, Audience, Situation, Product developed by Wiggins and McTighe.

> need. You will see English classes, where they are really talking about literature and the student with autism hardly communicates in English and makes meaning. But it works, it works because he knows that he is in there and the class is discussing certain things that he can connect with his own learning.

In addition to providing instruction in a general education setting, students with disabilities are provided with pull-out supports, as needed. When a child needs extra support for certain subjects and skills, the learning support team provides differentiated activities and adaptations. They embrace the philosophy that the child should be with his/her peers in the classroom as much as possible. Based on the needs identified in the individualized learning plans, students with cognitive disabilities are given support in developing life skills, such as social skills and functional skills.

IV. Schoolwide Implementation Issues

Inclusion has come very naturally to most of the staff of Luis' school. He emphasized that point, stating, "If you go to our kindergarten today, you can see that it is just the mindset to welcome everyone. It is within their heart. If you come to our high school they are still working on it." If a teacher is unsure how to assess a particular student, Luis suggests that they try to bond with that student first and then figure out how to assess them. His goal is to put the students first, and to consider their social and emotional needs along with their academic skills.

Luis stated that teachers are conscious of their own learning styles and careful to be aware of this as they design lessons. Strong in-house PD is provided, most often IB-focused courses. Luis was interested in providing training on UDL. Although his teachers knew about differentiation and embraced inclusion, Luis felt that UDL's basis in brain research would give them new ideas and insights into the "why" of inclusive practices. He noted that UDL-based practices can be modeled for teachers as they are introduced to UDL:

> We are in a practical world and teachers want hands-on strategies to use in the classroom. I would put that as a priority, that they understand what's beyond diversity, what they don't see…we have been more into the IB resources and Carol Ann Tomlinson, but I think we have to go deeper into UDL. We have to see what UDL is in practice.

The main barrier to implementing inclusive practices is time, especially for secondary school teachers. When teachers are under pressure to cover a lot of content, some revert to traditional lecture-based methods. Luis noted that it is important to him to set an example, and that although some lecture-based teaching is okay, it should not be the main teaching method.

V. UDL Connections

Luis has established a strong foundation for inclusive practices at his school. Inclusive practices are integrated at all levels, from offering flexible choices and options and focusing on engaging students to the more specific adaptations and strategies used to support students' special needs. The table below denotes how some of the strategies that Luis mentioned address the UDL guidelines and checkpoints.

Instructional Strategies used by Luis (and teachers at his school)	UDL guidelines and checkpoints addressed
Uses inquiry-based techniques that rely on various multimodal stimuli to introduce new concepts.	UDL Guideline 1. Provide options for perception 1.1 Offer ways of customizing the display of information 1.2 Offer alternatives for auditory information 1.3 Offer alternatives for visual information UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation 3.4 Maximize transfer and generalization
Provides flexible choices and options during instruction. For example, uses the GRASP (Goal, Role, Audience, Situation, Product) model for performance assessments.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity UDL Guideline 8. Provide options for sustaining effort and persistence 8.1 Heighten salience of goals and objectives 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community 8.4 Increase mastery-oriented feedback
Students can suggest how they want to do things and are encouraged to self-advocate.	UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.3 Develop self-assessment and reflection
Uses technology both for specific assistive purposes (e.g., iPad apps) and for classroom instructional purposes.	UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation 4.2 Optimize access to tools and assistive technologies
Provide scaffolds during instruction to help students connect with information at their levels.	UDL Guideline 5. Provide options for expression and communication 5.3 Build fluencies with graduated support for practice/performance UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting

	6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress

Case Story #9: North America

Educator: Becca
Role: Resource Teacher
Region: IB Americas (North America)
School: Independent college-preparatory school, grades 8-12
IB Programs: DP

I. Information about the Interviewee

Becca is a resource teacher whose primary role is to provide support and coaching for students and teachers through the school's Academic Resource Center. The Resource Center serves students who have formal education plans (students with disabilities, or 504 plans) and need extra learning supports. Becca has been an educator for 24 years, with a background in general and special education. She completed her bachelor's and master's degrees in literature in the U.S. and is currently pursuing a doctoral degree in education.

II. School Information

Becca works at an independent college-preparatory school, which is located in a suburban area in the eastern United States. It enrolls about 500 students in grades 8-12, but most of them start in the ninth grade. Some come from private schools and others from public schools, both urban and rural. Most students are native English speakers, and the few students from overseas tend to speak English fluently. Students at the school have a wide range of ability levels.

There has been a push to increase diversity at the school and the demographics have changed in the past 5-10 years. The majority of students are traditionally Caucasian, and the school has offered scholarships over the past decade to increase socioeconomic diversity. As a result, there is greater academic, cultural, and ethnic diversity at the school today. Teachers have found it challenging to address the increased variability resulting from the greater range of student backgrounds and educational experiences.

Becca estimates that 80-90 students have a documented learning disability, ADHD and/or motional and behavioral disorders. Four or five students are on the autism spectrum. Because of the structural limitations of the campus, very few students have physical disabilities. However, the school is working to make the campus more physically accessible.

III. Knowledge and Implementation of Inclusive Practices/UDL

Becca had a high level of knowledge about UDL. She is currently enrolled in a PhD program, and UDL is the focus of her dissertation. She first learned about UDL in her doctoral courses and had been familiar with the framework for about five years at the time of her interview. She did not have any formal training in inclusive practices in her undergraduate education or earlier in her career. She became interested in differentiation as a way to support students in her classes who had high-incidence disabilities. She started out by using new strategies with students who had challenges with reading. She learned about these strategies by attending workshops and doing research on her own. Over the years, supporting students who were falling behind became one of her goals.

Becca was the only staff member in the Academic Resource Center until last year, when the school hired a second person. Becca stated, “We are timed to rebrand ourselves not just as resource teachers for students who are struggling but as a resource for teachers and students at all levels, offering PD, [and] coaching for teachers and students.” In her role as a resource teacher, Becca works with other teachers at her school, supporting them in the classroom and through the resource center. Both she and her colleague at the Resource Center are interested in using UDL for curriculum design. She is knowledgeable about various strategies that align with the UDL guidelines, and described how she incorporates multiple means of representation, action and expression, and engagement into lessons. For example, Becca described how she helped an algebra teacher support her students. She designed a lesson that asked students to create their own word problems, based on their interests. Students picked a topic, wrote a word problem, and created linear equations and graphics for those equations. The students were able to do these activities in various formats using varied resources. They were able to use technology to create slides and use other media to make posters and visual displays. Students also created timelines and graphs using different tools, connected the lesson to matters they are interested in, and made connections to previous problems.

Becca explained that she and her colleague at the Resource Center are training other teachers about inclusive practices and UDL-based strategies by modeling them. For example, they are redesigning a world geography class and using it as a model for ways to incorporate UDL into curriculum and instruction. They are using CAST’s UDL Exchange website to create lessons and using the UDL guidelines while creating the curriculum. To get buy-in from teachers, they start by looking at what teachers are doing and offering resources and supplementary strategies. They approach a teacher ahead of time and say, “You are coming up to this unit where in the past it seemed that a lot of our students struggled, so we were thinking about offering some of these other tools.” These strategies include taking the PowerPoint presentation created by the teacher and adding visual aids or links to other resources, and generating graphic organizers to help students understand the material. Their objective is to support teachers, and to anticipate ways to help them teach the same unit again the following year.

If a student has a formal education plan, Becca and her colleague at the Academic Resource Center work with the student and their teacher. They offer accommodations like extended time, computer use, and other standard accommodations, as per school board guidelines. If a teacher is skeptical about students receiving these accommodations, the academic support staff talks to them about why the student needs the extra supports. Becca explained that there was a lot of resistance to accommodations in the beginning because teachers felt that some students were getting special treatment. However, things have changed dramatically in the past ten years, and teachers are now more open to accommodations and supports.

As a resource teacher, Becca finds that her colleagues who teach grades 8-10 are more open to using differentiated strategies than grade 11-12 teachers. Some teachers believe that accommodations do not belong at the higher levels because it reduces the rigor of the curriculum, and that hands-on projects are a better fit in the lower level classes. Becca noted that these sentiments vary from teacher to teacher and tend to be more common among senior faculty:

> A lot of our younger teachers, who are more recent graduates of teacher training programs, seem to be incorporating more of these inclusive practices. They do a lot of these things more naturally as best practices. It tends to be our older faculty or faculty who have been working for a longer period of time who are more focused on subject matter than on teaching strategies. Teachers are becoming more aware of the IB mandate towards UDL, but not yet.

IV. Schoolwide Implementation Issues

Becca described how the IB philosophy and language facilitate incorporating UDL into the classroom environment. In her words, "IB does a lot to eliminate some of the curriculum silos that it traditionally had...[by] talk[ing] about accessibility and inclusivity." She noted that the CAS project integrates service, action, and interdisciplinary approaches, which dovetail nicely with UDL-based instructional practices.

The school has been able to support integrating technology into the curriculum, most recently by implementing a one-to-one laptop program starting with eighth- and ninth-grade classes. Becca described this as one of the greatest factors in facilitating the implementation of UDL. When all students have MacBook's, teachers can use digital text and other online tools more effectively.

Becca noted that the attitudes of some teachers were the main challenge in implementing UDL. Some teachers were reluctant to give up practices they had been using for many years, and had trouble buying into new ways of thinking about what it means to be academically accessible. She described their attitudes:

> There are a lot of independent schools where there is this idea about exclusivity, "This is the way we do things; if students are not able to keep up then perhaps it is not a good fit." Because independent schools don't have to teach everyone, there is an attitude that maybe we shouldn't teach students from a wide range of abilities. Redefining what it means to be a good student or a higher level student is one of our biggest challenges.

Becca was passionate and articulate about how strongly she disagreed with these exclusive beliefs, and in her role at the school she works to change them. Becca noted that independent schools have an advantage because they have the resources and are small enough to make changes that public schools cannot make as easily. On the flip side, they are not mandated to include everyone and, as a result, are not forced to make changes the way public schools are.

Becca and her colleague have conducted introductory trainings in UDL at the school. In addition to explaining to teachers what UDL is, Becca and her colleague are developing a lab model to foster a professional learning community for teachers that will enable them to apply UDL to their lesson plans in a collaborative setting. Teachers can bring in an idea for a unit and work together to develop resources and create tools and curricula that incorporate UDL. Becca also described how she uses UDL in her work to model and teach about UDL; instead of having extra workshops, she incorporates UDL in her own work to demonstrate how it can be implemented in the classroom and how it supports learners.

V. UDL Connections

Becca described her practices that address various UDL principles. The table below denotes the strategies she uses in her role as a resource teacher and their relationship to the UDL guidelines. While describing her instructional practices, Becca demonstrated expert knowledge about UDL and about proactive and intentional ways to use UDL-based strategies to support learner variability. Her practices draw from all three UDL principles, supporting guidelines, and checkpoints across all principles, as noted in the table below.

Instructional strategies Becca used	**UDL guidelines and checkpoints addressed**
Takes teachers' lecture notes and develops illustrated PowerPoints that highlight key ideas. Creates graphic organizers to help students recognize relationships between key ideas. Shares these with the classroom teacher and suggest ways to incorporate them into lessons.	UDL Guideline 1. Provide options for perception 1.2 Offer alternatives for auditory information 1.3 Offer alternatives for visual information UDL Guideline 2. Provide options for language, mathematical expressions, and symbols 2.1 Clarify vocabulary and symbols 2.5 Illustrate through multiple media UDL Guideline 3. Provide options for comprehension 3.1 Activate or supply background knowledge 3.2 Highlight patterns, critical features, big ideas, and relationships 3.3 Guide information processing, visualization, and manipulation 3.4 Maximize transfer and generalization
Students create their own word problems based on their interests. Students pick a topic and write word problems, create linear equations and graphics for those equations. Students are able to do these activities in various formats and with varied resources. They use technology to create slides or use other media to make posters.	UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition 5.3 Build fluencies with graduated support for practice/performance UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy
Helps students develop strategies to master larger, long-term assignments. Breaks larger tasks into manageable chunks, set deadlines, check progress; meeting with students; Students update their agendas, plan weekly and daily goals, and monitor progress.	UDL Guideline 6: Provide options for executive function 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress UDL Guideline 9: Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies

	9.3 Develop self-assessment and reflection UDL Guideline 8. Provide options for sustaining effort and persistence 8.4 Increase mastery-oriented feedback
Gets students working together and supporting each other. This keeps students motivated and offers opportunities for peer support and tutoring.	UDL Guideline 8. Provide options for sustaining effort and persistence 8.1 Heighten salience of goals and objectives 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community UDL Guideline 9. Provide options for self-regulation
Uses laptops to give students access to digital text.	UDL Guideline 1. Provide options for perception 1.1 Offer ways of customizing the display of information UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation 4.2 Optimize access to tools and assistive technologies

Case Story #10: North America

Educator: Sara
Role: Teacher, Department Head
Region: IB Americas (North America)
School: Independent, K-12 IB Programs:
DP

I. Information about the Interviewee

Sara is a teacher and head of the social studies department at her school. She teaches global politics to students in grades 11 and 12. She is licensed as a general education teacher at the secondary level (grades 6-12), with a specialization in social studies and a certificate in ESL. Sara completed her bachelor's, master's, and doctoral degrees at U.S. universities and also has a post-baccalaureate teaching certificate from a U.S. university. She has been a teacher for 18 years.

II. School Information

Sara works at an independent K-12 school located in the western United States. The school is in an urban setting and enrolls about 1,500 students. The school's demographics reflect those of the state where it is located. About 80% of the students are Asian or Pacific Islanders. The school has an ESL department to assist its approximately 90 ESL students with language acquisition. Many of them come from abroad and stay with host families while they attend the school, which was a boarding school until the 1980s.

In the DP program, students can choose to take courses in preparation for the full diploma program, or enroll in the DP courses for advanced course credits. Of the 200 students in the senior class, about 15% are working toward the IB diploma. In the three global politics sections Sara teaches, about 30 students have made the commitment to work toward the full diploma. However, Sara teaches all of the students in her classes in accordance with IB guidelines whether or not they are committed to the full program. All students sit for the exam even if they do not plan to apply for the diploma.

Although Sara did not know the exact percentage of students with disabilities at the school, she stated that several in her classes had learning disabilities, ADHD, and autism. The school also enrolls students with physical disabilities, and many students have undocumented disabilities. Sara noted that, although some parents are forthcoming with teachers about their child's disability, others enroll their students at this school to avoid having their child labeled in a public school. The school has no formal system for identifying students with disabilities, but they bring in specialists to give teachers professional development on learning differences. The grade-level dean gives the teachers information on the specific accommodations needed for a child who has a documented disability.

Because the school has no formal process to identify disabilities or create individualized education plans, parents are often the most helpful source in determining if a student has a

specific disability. Some parents have told Sara what supports their child needs at home, and she has been open to incorporating the same supports and strategies in her classroom.

III. Knowledge and Implementation of Inclusive Practices/UDL

Sara was not familiar with the terminology of UDL but had considerable experience integrating inclusive practices and differentiation into her work as an educator. She had previously worked as part of university-based research group, and part of her job was to develop social studies curriculum and textbooks. Her curriculum development team always integrated inclusive practices into their textbooks, including hands-on activities such as simulations and role plays, to provide varied modalities for learning.

Sara had also learned about inclusive practices during her teacher licensure program and subsequent PD activities. In the instructional methods courses she took as part of her post-baccalaureate teacher licensure program, she was required to develop formal lesson plans that included information on differentiated teaching and learning strategies. Sara also had attended two IB trainings at which teachers developed inclusive lesson plans and shared them with others. Out of interest in the topic, Sara has continued exploring and learning more about inclusive instructional strategies on her own. For example, she read a book about visual thinking routines that her elementary-level colleagues had been asked to read and learned strategies such as see-think-wonder and think-pair-share, which she uses in her classroom. Sara summarized her feelings about integrating inclusive practices in her classroom:

> In this teaching job and at [my prior position] we were really expected to provide multiple ways of learning and teaching, there was never an option. So I have had great teaching jobs and I have been expected to ensure that all are participating.

Sara described the many engaging and inclusive strategies she learned while doing coursework to earn an ESL credential. She noted that "there were many meaningful activities within that coursework that helped to motivate me and increase my creativity when developing lessons."

Sara described a lesson she uses in her model United Nations unit, in which students prepare for an in-class "UN conference." Sara includes a variety of flexible options and scaffolds in the activity—in her words, "there is a lot of student choice and voice." Students can choose their country and select one of two topics. In alignment with the IB social sciences expectation that students act as historians and social scientists, students analyze primary sources using the "origin, purpose, value and limitation" strategy. Sara provides a range of scaffolds and supports during this process. Because finding primary sources can be a challenge for some, Sara meets one-on-one with each student and provides appropriate assistance at their level. Sara also avails herself of library resources, and the librarians are available to assist students as they do their research. The students can use multimodal resources to access text, such as listening to audio versions of sources and using text-to-speech options as they read. Many students prefer listening to audio or watching videos to learn key content.

The ultimate goal of this unit is for students to create position statements on an issue related to their country of choice, take the role of the delegate for that country, and participate in a class debate. To prepare her students for this, Sara allows them to work at a pace that is appropriate for

them, conduct research, and set their own goals. They can work in groups that were assigned to them at beginning of the year, or go solo if they feel ready. Sara noted that her objective with all of these strategies is to have students "working towards the same goal, but students have the opportunity to use resources that are more manageable for them."

The school has a one-to-one iPad program and is also a Google School. Using these technological resources, Sara provides various ways for students to engage with information, collaborate, and express what they know. As part of the model United Nations unit, students create infographics about their countries using an app called Notability. They integrate visual and textual information about current events, their country's form of government, recent conflicts, current events, and the role their country plays in the world. They create a Google link to their infographic, pinning it onto a collaborative Google map that all students can access. In this way, students create digital multimodal resources and have the opportunity to express what they know in flexible formats and share their expertise with each other.

Sara seamlessly integrates technology into various ongoing projects, which gives students multiple ways to create their knowledge base and express what they learn. Early in the semester, students are assigned a region and expected to become an expert on that area. Throughout the semester, students create newscasts about current events in their region using iMovie software on their iPads. They share these newscasts on a class Weebly site, and their peers provide feedback using the see-think-wonder method. They also use Google Presentations to do their see-think-wonder activities collaboratively.

IV. Schoolwide Implementation Issues

The administration is supportive of inclusive education and has actively pushed teachers toward using inclusive practices. They provide funding for teachers to attend conferences, take online training courses, and participate in PD workshops. They also bring in outside trainers and experts to conduct on-site trainings, and some workshops on the inclusion of students with disabilities have been provided. Sara also explained that while the teachers who teach in the IB Diploma Program have opportunities to learn about engaging students through inclusive practices in IB trainings, the teachers in the other secondary grade levels may not get this training. She noted that a useful schoolwide approach would be to provide more training about these practices for teachers of grades 9-10, whose students enter the DP program in grades 11-12 years. Sara identified an overall need for training that models inclusive practices and illustrates the "how" and "why" of various instructional strategies that can be more inclusive and broaden access to more students.

As department head, Sara tries to help teachers move forward with adopting new practices. Some of her teachers are intimidated by the new technology and ideas, but she continues to introduce these ideas and provides support at department meetings to slowly bring more teachers on board with integrating inclusive practices.

Sara emphasized that inclusiveness is an important part of IB philosophy and expectations, including assessment. All teachers who teach DP courses are trained in such IB approaches. Sara noted:

> IB expectations are very different because they require engagement, so you really cannot not provide inclusive practices or engaging activities because students have to be engaged in the IB, it is actually part of the testing process.

She went onto explain that there are three IB assessments in her subject area of global politics. One is an activity that requires student to be engaged politically, write about it, and link their experience to course concepts. Another assignment requires students to create two videos presenting information about issues of global significance, such as human trafficking. The third section is in a written format, but it has built-in flexibility because students analyze primary sources that might include a photo; they have to determine what they see and what the photo represents, and what perspective it shows. Sara also described an IB history exam, which is given in a more traditional written format. Students choose three questions out of 24, which gives teachers some flexibility because they can teach about concepts relevant to their regions of the world. Sara was able to differentiate her instruction while preparing students for this more traditional exam by focusing on three events over the course of the school year using various differentiated strategies. She focused on a local site of global historical significance (i.e., a site related to World War II) and took students on a field trip to the site as part of their exploration of historical events. Thus she was able to increase authenticity and relevance for her students and pace the core lessons in flexible ways to prepare students for the written exam.

The greatest challenge to implementing inclusive practices schoolwide is some teachers' resistance to change. The level of inclusive practices implemented varies by teacher. Sara stated that about half of her colleagues are still using traditional strategies such as lecture-based classes, while the other half are eager to learn and try new strategies. Sara noted that having resources or a learning support team to support students and teachers on site might help promote schoolwide implementation of inclusive practices.

Sara concluded with an insight on ESL students who would be well-served by IB's inclusive practices, but who ironically may not have access to the very IB courses that would suit them. These ESL students, who would be in an IB program in their home countries, might not have the scores needed on reading and writing assessments to enroll in IB courses. She stated, "I think these classes would be an even better fit for them because they are globally focused classes. Here are students who already have a multicultural perspective on life but are not able to take advantage of these opportunities." She said this an important thing to consider when developing inclusion and access to IB programs, especially as more U.S. public schools that have large ESL populations adopt IB programs.

V. UDL Connections

Sara is knowledgeable about student engagement and differentiation strategies from her training as an ESL teacher and her prior experiences as curriculum developer. Although she was not familiar with the UDL framework specifically, she described various practices she uses in her lesson design process and while implementing lessons that are consistent with a range of UDL guidelines. The table below denotes some of the practices Sara described and their connections to the UDL guidelines and checkpoints.

Instructional strategies Sara used	UDL guidelines and checkpoints addressed
Focuses on having students working toward the same goal through various flexible methods/pathways.	Identifying clear goals and using flexible strategies to meet the goals underlies the core philosophy of UDL.
Provides student choices for activities and assignments. For example, students can choose to work alone or in a group and can choose topics.	UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity UDL Guideline 8. Provide options for sustaining effort and persistence 8.2 Vary demands and resources to optimize challenge 8.3 Foster collaboration and community
Lets students go at their own pace while conducting research; provides scaffolds, such as assistance from teacher and librarian during research phases.	UDL Guideline 5. Provide options for expression and communication 5.3 Build fluencies with graduated support for practice/performance UDL Guideline 8. Provide options for sustaining effort and persistence 8.4 Increase mastery-oriented feedback
Meets one-on-one with students to conference about progress and set goals.	UDL Guideline 6. Provide options for executive functions 6.1 Guide appropriate goal-setting 6.2 Support planning and strategy development 6.3 Facilitate managing information and resources 6.4 Enhance capacity for monitoring progress UDL Guideline 9. Provide options for self-regulation 9.1 Promote expectations and beliefs that optimize motivation 9.2 Facilitate personal coping skills and strategies 9.3 Develop self-assessment and reflection
When reading primary sources, students can choose from varied options suitable for their levels. Students can also choose to listen to text, use videos, etc., if they choose.	UDL Guideline 1. Provide options for perception 1.1 Offer ways of customizing the display of information 1.2 Offer alternatives for auditory information 1.3 Offer alternatives for visual information UDL Guideline 7. Provide options for recruiting interest 7.1 Optimize individual choice and autonomy 7.2 Optimize relevance, value, and authenticity 7.3 Minimize threats and distractions
Utilizes various technology tools (apps on iPads, iMovie to create	UDL Guideline 4. Provide options for physical action 4.1 Vary the methods for response and navigation

newscasts, Google Classroom) to provide multimodal and collaborative environments for creating and sharing information.	4.2 Optimize access to tools and assistive technologies UDL Guideline 5. Provide options for expression and communication 5.1 Use multiple media for communication 5.2 Use multiple tools for construction and composition

Discussion

The purpose of this study was to gain an understanding of ways IB schools around the world implement Universal Design for Learning and inclusive instructional practices. In this section, we present key findings that emerged from our analysis of the survey results and a cross-case analysis of the ten case stories, relative to the research questions that guided this study. The survey results provided a snapshot of IB educators' understanding and use of UDL and inclusive instructional practices. The case stories added depth to the inquiry by revealing educators' attitudes, beliefs, and perceptions about inclusive practices, in addition to information on how they implement inclusive instructional practices in their classrooms and schools.

An objective of this study was to examine how UDL and inclusive instructional practices are currently implemented in IB schools (Research Question #2). To do this, we examined (a) knowledge/understanding of UDL and inclusive practices, (b) implementation of UDL and inclusive practices in the classroom, and (c) factors that supported and presented barriers to UDL and inclusive practice implementation at IB schools. Another objective of the study was to examine how UDL supports the academic achievement of all learners and promotes inclusive education in IB schools (Research Question #3). The Survey Results and Case Stories sections of this report present the detailed findings relative to each question. In the subsections below, we present a synthesis of the findings from the survey and case stories relative to these two research questions.

Inclusive Practices and UDL

The results of this study illustrate the ways IB educators understand and use inclusive practices on two levels. On a broad level, the study depicts how IB educators use *inclusive instructional strategies*, which include differentiated strategies that enable all students to access instruction and fully participate in learning, and that take into account student diversity. These strategies give students options and choices, scaffolds and supports during the learning process; use varied forms of assessment and methods to engage students; and provide accommodations and modifications for students who have an identified need for supports (Scruggs & Mastropieri, 2003; Tomlinson, 2014). Educators often refer to these practices using the umbrella terms *differentiation* or *differentiated strategies*. These practices are consolidated and presented in a variety of ways by educational researchers. Models that bring together inclusive instructional strategies include Understanding by Design (Wiggins & McTighe, 2005), Teaching ESL Students in the Mainstream Classroom (DECD, 2015), and differentiated classrooms (Tomlinson, 2014).

On a more specific level, the study reveals how IB educators understand the UDL framework and the extent to which they use it while designing and implementing instruction. The UDL framework provides a set of guidelines that can be used while designing curriculum and instruction. They delineate a range of strategies that address learner variability and reduce barriers in the instructional environment (Meyer, Rose, & Gordon, 2013). The UDL guidelines consolidate various differentiated and inclusive instructional strategies, and categorize them under three main principles: 1. Multiple Means of Representation, 2. Multiple Means of Action and Expression, and 3. Multiple Means of Engagement (CAST, 2015). These three UDL principles are derived from research on the learning networks in the brain. They provide a

conceptual framework for how and why specific instructional strategies can reduce barriers and increase access to instruction for a range of learners.

By presenting various effective inclusive instructional strategies within one framework, UDL not only gives educators information about differentiated and inclusive strategies but also delineates how and why these strategies can support learners during the learning process. Teachers can use the UDL guidelines in their lessons in varied ways and select the strategies that are relevant to the content and skills they are teaching in any given lesson. UDL emphasizes proactively designing curriculum and instruction and building in flexible options from the outset. To design with UDL, teachers first identify clear instructional goals and then develop flexible materials, methods, and assessments to address those goals. There is considerable overlap between inclusive and differentiated strategies and UDL, the main distinction being that UDL provides a cohesive framework for integrating differentiated and inclusive instructional strategies into teaching and learning, and provides a clear definition of how and for whom the practices are effective.

Knowledge/Understanding of UDL and Inclusive Practices

The survey and interview questions were designed to elicit information about participants' understanding and knowledge of inclusive practices in a general sense, and of UDL in a specific sense. To gain information on their general knowledge of inclusive practices, participants were asked about their use of flexible and differentiated instructional strategies, provision of scaffolds for learning, and strategies for engaging students. To evaluate how much they knew about UDL, participants were asked about their knowledge of the UDL framework (e.g., the principles and guidelines) and their application of the UDL guidelines to their instructional practices.

The IB educators who participated in this study were knowledgeable about inclusive practices and differentiation in a general sense. The majority did not know about UDL specifically, but the inclusive instructional strategies they reported implementing aligned with the UDL guidelines. Teachers reported implementing various flexible and differentiated strategies and provided examples of ways they took learner variability into account during lessons. Although less than one-fifth of the survey participants reported having knowledge about UDL and almost half rated themselves as completely unfamiliar with UDL terminology, a majority of participants were familiar with concepts related to using flexible methods, materials, and assessments, which are core practices within UDL. Similarly, most of those interviewed for the case stories did not know about UDL specifically but were highly knowledgeable and proficient in using various inclusive instructional strategies that align with UDL.

The information provided by those interviewed for the case stories offered insights into this phenomenon. Of the ten people interviewed, two had considerable prior knowledge of UDL concepts and the remaining eight had either not heard of UDL or did not know much about it, other than a broad conception that it was a set of guidelines related to inclusive education. The ten interviewees had learned about inclusive practices in a variety of ways—some during their teacher preparation programs, some through self-study, and all of them through in-service professional development opportunities. They described the PD opportunities their schools provided to support teachers' inclusive practice, such as the IB workshops they attended in their subject areas, professional development workshops conducted by experts in the field (e.g., about

assessment and inclusion), and trainings such as Teaching ESL Students in the Mainstream Classroom (DECD, 2015). None had learned about UDL in their teacher preparation programs, which can be attributed to the fact that all of the interviewees had been teaching for over a decade and most had completed their teacher licensure programs before the year 2000, when the UDL framework was still being developed and was less widely known.

Implementation of UDL and Inclusive Practices in the Classroom

IB educators use a range of inclusive instructional strategies that align with the UDL guidelines. Teachers described various examples of the options they provided for representation, expression and action, and engagement during lessons. Below we summarize the instructional strategies that were frequently mentioned in the surveys and the case stories, and have categorized the instructional strategies under the UDL principle with which they primarily align.[2]

UDL Principle I: Provide Multiple Means of Representation

- Use a range of multimodal tools and resources to provide information through a combination of visual, auditory, oral, and text-based formats. Teachers use digital media and technology extensively to provide varied options for students to learn about topics and new information in engaging and authentic ways.
- Provide various supports for vocabulary and comprehension. Examples of strategies included presenting information in varied formats, highlighting key terms, and using graphic organizers and K-W-L charts. Teachers are familiar with providing supports that assist with language learning, especially in the international school settings that have EAL learners.
- Connect new topics to prior knowledge and provide authentic entry points to help students comprehend new information. Teachers use strategies that let students connect information with their backgrounds, experiences, and interests.

UDL Principle II: Provide Multiple Means of Action and Expression

- Integrate digital and online tools into instruction to provide options for students via technology. Teachers use collaborative online environments and digital text to increase access to materials (e.g., course management systems, interactive whiteboards, collaborative documents, manipulatives, simulations, multimodal resources, a variety of online tools).
- Provide various formats for students to express and demonstrate knowledge (e.g., writing for different purposes, making videos, oral presentations, illustrations, role plays).
- Integrate opportunities for guided practice and provide scaffolds during the learning process to let students reach mastery of skills.

UDL Principle III: Provide Multiple Means of Engagement

- Connect lessons with authentic and relevant information. Teachers bring in practical applications, case stories, and real-world examples that students can relate to and give students choices based on their interests and preferences.

[2] The Survey Results and Case Stories sections provide more detailed information on the practices described by respondents and their alignment with the UDL guidelines and checkpoints.

- Provide opportunities for group work that allow students to learn from and with each other, provide support to each other, develop their own knowledge and present it to others, make choices and be creative, and learn to work collaboratively with their peers.
- Use a variety of self-regulation and self-assessment tools and methods, such as rubrics and checklists, to help students set goals, progress on timelines, and self-reflect on their learning.

During the interviews, we asked each educator to describe a typical lesson and the inclusive strategies they used while teaching the lesson. Although most of the interviewees did not use the terminology of UDL to describe how or why they used particular strategies, they explained how they used differentiated strategies that aligned with IB approaches to teaching and learning. While describing these practices, the terminology they used depended on the professional development workshops they had attended or the self-study they had done. For example, one interviewee used the language of multiple intelligences (Gardner, 2011) because his school had given training on this model, and another used terminology associated with the Understanding by Design framework (Wiggins & McTighe, 2005). Several interviewees used inclusive practice terminology and engagement strategies they had learned at IB workshops. Based on responses from the survey and case studies, it appears that IB educators implement inclusive practices using frameworks and practices they have learned about through their educational experiences, developed during their years as teachers, and learned about through in-service professional development experiences.

While describing the inclusive instructional practices they used, each interviewee articulated a commitment to supporting all learners. Although they had wide-ranging backgrounds and experiences, they shared a genuine passion for ensuring student success. Some described how they had taught themselves these inclusive practices when they began teaching because of a personal interest in engaging and supporting all learners. Each individual mentioned being actively engaged in professional development and self-study to learn about inclusive practices and/or UDL. Several mentioned that they had volunteered to participate in this study because of their interest in supporting IB's efforts toward inclusive education. Some had looked up resources about UDL online prior to participating in the interview and expressed their surprise and delight that several of the practices they were already doing were consistent with the UDL guidelines. Overall, a sincere passion to serve all learners was apparent with all ten interviewees, and each one attested to their schools' commitment to fostering an accessible, supportive, and inclusive environment for all students.

Facilitating Factors

Four key factors facilitated the integration of inclusive practices in IB schools: (a) the IB philosophy, (b) administrative support, (c) learning support teams,[3] and (d) professional development opportunities.

IB educators emphasized that IB philosophy and practices, by definition, support inclusive education. IB programs have a focus on student-centered learning, active learning, and

[3] Because IB schools use varied terminology to describe the learning support services they provide, in this section we use the term "learning support teams" to describe the teams that provided student support services in participating schools. In the case stories, interviewees used various terms for these teams, including academic resource center and student services.

interdisciplinary approaches. Strategies that support differentiation are at the core of the IB approaches to teaching and learning, and educators fully espoused the IB's focus on inquiry, student engagement, and authentic learning. The study participants noted that lessons incorporating these elements were, by nature, inclusive. For example, the CAS project and techniques, such as use of the "origin, purpose, value, and limitation" strategy, inherently integrated opportunities for choice, flexibility, and student engagement that are consistent with inclusive instructional strategies. Inclusive practices were emphasized at IB trainings, and teachers had the opportunity to develop lessons with these practices when they attended trainings in their IB content area.

Administrative support was also a key facilitator of inclusive education in IB schools. In the case stories, every interviewee described a strong focus on inclusion coming from the directors, headmasters, or principals of their schools. The two administrators who participated in the interviews were both passionate about inclusion and held it as a deep personal value. As a result, they ensured that their schools had support structures in place that allowed inclusive practices to take place. In both of these cases, there was a strong sense of the need to include teachers, family members, and the students who needed the learning supports in coming up with a plan and in revisiting and updating the plans. These administrators provided their faculty and staff with ongoing support to foster this inclusive environment, including PD opportunities and learning support team assistance.

Schools that had learning support teams benefited from consistent, schoolwide implementation of inclusive practices. Two interviewees who were part of the learning support teams at their schools discussed in detail how they supported teachers with inclusive practices and provided the necessary tools and strategies for specific learners. Schools with learning support teams had comprehensive services for students with special learning needs and language learners. For example, they had formal procedures for developing individual learning plans or profiles (terminology for these individualized plans varied across schools) and follow-up services to assist teachers in their classrooms. In schools that had learning support teams, inclusive education services included supports for differentiation at the whole-class level, pull-out services for specific students as needed, and ongoing collaboration between the team and the classroom teacher to ensure that the necessary scaffolds, accommodations, and modifications were provided for specific students.

IB educators had access to numerous PD activities that supported them in implementing inclusive practices. Teachers described having adequate financial support from their schools to attend trainings in-house and externally, study for advanced degrees, and participate in professional learning communities to expand their knowledge base. Educators were allowed to select workshops and trainings of interest to them. They described learning about inclusive strategies in workshops that focused on the topic and in workshops that addressed other topics, but included information on differentiation and/or inclusion.

Barriers

The barriers to implementing inclusive education in IB schools included (a) the standardized format of external exams/assessments, (b) attitudes about rigor and selectivity on the part of

some teachers and parents, (c) resistance to change, and (d) lack of time and knowledge to implement new practices.

Preparing students for the Diploma Program IB exams that are administered in written format posed challenges for some teachers, who noted that, although they could differentiate while teaching students in their classrooms, students ultimately had to take the exam in one standard format. Although students with identified special needs could use accommodations or modifications, teachers noted that learner variability was not addressed by some external exam formats that relied on a standard written assessment. For a student who was knowledgeable about a topic but not as proficient in written expression, this could pose a barrier to their successfully demonstrating what they know. Teachers noted that the CAS and other practical experiences that students could do as part of the IB curriculum gave students more flexibility to truly express what they were capable of. Some teachers described IB exams in their content areas that allowed for flexible assessment formats.

Some participants mentioned that school staff, especially those in international or independent college-preparatory schools, still espoused attitudes about these schools being selective. Educators who had these attitudes felt that differentiated and inclusive practices weaken academic rigor. Some teachers were also resistant to change and preferred using traditional practices, such as lecture-based learning. Some IB schools are addressing this by evaluating during the hiring process whether teachers are open to inclusion. Another factor that may mitigate this challenge is that newer faculty, who have graduated from teacher preparation programs more recently, have had more training in inclusive practices and bring this to their teaching practice from the start. Participants also mentioned some cultural barriers to inclusion. In some countries, parents selected schools based on their perception of its rigor and standards; these parents often associated a rigorous curriculum with traditional learning formats. In addition, some parents felt there was a stigma associated with the school if it was perceived to be for children with special learning needs. The IB educators who mentioned these barriers noted that, despite these issues, their schools remained committed to inclusion. They were working to educate parents and teachers on the need for inclusion and the value of having all students participate together in educational environments.

Finally, a barrier that was often mentioned in the survey responses was a lack of time to implement new practices and a lack of knowledge about inclusive practices. Although participants did not provide great detail about these responses, we can infer that additional opportunities for professional development about inclusive education may be useful for some IB schools. The lack of time to implement new practices is a universal challenge for teachers in all settings, so this is not a challenge restricted to IB schools. Teachers often struggle to meet all the academic and curricular goals they are expected to during a school year and still have the time to integrate new strategies and plan to use flexible and engaging new methods. Participants in this study suggested that training on inclusive practices should include the opportunity to plan and implement lessons. Teachers also noted that professional development that models how these practices are used in classrooms and provides more insights into how and why these practices help specific students would help build their knowledge base and their ability to implement inclusive practices.

UDL's Role in Fostering Inclusive Education in IB Schools

An essential feature of UDL-based instruction is the proactive consideration and design of environments to address learner variability. Teachers who implement UDL at a high level generally have an understanding of how to state clear lesson goals that reduce barriers to learning. With clear goals in mind, teachers can design flexible instructional materials, methods, and assessments to meet these goals. The UDL guidelines provide teachers with a design framework that includes several UDL checkpoints that can be integrated into lessons to increase flexibility and reduce barriers to learning.

Some IB educators who participated in this study were knowledgeable and intentional about how and why their strategies were helpful for students who needed learning supports. They described the affordances provided by specific strategies they used and mentioned how these supports address specific issues, such as learning disabilities, communication needs, or language acquisition needs. Others were aware that these strategies are best practices that help support students, but they were not as knowledgeable about what sorts of supports can be most helpful for a specific need. Some teachers who used differentiated strategies knew that the strategies increased access for more learners, but they may not have been as knowledgeable about how these strategies addressed the specific needs of a student who had a disability or needed extra support for other reasons. With knowledge of how strategies can support specific student needs, teachers are more likely to ensure that the strategies they use support certain students while addressing learner variability at the whole-class level.

UDL-based and inclusive instructional strategies were integrated more intentionally and systematically at schools that had learning support teams, primarily because they gave teachers expert help. Although many IB schools emphasize the need for all teachers to be able to differentiate and to keep children together in one classroom, not all teachers had the motivation or time to implement these practices on their own. Learning support teams were able to address modifications/accommodations for specific students and also provide information on inclusive instructional strategies that could benefit all learners. Learning support teams often had training in special education/inclusion or experience with differentiated strategies, and thus they were invaluable to teachers who had limited time to implement these strategies. They were able to help teachers analyze and modify their lessons to add flexibility as needed for individual learners and for whole-class supports.

Interviewees who were familiar with the UDL framework suggested that a more specific understanding of UDL would be useful for IB educators in general. One interviewee noted that UDL's foundation in neuroscience research and its focus on reducing barriers to instruction could be useful knowledge for all IB educators. Knowing how to design instruction using the UDL framework could give teachers a better understanding of why and how to differentiate instruction, and enable them to build this into their lesson designs.

In summary, this study illustrated that IB schools implement inclusive practices at varying levels that include:

1. *Whole class level*: Teachers implement inclusive instructional practices by providing flexibility, choice, and scaffolds for the processes of learning. Many of the differentiated practices used by teachers are consistent with IB teaching and learning approaches. Teachers

familiar with the UDL framework design instruction with clear goals and flexible methods, materials, and assessments to make instruction accessible to all learners.

2. *Whole class level, with supports for specific students*: Some teachers provide supports for students who have specific needs (students with disabilities, EAL/ESL students). For example, providing flexible options within a lesson can be helpful for a student with a learning disability, but by knowing when that student can benefit most from specific supports (e.g., use of digital text, scaffolds for writing), a teacher can target her interventions. These supports are often provided at IB schools that have learning support teams because a resource teacher was available to help the classroom teacher integrate various targeted supports that extended their use of differentiated practices that were part of the IB Approaches to Teaching and Learning (ATL).
3. *Student level:* Pull-out services are provided for students who need additional targeted instruction and practice on specific skills. These services are often provided at IB schools with learning support teams, who can develop an individualized learning plan or profile for students who need specific supports or pull-out services.
4. *Student level:* Students with identified disabilities or other special needs receive accommodations and modifications. At schools that create an individual learning plan or profile for these students, the supports are integrated into whole-class instruction. For students with identified needs, accommodations and modifications were also provided for taking IB exams.

Based on the results of the survey and case stories, we find that IB educators are proficient at using differentiated and flexible instructional strategies that foster inquiry and engagement at a whole-class level. These strategies can support learner variability because they inherently provide multiple means of representation, action and expression, and engagement. At schools that have learning support teams, teachers are more aware of the specific supports for students with specific needs, have access to pull-out services, and are given support to implement individual accommodations and modifications for students as needed. Although teachers can integrate inclusive practices in various ways, the UDL guidelines can provide a useful framework that is relevant for the four levels of implementing inclusive practices noted above, and it gives teachers guidelines for whole-class activities and information on how to support specific needs.

Recommendations for Practice

Two IB publications, *Learning Diversity in the International Baccalaureate Programmes* (2010) and the *IB Guide to Inclusive Education* (2015) emphasize the importance of increasing student access and engagement and removing barriers to learning:

> The four principles of good practice identified by the IB as promoting equal access to the curriculum for all learners are: affirming identity and building self-esteem, valuing prior knowledge, scaffolding and extending learning. Student learning is enhanced when these four principles of good practice are considered in conjunction with the IB approaches to teaching and learning, which are those deliberate strategies, skills and attitudes that permeate the teaching and learning environment. (IB Guide to Inclusive Education, p. 2)

The results of this study illustrate that IB educators espouse these principles of good practice and are actively using them along with IB approaches to teaching and learning. IB teachers and administrators described in depth how they attend to these principles in their classrooms and schools, and clearly expressed their understanding of how inclusive practices are consistent with IB approaches to teaching and learning in their content/topic area. The study indicates that some teachers need more information and training on how to integrate inclusive practices effectively in the time they have, and to support the content and skills they are teaching. Teachers also can benefit from more knowledge about how differentiated and flexible strategies support specific learner needs while concurrently addressing a range of learners in the classroom.

IB schools have approached differentiation and inclusion in varied ways, while keeping a focus on the essential premise of supporting and creating educational access for all learners. For IB schools that wish to expand their current range of inclusive practices, training in UDL can provide a framework to guide and extend that implementation. UDL gives teachers a systematic way to design educational environments (including curriculum and instructional lesson plans), resources to draw from, and a process they can use to reduce barriers in the learning environment for all learners. IB educators might also benefit from understanding how the IB approaches to teaching and learning and differentiated practices that they already implement can be extended and expanded on using UDL as an instructional design framework.

Limitations and Recommendations for Future Research

This study had several limitations. The online survey link was distributed to 490 IB coordinators worldwide with directions to forward the link to teachers and administrators. More specifically, the link was sent to 153 coordinators in IB Africa, Europe, and the Middle East, 78 coordinators in IB Asia-Pacific, and 258 coordinators in IB Americas. This method of distributing the survey resulted in a total of 127 participants who responded to and submitted the surveys; they did so voluntarily. This voluntary participation represents a self-selection of those who were inherently motivated to complete the survey, and these 127 participants do not represent any particular subset of IB educators or IB schools in the aforementioned regions. The survey responses of these 127 individuals, and our findings based those responses, cannot be said to represent the entire population of IB teachers and administrators. The findings are prone to self-selection bias, and those who chose to respond to the survey may disproportionately represent the perspectives of IB teachers and administrators who were motivated to participate due to an interest in inclusive education and inclusive practices.

For the case stories, we selected participants from a subset of people who agreed to be interviewed in their survey responses and subsequently responded to a personal invitation (sent via email) to participate in an interview. Again, these participants likely represent a self-selection of individuals who agreed to participate because they were interested in the topic of inclusive education. During the interviews, we found that all ten interviewees used inclusive instructional strategies at a high level and were very articulate about the topic, which supports the notion that they were naturally inclined and motivated to practice inclusive education. Findings about their knowledge and implementation levels cannot be generalized to other IB educators and IB schools. In addition, the case stories were based on each interviewee's narrative and self-report about their own practices, as described to the interviewer via Skype or phone. We did not collect data via direct observations of each participant's teaching practices or triangulate interview data

with other data sources at each school site. Because the case stories represent individual participants' perspectives, these stories are limited to what that individual experienced and knew about inclusive education at their respective schools.

Finally, all participants in the case stories were teachers or administrators at independent and/or international schools. Consequently, we cannot conclude that their experiences are representative of educators at other types of schools, such as public/government schools with IB programs. Independent and international schools have regulations based on their own governing and accreditation bodies, whereas public/government schools, which are mandated to educate all students, are held to different laws and regulations related to special education and inclusion.

Further research can explore how inclusive practices are implemented at different types of IB schools, including schools that did not participate in this study. This study's scope was limited to ten in-depth case stories that represented three or four schools in each of the three IB regions. The case stories present snapshots rather than a comprehensive album of the implementation stages and levels at all IB schools. In addition, the international and independent schools represented in the case stories catered to specific populations and had substantial resources to provide professional development for their teachers. This level of resources for professional development might not be available or used at schools in other countries/regions or at public/government schools with IB programs. Selecting a set of schools in each region that represent different countries and types of schools (independent, public/government, and international) would provide more generalized information about how inclusive practices are implemented at a range of IB schools.

Although we concluded that inclusive practices were implemented at a high level in the schools represented in this study, study participants, especially those who responded to the survey, frequently reported that they needed more knowledge and time to implement these practices. Future research can examine how IB schools with high levels of UDL and/or inclusive practice implementation have gone about creating environments for the widespread use of these practices, and consider how to disseminate this information to other IB schools interested in scaling up their implementation. It would be useful to examine the types of support teachers need to apply and implement practices in their classrooms that they learn about through professional development.

Conclusion

In conclusion, this study highlighted the fact that IB schools fully espouse the IB philosophy of creating inclusive educational environments for all learners. IB schools have implemented inclusive education in various ways and to various degrees. Some are further along with the implementation of schoolwide systems that include learning support teams and comprehensive services to support all learners. Others are implementing inclusive practices at a classroom level using various differentiated practices that are aligned with IB teaching and learning approaches. This study illustrates that, on the whole, IB schools are actively committed to continuing and expanding their inclusive educational services and approaches.

Instructional practices consistent with UDL are widely used at IB schools. With strong administrative support for inclusion, IB teachers and staff are encouraged to use effective

practices and integrate inclusive instructional strategies into their teaching. Participating schools regularly give their teachers PD opportunities and emphasize the need for teachers to be trained and proficient in creating classroom environments that include and engage all students. As a result, IB educators strive to use instructional approaches that maintain high standards and rigor, while concurrently creating welcoming and supportive instructional environments for all learners.

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NOTE: This References section includes sources cited in the Study Design and Discussion sections of this report only. A comprehensive list of publications cited in the Literature Review are organized by topic and listed in the Bibliography section of the Literature Review.

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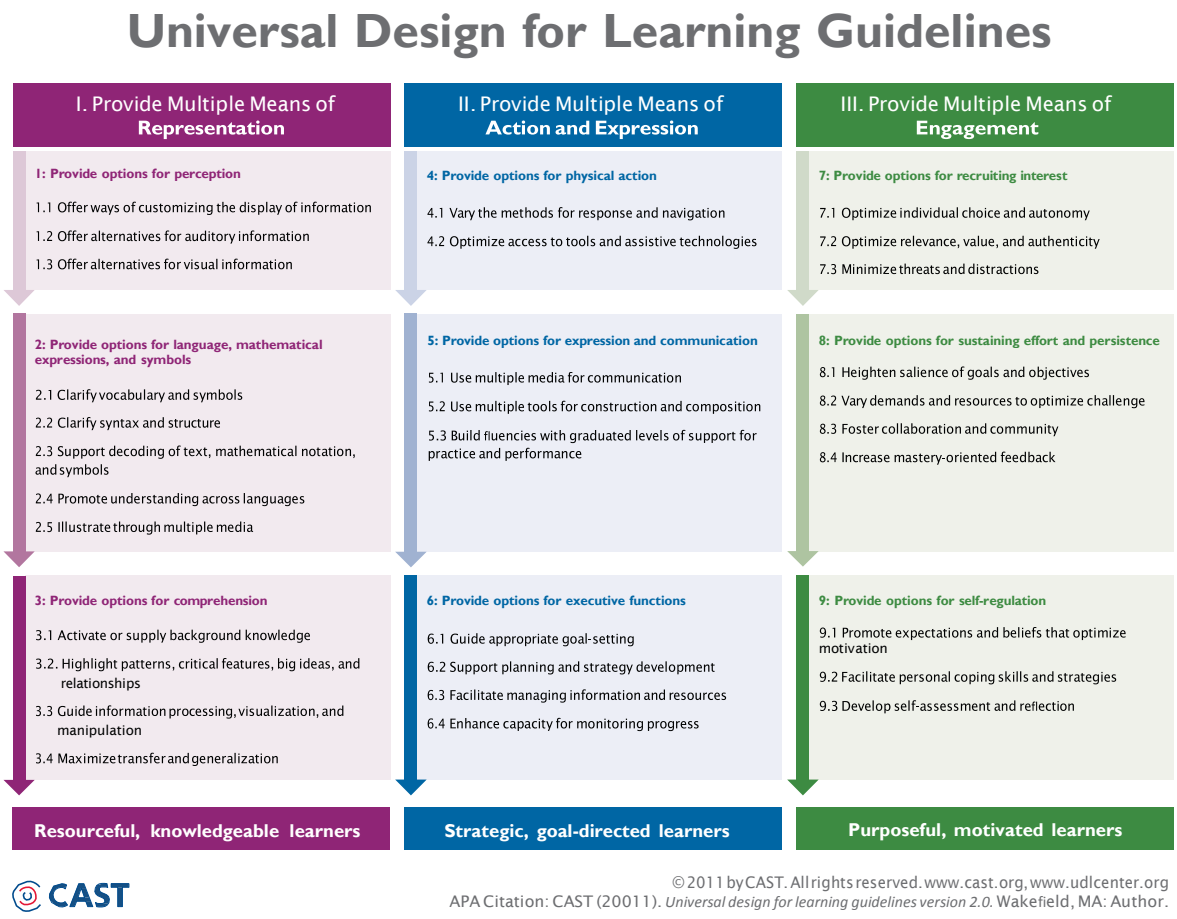
Appendices
Appendix A: UDL Guidelines v2.0



NOTE: These are the UDL Guidelines V2.0. For more information on these guidelines, please see *http://www.udlcenter.org/aboutudl/udlguidelines.*

Appendix B: UDL Survey

This survey is designed to examine the understanding of and use of Universal Design for Learning (UDL) in IB schools worldwide. Survey results will be aggregated to examine how UDL is being applied to IB curricula and what factors facilitate or impede the use of UDL.

The survey has four parts:

I. Demographic Information,
II. UDL Knowledge and Understanding
III. Teaching Practices
IV. Additional Information.

We appreciate your honest answers. The survey will take approximately 15 minutes to complete.
The survey results will be confidential.

Section 1: Demographic Information

Location of School

Country _____

Which programme(s) are offered at your school?

- ❑ PYP
- ❑ MYP
- ❑ DP
- ❑ CC

My role is (*select one*)

- ❑ Teacher
- ❑ IB coordinator
- ❑ Administrator
- ❑ Both
- ❑ Other _____

I primarily teach ages (*select all ages that you teach*)

3-4
5- 8
9-12
13- 16
17-19

I am trained in (*select all relevant categories*)

- ❑ General Education
- ❑ Special Education
- ❑ Inclusion
- ❑ Other_____

My educational licensure is in (*select all relevant categories*)

- ❑❑ Early childhood (Pre-K)
- ❑❑ K-5
- ❑❑ 6-8
- ❑❑ 9-12
- ❑❑ Administrator
- ❑❑ Other _____

If you are an administrator, my current role is (*select one*):

- ❑❑ Principal
- ❑❑ Vice Principal
- ❑❑ District Level Administrator

❑❑ Resource Teacher (please specify area) _____
❑❑ Other _____

In our general education classroom, we include (select all relevant categories):

❑❑ Students with physical disabilities
❑❑ Students with learning disabilities
❑❑ Students with emotional/behavioral disabilities
❑❑ Students with cognitive disabilities (intellectual disabilities)
❑❑ Children on the autism spectrum
❑❑ Children with learning challenges
❑❑ Students who are non-native speakers of the language of instruction

Section II: Knowledge & Understanding (RQ#2a)

A. Training

Please provide information about your training on UDL.

I learned about UDL through professional development workshops/courses.(Yes/No)

I learned about UDL in my teacher preparation program. Yes/No

I learned about UDL through self-study (reading articles, visiting websites).(Yes/No)

I have used UDL resources that are published in articles, books or on the web.(Yes/No)

B. Familiarity

Please rate the questions below on a scale of 1-5

1 – I am not at all familiar with this topic
2 – I am slightly familiar with this topic
3 – I am somewhat familiar with this topic
4 – I am moderately familiar with this topic
5 – I am extremely familiar with this topic

Please rate your familiarity with the following topics on a scale of 1-5

1. The three principles of Universal Design for Learning (UDL)
2. How to apply the UDL principles and guidelines to instruction
3. The three learning networks of the brain (recognition, strategic, affective networks) that are associated with UDL
4. How UDL can be used to reduce barriers in the learning environment
5. How to use UDL during the lesson planning process
6. How UDL can be used to create inclusive learning environments
7. How to design instruction to address learner variability during the lesson planning process
8. How to include flexible options and instructional scaffolds for students with disabilities
9. How to include flexible options and instructional scaffolds for students from diverse cultural/ethnic/linguistic backgrounds
10. How to use digital media and technology tools to create accessible instructional environments

Section 3: Teaching Practices (RQ#2b)
Please estimate how often you integrate the following practices into your teaching in the course of a school year. The term "lessons" is used to mean the instructional lessons, units, and/or curriculum you develop or use.

Scale:

1 – Never
2 - Rarely (<20% of the time)
3 – Occasionally (20-50% of the time)
4 – Often (50-80% of the time)
5 – Almost Always or Always (80-100% of the time)

A. Lesson Planning

11. I plan lessons with learner variability in mind.
12. When I design a lesson, I clearly define instructional goal(s) for each lesson.
13. When I design a lesson, I consider how I can include flexible instructional strategies that provide options and choices and engage students.
14. When I design a lesson, I consider how to use flexible materials that provide options and choices and engage students.
15. When I design a lesson, I consider flexible assessments that give students varied ways to demonstrate mastery of lesson goal(s).
16. I use the same assessments for all students.

B. Multiple Means of Representation

17. As appropriate, I provide options for perception by presenting information in more than one format (e.g., text, oral, multimedia).
18. I present information in only one format to all students.
19. I use instructional strategies to clarify key terms, vocabulary and symbols related to the content that I am teaching.
20. I use strategies to promote understanding across languages.
21. I use instructional strategies to make new information comprehensible for students.
22. I use instructional strategies that provide scaffolds for comprehension (e.g., highlighting key concepts, connecting to background knowledge).
23. I use instructional strategies that help students transfer knowledge and generalize what they are learning.
24. Open-ended question (required): Select one item from #21-27 above and note the number_____. Describe an example of an instructional strategy you use in relation to this item.

C. Multiple Means of Action & Expression

25. My students have varied ways to respond and navigate information within a lesson.
26. My students have access to instructional and assistive technologies as needed *(e.g., digital text for students with literacy-related disabilities, technology tools to communicate).*
27. I provide opportunities for students to use multiple media to express their knowledge *(e.g. constructing/creating knowledge with digital tools, various materials and media).*
28. I provide opportunities for students to express their knowledge in varied formats (e.g. verbal, written, drawing, through physical demonstration).
29. I present my students with only one way to express their knowledge.
30. I include opportunities for my students to practice skills that they are expected to master.
31. I guide my students to set goals for themselves during the learning process.
32. I use instructional strategies that help students organize and plan out their work during a lesson.
33. I provide ways for my students to monitor their own progress.
34. Open-ended question (required): Select one item from #29-37 above and note the number_____. Describe instructional strategies you do in relation to this item.

D. Multiple Means of Engagement

35. I include options that let students make choices during a lesson.
36. I include instructional strategies to make lessons relevant and authentic to my students.
37. I use instructional strategies to minimize threats and distractions for my students.

38. I include options to give students a range of challenge they can choose from within a lesson.
39. I give all students the same challenges within a lesson.
40. I use collaborative grouping strategies with the goal of supporting my students with persistence and effort.
41. I provide mastery-oriented feedback to students during lessons (mastery-oriented feedback includes feedback on progress toward the goal and emphasizes effort and practice).
42. I use instructional strategies that foster student self-belief and confidence.
43. I provide opportunities for my students to assess their own progress and self-reflect on their learning.
44. Open-ended question (required): Select one item from #39-47 and note the number_____. Describe instructional strategies you do in relation to this item.

Section 4: UDL Implementation

For the open-ended questions below, write your responses in the text box. If you do not have a response, please type in "No comment" or N/A

45. What is your definition of Universal Design for Learning (UDL)?
46. What are the challenges you face with implementing UDL in your school or classroom setting?
47. If you have any other comments in relation to UDL use in your IB school setting, please note them below.
48. Are you willing to participate in a 30-minute phone or Skype interview about the topics in this survey?
    - ❑❑ Yes (Next prompt asks for name and email address of respondent)
    - ❑❑ No

Appendix C: Interview Protocol for Case Stories

PREFACE:
Thank you for agreeing to be interviewed. We really appreciate your time and willingness to provide more information about inclusive practices at your school. We are interested in finding out what schools are doing to support diverse students and to what extent Universal Design for Learning is being used. I will be using the acronym UDL for Universal Design for Learning. All information you provide will be confidential and your name/school name will not be used.

In the UDL in IB Schools survey, you described how you address UDL in your classroom. The questions I will ask during this interview are designed to give me more information about inclusive practices at your school.

Demographic Information:

- Role(s):
- Grade/ages levels:
- Training/licensure:
- How long have you been an educator (in various roles)?
- Where did you get your degrees/training in education?

1. How did you learn about UDL [or inclusive practices/differentiated strategies]?

- Have you had UDL [or inclusive practices/differentiated strategies] professional development at your school (or elsewhere?)
- Did you learn about UDL [or inclusive practices/differentiated strategies] in your teacher prep program?
- Have you studied it on your own? How long have you known about/used UDL?

2. Describe the learner diversity you have your classroom and your school.

- Do you have students who speak different languages? Are from different cultures? Have disabilities? Come from varied socioeconomic backgrounds?
- Does your school provide training or support about inclusive practices for diverse learners?

3. Describe a lesson you implement that uses UDL [or inclusive practices/differentiated strategies].

- Tell me more about the UDL components [differentiated components] of this lesson.
- Tell me more about how the UDL components [differentiated components] of this lesson support diverse students

4. How do you use UDL when you design lessons? [How do you integrate differentiated components when you design the lesson]

- Do you proactively use UDL while planning the lesson?
- Do you apply UDL to goals, methods, materials, assessments?

5. In your opinion, how can UDL create a more inclusive environment in your classroom (or in your school)? [In your opinion, how can teachers create a more inclusive environment in your school?]

- How does UDL support achievement for diverse students in your classroom?

6. Tell me more about UDL [use of inclusive practices/differentiation] at your school.

- Do your colleagues use UDL when they teach?
- How is inclusive education supported at your school by administrators?
- What are the barriers to inclusive education?

7. What are some factors that facilitate your use of UDL [inclusive practices] in your classroom/school?

8. What are some challenges to UDL [inclusive practices] implementation? What additional support/resources do you need to implement UDL [inclusive practices] in your classroom/school?

- For an interviewee who does not know about UDL or whose school does not use UDL ask: Is there interest at your school to learn about UDL and inclusive practices?

9. Any other comments?

Appendix D: All Responses for Survey Items #45-47

Responses to Item #45: What is your definition of Universal Design for Learning (UDL)?

1. UDL enables us to meet understanding and requirements of diversified learners and the strategy needed to adopt to do so!
2. Good (backwards by) design of a curriculum focused on intended learning outcomes for students.
3. Design lessons for all students meeting the needs of the holistic student.
4. As a set of strategies that facilitate learning.
5. A set of principles for each learner to achieve their potential and equal opportunity to learn.
6. it is an approach that enables teachers to use teaching strategies that enable learners with different learning abilities to be accommodated and be assured understanding of the taught concepts
7. Ensuring that lessons are systematically planned to ensure that they are accessible and achievable for all learners regardless of their personal barriers to learning.
8. A way to use strategies to help make the environment (classroom) a learning opportunity for all students regardless of their learning styles of abilities. It is a product of the digital age where students can use devices to help their learning by listening, watching, presenting, and designing lessons that help them reach mastery.
9. It is an educational framework which allows all different types of learners to maximise the learning opportunities which are available.
10. Is a methodology for teaching designed with the variability of learners in mind, and implies that there is a lot of interaction between the teacher and the learners
11. I think that is enough to make a flexible design to adapt to get favors diversity and inclusion.
12. Finding ways to provide learning opportunities that meet the individual needs of each student, based on best practice and understanding the different ways students learn.
13. an instructional framework that takes all learning styles into consideration
14. No one person is the same as another, thus learning in various ways. UDL gives us the opportunity to reach out each and every one of the students and provide them with exactly what they need.
15. A flexible form of learning that can accommodate student with various learning capabilities.
16. Using a variety of instructional methods and strategies in order to allow students with diverse needs in order to facilitate their learning in a more productive way.
17. UDL applies the principles of Universal Design to educational settings in order to identify and eliminate barriers to learning. The goal of UDL is to provide access to curriculum and to help students become expert learners.
18. It is learning with different strategies and forms of tools to involve all level of students during instruction.
19. Creating a learning environment which makes education accessible for as many different types of learners as possible.
20. I am not so familiar with UDL but from the understanding that I have I would suggest that UDL is an ideal of education intended to prepare learners from diverse backgrounds and with diverse abilities to face the challenges of the 21st century. UDL appears to have an inclusive educational philosophy.
21. An understanding of what the students are learning, how they are learning and why they are learning. What is it they need to learn, how are they going to learn as their ways of understanding differ, and why in the sense that we need to catch their interest in what is being taught
22. Making learning materials and content accessible to all students
23. It defines it as a strategy to be used by the teacher to make learning takes place in all students in the classroom; this strategy should have a goal, a method and means to carry it out and that education is not a limitation for each student but an opportunity for personal fulfillment learning."
24. A framework for inclusive educational practices.
25. A method that takes into consideration all of the factors that can make it possible for a child to learn.
26. A set of ideas in which to help support inclusion and learning in classrooms.
27. Creating lessons and units that are inclusive of all learners, and then following inclusion/differentiation strategies for implementation and assessment.
28. I would call it differentiation which means that teachers are providing different access points for learners based on how they learn and prior knowledge of the student.
29. Learning designed to be accessible to all students
30. Making learning more accessible and student oriented.
31. One way to implement strategies to reach using cognitive learning options

32. Providing learners with different sources and assignments giving them the opportunity in very different ways (in the way they prefer).
33. Universal, but the difficult start to meet.
34. Incorporating new teaching methodologies in class.
35. Our terminology for this concept seems to be to differentiate instruction. California law requires that our programs be open to all students who wish to participate and that we educate all students in the least restrictive environment. We stress full inclusion for our students with disabilities.
36. Age understanding
37. I think it is for special needs students.
38. It is the way to find the best practices for a learning strategies class content where the students put into practice the do - make their learning.
39. Learning where all matters were not as integrated and independent tailor drawers. Knowledge as a unit.
40. Good teaching
41. All students learn differently but all learn challenging material.
42. Differentiation
43. Guide to plan and organize strategies and techniques to achieve global learning.

(Responses below were marked "No Idea" or "Not Sure" during data analysis)

44. I'm not really sure, but judging from the survey, it sounds like an approach that tries to address differentiated instruction and assessment methods. It seems designed to address different learning styles so that students can both learn and demonstrate their learning using the strategies that best suit them.
45. Still not completely sure about what this label entails.
46. I have never come across UDL before.
47. I have never been trained in UDL. I have been trained in Understanding by Design (UBD).
48. Not an expression I know.
49. I did not know that name. It is the first time I see it.
50. Don't know
51. I have no idea. It seems to be a fancy term for differentiation.
52. I had not heard of it.
53. Never heard of it until this survey.
54. No idea what UDL is.
55. This is the first time I've heard of UDL, so.

Responses for Item #46 : What are the challenges you face with implementing UDL in your school or classroom setting?

1. Time constraint - There's always a pressure of completing syllabus for DP students and therefore, I tend to get into structured teaching towards the mid of second year of diploma programme. 2. Wide difference in the level of students. As number of students are mostly not very big to divide the students into two sections with equivalent caliber to get across to all students every class. 3. Lack of commitment from students- Many students lack self-study habits this hinders me from moving ahead in the syllabus, as I know the sub-topics have been taught by the students and it has understood as well but is not persistent at his effort to revise so that he/she can connect that knowledge to what is being taught. Thus, going back every time to the recapitulating sub-topics is not possible and thus students .
2. A wide range of personalisation is required in some classes which significantly increases the planning time. High turnover of students in an international setting make it challenging to build up a strong relationship with some learners and to determine their needs for incorporation in UDL process.
3. Accommodating students who have severe learning disabilities has required working with students who must use a scribe for examinations, an aid for mobility and notes of any lectures. Full inclusion and California law often requires that I create plans so that wheelchair access (when students are in wheelchairs) is not impeded as we make group presentations and participate in activities that require movement in the classroom. This has required me to modify lessons in the past.
4. At one time we had computers in every classroom, but now we do not and students use their own devices which is not easy when you are trying to type materials onto a phone. I love using technology. Some of my students take art and theatre as their 6th subjects. As often as is possible I allow them to use their 6th subjects in presentations. My biggest issue is always time. We are on a 50 minute period so multiple variations in teaching strategies are not always feasible. I usually give a pre-test to gain a starting point and a post-test to judge mastery.

5. Behavior, Motivation
6. class size sometimes makes it difficult to implement UDL
7. Coverage of the curriculum. Since I came upon this framework on my own, I haven't mastered the tenets of UDL, and lessons tend to be a little longer than planned. This worries me, making implementation hesitant on my part
8. Differentiated instruction and assessment, scaffolding, learning goals and outcomes are some of the terms we use. Time and large classes are the challenges, along with the limited forms of assessment for which students must be prepared for the IB.
9. Do it without a guide, as we designated students with disabilities and no training in accordance with these cases.
10. Fundamentally the question of evaluation, especially when it depends on external tests to standardize learning
11. Having the supplies, time and technology to implement.
12. I have no challenges other than sufficient time for planning or collaboration.
13. I need to implement it yet.
14. In our school, there is not a lot of time allotted for planning and preparation of classes which results in instruction and products with less variation. In many subject areas, there is pressure to cover the content of the IB curriculum which results in more of a teacher centred approach in the classroom and again, fewer access points for student engagement.
15. In setting tasks for slow and fast learners.
16. It is sometimes difficult to serve a student population coming from different backgrounds and facing different types of problems. Another problem is to make some of the kids understand that instruction needs to be differentiated sometimes.
17. It's easy to say, harder to do.
18. Knowing the way our students learn involves time.
19. Lack of knowledge and training.
20. Lack of knowledge by teachers on the inclusion.
21. Large groups
22. Lesson preparation
23. Main challenges are often having time to plan effectively. While we do not use "UDL' specifically, from my limited knowledge of UDL I think that it is not incompatible with our school philosophy; achieving such aims is always a work in progress. One specific challenge is that eventually all students will be assessed in writing (for the most part), this can be very frustrating as some students may be able to show good understanding in other ways. How do we address this?
24. My classroom setting is unique because it is an Academic Resource Center. My background is in UDL (I am presently a doctoral candidate writing my dissertation on UDL implementation), and the other resource teacher also has a background in curriculum design and UDL. We both incorporate UDL principles in everything we do; however, despite our efforts to educate colleagues on issues related to learner variability, UDL, and accessibility, we have met with a great deal of resistance from teachers who believe that "traditional" practices (lecture) will better prepare students for college.
25. My students understand what they are doing and not doing memory. The time to perform the activity Ask when not clear what they are doing or done in groups. To resume themselves, the importance of observational made of them and correct them.
26. Not only does our school have little or few technological equipment items but we often rush to finish the syllabus in order to produce 'the best results'. Sometimes we are just used to the traditional methods of giving instruction and have some reluctance of trying out new methods. We do not often discuss the best methods of giving instruction during our departmental or plenary meetings.
27. Our school has been fairly homogenous for the last few years. This year, we have an influx of students with more variable learning needs. Teachers are struggling to implement different strategies or don't know enough about methods and strategies to implement. Our challenge as admin and coordinator is to provide professional development for all teachers so that they might learn how to help all students succeed in their classrooms.
28. Ours is a highly centralized US public school district, so any pedagogical approach must first be approved by our district's central administration!
29. Planning time is always at a premium. It is time consuming to come up with different methods for each class and assignment. There is also a lack of information and instruction about how to implement UDL in our school.
30. Planning time, finding appropriate materials to differentiate when needed.
31. Properly identifying the student challenges and ways to reach them best in order to learn challenging material

32. Resources, at times students are weak in English comprehension and vocabularies. Application based problems in mathematics is a real challenge for the faculties to make them understand.
33. Sometimes it can be quite hard to cater for the various needs. In my school the differences in the students is quite varied, right from ability to grasp to interest as well as certain disabilities. It would therefore take time for one to ensure they are utilising the UDL very well for all the students. Inevitably, write exams are a must. Some students are excellent in oral presentation but have serious problems doing the same through written exams. Yet our system is written exam oriented for example to a large extend.
34. Sometimes no availability of the internet.
35. Sometimes the availability of uninterrupted internet in the classroom becomes a major limitation.
36. Sometimes we NEED to all do the same thing!
37. Staff familiarity with the process.
38. Teacher training for the same and planning time.
39. The first challenge is changing the mindset of teachers; when there are certain educational streams, teachers think it's something new you have to learn and thus make time available shortly. Second is the training: teachers must have special training to enable them to implement the three basic elements of design. Third, it is to make the respective teachers and provide the support you need during use and monitoring teaching practice. Finally, train teachers to change the way they assess students taking into account the different learning styles of students.
40. The internet is mostly not working properly and availability of teaching aids.
41. The time frame. For example a struggling student has the same number of hours of learning like the extremely fast and gifted learners.
42. The varied pace of my learners in understanding and responding to certain tasks. Lack of motivation when they feel the difficulty to the task.
43. Time for lesson preparation within the scheme.
44. Time to deliver a personalised experience for each and every student.
45. Time to put together classes and teaching materials.
46. To implement it in the normal lessons, e.g. to do it more regularly.
47. Training for all teachers.
48. We are just beginning to discuss it at our school. I am concerned about "pandering", where we do not ask students to move beyond their comfort zone or their currently preferred strength. A student should have more opportunity to experiment with various ways and modes of learning.
49. We are not focused on UDL but we do have a strong policy toward effective differentiation. One major challenge is that we have teachers from all over the world with various degrees of understanding about differentiation. There are some cultural biases, especially among DP teachers, against differentiation.
50. We face the final DP Diploma assessments and set external syllabus requirements, so a clear common final assessment process dictates the skills needed for expressing learning. I cannot offer oral commentaries as a type of assessment of learning outcome, because all assessment tasks are written in nature under timed exam conditions for the majority of the assessment. I can use UDL strategies along the way, but ultimately all students sit a standardized test.
51. Workload and number of classes taught limits prep and marking time.
52. you need are very good k-12 Syllabus work plan realt with all the subject find Contact between courses, show we will have Many ways to help students learn to wake repeated memory, become long-term memory
53. No idea what UDL is.
54. Not an expression I know.
55. Not sure as I have been at this school for only three months.
56. Cannot answer (see previous question)

Responses for Item #47: If you have any other comments in relation to UDL use in your IB school setting, please note them below.

1. I would like to see it implemented by more teachers. Some teachers who have not embraced technology and who are not as open to new ideas often still use the sage on the stage concept.
2. Academic staff could use more training to this end.
3. Access to resources would be great to foster and encourage more work in this area.
4. Although the practices are familiar, this is a new term to me.
5. Another challenge is to adapt classrooms rigid and flexible school curricula is also to convince the directors of the schools apply to be new ways of learning.

6. Because of the constraints willing to regulator, the time actually should have for mainstreaming the process is poor, and likewise for retroalimentasión. Another point is the lack of brindadas training, especially for some of the subjects.
7. Environment, resources
8. How much money do people get paid to come up with another term for strategies teachers are already using? I want in on this.
9. I do not know of any other teacher using this methodology in my school.
10. I started this course to teach the International Baccalaureate in my heart and I still lack experience and shooting.
11. I use a 4 part lesson plan (Connect, Activate, Demonstrate and consolidate) that attempts to structure lessons and provide opportunities to differentiate learning tasks. We have working hard on the use of technology (google docs) and Smart boards to provide a more interactive learning environment. Key PD has been introduced to differentiate learning strategies. Although UDL has not been explicitly introduced it seems to follow the same work we have looked at (Powells).
12. I will know more after this school year.
13. I wish to get more teaching materials for each part of the syllabus. Learners feel very frustrated when looking at the IB memo as it is just a simple guideline. It would be nice if it can be more elaborate.
14. I would like to know what Universal Design for Learning is. It is not a framework with which I am familiar.
15. I would not say that we have been implementing UDL. In fact, the first time I heard of it was from Dr. Kumar at the IBO when she told me that the IBO is working on UDL and Assessment for Learning and that she will soon be writing a paper which I should be on the lookout for some time next year. Prior to this, I had never heard of UDL. It is a new concept to me and I am not sure whether my colleagues will be able to complete this survey.
16. IB should help schools with some facilities which they cannot provide. They should also organise regular training with regards to UDL.
17. It would be very important to receive guidelines or training on what is and the use of Universal Design for Learning.
18. Much of this learning is new and it challenges some teachers in their core beliefs. Can students of all backgrounds, learning types, etc. REALLY learn in a classroom? These are the kinds of questions that I hear teachers asking. I think seeing models of how it works and then breaking it down for teachers would be very useful.
19. Our IB school is a school within a school, and we have to follow the whole school educational strategies of the moment. We use Gradual Release of Responsibility and many ESL strategies because we are high ESL.
20. Right now, we are not using UDL in our school, but soon we are planning to set up UDL.
21. Teachers need training.
22. There is a fear among many at our school that by making education more accessible, we are "dumbing down" the curriculum. I have heard from many that "students in higher level classes shouldn't get accommodations." I strongly disagree with this statement, and I feel that additional teacher education in needed in this area.
23. They should give workshops on the subject to date.
24. UDL also supports English language learners and can be used as an overarching strategy to support ELL support.
25. UDL is helping students to build Learning and accumulation of knowledge. especially from those just entering school students, IB is Idea is we are a culture can assume responsibility for the future citizens of the world, he must have a wealth of knowledge and experience, and with understanding, respect and the identity of the participants to address the issues raised ideas. UDL is helping students Knowledge to help students better understand what they learn to help students learn in the future a better life and to apply their knowledge and real life are associated. Instead of learning useless.
26. UDL is NEVER mentioned during PD sessions for IB courses. If it is something the IB values, then it needs to become a part of teacher training (all teacher training and all course training). Perhaps all IB schools and teachers should also have mandatory sessions on UDL. The focus of the IB seems to be on content and information overload. Perhaps if the IB considered asking its students to do less, it might be able to include more diverse learners in the programme.
27. We are having a workshop on ATL this year, and I think it is related to UDL.
28. We just started this year with the IB-programme.
29. Not an expression I know.
30. This is the first time I've heard of UDL.
31. No idea what UDL is.