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Cogenerative Dialogue: Developing Biology Learning Accommodations for Students with Disabilities

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Abstract

A prominent challenge, at times under-addressed in the science education literature, is considering what types of learning accommodations science teachers should employ for students with disabilities. Outside of science education, researchers have consistently outlined how Universal Design for Learning (UDL) is one efficient means by which to engage students with disabilities in the curriculum. This paper presents the results of a research study in which teachers employed cogenerative dialogue as a learning space where UDL was used to differentiate and individualize instruction in an inclusive biology class. The data originated from a larger, ongoing, longitudinal ethnography of science learning in several New York City special education classrooms. This ethnographic work presents a case study where teachers and a student used cognerative dialogue to develop learning accommodations which conformed to the principles of UDL. This research demonstrates how cgnerative dialogue can provide biology teachers and special education co-teachers with an opportunity to collaborate with students to create learning accommodations that connect to the broader biology curriculum.

Keywords

cogenerative dialogue, coordinated practices, learning accommodations, special education, universal design for learning

1. Cogenerative Dialogue: Developing Biology Learning Accommodations for Students with Disabilities

A prominent challenge in the field of science education is that larger numbers of students with disabilities are learning science in inclusive science classrooms. Cantu (2015) and Weiss and Lloyd (2003) outline how more special education students are instructed in inclusive science classrooms, yet the science education research community has not altogether come to a consensus on how to address this phenomenon. This is not to assert that the field has overlooked the concerns of inclusive science classrooms. In fact, as a field, science education has seriously considered which teaching approaches are better suited for inclusive classrooms. Until now, however, too little empirical work has been done to gauge satisfactorily what type of learning accommodation provides adequate support for students

with disabilities in science classes. While Mastropieri and Scruggs (1988, 1994, 2001, 2007, 2013) have done extensive research on the inclusive science classroom, they have not examined how learning accommodations are created. Building on Mastropieri and Scruggs, this research seeks to advance the work done in inclusive science classrooms and specifically examines how learning accommodations are developed. Chiefly, this research investigates the nature of science learning accommodations and their role in helping students with disabilities learn biology.

1.1 The Research Begins with Two Basic Questions

Research Question 1: Can cogenerative dialogue assist in creating a science learning accommodation which aligns with Universal Design for Learning (UDL)?

Research Question 2: Can new learning accommodations developed in cogenerative dialogue be used in the science classroom?

1.1.1 Employing Cogenerative Dialogue in Inclusive Settings

"I was never any good in science. Never! And this class gave me a chance to try it one more time. I mean, I have always been in science class but I have not been learning anything. At least in this class, we tried to use science as a way to talk about our daily lives (Christine shrugging), it's a start" (Christine, 2015, interview).

Christine (pseudonym) was a student who had to repeat the required biology course. As a case study, Christine's experiences here detail a semester of ethnographic work examining how cogenerative dialogue assists teachers and students in developing and negotiating the implementation of science learning accommodations. This research closely examined how cogenerative dialogue provided Christine with the opportunity to customize her learning. Christine's Individualized Education Plan (IEP) did not account for her vast strengths or her difficulties with science. Although not always explicated, it was the role of Christine's biology teacher and co-teacher to find these strengths and use them to engage her in classroom learning.

Science teachers and special education co-teachers often hear statements similar to Christine's declaration that she is not good at science. One does not have to be a biology teacher for very long to understand that students with disabilities often struggle in high school science classes. Research detailing science achievement reports that students with disabilities perform poorly compared to their non-disabled peers (Anderman, 1998; DeBacker & Nelson, 2000; Steel, 2007). Many interventions have been proposed to close this achievement gap (Mastropieri & Scruggs, 2001; Roth & Barton, 2004), yet underachievement remains a prominent concern.

In no small way are the goals of cogenerative dialogue and UDL akin to each other. For example, UDL is an approach to instruction that fosters more involvement from special education students (Burgstahler, 2001). The Individuals with Disabilities Education Act (IDEA) (2004) exhorts special education teachers to employ UDL in order to include students with disabilities more readily into the general curriculum (Rose, 2001; Rose & Dolan, 2000). Cogenerative dialogue is a means by which to employ UDL principles in the biology classroom. Roth (2006) confronts the misconceived idea that

students with disabilities somehow lack science learning skills and argues that standard pedagogical approaches do much to construct "scientific dis/ability". Roth details how students with disabilities are often marginalized in the science classroom and how material and human resources dedicated to including them in the curriculum are insufficient.

1.1.2 Context and Study's Rationale

The current work describes a biology class at Liberty High School Suspension Center (LHSC) chronicling one semester (four months) of ethnographic study. A cogenerative dialogue was held each Tuesday during lunch following science class. Both the science classes and the cogenerative dialogues were 40 minutes long, or the equivalent of one class period.

LHSC is located in the East New York section of Brooklyn and is organized by the Alternative Division of New York City Schools. Suspension centers are small high schools where students attend classes after receiving a suspension for committing a violent offense. Because students' suspensions preclude them from returning to their home school for an entire academic year, they receive their education in a suspension center. Although there are over 40 detention sites, the New York City Department of Education has only four year-long suspension centers. LHSC students range in age from 14 to 19 years old, 85% of whom are male and 15% female. LHSC's roster records the student population as 60% African American, 38% Latino/a, and 2% Asian.

In this research, a special education, or inclusion, co-teacher supported the biology instruction in Christine's classroom. Her tasks included making the curriculum more accessible to students with disabilities. The primary role of a special education science co-teacher is to develop already existing learning accommodations that have been developed for students. Despite the complexity of the students' science learning difficulties, their IEPs did not address any form of intervention for science learning. Skrtic (1995a, 2005) writes that IEPs are often constructed to meet Federal guidelines rather than fulfill the individual learning needs of each student. The students' IEPs examined in this work aligned with Skrtic's conception of the problem in that only a few of the documents addressed specific learning needs.

1.1.3 Christine: A Committed Student with a Learning Disability

Diagnosed with a reading comprehension problem, Christine diligently applied herself in biology, yet struggled with many of the written parts of the class. A student who has a comprehension/reading disability is acutely hampered when required to learn new terms and read more complex course material without the proper mandated assistance. Because of her difficulties, Christine needed to spend additional time outside of class to be prepared for each science lesson. She self-admitted being a struggling science student who was developing new learning approaches in her study of biology.

Christine was determined, yet her resolve frequently did not yield the level of achievement she desired, nor did it meet the level of achievement required. At the start of this research, Christine was repeating the mandatory biology class. A weighty disconnect existed between her efforts and her achievements in biology. That is, Christine closely followed and participated in the lesson each day. She had serious

difficulties completing her homework nearly each evening. However, she still attended and actively engaged with the classroom. But was she learning? It was hard to fully assess that. Too often, our test-centered, word-oriented science teaching approach prevents a direct answer to this critical question. It is imperative for students like Christine that test results from a standards-based biology examination not be the only evidence of science understanding because the results may not account for individual learning trajectories and unique learning needs.

1.1.4 Methods and Research Questions

Science education research has a strong tradition of valuing quantitative measures, yet there is a growing inclination to acknowledge the importance of qualitative methods to provide insight into the multi-logicality of science teaching. This study employed qualitative methods to provide insights into the nature of using learning accommodations that were not so easily assessable with quantitative measurements.

Data were collected from a number of sources during this work. The primary data were gathered from an inclusive biology class that met each day during the semester and from the cogenerative dialogue which occurred after each class. At each stage of the research, data were collected via field notes, interviews, group discussions, and digital videotapes of the cogenerative dialogues and classes. The students, biology content teacher, and special educator viewed the footage in movie, an Apple Computer product that allows micro-analysis of digital video. In particular, the digital video served as an important artifact in that it provided participants a chronological account of the biology classes and its learning practices.

1.1.5 Health Literacy as a Biology Learning Accommodation

As a theoretical and pedagogical consideration, this work considers how using health literacy can be utilized in the inclusive biology classroom. As already established, science learning accommodations conform to IDEA (2004) and UDL principles in that both are geared toward the students' learning and inclusion in the science classroom. In the spirit of IDEA (2004) and UDL, the teaching described in this research utilized health literacy as an approach to biology teaching that helped students make their science instruction relevant. This work studies health literacy and the ways it was used to teach biology. Often, students used a health literacy lens to personalize their connection to the biology curriculum. Swartz (1997) maintains that organizational structures can both shape individual behavior and sustain its reproduction.

Lederman (2002) describes health literacy as important to the lives of students. In contrast with the NYS high school biology curriculum, health literacy employs multiple pathways to address scientific and practical concerns about health. Drawing its roots from the medical profession and adult basic education, health literacy seeks to engage individuals with the practical science involved in healthy living. Osborne (2005) explains how the study of health literacy helps students discern the exercise, nutritional, and medical information with which they are bombarded. Osborne also outlines how health literacy may help students discover which information has the most relevance for their personal health.

Keselman, Kaufman, Kramer and Patel (2007) address how appropriate science knowledge develops pathways to health literacy applications that students can use in their daily lives. They provide compelling data for inclusive science teachers to consider such a teaching lens for students with disabilities.

In line with Lincoln and Guba's (1989) notion of catalytic authenticity, this research used health literacy as a way to help students with disabilities engage with the curriculum. Catalytic authenticity accounts for the ways the participants "changed" as a result of their learning experiences. In this way, health literacy was very effective in precipitating catalytic authenticity in Christine's case study. Catalytic authenticity was exhibited in the students' expanded uses of content material in their classroom discussions. Additionally, catalytic authenticity was manifested in the increased levels of student classroom engagement in content-related activities and more frequent classroom discussion focused on lesson-related science topics.

1.2 Findings

Research Question 1: Can cogenerative dialogue assist in creating a learning accommodation which aligns with UDL?

Now, (laughing) I am not saying this is my favorite class, it is just better than the others. Plus, you know what I liked. You drew me in! You asked some questions about science that got me interested in the conversation. I don't think it will make me a biology genius, but who knows. Let's see where it goes (Christine, 2015, interview).

In the observation above, Christine's open, gregarious personality shone through. Her amiability, intelligence, and humor belied the fact that she was repeating this required biology course. Despite her reading comprehension difficulties, she made important, albeit contained, progress in her biology course.

An updated IEP offered Christine little help because it contained no instructional guidance for her development in science. It was now the responsibility of Christine and her teachers to generate learning strategies given that no assistance was provided in the IEP.

In many ways, Christine serves as an archetype for special education learners. She reflects how students with disabilities often learn science in inclusion classes when no formal accommodations are being provided. O'Donoghue and Chalmers (2000) attest to this trend where inclusive classrooms are widely used as the preferred method by which students with disabilities receive all their education, including science instruction. Specifically writing on science inclusion, Friend (2000) argues that inclusive science classes have become standard practice in many American high schools, creating classrooms which special and general education students attend together. Inclusive science classes are of acute concern because students with disabilities have complex learning needs.

For instance, during the third week of the research, Christine and the special education co-teacher shared a cogenerative dialogue that directly prepared her for new material to be covered in class. Christine and the biology co-teacher conversed about the importance of food webs and food availability

while reviewing her nightly science reading. Using Roth's (2006) conventions for classroom transcriptions, I provide the following conversation because it gives insight into the extent to which Christine desired to succeed. This transcript also highlights how short, relatively uncomplicated learning interventions can help a student reinforce salient aspects of the curriculum.

1.3 Episode 1

(Christine and the special education co-teacher discuss the class reading. C=Christine and T=Biology co-teacher)

1) C: Well, here we are.

2) T: How should we use this time?

3) C: I don't know, you're the teacher.

4) T: Okay, you know our purpose in meeting, right?

5) C: Yes. You check if I did the work.

6) T: Is that the only reason, we meet?

7) C: No. We also talk about how I can do better. And, I do want to do better.

8) T: So, how can you do better?

9) C: By reading- and I have been doing the work each night. Last night I read about food webs. Some of the reading talked about predators and prey. I don't know if I got it.

10) T: What did you learn?

11) C: (opening her book) The reading talks about how everything starts with solar energy and light. This starts everything—then the reading talks about photosynthesis. But not a lot. I got that. I think we covered that in the last chapter

12) T: Good. It looks like you are putting ideas we already covered with new material. That's good.

13) C: Well, I am still not sure I get it.

14) T: Okay, well this is a start. Now we can talk about what you read and what will be covered in class.

When "zooming and focusing" on this interaction, we see that a significant learning opportunity was both constructed and reinforced. Roth (2006) utilizes the approach of zooming and focusing as an analytic tool to recognize patterns in social life. I zoomed in on Christine and the co-teacher's interaction to examine the exchange for patterns of coherence and contradictions. By employing Roth's approach, this episode illuminates how Christine continued to seek a way to succeed in class by preparing herself for each session. Christine's stated desire to perform better seems to cohere with her nightly learning practice of completing her science assignments. In terms of coherent ethnographic patterns, Christine also regularly attended cogenerative dialogues during her lunch. She prepared for these meetings and avidly participated.

In these ways, Christine seemed to use learning agency and as a result she benefited from a learning accommodation. Both she and the co-teacher sought learning opportunities in an effort to integrate the new information on food webs into her current knowledge base. I have coded these patterns of

coherence as student-developed learning accommodations.

The co-teacher initially supported a learning accommodation by providing Christine with the opportunity to articulate what she learned from the reading. Christine's interest in succeeding and her own reading efforts structured the cogenerative dialogue. The dialogue seemed to change from an accountability session to one focused, to a high degree, on the biology content.

1.3.1 Cogenerative Dialogue Affords Collaboration and the Development of Interstitial Culture

As partially seen above, cogenerative dialogue is an informal learning space where a teacher and a student can discuss and reflect upon the important themes in the curriculum. Well established in the science education literature, cogenerative dialogue is described as a reflective and practical discussion that takes place in an effort for members to take collective responsibility for the classroom's results (Tobin, 2005). Cogenerative dialogue, as seen in the episode above, served as a space to both create and discuss possible teaching strategies that align more directly with Christine's learning preferences. The co-teacher appeared to naturally direct the dialogue back to the content.

As noted, cogenerative dialogue creates and fosters collaborative learning spaces. Such collaborative learning spaces are the essence of UDL (Orkwis, 2003). Cogenerative dialogue provides Christine with a social space in which she could articulate her achievement aspirations and learning needs. This is the essence of a learning accommodation (Polloway & Bursuck, 1996). Although Christine was at first reluctant, her participation attests to the effectiveness of cogenerative dialogue as a field for producing new learning culture.

1.4 Episode 2

(This episode is a continuation of the transcript seen in episode 1. C=Christine and T=Biology co-teacher)

1) C: Okay, so what are we covering in class? Is it what I read?

2) T: Yes. The reading from chapter 5 is what we are covering for the next two classes.

3) C: It sounds like I will be ready.

4) T: Yes, and no. You will be familiar with the material. This is good. How much do you remember about food webs?

5) C: I Googled it and I learned more. A food web is like a food chain. But a food web is much larger. It includes more. Like plants, they are a big part of a food web.

6) T: Okay. So you do remember a lot. Good. What else?

7) C: The book talks about producers and consumers. I used the internet on this too. The book is okay but I saw a chart online. On the web it shows that plants are the producers and how the whole food web starts with them. Or, the web starts with sun light- and then the plants.

8) T: Okay. Great. Anything else?

9) C: I thought about where I am in the food web and what I eat. In my neighborhood, I don't see a lot of fruit or vegetables. Not a lot of producers (sighs). I wonder what that means for my health. Christine's engaged interaction may be one form of a successful science learning accommodation

because it develops her interests in the broader applications of the science curriculum.

2. Cogenerative Dialogue Provides Accommodation through the Development of New Learning Culture

Summarizing research question 1, I argued that one aspect of providing science education learning accommodations is development of a link between the student and the content material. These learning links reinforce content knowledge in such a way that fosters learning. Such links, or connecting points, Appiah (2006) refers to as interstitial culture. UDL and the development of interstitial culture align in that both support the student's next step in science learning. This form of culture is interstitial in that it serves as a "middle" culture between present abilities and desired outcomes. This interstitial culture connects Christine's current knowledge with her greater interest in health literacy and wider applications of the biology curriculum. In this way, UDL and interstitial culture provide the fortification and a learning framework to continue Christine's progress.

In fact, Christine's health literacy comments are best understood as the development of interstitial culture in the form of an informal request for engaged content-driven conversation. The conversation in the transcript above, in effect, is an important learning accommodation. Christine's health literacy comments are demonstrations of her burgeoning interest in how science relates to her life. Although her comments are situated as health literacy interests and not formal content area material, the scenario nonetheless displays how such interests may serve to catalyze science learning.

2.1 Research Question 2: Can a New Learning Accommodations Developed in Cogenerative Dialogue be Used in the Classroom?

Research question 2: addressed how cogenerative dialogue affords the social space where Christine appropriates a new learning accommodation strategy. Building on this idea, research question 2 details how this new learning plan unfolds during a class. In this episode, Christine assumes some of the responsibilities of the biology co-teacher as she enacts her new science learning approach. Put plainly, Christine seems to take the ideas learned for reading and the interactions with the co-teacher and brings this learning into the classroom.

2.2 Episode 3

(Below, I provide a transcript of 24 seconds from of the biology class. Participants: C=Christine, G=Gabriel, a student in the class, and T=Biology co-teacher)

1) T: So where can we start our conversation on food, food webs and overpopulation?

2) (3.34 Pause)

3) C: [looking at the co-teacher] I think we should start with food webs.

4) G: With what?

5) C: Food webs. It is like the pecking order in the animal kingdom. Some eat and others don't.

6) G: Really? That's what's up. That's hood.

7) C: I don't really like to think about it that way. I want everyone to eat.

8) G: Not everyone does, you know that is true.

9) C: Well, in a food web, if there are too many species trying to eat the same food source, then it becomes scarce. So, you are right: not everyone eats.

10) T: (1.1 Pause) What do you mean Christine. What becomes scarce?

11) C: (2.2 Pause) Food. Food is tough to find. Like if there are too many things trying to eat the grass. Someone is not going to eat. Look at the chart (pointing to the chart on the board). All those that eat grass will not survive without grass.

The above interaction shows that Christine has gleaned ideas from the cogenerative dialogue and her reading. Appiah's (2006) conception of interstitial culture anchors the following analysis. As outlined earlier, UDL, cogenerative dialogue, and interstitial culture weave together when analyzing how a student navigates this process. Research question 1 outlined how cogenerative dialogue helped Christine develop new learning accommodations.

This new ontology can also be described as interstitial culture because it serves her in the "in-between" ways of being in the classroom. Previously, her classroom engagement reflected that she did not know the biology content well and this was reflected in her classroom behavior. That is, Christine did not readily participate in classes and rarely spoke up about content themes. Now, at least in this instance, Christine participates in the lesson and discusses the content themes which seem to reflect that she is becoming more knowledgeable of biology. Her discourse can be seen as a form of co-teaching because of the content directedness and her pointed statements to clarify ideas in the curriculum. The interstitial culture is an outgrowth of an appropriate learning accommodation and leads to a high degree of classroom participation and biology discourse.

I zoom and focus (Roth, 2006) on this exchange because it highlights how a learning accommodation can lead to ontological change. Christine marshals her biology knowledge by tactfully, yet convincingly, refuting Gabriel's approval of limited resources in a food web. The above transcript attests to the way that a learning accommodation can dramatically reorganize learning opportunities for a student with a disability. Throughout the exchange, Christine articulates ideas from the curriculum that makes her relatively expert compared to her peer, Gabriel. Again, Christine may not have been knowledgeable enough to fully participate in this discussion if a learning accommodation had not supported her reading.

2.3 Tactical Authenticity and the Development of Interstitial Culture

2.3.1 Episode 4

(This transcript of 35 seconds. Participants: C=Christine, G=Gabriel, a student in the class, and T=Biology co-teacher)

1) G: So why is this important to me? Why are you so interested in this?

2) (3.34 Pause)

3) C: [looking at the co-teacher] Well-I think food webs explain a lot.

4) T: Ok. (2.1 Pause) Please go ahead.

5) C: A food webs explains where you get your food. Look at the food in the stores here. There's not a lot of fruits. Fruits and vegetables are producers. Most people are eating only consumers- animals. That can't be too healthy. May be that is why people get so big.

6) G: (1.3 Pause) I don't know about that. Meat is good for you.

7) C: I am not saying meat is bad for you. But it is how much you eat. And where it is from and how it is cooked.

8) T: Okay-sounds like we are going beyond food webs and into health and what foods are good for people (Pause 3.7).

9) C: Well-shouldn't we be. Is not that the whole point of learning about this?

Learning accommodations are both student centered and to some degree, implemented by the co-teacher. The co-teacher merely pauses long enough for Christine to initiate classroom conversation. In other words, the learning accommodation's implementation is afforded simply by allowing the learning space which Christine seizes. In exchanges 04 and 08, the co-teacher's pauses create the space for the enactment of such a learning accommodation. The pauses also allow Christine to more fully engage her energies for engaged learning. Christine seizes the learning space afforded her and she uses it to become more involved. This involvement is seen by her health literacy interests at turns, 05, 07 and 09. Signifying changed learning dispositions, Christine displays that such learning affordances can be described as tactically authentic. Lincoln and Guba (1989) describe tactical authenticity as research act that empowers participants to more fully participate in their environment.

Examining the video, tactical authenticity manifests itself in the self-assured ways that Christine interacts with the biology curriculum. Christine constructs ways to connect with biology and while she was not fluent in much of the biology terminology, her new science ontology is clear. Christine interacts comfortably. This is the essence of both learning accommodations and UDL. In short, UDL is realized when a student with a disability has an equal chance to learn.

2.4 Discussion of Research Questions 1 and 2

Christine is a bright, social, and popular African-American student in New York City who receives her science instruction in an inclusive setting due to a reading impairment. She was introduced to the concepts of cogenerative dialogue at the beginning of the fall term. In time, her increased participation and achievement in biology is concurrent with her introduction to the cogenerative dialogue model. Her participation and test scores appreciably increased and serve as anecdotal, but not insignificant, evidence to the merit of student/teacher generated modifications. Moreover, Christine passes a biology course which proved immensely difficult for her to complete the year prior. She seemed to utilize the structured process of cogenerative dialogue to take responsibility for improving her science learning and meeting her individual academic goals.

This study provides ethnographic accounts into how cogenerative dialogue can serve as a teaching practice to engage students with disabilities in their science classes. Specifically, this research demonstrates how cogenerative dialogue can be employed in special education classes to help develop

learning accommodations. As a method, cogenerative seems to engage students while connecting them to larger themes in the biology curriculum. Cogenerative dialogue is a conversation that classroom stakeholders have about shared learning experiences. However, this research expands the notion of cogenerative dialogue by demonstrating how it follows both the learning principles of IDEA (2004) and UDL.

In this research, I built upon previous work and initiated cogenerative dialogues with students with disabilities. I examined whether the practice helps them to develop new learning accommodations. It was learned that cogenerative dialogue restructures the linear, often teacher-centered, way of providing students with disabilities supports by inviting students to be an active part of the process. By engaging students in cogenerative dialogue, teachers provide spaces for students to create new learning practices and to more fully engage in classroom teaching and learning. This inquiry also shows how cogenerative dialogue can be used as a field to employ learning accommodations. Previously, researchers have examined how cogenerative dialogue engages students and teachers in focused conversations about classroom interactions and how these discussions often yield the development of new learning strategies. This work demonstrates how students with disabilities can redeploy personal learning accommodations as tools to help them learn the biology curriculum.

2.5 Inclusive Science Classrooms: Understudied and Underserved

In science education, too few research articles articulate how learning accommodations are developed. Given that this topic is under explored, it is not all together surprising that students with disabilities perform poorly compared to their non-disabled peers. Lack of research and intervention may indicate how education professional may misunderstand the complexity of educating students with disabilities in the inclusive science classroom. It underscores a widespread concern.

The lack of intervention highlights a systemic problem between the mandated services required in the IEP and everyday classroom experience. Skrtic (2005) writes about the symbolic nature of IEP interventions that serve no educative purpose. He contends that many learning accommodations are only emblematic and too often provide no really coping strategies to address the student's learning difficulty. On students' IEPs in this research, learning accommodations were not included for science. Effectively, at least in terms of science, the IEP served only functionary purposes. Skrtic's contention that learning accommodations are only symbolic highlights the need for substantive change in inclusive science classroom. Skrtic's argument, in effect, repositions an ongoing conversation about the nature of science education for marginalized populations.

Rodriguez (1997), nearly twenty years ago, wrote that a discourse of invisibility informs the National Research Council's science education standards because they do not directly address issues of ethnicity, race, gender, or socio-economic status. There is confluence between Skrtic's and Rodriguez's positions in that both faces up to how current school science teaching can under serve certain populations. The discourse of invisibility applies to students with disabilities who are in inclusion classes with few adequate learning accommodations. Rodriguez's contention is also relevant for students with

disabilities because a disproportionate amount of them perform poorly in science throughout their time in school.

3. Points of Analysis: Connecting UDL and Cogenerative Dialogue

Christine seems to understand the spirit of UDL by discussing appropriate applications to the biology course work. With the help of the co-teacher, she uses UDL principles when seeking to improve her performance and understand how chronic disease could be addressed in her family and community. Christine is a clear-eyed observer of health problems in her world, though unsure as to the reasons or the origins of such troubles. Christine's interest in health helps to structure both her learning accommodations and her high level of content engagement. Christine uses cogenerative dialogue as a forum to respond to the reading and share her health concerns. Stemming from the issues discussed in cogenerative dialogue, Christine and the co-teacher develop new approaches to understand the biology curriculum to engage more readily in the science classroom. These new practices expand instructional opportunities and improve Christine's science understandings of chronic disease and other topics. Christine and the inclusion co-teacher demonstrate how learning equity can be enacted by developing shared responsibility for teaching and learning.

Why did health literacy work as a process by which applicable learning accommodations were fashioned to make the inclusive science classroom more accessible for Christine? One must observe that cogenerative dialogue is not the simple act of talking. Cogenerative dialogue is structured talking where each participant has and takes responsibility. For example, if Christine expresses that health education benefits her success in biology, the inclusion co-teacher and the biology content teacher have a responsibility to understand these ideas and assist her in their implementation if both continue to see the ideas as effective and oriented toward the goal of biology instruction. Learning accommodations are central to an inclusive science classroom, yet the conception of how they are developed usually focuses solely on the teacher. Cogenerative dialogue eschews that concept.

Effectively, cogenerative dialogue understands that the learning accommodation is communication that leads to learning. Cogenerative dialogue is a strength based perspective that places the student's learning first. It is also a principled approach that focuses on the importance of learning science. This perspective is unified with current research on strength based science approaches. For example, Friend (2000) contends that an appropriate learning accommodation builds from the strengths of a student. Roth (2004) argues that science-learning accommodations are often inadequately thought-out and disappointingly implemented. In fact, insufficient learning accommodations are more the rule than the exception (Skrtic, 2005). As a result, this research conceptualized learning accommodations as a form of new learning culture that positions itself as the step between novice and a more skilled learner.

Appiah's (2006) notion of interstitial culture provides a lens to understand how both the co-teacher and the student mutually develop learning accommodations. In this instance, Christine creates interstitial learning culture by her formation of personal connections for the specific purpose of understanding the

biology curriculum. Starting from her health literacy interests, this culture of filling in the learning gaps is an important part of creating science learning accommodations. It provides a link between the student and the content material to foster learning. Building from Appiah's notion, this work refers to as interstitial culture as "middle" learning practices between a student's current skill and the preferred curricular result. Interstitial culture is the essence of all learning accommodations because it is the crucial link between current skill and the intended learning outcomes.

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