



# The Birds, Bees, and Special Needs: Making Evidence-Based Sex Education Accessible for Adolescents with Intellectual Disabilities

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## Abstract

Adolescents with intellectual disabilities (ID) represent an invisible at-risk population for multiple negative health outcomes. Much like their non-disabled peers, promoting healthy behaviors during adolescence has the potential to improve quality of life later on in life (McPherson et al. in *J Appl Res Intellect Disabil* 30(2):360, 2017). Many studies have analyzed disparities in obesity (Phillips et al. in *Matern Child Health J* 18(8):1964, 2014; Stancliffe et al. in *Am J Intellect Dev Disabil* 116(6):401, 2011), mental health (Charlot and Beasley in *J Ment Health Res Intellect Disabil* 6(2):74, 2013), and health care access (Baller and Barry in *J Disabil Policy Stud* 27(3):148, 2016), however sexual health needs further research and translation to practice. Access to sexual health education is limited for many youth with ID (Barnard-Brak et al. in *Ment Retard* 52(2):85–97, 2014). Studies have shown that students with ID experience higher rates of sexual abuse and assault than their non-disabled peers (Haydon et al. in *J Interpers Violence* 26(17):3476, 2011; Mahoney and Poling in *J Dev Phys Disabil* 23(4):369, 2011). Sexually active youth with ID are at a higher risk for contracting sexually transmitted infections compared to their non-disabled peers (Cheng and Udry in *J Dev Phys Disabil* 17(2):155–172, 2005; Mandell et al. in *J School Health* 78(7):382–388, 2008). Additional barriers exist including stigma and misperceptions around disability and sexuality and the assumption that the developmental status of the student will prevent sex education comprehension (Sinclair et al. in *Educ Train Autism Dev Disabil* 50(1):3–16, 2015). Qualitative studies of adult providers (Linton et al. in *Sex Disabil* 34(2):145–156, 2016; Murphy et al. in *J Genet Couns* 25(3):552, 2016), parents (Kok and Akyuz in *Sex Disabil* 33(2):157–174, 2015), and adolescents with ID (Löfgren-Mårtenson in *Sex Disabil* 30(2):209–225, 2012) have found overwhelming support for tailored sexual risk reduction interventions (Swango-Wilson in *Sex Disabil* 27(4):223, 2009). Developing evidence-based, inclusive curricula to prevent sexual coercion as well as promote sexual health self-determination for this vulnerable population is long overdue (McDaniels and Fleming in *Sex Disabil* 34(2):215, 2016). This study demonstrates the use of Universal Design for Learning (UDL), an educational framework, guidelines, and checklist tools (Eagleton, *Universal Design for Learning (UDL)*, Salem Press, Ipswich, 2015; Center for Applied Special Technology, *UDL curriculum self-check 2011* (updated 2011), 2011. <http://udlselfcheck.cast.org/resources.php>) to increase accessibility in HIP-Teens, an evidence-based sexual risk reduction intervention (Morrison-Beedy et al. in *J*

Assoc Nurses AIDS Care 13(1):21–27, 2002; Res Nurs Health 28(1):3–15, 2005; AIDS Behav 10(5):541, 2006; J Assoc Nurses AIDS Care 21(2):153–161, 2010; West J Nurs Res 33(5):690–711, 2011; J Adolesc Health 52(3):314–321, 2013; J Assoc Nurses AIDS Care 28(6):877–887, 2017). As a result, supplemental curriculum components were developed with UDL-guided technology use recommendations. A UDL-integrated evidence-based sexual risk reduction intervention could increase accessibility and, with additional research, could help inform inclusive policy.

**Keywords** Sex education · Intellectual disability · Universal design for learning · Adolescents · Sexuality · Sexual health · Accessibility · United States

## Introduction

Over the past century, the classroom and community have become more inclusive for adolescents and adults with disabilities (both physical and intellectual) since the passage of the Individuals with Disabilities Education and Americans with Disabilities Acts. These landmark pieces of legislation sought to create a culture and society where individuals with disabilities had expanded access and opportunities to pursue their dreams and a better quality of life. Despite progress made in policy, individuals with disabilities still suffer disproportionately from negative health outcomes and stigma [1]. Individuals with intellectual disabilities (ID) have significantly different health and social needs compared to their physically disabled counterparts due to developmental differences impacting behavior, communication, and independence [2].

Adolescents with ID represent an underrecognized at-risk population for multiple negative health outcomes. Much like their non-disabled peers, promoting healthy behaviors during this period of adolescence has the potential to improve quality of life later on in life and reduce the common morbidities of adolescence [3]. Many studies have analyzed disparities in obesity [4, 5], mental health [6], health care access [7] but many other topics need further exploration, research, and evidence-based practices including sexual health in this population [8].

The U.S. has made significant strides in reducing unplanned pregnancy among teens in the past decade. However, there are still some populations that are affected disproportionately by unplanned pregnancy, including adolescent minorities and special needs groups [9]. Access to sexual health education is limited for many youth with ID; students with moderate to profound ID were significantly less likely to receive sex education [10]. Adolescents with ID experience higher rates of sexual coercion [11] and sexual abuse and assault [12] than their non-disabled peers. Youth with intellectual disabilities are at a higher risk for contracting sexually transmitted infections compared to their non-disabled peers [13, 14]. A number of other barriers exist for adolescents with ID including stigma and misperceptions around disability and sexuality and the assumption that the developmental status of the student will prevent students from learning valuable skills and concepts related to sexual health education [15]. The overwhelming majority of qualitative studies of adult providers for adolescents with ID [16, 17], parents of adolescents with ID [18], and adolescents with ID [19] have found support from various stakeholders for population-specific sexual risk reduction interventions [20]. Developing evidence-based, inclusive curriculum to prevent sexual coercion [21] as well as promote sexual health self-determination for this vulnerable population is long overdue [8, 22]. Currently, the only comprehensive sex education curriculum for special education classrooms identified

is Family Life and Sexual Health (FLASH). FLASH is being tested in a longitudinal, randomized, behavioral evaluation in King County, Washington by a national evaluation firm and the U.S. Department of Health and Human Services [23]. Preliminary results of the evaluation have not been released yet.

## Addressing Accessibility with Universal Design for Learning

Universal design for learning (UDL) is a cognitive framework that focuses on removing barriers within learning environments by modifying curriculum, concepts, materials, and environments for all learners and abilities through the use of technology and creative options [24, 25]. This framework has roots in architecture and neuroscience and its use is encouraged by multiple national disability policy initiatives like the IDEA act [24, 25]. UDL focuses on the integration of curriculum for the learner rather than forcing the learner to adapt to the curriculum. This type of curricula considers different learning abilities, skills, needs, and the technological modifications that can meet all learning styles and needs. The UDL framework consists of three learning principles developed from neuroscience research: the recognition network of learning, the strategic network of learning, and the affective network of learning [24, 25]. Each network represents different aspects of learning; “what” (“what is it?”), “how” (“how do I do it?”), and “why” (“why should I do it?”) respectively [24, 25]. The Recognition Networks in the brain are responsible for how information is analyzed by our senses, therefore, providing multiple means of representation is important to help learners with different abilities [24, 25]. Strategic Networks control how the brain plans and performs different tasks, organizes ideas, expresses concepts, and devises solutions and strategies. To address different forms of comprehension demonstration, the UDL framework requires modifications for multiple methods of expression [24, 25]. Learners have multiple motivations and interests to fuel engagement; the UDL framework provides different ways to engage different learners in the Affected Networks of the brain [24, 25]. The UDL curriculum is comprised of four components, goals, methods, materials, and objectives, informed by the three principles [24, 25]. These components work together to foster the development of expert learners to become: (a) strategic, skillful, and goal-oriented; (b) knowledgeable, and (c) purposeful and motivated to learn more [24, 25]. The American Association on Intellectual and Developmental Disabilities (AAIDD) has recognized the need for further research on the efficacy and use of UDL as a framework for more inclusive and accessible curriculum modifications in K-12 education [26]. The National Center on Universal Design for Learning (NCUDL) has developed comprehensive guidelines and tools for UDL curriculum development and integration as well as an online curriculum checklist to ensure that each component of the cognitive networks and UDL curriculum is addressed [27]. This project used these guidelines and checklist tools to integrate the UDL framework into the *HIPTeens* intervention curriculum and facilitator manual by developing supplemental UDL curriculum components. This article illustrates the process as an example for other evidence-based intervention seeking to make their curriculum and practice more inclusive and accessible.

## Methods

The first stage of this project was conducting a curriculum assessment of *HIPTeens* using the UDL Curriculum Self-Check online web application [27]. *HIPTeens* was identified as the evidence-based intervention for UDL integration because it is brief, has different

activities that could be modified for different learning styles, and each session focuses on skill-building, role playing, and risk assessment which can be applicable to the ID adolescent population [28–37]. This evidence-based intervention was recognized by the Department of Health and Human Services Office of Adolescent Health for its multiple positive behavioral outcomes in reducing teen pregnancy [38] as well as the Centers for Disease Control for its behavioral outcomes impacting the HIV prevention [39]. The *HIPTeens* curriculum consists of four 90-min sessions and two 120-min booster sessions with visual presentations of various sexual health, communication, and risk behavior reduction information, condom demonstrations, kinesthetic activities related to risk behavior assessment (general and self), communication and partner negotiation role playing, and written activities using a custom workbook [28–37]. This assessment provided checkpoints for each UDL principle and curriculum component to inventory what the curriculum offers students of different learning styles as well as what approaches could be expanded to meet the needs of adolescents with ID. The Self-Check online application [27] allows users to add “lessons” to assess the goals, methods, materials, and assessments integrated with nine UDL principle checkpoints with expanded information available online (see Table 1).

Once the *HIPTeens* curriculum assessment was completed (components inventory and needs identified), the researcher used the UDL Curriculum Adaptation Guidelines Overview to help guide the development of supplemental curriculum materials and methods to provide learning options for all learners [24]. The Center for Applied Special Technology or CAST (who founded and manages the NCUDL) provides research-based online tools for educators and other teaching professionals to develop and share UDL lessons and tools as well as learn about new practices and technology in UDL. For example, the UDL Exchange allows educators to build UDL lessons using guided prompts that address each UDL curriculum component and principle [40]. Once the goals or learning objectives for each session were determined, the researcher then identified the methods, materials, and approaches needed to facilitate learning and uptake.

## Results

### Established Components

Assessing the current *HIPTeens* curriculum and materials using the UDL Curriculum Self-Check provided by [27] helped identify established UDL components. One of the promising and insightful results of the curriculum self-check was the significant amount of established UDL components embedded into the *HIPTeens* curriculum. This discovery could help support the various positive behavioral outcomes of the original randomized controlled trial that tested the efficacy of *HIPTeens* [29, 31, 37]. *HIPTeens* curriculum and activities included many concepts and components from each UDL Principle (See Table 2), most notable in means of action and expression (See Table 3) as well as Means of Engagement (See Table 4) [24]. *HIPTeens* intervention activities provide various ways for learners to interact with the learning environment and express the knowledge they have acquired in the session. Activities included opportunities for physical movement by using role-playing and physical interaction with curriculum materials [25]. There are various modes for expression and communication, including written composition, multimedia interaction, and verbal discussion and experience sharing [25]. Throughout each session, activities provide scaffolding to help participants set goals for healthy behavior change and assess various

**Table 1** UDL guidelines [25]

<i>1. Provide multiple means of representation</i>		
1. Provide options for perception	2. Provide options for language, mathematical expressions, and symbols	3. Provide options for comprehension
Offer ways of customizing the display of information Offer alternatives for auditory information Offer alternatives for visual information	Clarify vocabulary and symbols Clarify syntax and structure Support decoding of text, and mathematical notation, and symbols Promote understanding across language Illustrate through multiple media	Activate or supplement background knowledge Highlight patterns, critical features, big ideas, and relationships Guide information processing, visualization, and manipulation Maximize transfer and generalization
<i>2. Provide multiple means for action and expression</i>		
4. Provide options for physical action	5. Provide options for expression and communication	6. Provide options for executive functions
Vary the methods for response and navigation Optimize access to tools and assistive technologies	Use multiple media for communication Build fluencies with graduated levels of support for practice and performance	Guide appropriate goal setting Support planning and strategy development Facilitate managing information and resources Enhance capacity for monitoring progress
<i>3. Provide multiple means for engagement</i>		
7. Provide options for recruiting interest	8. Provide options for sustaining effort and persistence	9. Provide options for self-regulation
Optimize individual choice and autonomy Optimize relevance, value, and authenticity Minimize threats and distractions	Heighten salience of goals and objectives Vary demands and resources to optimize challenge Foster collaboration and community Increase mastery-oriented feedback	Promote expectations and beliefs that optimize motivation Facilitate personal coping skills and strategies Develop self-assessment and reflection

**Table 2** Established *HIPTeens* means of representation [24, 25]*1. Provide multiple means of representation*

## Provide options for perception

Checkpoints	<i>HIPTeens</i> components
1. Offer ways of customizing the display of information	PowerPoint slides included visual content (text, graphics, etc.) that varied throughout the sessions Differing colors were used for emphasis on important information or concepts Slides and video allowed for timing and speed variations as well
2. Offer alternatives for auditory information	Symbols and iconography were embedded into slides to convey emphasis
3. Offer alternatives for visual information	Videos and graphics include descriptions Some activities provide touch equivalents (condom demonstration) and physical objects to convey perspective

## Provide options for language, mathematical expression and symbols

1. Clarify vocabulary and symbols	Additional explanations are provided for vocabulary used in each activity Facilitators work with group members to establish jargon commonality with unfamiliar references to sex, relationships, anatomy, etc
2. Clarify syntax and structure	Relationships between elements are made explicit through visual cues, colors, and discussion
3. Support decoding of text, and mathematical notation, and symbols	Flexibility in multiple representations of different concepts are provided throughout the curriculum (e.g. symbols vs. text)
4. Promote understanding across language	Videos and pictures are embedded into the curriculum for non-linguistic support for vocabulary clarification
5. Illustrate through multiple media	Key concepts are presented in one form of symbolic representation (narrative text) with an alternative visual form (e.g. video, photo, or role-play) Some curriculum elements included explicit links between text information and visual representation

## Provide options for comprehension

1. Activate or supply background knowledge	Activities utilize personal experience to activate participant background knowledge Facilitators pre-teach critical concept through demonstration and modeling Concepts are bridged throughout the sessions using analogies
2. Highlight patterns, critical features, big ideas, and relationships	Key elements and concept are highlighted using graphics and diagrams Some activities include examples and non-examples to emphasize critical features Activities build on previously learned skill to solve unfamiliar problems (e.g. trigger behaviors, partner communications, etc.)

**Table 2** (continued)

## Provide options for comprehension

3. Guide information processing, visualization, and manipulation	<p>Explicit prompts are given in each step of sequential activities and transitions</p> <p>Some activities include interactive models that guide exploration</p> <p>Graduated scaffolding is used to help move participants through information process strategies (i.e. goal setting)</p> <p>Information and concepts are “chunked” into smaller elements (i.e. condom use)</p> <p>Sequential highlighting is used to guide participants through lots of information</p>
4. Maximize transfer and generalization	<p>The participant workbook can be used as an information and graphic organizer and has space for note-taking</p> <p>Each session provides opportunities for practice and review</p> <p>Each session provides scaffolds that link new information and concepts to prior information in previous sessions and life experiences</p> <p>All activities include generalized learning and relate to participant lives</p> <p>Each session provides opportunities to revisit key ideas (e.g. values) and linkages between ideas (e.g. goal setting and trigger behaviors)</p>

challenges and smaller, sequential steps in reaching short and long term goals [25]. Facilitators and associated activity materials provide models for goal setting and task completion to help participants achieve success [25]. The *HIPTeens* curriculum also provides embedded prompts for facilitators to elicit feedback from participants about their progress, questions about concepts or information, and difficulties related to personal behavior change [25]. Because *HIPTeens* is a theoretically-driven intervention based on the information-motivation-behavioral-skills model of HIV prevention [41, 42], there are various means of engagement established throughout the curriculum to increase and sustain motivation [25]. The curriculum is participant-centered, drawing on participant experience, attitudes, and motivations to sustain engagement throughout the sessions and boosters. Autonomy and choice are featured in multiple activities that focus on individual goal-setting, behavioral assessment, and levels of motivation to change [25]. *HIPTeens* was developed using target audience input [28], therefore, culturally and linguistically relevant information and language are used throughout the curriculum [25]. However, as additional audiences are considered for implementation, further research will be needed to ensure audience cultural, linguistic, and social relevance. Incorporating these components for adolescents with ID could be done using a similar formative approach employed by the developer of *HIPTeens* [28].

## Integration Results

A couple of curricular gaps were found during the UDL assessment including a lack of graphic and visual information, visual and informational aids for students with sensory

**Table 3** Established *HIPTeens* means for action and expression [25]*I. Provide multiple means for action and expression*

## Provide options for physical action

Checkpoints	<i>HIPTeens</i> components
1. Vary the methods for response and navigation	Activities provide alternatives to responding or indicating selections (i.e. using stickers, writing, lining cards up, etc.)
2. Optimize access to tools and assistive technologies	* <i>HIPTeens</i> lacked means for using assistive technology and tools

## Provide options for expression and communication

1. Use multiple media for communication	Activities provided multiple opportunities to compose in multiple media (i.e. text, speech, movement, etc.) Some activities provided opportunities for physical manipulatives (i.e. condom demonstration) Problem solving activities allowed participants flexibility in strategies
2. Use multiple tools for construction and composition	The participant workbook can be used as a tool to outline or map out concepts
3. Build fluencies with graduated levels of support for practice and performance	Some activities provide differentiated models that help students explore various strategies that end in similar outcomes (e.g. using condoms or engaging in safer sex behaviors both result in risk reduction) Each session includes scaffold activities that increase self-efficacy and can be performed with increasing independence Facilitators provide individual feedback on progress and responses as well as examples of unique solutions to real world problems (i.e. individual feedback for participant healthy choices menu based on participant lived experience or situation)

## Provide options for executive functions

1. Guide appropriate goal setting	Activities sequentially scaffold and use prompts to estimate effort and difficulty Facilitators provide examples in activities to demonstrate the process and the product (i.e. steps of assertive statements) Participant workbooks include guides to help participants with goal-setting (i.e. healthy choices menu, trigger behaviors)
2. Support planning and strategy development	Curriculum guide includes prompts for facilitators to “stop and think” about concepts and information as well as opportunities for participants to showcase their work or progress (i.e. healthy choice menu, value stack, etc.) Participant workbook and curriculum help participants break down long-term goals through “Good Goal” activity and review



**Table 3** (continued)

## Provide options for executive functions

3. Facilitate managing information and resources	Participant workbook provides space for participants to collect data in templates and graphic organizers Curriculum includes prompts for students to categorize topics and information (e.g. HIV facts, condom disadvantages and advantages, etc.)
4. Enhance capacity for monitoring progress	Throughout each activity and session, facilitators consistently ask questions to prompt self-reflection and behavior monitoring As participants go through each session, facilitators remind them of their individual progress with specific examples Some activities include differentiated models of self-assessment strategies, including role-playing, video reviews, and group member feedback (e.g. assertive statement review and practice)

difficulties, and limited options for information organization, retention, and comprehension. To address the UDL gap areas identified in the curriculum assessment, a supplemental package of educational materials was created for the *HIPTeens* curriculum. These supplements were developed using UDL-guided principles addressing various types of learners and barriers to comprehension. *HIPTeens* uses PowerPoint slide sets to display information, concepts, and prompt discussion in the facilitated groups. Additional graphics, icons, visual organizers, and multimedia were added to the slides to help facilitate comprehension for those needing alternative visual and informational organization options and preferences to address the gaps found in Multiple Means of Representation [25]. For example, videos explaining complex concepts like HIV transmission and consent were provided as options for students needing visual cues and multimedia to enhance comprehension. Handouts with templates and graphic and information organizers were created for activities in each session and booster session were created to help students who may need additional support organizing and retaining important information from each activity and concept. These organizers are available online and in print for participants. Displays and PowerPoint slides for group goals were created to provide options for executive function, outline group expectations, and manage group and individual progress. Custom videos were included in *HIPTeens* using young adults who act out different, real world risk scenarios for participants to evaluate and apply concepts like assertive statements, negotiating safer sex practices and condom use, and identifying trigger behaviors that lead to negative sexual-decision making and outcomes. However, these videos did not include captions for students with auditory impairments, therefore, captions were added using Adobe Premiere Pro. Online activities that mirrored the group activities were a critical component of providing additional alignment with all three UDL Principles. After searching for a comprehensive online learning management platform that could host multiple, custom activities, it became apparent that developing an online learning platform that could provide additional support for basic vocabulary and glossary terms with definitions for unfamiliar terms throughout each session as well as alternative text for visual objects, screen reader, automatic voicing and speech-to-text capabilities, and opportunities to clarify vocabulary and symbols would be needed [25]. Assistive technology and tools, online construction and composition tools and media, and alternative tools for information gathering are also innovative integrations

**Table 4** Established HIPTeens means of engagement [25]*I. Provide multiple means of engagement*

Provide options for recruiting interest

Checkpoints	HIPTeens components
1. Optimize individual choice and autonomy	Participants are given choices in the level of perceived challenge in the activity and the context and content used in practicing and assessing skills
2. Optimize relevance, value, and authenticity	Activities include personalized and contextualized information relevant to individual participants and their lives HIPTeens was developed with input from group members (urban adolescent girls) to include information that is culturally and socially relevant and responsive
3. Minimize threats and distractions	Facilitators outline group goals and guidelines at the beginning of Session 1 that include the elements to create an accepting and supportive classroom Transitions into each activity provide alerts and previews into the next activity Each session is similar in length and format to create a routine for participants needing structure

Provide options for sustaining effort and persistence

1. Heighten salience of goals and objectives	Goals are constantly reviewed throughout sessions with verbal and visual prompts Participants are explicitly encouraged and taught to break down goals into shorter objectives (e.g. good goals include steps) Facilitators provide prompts and scaffolds in some activities to help participants visual the desired outcome (e.g. healthy behavior goals) for their unique life situation as well as what their ideal future looks like
2. Vary demands and resources to optimize challenge	Some activities include varying degrees of difficulty (i.e. discussion topics and concepts) Because this intervention is based on individual behavior change, varied degrees of freedom for acceptable performance are inherent Verbal prompts are embedded throughout the sessions to emphasize participant progress, improvement, and effort
3. Foster collaboration and community	The group setting format and activities encourage support opportunities for peer group participants Group guidelines and activity instruction clearly outline expectations for group work and sessions

**Table 4** (continued)

## Provide options for sustaining effort and persistence

4. Increase mastery-oriented feedback	<p>Facilitators provide feedback that encourages perseverance, promotes self-efficacy and self-awareness (e.g. condom use and assertive statements), and encourages the use of specific supports and strategies in the face of challenges (e.g. trigger behaviors)</p> <p>Facilitators provide feedback that focuses on effort, improvement, and achieving a standard</p> <p>In each activity and session, prompts are given to provide feedback to participants</p> <p>Facilitators give individual feedback based on unique progress and achievement but does not encourage comparisons or competitiveness</p> <p>Facilitators provide feedback that models how to incorporate evaluation (e.g. self-assessment in risk behavior and triggers) and positive strategies for future success (e.g. healthy choices as goals)</p>
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## Provide options for self-regulation

1. Promote expectations and beliefs that optimize motivation	<p>Activities promote self-reflection and identification of personal goals</p> <p>Facilitator training includes finding and using spaces that reduce distractions</p>
2. Facilitate personal coping skills and strategies	<p>Facilitators are trained in the technique of motivational interviewing which provides scaffolding and feedback for managing frustration, seeking external emotional support, developing internal controls and coping skills, handling subject specific phobias, and using the participant's or other real life situations or simulations to demonstrate coping skills</p>
3. Develop self-assessment and reflection	<p>Participant workbooks allow for participant self-reflection on risk behaviors and change progress</p>

for potential use in an online environment and recommended for future development and implementation. The following table illustrates the UDL guidelines and how the deliverable package addressed each guideline (See Table 5).

## Lessons Learned

The singular task of applying UDL to a developed evidence-based curriculum for people living with intellectual disabilities was no small feat. Understanding the needs of those with intellectual disabilities requires the collaboration and expertise of professionals in the special education, psychology, instructional design, and technology fields. To further complicate this endeavor, meeting the broad needs of those with diverse array of intellectual disabilities is difficult (e.g. autism, Downs Syndrome). The need for interdisciplinary collaboration from aforementioned fields is crucial for further intervention tailoring, pilot-testing, and eventual, wider dissemination. This doctoral project provided the foundational work for future collaborative work, intervention testing, and community implementation and dissemination. Fortunately, there has been momentum for tailored sex education

**Table 5** *HIPTeens* educational supplements using UDL guidelines [24]*I. Provide multiple means of representation*

## Provide options for perception

Checkpoints	<i>HIPTeens</i> additions
1. Offer ways of customizing the display of information	Graphics and visual organizers were added for visual information in slides and handouts
2. Offer alternatives for auditory information	Videos were identified for complex concept comprehension (e.g. HIV transmission) that included text for those with auditory challenges
3. Offer alternatives for visual information	Captions were added to <i>HIPTeens</i> videos

## Provide options for language, mathematical expressions, and symbols

Checkpoints	<i>HIPTeens</i> additions
1. Clarify vocabulary and symbols	Spanish and other language translations have been considered for future adaptations but cultural context and information need to be considered in adaptation
2. Clarify syntax and structure	
3. Support decoding of text, and mathematical notation, and symbols	Icons were added as visual links to text and used consistently throughout slides and handouts
4. Promote understanding across language	Video illustrations of consent and HIV information were added as optional multimedia
5. Illustrate through multiple media	

## Provide options for comprehension

Checkpoints	<i>HIPTeens</i> additions
1. Activate or supply background knowledge	Additional handouts highlight patterns (ex. assertive statement steps), critical features (ex. bodily fluids that can and cannot transmit HIV), big ideas (ex. consent), and relationships (ex. condom disadvantages vs. advantages)
2. Highlight patterns, critical features, big ideas, and relationships	
3. Guide information processing, visualization, and manipulation	
4. Maximize transfer and generalization	

*II. Provide multiple means for action and expression*

## Provide options for physical action

Checkpoints	<i>HIPTeens</i> additions
1. Vary the methods for response and navigation	Digital and print versions of the participant workbook and handouts are available for student preference (hand writing vs. typing)
2. Optimize access to tools and assistive technologies	

## Provide options for expression and communication

Checkpoints	<i>HIPTeens</i> additions
1. Use multiple media for communication	Supplemental handouts and digital workbook are compatible with screen readers
2. Use multiple tools for construction and composition	Supplemental handouts use sentence starters and fill-in the blanks to help with information reinforcement
3. Build fluencies with graduated levels of support for practice and performance	

**Table 5** (continued)

Provide options for executive functions	
Checkpoints	<i>HIPTeens</i> additions
<ol style="list-style-type: none"> <li>1. Guide appropriate goal setting</li> <li>2. Support planning and strategy development</li> <li>3. Facilitate managing information and resources</li> <li>4. Enhance capacity for monitoring progress</li> </ol>	<p>Goals for each activity have been added to slides for visibility</p> <p>Group goals and guidelines have been developed into a poster to be posted in an obvious place throughout sessions</p> <p>Supplemental handouts also serve as information organizers and templates for data collection as well as places for group members to record notes and reflections</p>
<i>III. Provide multiple means for engagement</i>	
Provide options for recruiting interest	
Checkpoints	<i>HIPTeens</i> additions
<ol style="list-style-type: none"> <li>1. Optimize individual choice and autonomy</li> <li>2. Optimize relevance, value, and authenticity</li> <li>3. Minimize threats and distractions</li> </ol>	<p>Supplemental handouts offer students different ways to interact with the information and activities</p> <p>Supplemental handouts include areas for self-reflection and personal response in different activities</p>
Provide options for sustaining effort and persistence	
Checkpoints	<i>HIPTeens</i> additions
<ol style="list-style-type: none"> <li>1. Heighten salience of goals and objectives</li> <li>2. Vary demands and resources to optimize challenge</li> <li>3. Foster collaboration and community</li> <li>4. Increase mastery-oriented feedback</li> </ol>	<p>Group and activity goals are shown in slides as well as a printed poster</p> <p>Supplemental handouts provide different degrees of difficulty for group members</p>
Provide options for self-regulation	
Checkpoints	<i>HIPTeens</i> additions
<ol style="list-style-type: none"> <li>1. Promote expectations and beliefs that optimize motivation</li> <li>2. Facilitate personal coping skills and strategies</li> <li>3. Develop self-assessment and reflection</li> </ol>	<p>There are integrated means of helping student regulate behavior and encourage self-assessment and reflection included in the <i>HIPTeens</i> curriculum currently</p>

curricula for people (adults and adolescents) with intellectual disabilities, making collaboration and interdisciplinary work more likely [8, 43, 44].

## Future Recommendations and Discussion

Because UDL is widely used in the education field and promotes the use of technology [25], there are easy-to-use, comprehensive online tools for educators to use for self-checking curriculum [27], developing curriculum, and sharing UDL-guided curriculum with others [40]. To assess the *HIPTeens* curriculum, the CAST UDL Curriculum Self-Check online tool was used and provided guided questions to assess if the curriculum included specific UDL curriculum components, examples of curriculum elements, and space for note-taking [27]. This tool was extremely useful for those with limited

background and knowledge of UDL. Using this online tool, a complete assessment of the *HIPTeens* curriculum was generated, identifying established components and elements, gap areas, explore examples when needed, and take detailed notes for curriculum development and considerations. Wider marketing of these tools to professionals outside of the education field should be considered, specifically to those developing and disseminating evidence-based interventions with educational components.

The assessment of *HIPTeens* using UDL principles and guidelines also helped generate ideas for future technology use in the intervention as well as pilot-testing. Using the limited scope of design skills and resources, the development of supplemental educational components for *HIPTeens* provides a first step in wider development of technology and web-based educational activities and assistive tools for participants needing various learning alternatives and sensory support. As the curriculum was assessed, it became clear that a comprehensive online component was needed to address those needing additional information context (ex. Glossary of terms, multimedia examples), text to speech or screen readers, additional practice and repetition opportunities, and a space to learn about safely exploring the internet and social media and how to determine the informational credibility of websites. Development of this online learning platform would require activity customization to safeguard *HIPTeens* intervention fidelity as well as integration of the Web Content Accessibility Guidelines (WCAG) in web application development and maintenance [45].

The next step toward practical application of this project would be planning for a pilot study to test the *HIPTeens* curriculum, supplemental materials, and gather feedback from participants and facilitators about implementation and learning barriers for further intervention tailoring. This would include identification of potential sites with access to adolescents with ID. The scope and need of this intervention and population require an interdisciplinary approach, meaning that the content area experts and stakeholders are necessary for further deficit identification due to their unique experiences and knowledge. Interest in this curriculum and its supplements has increased as awareness of the needs of those with ID and spotlight on sexual assault among vulnerable populations has increased [43, 44]. Local and state sites in public schools and transition education programs at vocational and college campuses have been identified as potential pilot studies and should be further explored for partnerships. With pilot testing, the development of an online learning platform is recommended for testing and refinement based on feedback from the focus population, stakeholders, and content area experts. In addition, basic background information regarding reproductive organs, biologic processes, and sexual health and hygiene are recommended as topics to be appended to the current curriculum. Adolescents and young people with ID are less likely to receive any sex education than their non-disabled peers [10] and therefore may lack basic knowledge of reproductive processes and anatomy [8]. This knowledge is critical to scaffolding learning activities focused on sexual risk, behaviors, and ultimately supporting healthy behavior change and choices.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have not conflict of interest and authors Morrison-Beedy, Kirby and Hess were member of Grove's doctoral dissertation committee.

**Ethical approval** This article does not contain any studies with human participants or animals performed by any of the authors.

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