# The Promise of Universal Design in Postsecondary Education: A Literature Review

**Kyle Reardon[1]**
**Katherine W. Bromley[1]**
**Deanne Unruh[1]**

## Abstract

Institutions of higher education are facing new challenges in planning, delivering, and evaluating instruction in order to meet the needs of an increasingly diverse student population. Disability support services (DSS) offices, in turn, are often overburdened with providing and monitoring the implementation of appropriate classroom accommodations, necessitating a new model for ensuring access to instruction for all students. Frameworks aligned with the tenets of Universal Design (UD) have demonstrated effectiveness in meeting the needs of diverse learners, though there is little research investigating the effectiveness of the frameworks in postsecondary education. Therefore, a systematic review of the literature was conducted to understand the existing literature on UD to support students with disabilities in postsecondary education. The current review included articles featuring the use of UD frameworks in postsecondary, college, university, or higher education settings to meet the needs of students with disabilities. Included articles measured outcomes such as faculty attitudes and perceptions toward the implementation of UD frameworks and inclusive instruction as well as student attitudes toward and perceptions of the effective faculty implementation of UD principles in postsecondary classrooms. The results of the literature review are discussed along with implications and recommendations for DSS practitioners.

*Keywords: universal design, postsecondary education, disability*

The number of students with disabilities attending institutions of higher education (IHEs) comprises approximately 11% of the entire college student population and continues to grow (Horn, Peter, Rooney, & Malizio, 2002; Newman et al., 2009). Research suggests that 88% of postsecondary institutions in the United States enroll students with disabilities (Raue & Lewis, 2011), though the percentage of students with disabilities who complete a degree program is still far below that of students without disabilities (Newman et al., 2011). The number of students requesting academic accommodations and related services is growing along with enrollment (Davies et al., 2013; McEwan & Downie, 2013; Roberts et al., 2011; Stodden et al., 2011), creating a need for IHEs to be better prepared to support diverse learning needs in the classroom (Horn, Peter, & Rooney, 2002). IHEs must also reexamine their service delivery models to ensure students receive appropriate supports and that disability support services (DSS) offices are not overwhelmed with the provision of accommodations.

There has also been a recent shift in the distribution of disabilities in postsecondary environments with an increase in students with "invisible" disabilities (Raue & Lewis, 2011) who typically require adaptations in the way course content is delivered and assessed. Other diversity-related factors including life experience, academic preparation, native language, and learning abilities impact a student's ability to access instruction, regardless of disability status (American College Health Association, 2009). This increasingly diverse array of learning needs is not typically addressed through traditional instructional approaches in higher education and requires an increasing number of classroom accommodations and a need for inclusive teaching practices (Leyser et al., 1998; McGuire et al., 2003; Murray et al., 2009; Reed et al., 2003; Scott et al., 2003; Vogel et al., 1999). Such needs create new challenges both for faculty members in planning, delivering, and evaluating

*[1] University of Oregon*

their instruction to meet the needs of an increasingly diverse student population, as well as for DSS practitioners in designing and monitoring the implementation of classroom accommodations (Toutain, 2019).

To improve persistence and achievement levels for all students, many recent curricular design frameworks intended to meet the needs of a diverse set of learners have been based on the principles of Universal Design (UD). UD is a construct originally developed in the field of architecture as a way to create products and environments to support all individuals (Connell et al., 1997). Several classic examples of UD include curb cuts, handrails, and automatic doors. When environments are designed according to UD principles, they are designed to meet the needs of individuals with a wide range of characteristics, of which disability is just one. The original UD construct has since been adapted in several different forms to structure educational environments and instructional pedagogy to meet the needs of all students. While other constructs focus on providing unique supports for students with disabilities, UD frameworks instead focus on a broader perspective of curricular design to promote the success of all students. These constructs are not intended to be substitutes for targeted interventions and are not as specific as accommodations, but instead are tools to increase academic success and potentially limit the need for student-level classroom accommodations (Ketterlin-Geller & Johnstone, 2006).

While the use of UD in postsecondary settings has been supported by legislation, including the Reauthorization of the Higher Education Opportunity Act of 2008 (Roberts et al., 2011), there is limited empirical evidence of its utility in these settings to meet the needs of all learners, specifically students with disabilities. In addition, there are several different UD frameworks being used in postsecondary education, leading to potential confusion and lack of instructional cohesion. The primary purposes of this review, therefore, are (a) to better understand the existing empirical research on the use of UD frameworks in postsecondary education to support students with disabilities and (b) to provide salient implications of these findings for DSS practitioners. The conception and evolution of UD frameworks will be discussed followed by the methodology of the current literature review and associated findings and recommendations.

## Universal Design

The original concept of Universal Design included seven principles designed to guide product development to be designed to meet the needs of all users. Figure 1 provides information about each UD-aligned framework and its composite principles. The principles included in the original framework were established by the Center for Universal Design in 1997 and include:

1. equitable use,
2. flexibility in use,
3. simple and intuitive use,
4. perceptible information,
5. tolerance for error,
6. low physical effort, and
7. size and space for approach and use (The Center for Universal Design, 1997; Story et al., 1998; Zeff, 2007).
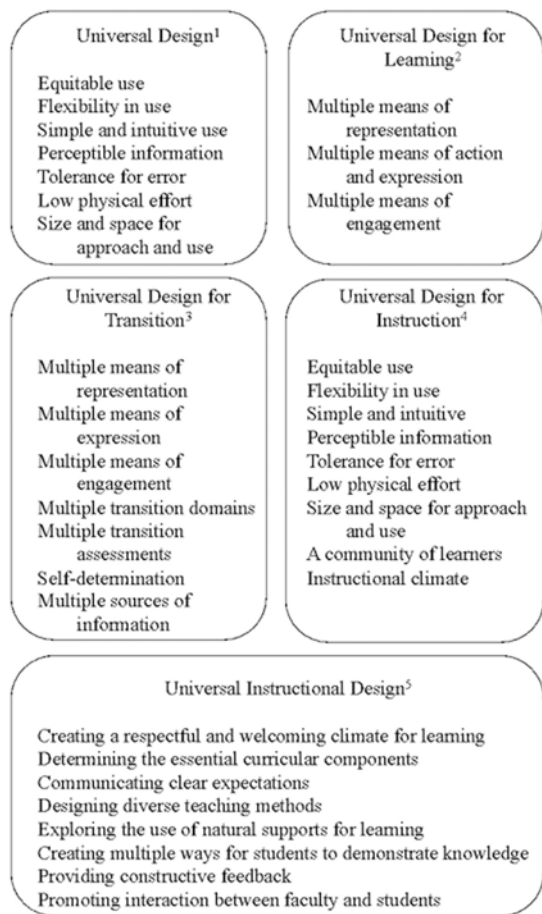
The principles of UD have been applied to education in multiple forms resulting in numerous frameworks with the intention of meeting the needs of a range of ability levels in inclusive settings (McGuire et al., 2006; Zeff, 2007). These educational frameworks include Universal Design for Learning (UDL) (Rose & Meyer, 2000), Universal Design for Transition (UDT) (Thoma et al., 2009), Universal Design for Instruction (UDI) (Scott et al., 2003), and Universal Instructional Design (UID) (Higbee, 2009). While all of these frameworks have unique components that set them apart (see Figure 1), they all center on best practices and providing access to students with disabilities. The frameworks most consistently appearing in the literature relevant to the present study are UD, UDL, and UDI, and as such, those frameworks will be the primary focus. UDT will not be discussed in this review as it focuses on applying UD principles to the secondary transition process and does not specifically relate to postsecondary education (Thoma et al., 2009); UID will also not be discussed due to its limited appearance in the literature. In the following section, we will discuss the educational applications of UD in order to understand how they have been and can be applied to postsecondary education settings to help meet the needs of diverse learners.

## Educational Applications

**Universal Design for Learning.** One of the most recognizable educational adaptations of UD is UDL, a model that is most commonly used in K-12 education settings for guiding the delivery of instruction intended to support all students. This framework has also been endorsed within Individuals with Disabilities Education Act Amendments (Individuals with Disabilities Education Act, 2004; Kennedy et al., 2013). The primary focus of UDL is to eliminate barriers within the learning environment, ensuring the

**Figure 1**

*Universal Design Frameworks*



| Universal Design[1] | Universal Design for Learning[2] |
|---|---|
| Equitable use | |
| Flexibility in use | Multiple means of representation |
| Simple and intuitive use | Multiple means of action and expression |
| Perceptible information | Multiple means of engagement |
| Tolerance for error | |
| Low physical effort | |
| Size and space for approach and use | |

| Universal Design for Transition[3] | Universal Design for Instruction[4] |
|---|---|
| Multiple means of representation | Equitable use |
| Multiple means of expression | Flexibility in use |
| Multiple means of engagement | Simple and intuitive |
| Multiple transition domains | Perceptible information |
| Multiple transition assessments | Tolerance for error |
| Self-determination | Low physical effort |
| Multiple sources of information | Size and space for approach and use |
| | A community of learners |
| | Instructional climate |

**Universal Instructional Design[5]**

Creating a respectful and welcoming climate for learning
Determining the essential curricular components
Communicating clear expectations
Designing diverse teaching methods
Exploring the use of natural supports for learning
Creating multiple ways for students to demonstrate knowledge
Providing constructive feedback
Promoting interaction between faculty and students

*Note.* [1]The Center for Universal Design (1997); [2]CAST (2018); [3]Thoma et al. (2009); [4]Scott et al. (2001); [5]Fox et al. (2003).

focus is on adapting the curriculum to the learner, and not assuming that the learner needs to fit the curriculum (CAST, 2018; Rose, 2001; Rose & Meyer, 2000). UDL's goal is to combine the best approaches for engaging students and supporting instructors to meet the needs of all students, without advocating for specific teaching practices. The principles of UDL implementation include providing multiple means of:

1. *representation* to give learners a variety of ways to acquire information and build knowledge (e.g., provide course content in multiple languages, solicit information from students about preferred presentation style, avoid unnecessary jargon, utilize both student and instructor-led discussions);
2. *action and expression* that provide learners alternatives for demonstrating what they have learned (e.g., multimedia projects, written papers, interactive media, visual displays, diverse project types); and
3. *engagement* to tap into learners' interests, challenge them appropriately, and motivate them to learn (e.g., establish a collaborative classroom culture; individualize instruction to meet unique student needs; develop supportive relationships; promote autonomy, self-determination, and collaboration).

**Universal Design of Instruction.** Originally designed specifically to meet the needs of diverse learners in postsecondary education, Universal Design for Instruction (UDI) focuses on designing academic teaching environments, learning products, and learning materials to meet the needs of a diverse set of learners (McGuire & Scott, 2003; McGuire et al., 2003, 2006; Scott et al., 2001, 2003). The principles of this framework include the original seven principles from UD in

addition to two new principles—community of learners and instructional climate—and focus more on instructional delivery than on product design (Scott et al., 2001). The principles are defined as follows:

1. *equitable use:* designing instruction to be useful to and accessible by people with diverse abilities, providing the same means of use for all students (e.g., post lecture notes and provide students with audio files of lectures, provide content through video);
2. *flexibility in use:* instruction is designed to accommodate a wide range of individual abilities, providing student choice in methods of use (e.g., lecture, small group discussions, student-led discussions);
3. *simple and intuitive:* instruction should be designed in a straightforward and predictable manner, regardless of the student's experience, knowledge, language skills, or current concentration level, ensuring that instructors eliminate unnecessary complexity (e.g., avoid unnecessary jargon, use visual as well as written content);
4. *perceptible information:* designing instruction so that necessary information is communicated effectively to the student, regardless of ambient conditions or the student's sensory abilities (e.g., written, visual, and verbal presentation of content);
5. *tolerance for error:* instruction anticipates variation in individual student learning pace and prerequisite skills (e.g., varied response opportunities, flexibility in student demonstration of learning);
6. *low physical effort:* instruction is designed to minimize nonessential physical effort to allow maximum attention to learning (e.g., provide clear rows and walkways, use classrooms and lecture halls without steps, provide adequate desks and workspaces);
7. *size and space for approach and use:* the design of instruction with consideration for appropriate size and space for approach, reach, manipulations, and use regardless of a student's body size, posture, mobility, and communication needs (e.g., set up classroom to minimize limitations, make all materials easily accessible for all students);
8. *a community of learners:* the instructional environment must promote interaction and communication among students and between students and faculty (e.g., develop teacher-student reciprocity, teach self-determina-

tion skills, facilitate positive and reciprocal classroom relationships); and
9. *instructional climate:* the instruction is designed to be welcoming and inclusive, espousing high expectations for all students (e.g., build a climate and culture of respect through facilitation of healthy student-to-student and small group interactions) (McGuire & Scott, 2003; McGuire et al., 2003, 2006; Scott et al., 2001, 2003).

While there is some evidence in the literature of the effectiveness of using UD principles to support students with disabilities in postsecondary settings, it is a nascent field in need of more empirical evidence. Roberts et al. (2011) conducted a systematic review of the literature on the use of UDI in postsecondary settings, though they did not look specifically at outcomes for students with disabilities, nor did they include any other UD frameworks in their review. Therefore, the present study was designed to better understand the existing research literature on UD in postsecondary settings in order to identify the UD frameworks studied, the dependent variables addressed, and actionable findings for DSS practitioners.

## Method

### Criteria

The authors conducted a systematic literature review of the use of different UD frameworks in postsecondary education to support students with disabilities. The criteria used for selection of articles were that the article (a) featured the use of UD, UDL, or UDI in a postsecondary, college, university, or higher education setting, (b) addressed outcomes for students with disabilities, and (c) was published in a peer-reviewed journal dated January 1990 or later. These criteria were chosen as the intent of the systematic literature review was to identify and review research on the use of UD frameworks and principles in postsecondary education settings. Though previous reviews searched articles starting in 2000, the year 1990 was chosen as a starting point for this review in an effort to include any seminal articles referencing UD frameworks as applied to postsecondary settings as UDL was developed in the 1990s (CAST, 2018).

### Data Sources

The literature search process is detailed in Figure 2. The search was conducted in May 2018 and included the following databases: Academic One File, Academic Search Premier, Business Source Complete, Education Abstracts, Education Research Complete,

**Figure 2**

*Search Procedure for Literature Review*
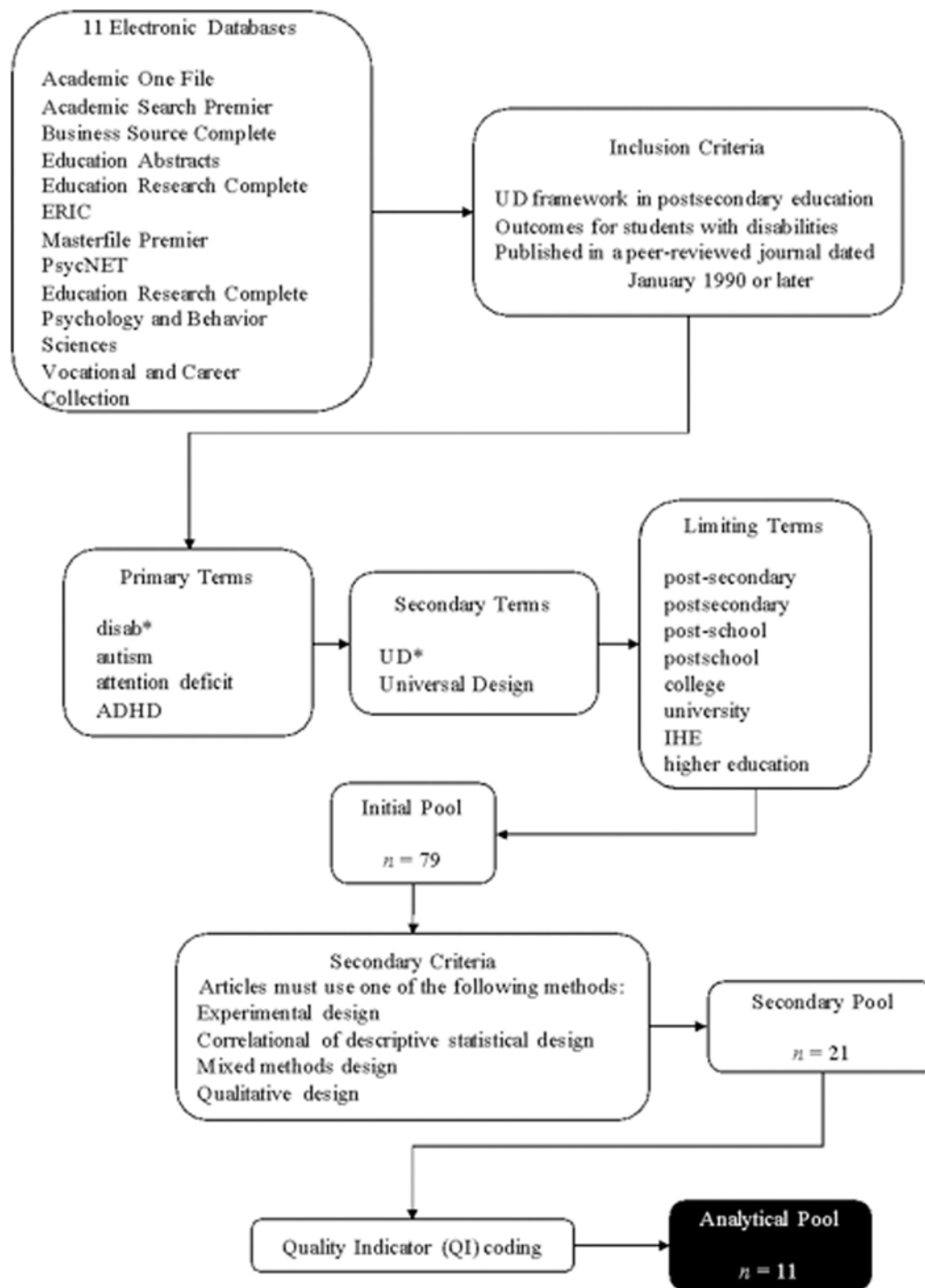
ERIC, Masterfile Premier, PsycNET, Education Research Complete, Psychology and Behavior Sciences, and Vocational and Career Collection. Truncated terms (disab* and UD*) were used as a search parameter strategy to return all articles that referenced any form of the word "disability" and any Universal Design construct (UDL, UDI, UDT, or UD), respectively. The primary search terms were "disab*," "autism," "attention deficit," and "ADHD." Secondary search terms used along with the primary terms were "UD*" and "Universal Design." Finally, each search was limited using each of the following tertiary search terms: "post-secondary," "postsecondary," "post-school," "postschool," "college," "university," "IHE," and "higher education." All searches were conducted with three search terms, and all combinations of primary, secondary, and tertiary terms were searched. The rationale for this was to generate all articles that reference the use of UD principles or frameworks in postsecondary education to support students with disabilities. There was no additional secondary searching strategy employed in this review.

The initial review of article titles and abstracts returned 79 articles based on the above criteria. Once returned, articles were reviewed through a more thorough secondary process resulting in a remaining 21 articles. The criteria for this secondary review was that articles must use experimental design, correlational or descriptive statistical design, quantitative survey design, mixed methods design, or qualitative design. The rationale for this additional limiting criteria was to gather evidence of UD's effectiveness in postsecondary settings through validated research designs. Thus, articles using action research, practitioner research, and practice briefs were excluded through secondary review.

## Coding Procedures

The Quality Indicator checklists developed by the National Technical Assistance Center on Transition (NTACT) were used to determine methodological rigor. These quality indicator checklists were developed in part based on research published in the 71st edition of *Exceptional Children* (2005). Quality indicators for group experimental research (Gersten et al., 2005), correlational research (Thompson et al., 2005), and qualitative research (Brantlinger et al., 2005; Trainor & Graue, 2014) were used to assess each article according to the research design that it employed. The rationale for using these checklists to code for quality was to ensure that only high-quality research was included in the review.

The Quality Indicator checklists were transferred into computer-based surveys using Qual-trics, a browser-based survey tool, and were used to code each article for quality. The first author coded all 21 articles and Inter-Rater Reliability (IRR) was calculated using the percent agreement calculation (McHugh, 2012) after seven articles (33% of the total article pool) were coded by the second author. The seven articles coded for IRR were selected using a random number generator. The 21 articles were arranged in alphabetical order by the first author's last name and assigned a number 1-21. A random number generator was then used to identify which seven articles would be coded by the secondary researcher. IRR was calculated by dividing the number of agreement responses by the total number of responses per Quality Indicator checklist. The total IRR percentage for all seven articles was calculated at 81.9% with a range of 41.2% to 100.0%.

## Data Analysis

After all articles were coded and IRR was determined to be acceptable (i.e., reaching a threshold of 80%), there were 11 articles that met inclusion criteria and acceptable quality on the Quality Indicator checklists to be included in the analysis. Once article identification and quality coding were complete, the articles were analyzed to identify common themes relative to UD frameworks used, dependent variables measured, measurement tools used, and research designs employed. Themes were then summarized to provide an opportunity for analysis.

## Results

This review examined the existing literature on the use of UD principles in postsecondary education to support individuals with disabilities. The 11 articles consisted of the following research designs:

- one experimental design (Dallas et al., 2016),
- one quasi-experimental design (Davies et al., 2013),
- one mixed methods design (Izzo et al., 2008), and
- eight quantitative survey designs (Dallas et al., 2014; Hartsoe & Barclay, 2017; Lombardi & Murray, 2011; Lombardi et al., 2015; Lombardi et al., 2013; Lombardi et al., 2011; Schelly et al., 2011; West et al., 2016).

All of the articles were published between 2007 to 2016 in peer-reviewed journals. The UD frameworks examined were UD ($n = 5$), UDL ($n = 4$), and UDI ($n = 2$). Each of the included articles featured a dependent variable relative to faculty attitudes and perspec-

**Table 1**

*Universal Design Literature Search Results*

| | Disab* | | Autism | | Attention Deficit | | ADHD | |
|---|---|---|---|---|---|---|---|---|
| | Hits | Criteria | Hits | Criteria | Hits | Criteria | Hits | Criteria |
| UD* + post-secondary | 70 | 26 | 3 | 0 | 2 | 0 | 1 | 0 |
| UD* + postsecondary | 23 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| UD* + post-school | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UD* + postschool | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UD* + college | 1,184 | 8 | 150 | 1 | 165 | 0 | 109 | 0 |
| UD* + university | 2,767 | 1 | 738 | 0 | 787 | 0 | 519 | 0 |
| UD* + IHE | 1 | 0 | 0 | 0 | 0 | 0 | 25 | 0 |
| UD* + higher education | 197 | 1 | 40 | 0 | 34 | 0 | 1 | 0 |
| Universal Design + post-secondary | 191 | 20 | 19 | 0 | 19 | 0 | 16 | 1 |
| Universal Design + postsecondary | 44 | 0 | 7 | 0 | 5 | 0 | 4 | 0 |
| Universal Design + post-school | 12 | 0 | 2 | 0 | 0 | 0 | 1 | 0 |
| Universal Design + postschool | 18 | 0 | 11 | 0 | 4 | 0 | 3 | 0 |
| Universal Design + college | 414 | 9 | 57 | 0 | 27 | 0 | 20 | 0 |
| Universal Design + university | 663 | 4 | 102 | 0 | 31 | 0 | 26 | 0 |
| Universal Design + IHE | 4 | 0 | 1 | 0 | 2 | 0 | 2 | 0 |
| Universal Design + higher education | 260 | 7 | 32 | 0 | 20 | 0 | 18 | 0 |
| | 5,850 | 77 | 1,162 | 1 | 1,096 | 0 | 745 | 1 |

*Note.* UD = Universal Design; IHE = Institutions of Higher Education.

tives or student perspectives and outcomes. As such, the findings are presented according to the addressed dependent variable with an additional section focused on findings relevant to the Inclusive Teaching Strategies Inventory (ITSI), a measurement tool used in seven of the included studies.

**Faculty Perspectives**

Eight of the articles that met inclusion criteria for the review included a dependent variable relative to faculty perceptions, perspectives, or knowledge of UD principles in postsecondary settings. Dependent variables in these studies included faculty attitudes toward the implementation of UDI (Dallas et al., 2014), faculty perceptions of inclusive instruction (Lombardi & Murray, 2011; Lombardi et al., 2015; Lombardi et al., 2013; Lombardi et al., 2011; West et al., 2016), faculty beliefs, knowledge, and confidence in the principles of UDI (Hartsoe & Barclay, 2017), and faculty perceptions of the most important components of inclusive instruction relative to student success (Izzo et al., 2008).

Dallas et al. (2014) measured faculty attitudes toward implementing accommodations for students with disabilities and found that respondents had favorable attitudes toward providing multiple means of presentation, engaging in inclusive lecture strategies, and providing classroom accommodations to students with documented disabilities. In measuring faculty knowledge of the principles of UDI, Hartsoe and Barclay (2017) found significant correlations between faculty beliefs, knowledge, and confidence. Lombardi and Murray (2011), Lombardi et al. (2013), and Lombardi et al. (2011) all found that faculty who had prior disability-focused training had more positive attitudes toward inclusive teaching strategies. As a result of these positive attitudes, faculty demonstrated a greater understanding of disability law, minimized instructional barriers, had greater awareness of campus resources, and had higher performance expectations for their students. In a study yielding similar results, Izzo et al. (2008) found UDL to be the most preferred training topic among university faculty and

that faculty were specifically looking for more training on how to promote educational access and meet the diverse learning needs of their students through more inclusive instructional practices. In comparing U.S. faculty attitudes toward inclusive teaching practices with attitudes from faculty in Spain and Canada, Lombardi et al. (2015) found that U.S. faculty were more likely to have favorable attitudes. Finally, while continuing to find favorable attitudes toward inclusive teaching practices, both Lombardi et al. (2011) and West et al. (2016) found discrepancies between these attitudes and associated faculty actions toward implementing inclusive instructional strategies in postsecondary classrooms.

## Student Perspectives and Outcomes

Three of the articles included in the review focused on student perceptions, perspectives, or attitudes regarding faculty implementation of UD principles (Dallas et al., 2016; Davies et al., 2013; Schelly et al., 2011). These studies measured dependent variables that included student attitudes toward and perceptions of faculty implementation of UD principles in postsecondary classrooms. In the only experimental study included in the review that focused on the use of closed captioning in postsecondary classrooms, Dallas et al. (2016) found that participants who were exposed to closed captions performed better on an information recall assessment. They also found that those in the closed captioning condition had more overall positive attitudes, as measured by a composite attitudinal score, toward the use of closed captions as compared to students who were not exposed to closed captions, suggesting that positive attitudes increase along with exposure to closed captions.

Schelly et al. (2011) found that students reported a significant increase in the use of UDL strategies by their instructors after a UDL-focused faculty training. Following the training, instructors presented information in multiple formats, provided more course materials in electronic formats, made more reading assignments available online, made key points in videos more apparent, provided feedback on assignments more promptly and constructively, and supplemented more lecture and reading materials with visuals. Similarly, Davies et al. (2013) found that a UDL-focused faculty training had a significant effect on students' perceptions of instruction in university courses. Strategies most impacted by the training were presenting material in multiple formats, relating key concepts to larger course objectives, providing an outline at the beginning of each lecture, summarizing material throughout each class, highlighting key points of an instructional video, using instructional videos, and using well-organized and accessible materials.

## Inclusive Teaching Strategies Inventory (ITSI)

Seven of the studies included used the ITSI to measure attitudes and perceptions toward inclusive teaching practices (Dallas et al., 2014; Hartsoe & Barclay, 2017; Lombardi & Murray, 2011; Lombardi et al., 2015; Lombardi et al., 2013; Lombardi et al., 2011; West et al., 2016). Relative to psychometric properties of the ITSI, Lombardi and Murray (2011) established content validity and partial construct validity, resulting in eight reliable factors. Relatedly, Hartsoe and Barclay (2017) found numerous correlations between the ITSI constructs of Beliefs (Accommodations, Accessible Course Materials, Course Modifications, Inclusive Lecture Strategies, Inclusive Classroom, and Inclusive Assessment), Knowledge (Campus Resources), and Confidence (Disability Law), indicating relationships between faculty beliefs, knowledge, and confidence in implementing the principles of UDI.

Lombardi et al. (2013) used the ITSI to measure faculty attitudes at two different universities, and Lombardi et al. (2015) used the ITSI to examine differences in faculty attitudes in the U.S., Spain, and Canada. Lombardi et al. (2011) used the tool to examine correlations between faculty characteristics (gender, years teaching, teaching status, personal experience, and prior disability-focused training) and faculty attitudes toward inclusive instruction, while West et al. (2016) used the ITSI to examine discrepancies between faculty attitudes and actions toward inclusive teaching practices. Finally, Dallas et al. (2014) used the ITSI to measure faculty attitudes toward providing classroom accommodations.

## Discussion

The purpose of this literature review was to investigate the existing empirical evidence on the use of UD frameworks in postsecondary education to support students with disabilities and to translate those findings into actionable recommendations for DSS practitioners. The inclusion criteria and coding procedures returned 11 articles for inclusion in the review that contained outcome variables related to faculty or student perceptions, attitudes, or perspectives toward the use of UD principles in postsecondary education classrooms. Findings indicate tentative evidence for positive student outcomes based on the use of these frameworks and are consistent with findings from previous literature reviews on this topic (Roberts et al., 2011). The final section of this review will include overarching themes, a discussion of limitations, and a presentation of actionable findings for DSS practitioners.

A salient finding from the article synthesis was the fact that most studies were exploratory and descriptive in nature, focusing on faculty and student attitudes and perceptions. Of the 11 studies included in the review only one included a true experimental design. There was one additional article that used a quasi-experimental design, but the remaining nine articles did not use an experimental research design in their study. It may be useful to move from more descriptive and exploratory research about attitudes and perceptions to more rigorous research, including correlational and experimental designs, to test the impact of UD frameworks on student outcomes, including graduation and retention rates. While preliminary evidence is positive, experimental design research can provide further empirical and correlational evidence for student-related outcomes for the use of UD frameworks in postsecondary education.

The results across studies included in the review also provided tentative evidence for the premise that faculty adherence to inclusive teaching practices and tenets of UD leads to more positive student perspectives of faculty instruction. This indicates that improving instructor knowledge of diverse learning needs and how to support those needs in the postsecondary classroom may make instruction more accessible and potentially lead to positive academic outcomes for students with disabilities and may increase the instructors' implementation of UD principles in university classrooms (Schelly et al., 2011). Overall, results from these studies provide evidence that UD frameworks may be a paradigm that faculty are willing to adopt to meet the needs of a diverse set of learners in postsecondary settings.

**Limitations**

There are several limitations to this review that should be understood when considering the implications of findings. While the researchers attempted to retrieve all existing articles that examined the use of UD frameworks in postsecondary education to support students with disabilities, it is possible that there are other articles on this topic that were not captured by the search methodology. While the literature search included what we presumed to be all relevant databases, there may be other relevant databases that we were not aware of and therefore did not search. Furthermore, though our search terms were designed to capture all disabilities, the fact that we used some specific disability labels in our search (e.g., "autism," "ADHD") and not all disability labels (e.g., "learning disability," "dyslexia") may have had an impact on the articles returned in the search and therefore on the generalizability of our findings.

In addition to these limitations, further limiting the generalizability of our findings was the fact that inclusion criteria were restricted to empirical studies that used an experimental, quasi-experimental, qualitative, correlational, survey, or mixed method design. While this allowed us to examine the quality of empirical evidence, there are likely other findings from action and practitioner research that were not captured here. Our pool of articles was further limited by our use of NTACT quality indicator checklists to evaluate the quality of the research designs included in the review which reduced our pool of included articles from 21 to 11. Finally, the number of articles included in the review, 11, may not be sufficient and may limit the generalizability of the findings from the cross-article analysis.

**Recommendations**

The results of the articles included in this review, taken together, have several important implications for DSS practitioners and offices. Results provide evidence for the use of UD frameworks in postsecondary settings to support students with disabilities and point to positive perspectives of faculty members toward students with disabilities' diverse learning needs and implications for positive impacts on academic performance. Findings also indicate the need for more faculty training and ongoing professional development on inclusive teaching strategies and the implementation of UD frameworks to support students with disabilities. Many articles note the positive impacts of even minimal faculty training on both faculty perceptions of students with disabilities and student perceptions of faculty implementation of UD principles. In order to increase the use of UD in postsecondary classrooms and shift faculty perceptions of disability and inclusive practices, DSS practitioners are of vital importance. These individuals are essential to providing and supporting faculty training, consulting with faculty during UD implementation, as well as providing ongoing collaboration. This section discusses these implications in detail along with recommendations for future research.

**Faculty training.** While the premise that faculty training on UD frameworks may increase their use in practice is encouraging, the inherent challenge is determining the source of this training. Successful faculty training will include initial training in UD principles, strategies for implementation, follow-up coaching, and both formative and summative assessment on the fidelity of implementation of and student outcomes related to UD-aligned instruction. This opens up a significant opportunity for DSS practitioners who have thus far been leaders in the UD movement in institutions of

higher education. While this significant undertaking will require resources and time, the energy spent on training faculty in UD principles and implementation may reduce the need for individual student accommodations, thus limiting the burden on accommodation provision for DSS practitioners.

**Inclusive teaching strategies inventory.** Results from the review also indicated that the ITSI is a valid and reliable tool for measuring faculty attitudes and actions toward inclusive instruction and students with disabilities. Understanding the attitudes and actions of faculty can provide valuable information for DSS offices in determining how and where to implement UD frameworks on campus. As such, DSS offices can survey faculty on their campus using the ITSI as a way of informing faculty trainings to make them even more relevant for their faculty. Analysis of ITSI survey results can also help DSS offices locate knowledge gaps and implementation discrepancies relative to inclusive and UD-aligned instruction. DSS offices can also use data gathered from the ITSI to present to campus administrators in order to strengthen the case for funding, time, and resources for improving implementation of UD frameworks and inclusive instruction. Lastly, the ITSI could be administered to faculty both before and after UD training to determine the impact of instructional changes resulting from the training, and can also be administered to students before and after faculty training to understand shifts in student perception toward faculty implementation of UD principles as a result of the training.

**DSS consultant model.** The rising number of students with disabilities attending IHEs continues to strain the resources of DSS offices, creating a need for a new or complementary service model (Toutain, 2019). If DSS offices are able to provide adequate faculty trainings on UD principles utilizing the ITSI as described above, these practitioners may be able to shift to a consultant delivery model, focusing more attention on instructional delivery and supporting inclusive instructional practices on campus than on the provision of individual student-level accommodations. This model is not intended to replace these important accommodations, but a strong emphasis on inclusive instructional practices may contribute to a reduction in the need for individual accommodations. This is a model that needs more empirical evidence to determine its effectiveness but may lead to improved academic outcomes for students with disabilities.

**Collaboration.** Each of these recommendations necessitates strong collaborative relationships in order to be effective. For faculty training to be fruitful and for faculty to perceive the administration of the ITSI as a value-added resource as opposed to an evaluative or punitive judgement on instructional delivery, collaborative relationships must be built and fostered. While these relationships will need to be reciprocal, will require buy-in from all parties, and will need to be supported by campus administration, DSS practitioners and offices can be leaders in the development and sustainment of these relationships. By offering their resources, guidance, and expertise in a supportive consultant capacity, DSS practitioners can lead the charge in bringing about positive instructional changes on their campuses.

**Future research**. Future research should focus on developing UD-focused training modules that can be used by DSS offices to train university faculty on the implementation of UD principles in order to develop inclusive instructional practices. Extending the postsecondary UD literature from exploration to the development of actionable interventions should be a significant focus of the research moving forward. Future research should also use the ITSI to determine the impact of faculty training modules on both faculty and student perspectives. Finally, future research should incorporate more rigorous experimental designs to empirically measure whether the use of UD frameworks in postsecondary education improves student outcomes, including course and degree completion, as to date research has primarily only examined attitudes and actions toward inclusive practices.

## Conclusion

Frameworks associated with the principles of UD have potentially positive implications for improving outcomes for students with disabilities in postsecondary education. DSS practitioners and offices have the potential to be significant leaders in the process of shifting postsecondary classrooms in the direction of more inclusive instructional practices aligned with UD principles. These practitioners can lead faculty trainings on UD, can assess faculty attitudes and actions toward inclusive instruction to ensure that these training modules are designed specifically with the needs of their faculty in mind, and can serve in a consultant capacity to monitor the implementation of inclusive instructional practices across their campuses. Development of a more extensive and rigorous research base relative to UD implementation in postsecondary education will add to the empirical evidence for its use and develop increasingly practical applications for implementation in postsecondary classrooms.

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## About the Authors

Kyle Reardon earned both his B.A. and M.A. from Northern Vermont University and his Ph.D. in special education from the University of Oregon. His experience includes work as a special education teacher, supported employment specialist, and in postsecondary support programs for students with disabilities. His research interests include secondary transition, special education teacher preparation, and postsecondary accessibility for students with disabilities. He can be reached by email at: kreardon@uoregon.edu.

Katherine W. Bromley received her M.A. and Ph.D. in special education from University of Oregon. Her experience includes working as a learning specialist and access specialist for University of Oregon serving college students with disabilities. She is currently a postdoctoral scholar in the Secondary Special Education and Transition research unit. Her research interests include social capital and networks, behavior support in community-based employment, and predictors of postsecondary outcomes. She can be reached by email at: kwagner3@uoregon.edu.

Deanne Unruh, Ph.D., is an Associate Research Professor in the College of Education at the University of Oregon. She directs the Secondary Special Education and Transition Research unit. Her research interests include interventions to support students with disabilities in their transition from school to adulthood, specifically youth involved in juvenile services. She can be reached by email at: dkunruh@uoregon.edu.