



# **NCD-ODEP**

## **National Online Dialogue:** *Encouraging People with Disabilities to Pursue Careers in STEM (Science, Technology, Engineering and Mathematics)*

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**July 28 – August 8, 2014**  
**Participation Metrics**

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## **Introduction:**

The following report outlines the results of the “*Encouraging People with Disabilities to Pursue Careers in STEM (Science, Technology, Engineering and Mathematics)*” national online dialogue. Co-hosted by the [U.S. Department of Labor's Office of Disability Employment Policy](#) (ODEP) and the [National Council on Disability](#) (NCD), this virtual event, the last in a three-part series, was held from Monday, July 28 through Friday, August 8, 2014 and was open for participation to the general public. The dialogue invited participants to contribute to a virtual conversation in an effort to work together to increase support and opportunities in the STEM fields for people with disabilities. The dialogue asked for ideas on to encourage people with disabilities to pursue careers in the STEM fields and to support their success in the workforce. As part of the registration process, registrants were asked to answer a series of questions, including if they were a person with a disability working in a STEM field; if they were an advocate for people with disabilities working in STEM fields and how educators, employers and federal agencies can better support people with disabilities interested in STEM careers.

Ideas posted to the online dialogue were organized into topics, including: Education, Training, Accessible Workplace Settings and Additional Input. In addition to posting ideas to the dialogue, participants were given an opportunity to “vote” on each idea and submit comments. Included in this report are the top posts and associated comments contributed by and voted on by participants. An archive of the complete dialogue is available for viewing at <http://STEMCareersforPWD.ePolicyWorks.org/>.

The information gathered from this dialogue will help NCD and ODEP better understand how best to support the advancement of people with disabilities in the growing STEM fields and ensure that opportunities are open to everyone, including those with disabilities.

### **Participation Summary:**

- Registration began on Thursday, July 24, 2014 at 8:00 am ET
- Dialogue opened on Monday, July 28, 2014 at 8:00 am ET
- 39 total ideas
- 139 comments
- 274 votes
- 193 registrations
- Dialogue closed on Friday, August 8, 2014 at 11:59 pm ET

### **Campaign Summary:**

- Total number of ideas: 39
- Idea breakdown by topic:
  - **Education:** 21 ideas (85 comments and 157 votes)
  - **Training:** 5 ideas (22 comments and 57 votes)
  - **Accessible Workplace Setting:** 12 ideas (32 comments and 60 votes)
  - **Additional Input:** 1 ideas (1 vote)

**Registration Metrics:**

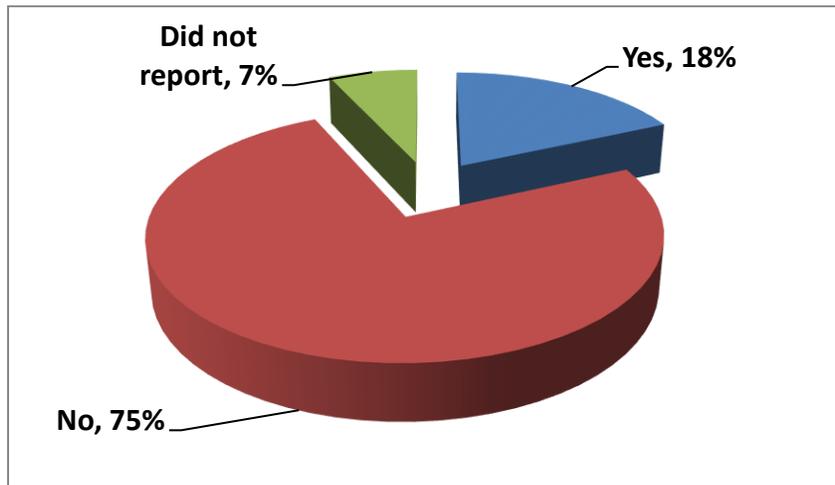
*Total registrants: 193*

*Total number of registrants that completed the registration process: 175*

*Following are breakdown of self-reported affiliations:*

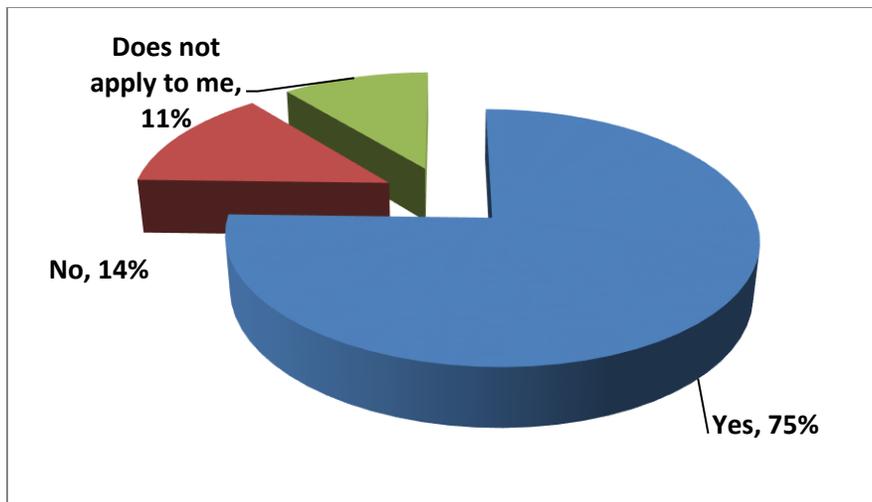
**Are you a person with a disability currently working in a STEM field?**

- Yes: 18%
- No: 75%
- Do not wish to disclose: 7%



**Are you an advocate for people with disabilities to work in STEM?**

- Yes: 75%
- No: 14%
- Does not apply to me: 11%

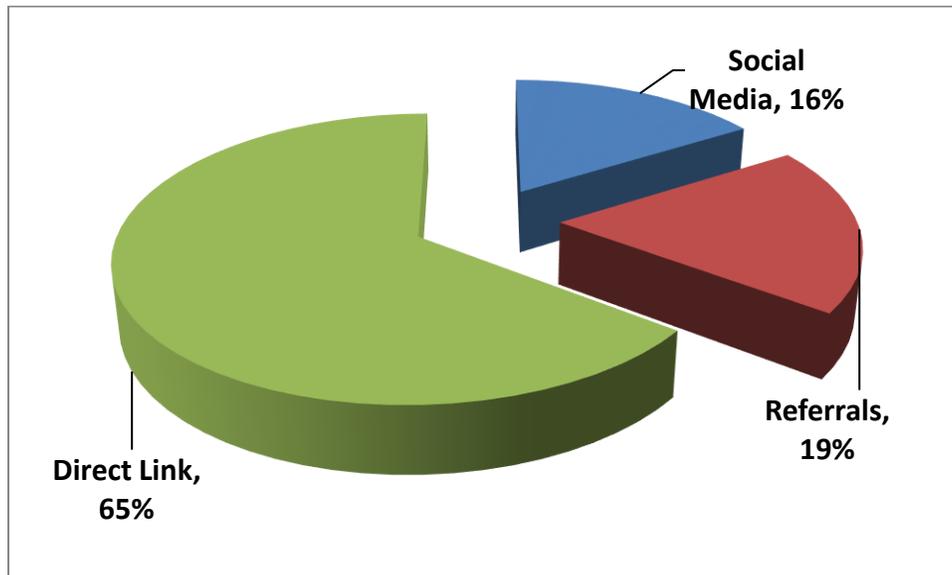


**Visits during the Dialogue (7/24/14 – 8/10/14):**

- Total visits during the live dialogue: 1,202
- Total unique visitors: 731
- Total page views: 6,355
- Average pages per visit: 5.29
- Average visit duration: 5:18
- Returning visitors: 40.10%
- Bounced Rate (percentage of participants who leave after viewing the first page of the dialogue): 14.73%

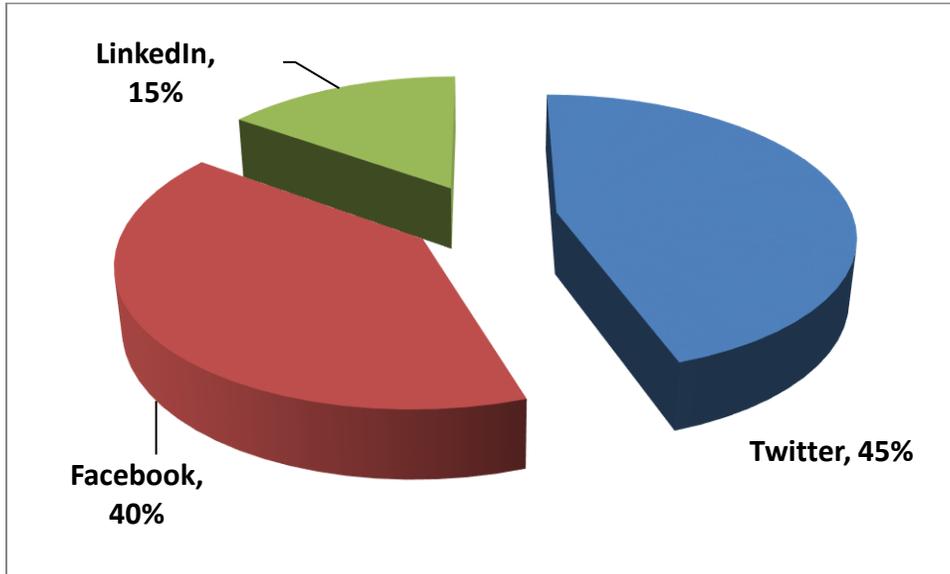
**Traffic Sources:**

- Direct link: 65%
- Referrals (DOL, NCD & ePolicyWorks emails): 19%
- Social media: 16%



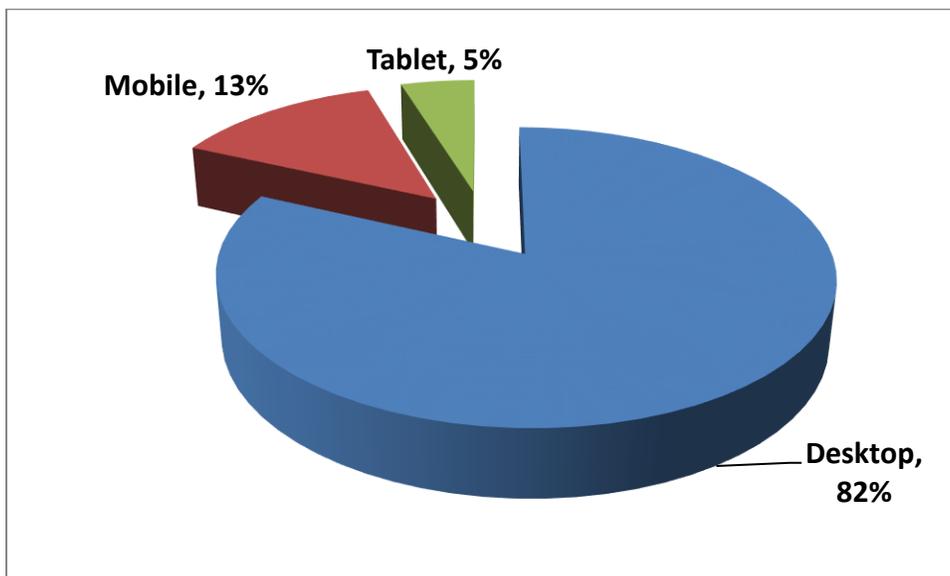
**Breakdown of Traffic from Social Media Sources:**

- Twitter: 45%
- Facebook: 40%
- LinkedIn: 15%



**Breakdown of Traffic from Type of Device:**

- Desktop: 82%
- Mobile: 13%
- Tablet: 5%



**Demographics of Visitors:**

<b>State</b>	<b>Visits</b>
Maryland	157
California	138
Texas	90
New York	81
District of Columbia	65
Virginia	64
Pennsylvania	49
Massachusetts	44
Connecticut	42
Florida	37
Illinois	28
Ohio	27
Indiana	26
Michigan	22
New Jersey	21
Wisconsin	21
Arizona	20
Missouri	20
Georgia	18
Washington	17
Colorado	11
Oregon	11
Iowa	10
Kentucky	9

<b>State</b>	<b>Visits</b>
North Carolina	9
Alabama	8
Nevada	8
Rhode Island	8
Tennessee	8
Minnesota	7
West Virginia	7
Delaware	6
Kansas	6
Idaho	5
Louisiana	5
South Carolina	5
Maine	4
New Hampshire	3
Oklahoma	3
Alaska	2
Arkansas	2
Mississippi	2
North Dakota	2
Hawaii	1
Nebraska	1
New Mexico	1
Utah	1
Vermont	1
Wyoming	1

*Note: The ideas listed in the following sections include minor typographical corrections, which have in no way impacted the substance or the intention of the revised posts.*

## **Top 5 Overall Ideas:**

### **Top Idea #1: Job Shadowing, Internships, and Work Experience**

19 Up Votes | 0 Down Votes | 19 Net Votes

I believe the best way to get our Transition-aged youth excited about careers in the STEM fields is to offer them the opportunity to participate in some work experience while in high school doing paid or unpaid work in a company in the field. Job shadowing is a great way to learn more about a career field of interest! Teens should also be encouraged to consider pursuing higher education in STEM fields, with appropriate accommodations and supports in place.

#### **Comment #1:**

I think job shadowing and internships are critical to encouraging people to pursue careers in STEM fields. However, I think this can start at a much earlier age than transition-aged youth. I have met many elementary school kids with disabilities that were incredibly advanced in math and science. Providing real world experiences to these kids at a young age can give them the motivation to push on through future hurdles.

#### **Comment #2:**

Good point! I naturally think of transition-aged youth because that is the population I work with, but I know that in our area there is a grant-funded program in several schools to encourage STEM exploration with middle-school aged kids, and the feedback so far has been very positive.

#### **Comment #3:**

Thank you for your ideas, Tom and kwilcox2! How do you think we can get employers to these types of job shadowing and internships for youth with disabilities? Looking forward to seeing more of your ideas in our dialogue!

#### **Comment #4:**

That is the key, Alice. We have many more kids eager to participate in internships than we have opportunities for them. We have interns each summer from the Texas School for the Blind. We have also worked with the Texas Department of Rehabilitation Services to create volunteer positions and internships. In three occasions over the years this has led to full time long term employment. So Tom's basic idea is sound, in fact it is critical. But the challenge is to get companies to overcome their mistaken perception that they will incur increased levels of liability. Studies show that employees with disabilities remain in jobs for longer periods, take

fewer days away from work, and have above average productivity. We need to find effective ways to get that message out.

Comment #5:

The STEM business community? How can we communicate to them the high demand and interest in STEM by students w/ disabilities? Looking forward to more of your ideas and comments.

Comment #6:

I think that a true marketing campaign is one effective way to get the message out there of the benefits to employing persons with Disabilities; Strong media supports and real life experiences often play a positive influential role in the perceptions others develop about individuals with disability. Seeing someone with a disability in a positive professional role not only motivates others with disabilities, like myself, but also lends much needed support to employers and their skepticism/fears about hiring someone with a disability. I believe that through media marketing both employers and persons with a disability can be more positively encouraged to take-on the challenge and enjoy the outcomes; and for our youth with disabilities, many of the fears, related to stereo-types and stigmas that contribute to adversity will be eliminated, and they too shall be more encouraged to pursue employment in the STEM field.

Comment #7:

In NY State our Vocational Rehabilitation program (ACCES-VR) is now able to provide paid, short-term (approximately 1 month) work experience to youth in high school and college in a competitive employment environment. The employer is reimbursed for the wages although they are still responsible for Worker's Compensation insurance. We have found this to be successful in encouraging some employers to consider our youth for real work experiences. But it's not the answer for everyone. I agree that we need to market the reality to employers that employees with disabilities are an ASSET rather than a LIABILITY.

Comment #8:

Thank you kwilcox2! Feel free to share more about ACCES-VR and some success stories involving students and employers.

Comment #9:

I have seen some interesting programs that use project-based learning. Since these projects are supposed to be real-world, would it be possible for companies to support students in developing their projects? For example, they could volunteer engineering and/or manufacturing resources to develop models or prototypes. This way they could encourage young students, who are too young to be "hired".

Big Picture Learning (<http://www.bigpicture.org/schools/>)

1. Learning must be based on the interests and goals of each student;
2. A student's curriculum must be relevant to people and places that exist in the real world;
3. A student's abilities must be authentically measured by the quality of her or his work.

EdVisions Schools (<http://edvisionschools.org/>)

1. Approach to teaching and learning focuses on highly personalized learning in full-time advisories
2. Students learn through rigorous, engaging projects, driven by student interest and connected to the real world.

Comment #10:

Hi Tom, these are intriguing ideas. This reminds me of how various companies and organizations have competitions or a call for crowdsourcing solutions to a specific problem/issue. Thank you of your participation!

**Top Idea #2: Allow / Encourage SWD STEM Participation in Middle & High School**

18 Up Votes | 0 Down Votes | 18 Net Votes

SWD are not allowed into the same robust STEM programs as their non-disabled peers in Middle and HS. We must promote and prepare them to take STEM courses in K-12 if we want to encourage them to pursue STEM careers.

Schools should be incentivized to support inclusive school environments instead of exclusive tracking practices. We know firsthand, students who excel in science and math, yet struggle with other areas are held to remedial programming across the board. Policy should be in place to aggressively foster student inclusion when they show strength in areas that support STEM success. Only then will you have the results you are seeking.

Comment #1:

Thank you so much for your comment, Eduadvocate. Can you elaborate a little more on the various factors that prevent students w/ disabilities from being fully included in STEM programs at school?

Comment #2:

Hi Alice, your question is not an easy one to answer and yet it is an obvious answer with a hard fix. It is systemic low expectations for SWD, misconceptions tolerated in an educational system that accepts low outcomes as a natural byproduct of disability. We reject this completely and this is obviously something you are working on addressing.

I have included a short video clip of a student speaking to the Texas SBOE on why students are not being identified for SPED. It is the same answer to why SPED students are not included in STEM in meaningful ways. It is the "perceived" cost burden. The "perceived" uniqueness of one SWD out of many SWD's that make including them not worth the effort by schools. Parents are not equipped to advocate for this type of inclusion without support and policy guidance that exclusion is unacceptable. We know this is false and until the DOE starts setting standards for inclusion, (not for inclusions sake, but full integration in meaningful ways) this will continue to be a problem.

We met with the Chair of the Senate HELP committee's Disability policy director last week in Washington. His comment was that Secretary Duncan is lacking in support of high expectations for SWD and that they are frustrated with his policy.

If you watch the YouTube clip, you can insert any number of disability scenarios into the statement. But it boils down to schools not being held accountable for low outcomes and being allowed to look the other way by the DOE. Including SWD in academic opportunities early on is key to preparing them and giving them the confidence and knowledge necessary to pursue STEM.

Comment #3:

For example, Downingtown STEM Academy is a top ranking public school in Pennsylvania. Based on reporting data from the PA School Performance Profile and Bureau of Special Education (<http://paschoolperformance.org/Profile/27561>), special education students are significantly under represented at this school: only 4.85% at the STEM Academy compared to 16.9% in the school district. The minimum requirements for admission include Algebra 1 and Language 1 (French, German, and Spanish) by the end of 8th grade. I think the Language pre-requisite would disadvantage many students with disabilities that impact spoken language. I'm sure the school would state that they are willing to work around the Language pre-requisite in special cases. But, would a student without the minimum requirements ever make it through the application process? This particular school only accepted about half of its initial applicants the first year (225 out of 400).

Comment #4:

Thank you Eduadvocate and Tom. I'd love for you both to consider posting additional ideas on how to address the low expectations, stereotypes and larger attitudinal barriers that keep students w/ disabilities from pursuing and exploring STEM.

Comment #5:

What Tom is referring to is an entry criteria that is not sensitive to the fact that there are students with various disabilities that may be discouraged from applying due to a prerequisite.

Even years before applying to these programs, knowledge of these types of prerequisites steer some SWD from even considering STEM as an option. They may even effect teachers and counselors from encouraging SWD from pursuing these schools or specialized courses as options based on their perception of the student not being able to meet ALL requirements. Yet areas the student my lack skills in may not be as vital to STEM as the core Math, Science aptitudes they may possess.

This is something that the Dept. of Ed must take a stance on, in the past they have refused to wade into these issues, the OCR won't touch it, so far neither will the DOJ. We have tried all three. SWD many times do not have balanced academic profiles across the board. They may have skills in STEM core areas but lack in the ELA areas and then are shut out entirely.

If a student has a disability that impacts ELA proficiency and they are interested and show aptitude in STEM these must be promoted and supersede any criteria that is not sensitive to this barrier. In order for this to happen The Dept. of ED, OCR and DOJ must take on this issue, there is a void of SWD in STEM, it is unacceptable and people in positions to do something need to step up...currently not happening!

Comment #6:

Thank you for your comments, Eduadvocate. What do you think the Dept. Ed, OCR/DOJ can do about this? What would you like to see in terms of taking a stance on students w/ disabilities and STEM?

Comment #7:

Thanks for asking Alice. They could write a policy position, dear colleague letter addressing that there is a gap in SWD in entering STEM courses in Middle and high school resulting in a lack of SWD entering these fields in the workforce. Future trends show increased demand for STEM fields. SWD are lagging in college entry and in college prep courses. Given that SWD may have unbalanced learning profiles (they may be strong in some areas and weak in others), they could encourage schools K-12 under RDA to focus on finding and supporting SWD areas of strength and/or areas of high interest.

Bypassing typical entry criteria that is weighted against non-typical learners could be one of the areas addressed in a letter. The Dept. of Ed OSEP has recently implemented RDA, Results Driven Accountability, This new policy could begin by encouraging outcomes in STEM, college prep and other higher level courses to fulfill results for SWD. As it stands now, SWD fulfill RDA by just making passing grades. SWD are capable of so much more and should be supported and encouraged to achieve higher goals, STEM being a high priority.

In the end, focusing on encouraging strength based learning opportunities in K-12 instead of the deficit model currently in place will help create confidence and pride in students that sometimes feel defeated in the process, marginalized and lose confidence. Going into STEM takes preparing

in Middle and High School and these students should be given every opportunity to excel despite their lack of skills that may be unrelated to STEM core curriculum.

Comment #8:

Thank you so much for elaborating, Eduadvocate. These are all very interesting recommendations.

Comment #9:

On the last day of this dialog on STEM I will share our story. We advocate because of the low expectations and outcomes that seem to be acceptable for SWD. These outcome are accepted by the Department of ED, the OCR, the DOJ in that not one of these entities have taken a stance on admissions criteria in a meaningful way. Other than listening to many parent's complaints, no action has been taken. Many times the response directs us to another agency who responds by pointing right back at the original one. We have approached them all, with statistics, with professional educators backing up our complaints. We feel strongly that a simple Dear Colleague Letter could have a huge impact on disability outcomes, one that targets unacceptable entry criteria, low outcomes and battles misconceptions of SWD academic potential.

Gladly this week our family has won a small victory without the help of any agency or organization charged with protecting our son's civil rights. I can assure you most people do not have the time or money to commit to equal opportunities that we have pursued. If anything is to come from this dialog, we hope it shines a light on the issue that it will take a coordinated effort and commitment of all agencies to allow all capable SWD the same outcome we have fought for three years to achieve.

Personally, our family had to send our son at 12 years of age away to get educational opportunities that our public school refused him several years ago. This is the first break down in the solution of including more students with disabilities in STEM. SWD must have equal opportunities to take courses that prepare them for STEM, despite their areas of challenge posed by their disability. These opportunities must take precedence to entry criteria that bases entry on "whole child" accomplishments or portfolios. Many times SWD have unbalanced learning profiles and their disability may complicate their scores on paper. These factors will prevent them for competing for entry. In order for our son to take Algebra 1 in 7th grade, a course he got an A in, we had to place him privately, even though this course is available in our public school system albeit only to those selected to enter exclusive campuses. We should have never had to do this. We alerted the OCR, the DOJ and the Department of ED along with Disability Rights groups.

Despite educational evaluations that showed strong skills in math reasoning and other test scores showed high academic aptitude, his reading scores and his writing ability and teachers comments, (which endorsed him for entry), reflected the heart of my child's disability and were factors in his denied entry into selective schools that focus on STEM. Schools are allowed to use

unquestioned criteria and different schools are allowed to offer different courses. The OCR, the Dept. of ED, the DOJ, Federally funded legal counsel like Disability Rights Texas all gave no assistance to us, with the excuse of lack of funds, which we are aware is another way of saying that high academic opportunities for SWD, Dyslexia, are not a priority and they will take no action.

Because we pulled our son out of public school for 1 year where he was able to take Algebra 1 like his non-disabled peers in public school, he returned to our district qualified to enter the STEM magnet since it was the only option for him to take the next math courses, his local middle school did not offer Geometry or Algebra 2. He got into the STEM magnet through the back door, he should have been let in through the Front. He also did extremely well on the SAT math section 98%, this nationally normed test. Had we not given him access to higher level math, privately he would still be in average Math classes with no hope of pursuing math and science or the same opportunities offered to his non-disabled peers.

This has been a three year journey of full time advocacy culminating in a very lack luster form letter of acceptance for a non-priority transfer, which we will hang proudly as if it were made of gold.

Since being accepted into the STEM magnet, he had to choose his courses, it was like a kid in a candy store...the candy was academics. He chose Geometry and in tandem Algebra 2, applied Chemistry and Physics, IB Japanese, along with his Science, history and English LA. Got a PE waiver so he could load up on what he loves....4 high school credits. (Good luck with the homework!)

Now the IEP stuff starts with just three weeks before school. Other kids without disabilities have had months to prepare for this coming year, our child has three weeks and there is much more for him to prepare with IEP's and accessible books and materials due to his print disability, dyslexia. We started the formal process in April of this year it is now August.

The lessons we learned and hope to share to effect change for ALL SWD.

Math, the gateway to STEM, must be available and encouraged despite other factors for SWD in K-12, the Department of Ed must get behind this.

SWD should have the same academic options as non-disabled peers, no exceptions.

Entry Criteria must have alternate Criteria in public schools if criteria is screening or discouraging SWD, no exceptions.

The OCR must take these issues seriously, they don't, at least in the Dallas office. Federally funded disability rights groups need to include advanced academic outcomes for SWD including those with hidden disabilities like Dyslexia. They take federal funds and do not protect students across the range of disability.

The Dept. of ED must encourage outcomes for SWD under RDA beyond average and just passing to comply under their new accountability system.

If you want to increase SWD in STEM we must equally prepare and encourage these students starting in middle and high school. Many of them are MORE than capable and are being left out. Through our journey we have become effective advocates and we will continue to speak out about the ability that lies in SWD. So glad you are hosting this dialog, you obviously care about this issue and we are grateful.

### **Top Idea #3: Peer Mentor Positions in Science**

18 Up Votes | 18 Down Votes | 0 Net Votes

Support peer mentor positions to facilitate education, advocacy, and employment.

#### Comment #1:

Hi Hector! Thank you for joining our third dialogue--I remember your participation in our previous dialogues this year. Hope to hear more of your ideas and thanks again.

#### Comment #2:

Thanks Alice. I love all the great ideas that are brought up on these forums.

#### Comment #3:

Thank YOU Hector! Keep on keeping on! Please encourage some of your friends and colleagues to join the conversation!

#### Comment #4:

Great idea. Thanks, Hector!

### **Top Idea #4: Accessible Tools**

17 Up Votes | 0 Down Votes | 17 Net Votes

While technology can be enormously empowering for students with disabilities, design choices can cause students to become marginalized because educational tools are not designed for accessibility. We need a focused effort to improve STEM resources such as online courses, text editors, math editors, math textbooks, virtual science experiments and the like. This requirement is particularly important in education but carries over into workplace tools as well.

#### Comment #1:

Accessible technology and course platforms are key; in addition, I would also underline the need for high-quality, thoughtfully created accessible content. While many things CAN be solved through the use of and investment in technology, some MUST be addressed by partnering with leaders in the field, considering the accessibility of the content from the start, and planning to provide access with high-quality image description, using approved and accepted guidelines and best practices.

Comment #2:

I think the STEM curriculums and education departments need to be more adaptive. Reflecting on my own engineering education, there are many required classes, such as engineering labs, that would be considered inaccessible. Hands-on labs were very helpful for me to learn and demonstrate my understanding. However, many people learn differently, and can demonstrate their understanding in different formats. Education in general needs to be more adaptive, instead of using the “one size fits all” method.

Comment #3:

Thank you for your comments, Donna, Tom and Knowbility. As we all know the accessible curricula may first benefit students with particular disabilities but once these features are integrated as a 'regular' feature in the product, EVERYONE starts to use them. Please continue sharing some ideas in our dialogue!!

Comment #4:

Please help yourself to NCAM's free STEM training/guidelines/resources, and share with colleagues/clients/vendors:

[http://ncam.wgbh.org/experience\\_learn/educational\\_media/stemdx](http://ncam.wgbh.org/experience_learn/educational_media/stemdx),

[http://ncam.wgbh.org/experience\\_learn/educational\\_media](http://ncam.wgbh.org/experience_learn/educational_media)

Comment #5:

Thank you for sharing, Donna! I appreciate your participation and feel free to continue to post additional ideas, comments and resources.

Comment #6:

Mathematics is often the gateway to a STEM career. It is also, sadly a gate keeper, particularly to SWD. There is an accessible tool for graphical mathematics, MathTrax, developed by NASA Learning Technologies, available free to the public from <http://prime.jsc.nasa.gov/mathtrax>. It was specifically designed to address challenges faced by students with vision loss; however, it has been used widely by students with and without disabilities across the board.

Comment #7:

Hi Robert, thank you so much for your comments. Would you like to expand more on barriers to mathematics that students with disabilities face? What are some other ways to increase accessibility to mathematics for students with a wide range of disabilities?

Comment #8:

All these comments highlight one of the larger factors in STEM outcomes. Accessibility, and Knowbility works at this as their non-profits core mission. Another commenter states on this thread that Math is the gatekeeper to STEM. So True! With the misconceptions that SWD can't access math, perform math, contribute to math etc...early on they are tracked away, too much reconfiguring of content, too much effort by schools, too little understanding of disability, too easy for schools not to support them and get away with it...Little enforcement or guidance as I have addressed on another idea post. I am including a video of a student addressing this issue, Ben is a student with a print disability explaining early on how he could not read or access the word problems and teachers thought he could not understand the math. He was allowed to be tracked away from the very Math he excels at today...

Comment #9:

Moderator Alice wrote:

>Would you like to expand more on barriers to >mathematics that students with disabilities face? What >are some other ways to increase accessibility to >mathematics for students with a wide range of >disabilities?

Eduadvocate Made excellent points regarding the additional barriers which result from misguided attitudes about the abilities of SWD to deal with Mathematics. The real problem is that although there are some notable exceptions, by and large we do not do a very good job of teaching mathematics to most students independent of disability. When a student with an "issue" enters a class that is difficult for most people, there is a natural tendency to expect failure.

Although our MathTrax project did not have anything like the resources to conduct a thorough evaluation, we did notice some common threads which might be useful to mention.

1. Multiple Presentations: We offered visual, text and auditory representations of graphs. The audible (tone graph) representation renders a curve with an audible tone with a pitch varying with the height of the graph. This approach reinforces the concept that graphs often represent physical quantities which change with time. The tone graph approach effectively makes time the independent variable. The visual display is coordinated to show a point moving on the graph along with the tone.
2. Experimentation: Often equations include parameters which when varied change the properties of the graph. MathTrax provides these and invites the student to experiment. The descriptions change as the student fiddles with the parameters.

These two concepts can be generalized far beyond their narrow uses with MathTrax. There are plenty of math tutor software applications on the market today, but I do not know of any that are making that much of a difference, and, of course there's the question of whether they would work with assistive technology. The sad fact is that the non-completion rate in community college remedial math courses is still quite high, and then, as was mentioned, adding an "issue" just makes the situation that much more difficult.

Sorry about the long post. I've thought about this quite a bit over the years, and it's a subject I'm passionate about.

Comment #10:

Hi Robert, we love long posts! Thank you so much for your comments. Overall instruction in mathematics needs to be improved as you suggested and having a wide range of accessible learning formats is one step in the right direction. Looking forward to any other ideas you have on this subject!

Comment #11:

Robert since you are passionate about accessible math please look into diagram center if you already are not familiar, which I am sure your already are...but just in case...you may want to start here and get involved.

<http://diagramcenter.org/accessible-dynamic-scientific-graphics.html>

**Top Idea #5: Collaborate with Higher Ed and Disability**

14 Up Votes | 0 Down Votes | 14 Net Votes

In the ADA era, more people with disabilities are entering two and four-year colleges than ever. As an aspiring professional (non-STEM), I found it very intimidating because there were no clear role models for me as someone with a disability; nor much awareness on the part of college or employers of candidates with disabilities.

What I think is needed is much closer collaboration between disability specialists and traditional higher education professionals to design more inclusive programming and practices. For instance, academic departments, career and disability service offices could connect students with disabilities with alumni, internships and companies in STEM fields. It would make the process of internship and career planning a lot less intimidating if the student could be assured that they will be supported as aspiring professionals and not have to worry about discrimination based on disability.

Currently, it seems that there is not much collaboration between the fields of disability and postsecondary education. This has to change, and much more attention is needed on what works for college students with disabilities. Research grants to identify best practices for inclusion in STEM might be a great incentive for higher ed and disability professionals to work together.

Comment #1:

Thank you so much for your comments, ahshefcyk. Great to hear that you are interested in a career in STEM! What has been your experience with a school's Services for Students w/ Disabilities office if you needed an accommodation related to STEM course & lab work? Has that been an issue for you?

Comment #2:

Actually, my position is less STEM and more social science: I am a research assistant whose primary interest is higher education and students with disabilities. Although I have not yet worked on a study involving specifically students with disabilities in STEM, I would like to someday!

I have an invisible disability and when I did take lab courses, I found that social communication was very difficult for me. It made meaningful lab participation very difficult. I did not seek accommodation for this because group work was required for the classes and I felt that someone without my disability would not understand why this would be so difficult. I have improved significantly on that line with age and experience since then, but I think there is more that can be done earlier in the college transition process to help cope with this. I would love to see mock group sessions and individual assignments in say, the summer leading up to college, so it won't come as such a rude shock when group work does come up!

Comment #3:

Hi ahshefcyk, I'm in the social sciences too (sociology). As a person in a wheelchair, I had difficulty with labs in high school. In many biology and chemistry classes I was unable to be 'hands-on' because I the lab tables were too high. This was pre-ADA and the only way I adapted was for dissections I was able to put my specimen on a lower table. For chemistry labs, I had to watch my partner do all hands-on stuff while I took notes. I agree that it can be difficult to ask for accommodations and even imagine what kinds of accommodations would help. I have a feeling most teachers would have no idea what might work for me.

Comment #4:

Please feel free to elaborate more on the issues facing people with invisible disabilities in STEM environments!

Comment #5:

This comment is very similar to the one I just posted (whoops). As a student with invisible disabilities in the biomedical sciences, I have found that my entire career path has been diverted by disability and the poor ability of my program and institution to handle it. Accommodations for lab work, class work, and length of degree are all on a case by case basis. Disability Services is not really equipped to manage these types of issues. I ended up leaving my first lab, which I

loved, because adaptation would have been extremely challenging. I don't even know what kind of job to look for now because I haven't gotten a lot of encouragement to pursue research. Research funding on disability and STEM training would probably be a great place to start. All universities love getting more federal funds!

Comment #6:

Thank you for your comments, cginpvd. If you wish, feel free to post some additional ideas you might have on how disability services at universities/community colleges/technical schools can better accommodate students in various science/lab courses.

**Top 5 Ideas Submitted for the Topic "Education":**

**Top Education Idea #1: Allow / Encourage SWD STEM Participation in Middle & High School**

18 Up Votes | 0 Down Votes | 18 Net Votes

SWD are not allowed into the same robust STEM programs as their non-disabled peers in Middle and HS. We must promote and prepare them to take STEM courses in K-12 if we want to encourage them to pursue STEM careers.

Schools should be incentivized to support inclusive school environments instead of exclusive tracking practices. We know firsthand, students who excel in science and math, yet struggle with other areas are held to remedial programming across the board. Policy should be in place to aggressively foster student inclusion when they show strength in areas that support STEM success. Only then will you have the results you are seeking.

Comment #1:

Thank you so much for your comment, Eduadvocate. Can you elaborate a little more on the various factors that prevent students w/ disabilities from being fully included in STEM programs at school?

Comment #2:

Hi Alice, your question is not an easy one to answer and yet it is an obvious answer with a hard fix. It is systemic low expectations for SWD, misconceptions tolerated in an educational system that accepts low outcomes as a natural byproduct of disability. We reject this completely and this is obviously something you are working on addressing.

I have included a short video clip of a student speaking to the Texas SBOE on why students are not being identified for SPED. It is the same answer to why SPED students are not included in STEM in meaningful ways. It is the "perceived" cost burden. The "perceived" uniqueness of one SWD out of many SWD's that make including them not worth the effort by schools. Parents are not equipped to advocate for this type of inclusion without support and policy guidance that

exclusion is unacceptable. We know this is false and until the DOE starts setting standards for inclusion, (not for inclusions sake, but full integration in meaningful ways) this will continue to be a problem.

We met with the Chair of the Senate HELP committee's Disability policy director last week in Washington. His comment was that Secretary Duncan is lacking in support of high expectations for SWD and that they are frustrated with his policy.

If you watch the YouTube clip, you can insert any number of disability scenarios into the statement. But it boils down to schools not being held accountable for low outcomes and being allowed to look the other way by the DOE. Including SWD in academic opportunities early on is key to preparing them and giving them the confidence and knowledge necessary to pursue STEM.

Comment #3:

For example, Downingtown STEM Academy is a top ranking public school in Pennsylvania. Based on reporting data from the PA School Performance Profile and Bureau of Special Education (<http://paschoolperformance.org/Profile/27561>), special education students are significantly under represented at this school: only 4.85% at the STEM Academy compared to 16.9% in the school district. The minimum requirements for admission include Algebra 1 and Language 1 (French, German, and Spanish) by the end of 8th grade. I think the Language pre-requisite would disadvantage many students with disabilities that impact spoken language. I'm sure the school would state that they are willing to work around the Language pre-requisite in special cases. But, would a student without the minimum requirements ever make it through the application process? This particular school only accepted about half of its initial applicants the first year (225 out of 400).

Comment #4:

Thank you Eduadvocate and Tom. I'd love for you both to consider posting additional ideas on how to address the low expectations, stereotypes and larger attitudinal barriers that keep students w/ disabilities from pursuing and exploring STEM.

Comment #5:

What Tom is referring to is an entry criteria that is not sensitive to the fact that there are students with various disabilities that may be discouraged from applying due to a prerequisite. Even years before applying to these programs, knowledge of these types of prerequisites steer some SWD from even considering STEM as an option. They may even effect teachers and counselors from encouraging SWD from pursuing these schools or specialized courses as options based on their perception of the student not being able to meet ALL requirements. Yet areas the student my lack skills in may not be as vital to STEM as the core Math, Science aptitudes they may possess.

This is something that the Dept. of Ed must take a stance on, in the past they have refused to wade into these issues, the OCR won't touch it, so far neither will the DOJ. We have tried all three. SWD many times do not have balanced academic profiles across the board. They may have skills in STEM core areas but lack in the ELA areas and then are shut out entirely.

If a student has a disability that impacts ELA proficiency and they are interested and show aptitude in STEM these must be promoted and supersede any criteria that is not sensitive to this barrier. In order for this to happen The Dept. of ED, OCR and DOJ must take on this issue, there is a void of SWD in STEM, it is unacceptable and people in positions to do something need to step up...currently not happening!

Comment #6:

Thank you for your comments, Eduadvocate. What do you think the Dept. Ed, OCR/DOJ can do about this? What would you like to see in terms of taking a stance on students w/ disabilities and STEM?

Comment #7:

Thanks for asking Alice. They could write a policy position, dear colleague letter addressing that there is a gap in SWD in entering STEM courses in Middle and high school resulting in a lack of SWD entering these fields in the workforce. Future trends show increased demand for STEM fields. SWD are lagging in college entry and in college prep courses. Given that SWD may have unbalanced learning profiles (they may be strong in some areas and weak in others), they could encourage schools K-12 under RDA to focus on finding and supporting SWD areas of strength and/or areas of high interest.

Bypassing typical entry criteria that is weighted against non-typical learners could be one of the areas addressed in a letter. The Dept. of Ed OSEP has recently implemented RDA, Results Driven Accountability, This new policy could begin by encouraging outcomes in STEM, college prep and other higher level courses to fulfill results for SWD. As it stands now, SWD fulfill RDA by just making passing grades. SWD are capable of so much more and should be supported and encouraged to achieve higher goals, STEM being a high priority.

In the end, focusing on encouraging strength based learning opportunities in K-12 instead of the deficit model currently in place will help create confidence and pride in students that sometimes feel defeated in the process, marginalized and lose confidence. Going into STEM takes preparing in Middle and High School and these students should be given every opportunity to excel despite their lack of skills that may be unrelated to STEM core curriculum.

Comment #8:

Thank you so much for elaborating, Eduadvocate. These are all very interesting recommendations.

Comment #9:

On the last day of this dialog on STEM I will share our story. We advocate because of the low expectations and outcomes that seem to be acceptable for SWD. These outcome are accepted by the Department of ED, the OCR, the DOJ in that not one of these entities have taken a stance on admissions criteria in a meaningful way. Other than listening to many parent's complaints, no action has been taken. Many times the response directs us to another agency who responds by pointing right back at the original one. We have approached them all, with statistics, with professional educators backing up our complaints. We feel strongly that a simple Dear Colleague Letter could have a huge impact on disability outcomes, one that targets unacceptable entry criteria, low outcomes and battles misconceptions of SWD academic potential.

Gladly this week our family has won a small victory without the help of any agency or organization charged with protecting our son's civil rights. I can assure you most people do not have the time or money to commit to equal opportunities that we have pursued. If anything is to come from this dialog, we hope it shines a light on the issue that it will take a coordinated effort and commitment of all agencies to allow all capable SWD the same outcome we have fought for three years to achieve.

Personally, our family had to send our son at 12 years of age away to get educational opportunities that our public school refused him several years ago. This is the first break down in the solution of including more students with disabilities in STEM. SWD must have equal opportunities to take courses that prepare them for STEM, despite their areas of challenge posed by their disability. These opportunities must take precedence to entry criteria that bases entry on "whole child" accomplishments or portfolios. Many times SWD have unbalanced learning profiles and their disability may complicate their scores on paper. These factors will prevent them for competing for entry. In order for our son to take Algebra 1 in 7th grade, a course he got an A in, we had to place him privately, even though this course is available in our public school system albeit only to those selected to enter exclusive campuses. We should have never had to do this. We alerted the OCR, the DOJ and the Department of ED along with Disability Rights groups.

Despite educational evaluations that showed strong skills in math reasoning and other test scores showed high academic aptitude, his reading scores and his writing ability and teachers comments, (which endorsed him for entry), reflected the heart of my child's disability and were factors in his denied entry into selective schools that focus on STEM. Schools are allowed to use unquestioned criteria and different schools are allowed to offer different courses. The OCR, the Dept. of ED, the DOJ, Federally funded legal counsel like Disability Rights Texas all gave no assistance to us, with the excuse of lack of funds, which we are aware is another way of saying that high academic opportunities for SWD, Dyslexia, are not a priority and they will take no action.

Because we pulled our son out of public school for 1 year where he was able to take Algebra 1 like his non-disabled peers in public school, he returned to our district qualified to enter the STEM magnet since it was the only option for him to take the next math courses, his local middle school did not offer Geometry or Algebra 2. He got into the STEM magnet through the back door, he should have been let in through the Front. He also did extremely well on the SAT math section 98%, this nationally normed test. Had we not given him access to higher level math, privately he would still be in average Math classes with no hope of pursuing math and science or the same opportunities offered to his non-disabled peers.

This has been a three year journey of full time advocacy culminating in a very lack luster form letter of acceptance for a non-priority transfer, which we will hang proudly as if it were made of gold.

Since being accepted into the STEM magnet, he had to choose his courses, it was like a kid in a candy store...the candy was academics. He chose Geometry and in tandem Algebra 2, applied Chemistry and Physics, IB Japanese, along with his Science, history and English LA. Got a PE waiver so he could load up on what he loves....4 high school credits. (Good luck with the homework!)

Now the IEP stuff starts with just three weeks before school. Other kids without disabilities have had months to prepare for this coming year, our child has three weeks and there is much more for him to prepare with IEP's and accessible books and materials due to his print disability, dyslexia. We started the formal process in April of this year it is now August.

The lessons we learned and hope to share to effect change for ALL SWD.

Math, the gateway to STEM, must be available and encouraged despite other factors for SWD in K-12, the Department of Ed must get behind this.

SWD should have the same academic options as non-disabled peers, no exceptions.

Entry Criteria must have alternate Criteria in public schools if criteria is screening or discouraging SWD, no exceptions.

The OCR must take these issues seriously, they don't, at least in the Dallas office. Federally funded disability rights groups need to include advanced academic outcomes for SWD including those with hidden disabilities like Dyslexia. They take federal funds and do not protect students across the range of disability.

The Dept. of ED must encourage outcomes for SWD under RDA beyond average and just passing to comply under their new accountability system.

If you want to increase SWD in STEM we must equally prepare and encourage these students starting in middle and high school. Many of them are MORE than capable and are being left out. Through our journey we have become effective advocates and we will continue to speak out

about the ability that lies in SWD. So glad you are hosting this dialog, you obviously care about this issue and we are grateful.

Comment #3:

Thank you so much for your comments, Craig! I hope you'll continue to share any ideas or solutions you might have regarding social media accessibility!

Comment #4:

YouTube does a great job of getting the captioning started. Yes there are many errors, but the time it takes to correct the errors are minimal in comparison to having to create the captioning file from scratch. What was once 5 - 10 minutes for a professional captioner to caption one minute of video is reduced to about 2 - 3 minutes for the novice. YouTube has provided a wonderful service. As Craig indicated it is quite simple to export what YouTube creates and edit and upload. There is no reason why any video on YouTube should not be captioned

Comment #5:

It is also the user that does some of captioning. I mean Professor Messar does his because YouTube is not the only site that he is on.

**Top Education Idea #2: Peer Mentor Positions in Science**

18 Up Votes | 18 Down Votes | 0 Net Votes

Support peer mentor positions to facilitate education, advocacy, and employment.

Comment #1:

Hi Hector! Thank you for joining our third dialogue--I remember your participation in our previous dialogues this year. Hope to hear more of your ideas and thanks again.

Comment #2:

Thanks Alice. I love all the great ideas that are brought up on these forums.

Comment #3:

Thank YOU Hector! Keep on keeping on! Please encourage some of your friends and colleagues to join the conversation!

Comment #4:

Great idea. Thanks, Hector!

**Top Education Idea #3: Accessible Tools**

17 Up Votes | 0 Down Votes | 17 Net Votes

While technology can be enormously empowering for students with disabilities, design choices can cause students to become marginalized because educational tools are not designed for accessibility. We need a focused effort to improve STEM resources such as online courses, text editors, math editors, math textbooks, virtual science experiments and the like. This requirement is particularly important in education but carries over into workplace tools as well.

Comment #1:

Accessible technology and course platforms are key; in addition, I would also underline the need for high-quality, thoughtfully created accessible content. While many things CAN be solved through the use of and investment in technology, some MUST be addressed by partnering with leaders in the field, considering the accessibility of the content from the start, and planning to provide access with high-quality image description, using approved and accepted guidelines and best practices.

Comment #2:

I think the STEM curriculums and education departments need to be more adaptive. Reflecting on my own engineering education, there are many required classes, such as engineering labs, that would be considered inaccessible. Hands-on labs were very helpful for me to learn and demonstrate my understanding. However, many people learn differently, and can demonstrate their understanding in different formats. Education in general needs to be more adaptive, instead of using the “one size fits all” method.

Comment #3:

Thank you for your comments, Donna, Tom and Knowbility. As we all know the accessible curricula may first benefit students with particular disabilities but once these features are integrated as a 'regular' feature in the product, EVERYONE starts to use them. Please continue sharing some ideas in our dialogue!!

Comment #4:

Please help yourself to NCAM's free STEM training/guidelines/resources, and share with colleagues/clients/vendors:

[http://ncam.wgbh.org/experience\\_learn/educational\\_media/stemdx](http://ncam.wgbh.org/experience_learn/educational_media/stemdx),

[http://ncam.wgbh.org/experience\\_learn/educational\\_media](http://ncam.wgbh.org/experience_learn/educational_media)

Comment #5:

Thank you for sharing, Donna! I appreciate your participation and feel free to continue to post additional ideas, comments and resources.

Comment #6:

Mathematics is often the gateway to a STEM career. It is also, sadly a gate keeper, particularly to SWD. There is an accessible tool for graphical mathematics, MathTrax, developed by NASA Learning Technologies, available free to the public from <http://prime.jsc.nasa.gov/mathtrax>. It was specifically designed to address challenges faced by students with vision loss; however, it has been used widely by students with and without disabilities across the board.

Comment #7:

Hi Robert, thank you so much for your comments. Would you like to expand more on barriers to mathematics that students with disabilities face? What are some other ways to increase accessibility to mathematics for students with a wide range of disabilities?

Comment #8:

All these comments highlight one of the larger factors in STEM outcomes. Accessibility, and Knowbility works at this as their nonprofits core mission. Another commenter states on this thread that Math is the gatekeeper to STEM. So True! With the misconceptions that SWD can't access math, perform math, contribute to math etc...early on they are tracked away, too much reconfiguring of content, too much effort by schools, too little understanding of disability, too easy for schools not to support them and get away with it...Little enforcement or guidance as I have addressed on another idea post. I am including a video of a student addressing this issue, Ben is a student with a print disability explaining early on how he could not read or access the word problems and teachers thought he could not understand the math. He was allowed to be tracked away from the very Math he excels at today...

Comment #9:

Moderator Alice wrote:

>Would you like to expand more on barriers to >mathematics that students with disabilities face? What >are some other ways to increase accessibility to >mathematics for students with a wide range of >disabilities?

Eduadvocate Made excellent points regarding the additional barriers which result from misguided attitudes about the abilities of SWD to deal with Mathematics. The real problem is that although there are some notable exceptions, by and large we do not do a very good job of teaching mathematics to most students independent of disability. When a student with an "issue" enters a class that is difficult for most people, there is a natural tendency to expect failure.

Although our MathTrax project did not have anything like the resources to conduct a thorough evaluation, we did notice some common threads which might be useful to mention.

1. Multiple Presentations: We offered visual, text and auditory representations of graphs. The audible (tone graph) representation renders a curve with an audible tone with a pitch varying

with the height of the graph. This approach reinforces the concept that graphs often represent physical quantities which change with time. The tone graph approach effectively makes time the independent variable. The visual display is coordinated to show a point moving on the graph along with the tone.

2. Experimentation: Often equations include parameters which when varied change the properties of the graph. MathTrax provides these and invites the student to experiment. The descriptions change as the student fiddles with the parameters.

These two concepts can be generalized far beyond their narrow uses with MathTrax. There are plenty of math tutor software applications on the market today, but I do not know of any that are making that much of a difference, and, of course there's the question of whether they would work with assistive technology. The sad fact is that the non-completion rate in community college remedial math courses is still quite high, and then, as was mentioned, adding an "issue" just makes the situation that much more difficult.

Sorry about the long post. I've thought about this quite a bit over the years, and it's a subject I'm passionate about.

Comment #10:

Hi Robert, we love long posts! Thank you so much for your comments. Overall instruction in mathematics needs to be improved as you suggested and having a wide range of accessible learning formats is one step in the right direction. Looking forward to any other ideas you have on this subject!

Comment #11:

Robert since you are passionate about accessible math please look into diagram center if you already are not familiar, which I am sure your already are...but just in case...you may want to start here and get involved.

<http://diagramcenter.org/accessible-dynamic-scientific-graphics.html>

**Top Education Idea #4: Collaborate with Higher Ed and Disability**

14 Up Votes | 0 Down Votes | 14 Net Votes

In the ADA era, more people with disabilities are entering two and four-year colleges than ever. As an aspiring professional (non-STEM), I found it very intimidating because there were no clear role models for me as someone with a disability; nor much awareness on the part of college or employers of candidates with disabilities.

What I think is needed is much closer collaboration between disability specialists and traditional higher education professionals to design more inclusive programming and practices. For instance, academic departments, career and disability service offices could connect students with disabilities with alumni,

internships and companies in STEM fields. It would make the process of internship and career planning a lot less intimidating if the student could be assured that they will be supported as aspiring professionals and not have to worry about discrimination based on disability.

Currently, it seems that there is not much collaboration between the fields of disability and postsecondary education. This has to change, and much more attention is needed on what works for college students with disabilities. Research grants to identify best practices for inclusion in STEM might be a great incentive for higher ed and disability professionals to work together.

Comment #1:

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Please feel free to elaborate more on the issues facing people with invisible disabilities in STEM environments!

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This comment is very similar to the one I just posted (whoops). As a student with invisible disabilities in the biomedical sciences, I have found that my entire career path has been diverted by disability and the poor ability of my program and institution to handle it. Accommodations for lab work, class work, and length of degree are all on a case by case basis. Disability Services is not really equipped to manage these types of issues. I ended up leaving my first lab, which I loved, because adaptation would have been extremely challenging. I don't even know what kind of job to look for now because I haven't gotten a lot of encouragement to pursue research. Research funding on disability and STEM training would probably be a great place to start. All universities love getting more federal funds!

Comment #6:

Thank you for your comments, cginpvd. If you wish, feel free to post some additional ideas you might have on how disability services at universities/community colleges/technical schools can better accommodate students in various science/lab courses.

**Top Education Idea #5: Accommodating kids w/ disabilities at STEM camps**

11 Up Votes | 0 Down Votes | 11 Net Votes

Hi everyone! We're very excited to hear about your ideas on how to encourage people with disabilities to go into STEM careers.

Summer camps for kids about STEM are very popular. I was disheartened to hear about a young girl w/ cystic fibrosis and her experience at a recent camp for girls interested in STEM.

<http://www.nbcsandiego.com/news/local/San-Diego-Teen-Discrimination-AAWU-Summer-Camp-Cystic-Fibrosis-268205372.html>

What are your thoughts on how STEM events for youth can be more inclusive of kids w/ disabilities?

Comment #1:

This article sheds light on an issue that we are well aware of...that individuals with disabilities often face challenges to pursuing careers and degrees in STEM and are underrepresented in the STEM fields. I invite you all to participate in an online dialogue hosted by the U.S. Department of Labor's Office of Disability Employment Policy and the National Council on Disability,

"Encouraging People with Disabilities to Pursue Careers in STEM (Science, Technology, Engineering and Mathematics)." We are looking for ideas on how to increase the number of people with disabilities pursuing STEM careers, as well as suggestions on how to provide better support to ensure successful employment outcomes in these growing fields. Join us today at: <http://STEMCareersForPWD.ePolicyWorks.org>.

Comment #2:

As a member of AAUW I am extremely saddened but not defeated. AAUW is an amazing organization. This needs to be seen in the context of the young girl and persons involved rather than to collaterally attach AAUW. Our mission is difficult enough...

**Top Ideas Submitted for Topic "Training":**

**Top Training Idea #1: Job Shadowing, Internships, and Work Experience**

19 Up Votes | 0 Down Votes | 19 Net Votes

I believe the best way to get our Transition-aged youth excited about careers in the STEM fields is to offer them the opportunity to participate in some work experience while in high school doing paid or unpaid work in a company in the field. Job shadowing is a great way to learn more about a career field of interest! Teens should also be encouraged to consider pursuing higher education in STEM fields, with appropriate accommodations and supports in place.

Comment #1:

I think job shadowing and internships are critical to encouraging people to pursue careers in STEM fields. However, I think this can start at a much earlier age than transition-aged youth. I have met many elementary school kids with disabilities that were incredibly advanced in math and science. Providing real world experiences to these kids at a young age can give them the motivation to push on through future hurdles.

Comment #2:

Good point! I naturally think of transition-aged youth because that is the population I work with, but I know that in our area there is a grant-funded program in several schools to encourage STEM exploration with middle-school aged kids, and the feedback so far has been very positive.

Comment #3:

Thank you for your ideas, Tom and kwilcocx2! How do you think we can get employers to these types of job shadowing and internships for youth with disabilities? Looking forward to seeing more of your ideas in our dialogue!

Comment #4:

That is the key, Alice. We have many more kids eager to participate in internships than we have opportunities for them. We have interns each summer from the Texas School for the Blind. We have also worked with the Texas Department of Rehabilitation Services to create volunteer positions and internships. In three occasions over the years this has led to full time long term employment. So Tom's basic idea is sound, in fact it is critical. But the challenge is to get companies to overcome their mistaken perception that they will incur increased levels of liability. Studies show that employees with disabilities remain in jobs for longer periods, take fewer days away from work, and have above average productivity. We need to find effective ways to get that message out.

Comment #5:

The STEM business community? How can we communicate to them the high demand and interest in STEM by students w/ disabilities? Looking forward to more of your ideas and comments.

Comment #6:

I think that a true marketing campaign is one effective way to get the message out there of the benefits to employing persons with Disabilities; Strong media supports and real life experiences often play a positive influential role in the perceptions others develop about individuals with disability. Seeing someone with a disability in a positive professional role not only motivates others with disabilities, like myself, but also lends much needed support to employers and their skepticism/fears about hiring someone with a disability. I believe that through media marketing both employers and persons with a disability can be more positively encouraged to take-on the challenge and enjoy the outcomes; and for our youth with disabilities, many of the fears, related to stereo-types and stigmas that contribute to adversity will be eliminated, and they too shall be more encouraged to pursue employment in the STEM field.

Comment #7:

In NY State our Vocational Rehabilitation program (ACCES-VR) is now able to provide paid, short-term (approximately 1 month) work experience to youth in high school and college in a competitive employment environment. The employer is reimbursed for the wages although they are still responsible for Worker's Compensation insurance. We have found this to be successful in encouraging some employers to consider our youth for real work experiences. But it's not the answer for everyone. I agree that we need to market the reality to employers that employees with disabilities are an ASSET rather than a LIABILITY.

Comment #8:

Thank you kwilcox2! Feel free to share more about ACCES-VR and some success stories involving students and employers.

Comment #9:

I have seen some interesting programs that use project-based learning. Since these projects are supposed to be real-world, would it be possible for companies to support students in developing their projects? For example, they could volunteer engineering and/or manufacturing resources to develop models or prototypes. This way they could encourage young students, who are too young to be “hired”.

Big Picture Learning (<http://www.bigpicture.org/schools/>)

4. Learning must be based on the interests and goals of each student;
5. A student’s curriculum must be relevant to people and places that exist in the real world;
6. A student’s abilities must be authentically measured by the quality of her or his work.

EdVisions Schools (<http://edvisionschools.org/>)

3. Approach to teaching and learning focuses on highly personalized learning in full-time advisories
4. Students learn through rigorous, engaging projects, driven by student interest and connected to the real world.

Comment #10:

Hi Tom, these are intriguing ideas. This reminds me of how various companies and organizations have competitions or a call for crowdsourcing solutions to a specific problem/issue. Thank you of your participation!

**Top Training Idea #2: Collaboration among career counselors & disability services**

12 Up Votes | 0 Down Votes | 12 Net Votes

Just came across this last week and it seems like a very innovative idea that echoes many comments in this dialogue by various participants:

“Elevator Pitch Contest” to help students build presentation skills about their abilities. The organizing team included career counselors and disability service providers at local colleges, and two college students with disabilities. Organized by DO-IT (Disabilities, Opportunities, Internetworking, and Technology).

For more:

<http://csne-erc.org/engage-enable/post/elevator-pitch-contest-helps-prepare-stem-students-disabilities-employment>

Thoughts?

### **Top Training Idea #3: Mentoring and Career Development for Graduate Study**

10 Up Votes | 0 Down Votes | 10 Net Votes

As a graduate student with an invisible disabilities, I have found that what has hindered my career in STEM the most are two things: the lack of mentors with disabilities and tailored career development. The majority of STEM training at the graduate level assumes able-bodied functioning. The trainers are, by presentation, predominately able-bodied as well. Given the academic setting, these trainers, while able to serve as research mentors, are unable to serve as career mentors who are able to address issues specific to students with disabilities interested in pursuing a STEM career.

Most universities have career services centers and disability services centers. These programs can work, in conjunction with STEM departments, to develop a program to support STEM students as they progress through their training. The career development goal would be to identify STEM careers that can be performed at varying levels of disability and also build relationships with institutions and employers that are known for supporting employees with disabilities.

A mentoring program could "easily" be developed with the efforts of disability services, academic departments, and schools/faculties. Self-identified students with disabilities would be matched with professors who identify themselves with disabilities for career and life mentoring. Given that self-disclosure can be challenging for professionals, professors would be ensured that their status would not go beyond the program if they so wish. The mentoring relationship would last for as long as it took the student to complete the degree.

There is a significant dearth of consideration for disabilities at the graduate level in STEM education. As I reach the end of my doctoral program and consider my future career(s), I feel that mentoring and career development specific to working with disabilities have been lacking the most. As the beneficiary of programs developed for other underrepresented groups in STEM, I know that it is possible to build a supportive structure. However, it requires effort from everyone involved, from the federal government to the individual institutions, and all the people within them.

#### Comment #1:

Thank you very much for sharing your story, Cginpvd. One recurring theme that you and other participants mentioned is the need for greater coordination among educators, career services centers and disability services centers. Another major issue raised is the need for self-identified mentors and students. With so few 'visible' and 'out' professionals w/ disabilities working in STEM, it is difficult to have mentors available for students and adult learners interested in STEM. Can you suggest any changes to STEM workplace cultures and practices that would make conditions more welcoming for people w/ disabilities (invisible and visible)? It's almost a chicken-and-egg situation where mentorship can't happen without people who are open to self-identifying in their respective fields. Looking forward to hearing more of your ideas.

Comment #2:

"It's almost a chicken-and-egg situation where mentorship can't happen without people who are open to self-identifying in their respective fields"

And extending this, who are out. Mentorship is valuable, and I totally agree with Cginpvd, but the lack of out older (or more experienced/established/already successful - whatever qualifier you want to put there) academics makes it harder to say "oh, I see people like me in this field".

Starting that conversation and encouraging people to be more public with their identities and experiences might be useful not just in its own right, but in creating more opportunities for mentorship relationships to develop.

Comment #3:

Have to qualify that I can only speak to my experiences in the biomedical sciences, not STEM at large. I believe the culture of success via suffering is one of the barriers to participation of people with disabilities. The idea that one must work the longest hours, seven days a week to be recognized as a good contributor. Or put up with workspaces that could easily be accommodated, but don't want to rock the boat. This is rather untenable for those without disabilities, given the increase in "work/life" balance discussions. A broad movement toward prioritizing quantifiable contribution, rather than time clocked or blending in would be a start. Then people with disabilities may not be penalized or be considered "not a team player" because their personal needs sometimes have to come first.

In regard to encouraging more openness regarding disability and building mentorship networks - I think there are some models that can be adapted from other groups who have had similar issues. Underrepresented minorities suffered from low numbers of visible "like me" mentors, and LGBTQ students as well. Things are far from perfect for mentorship with those groups. However, I think they are a good model because they required two things to develop: individuals both within and outside who were able to step out, and a commitment to systemic change, at least on an institutional basis. On the individual level, we need to create safe spaces for people to be comfortable within which people can feel comfortable with their identity and know each other. There is no community in most STEM spaces. I think future mentors would emerge from this model. For current mentors though, it would probably take more effort. Perhaps established researchers could be given a carrot of sorts to lure them out, to try and mitigate ill effects (hopefully few). Allies would be huge, huge, huge. I know that they can be problematic in many "minority" spheres, but nothing seems to change, even on an individual level, without out-group advocates.

Just a start.

Comment #4:

Thank you for your thoughts, ismith and cginpvd. This is something that is common in many fields, especially academia where it's a bit of a 'rat race,' a constant need to produce and compete. Perhaps we could extend the discussion of work/life balance that many people associate with working parents and include people with disabilities who need flextime and a reconceptualization of productivity.

Having safe spaces where people can support one another is incredibly important and a good start to encouraging people to be more 'out' in their workplaces. I also agree that having allies outside who can call-out on various practices can be helpful.

Comment #5:

I agree with the initial statements that there needs to be a stronger link between the disability service centers, professors and employers. I believe strengthening that link could provide a greater sense of community, an ease of transition from education into the workforce, and could establish long-lasting partnerships and relationships that would yield benefits for everyone involved.

**Top Training Idea #4: Of possible interest: Free upcoming webinar**

3 Up Votes | 0 Down Votes | 3 Net Votes

We invite you to join us for the DIAGRAM Center's upcoming free Webinar: "New Models for Creating Accessible Interactive Widgets for STEM Learning" on Thursday, August 7, 2014 at 11:00 a.m. Pacific (2:00 p.m. Eastern; 19:00 GMT). The webinar will be presented by NCAM's Madeleine Rothberg, and Kyle Keane from Wolfram Research, and you can register using the link included here: <http://diagramcenter.org/webinars.html>

**Top Training Idea #5: Major Worker Group & Cost Cutting Industries**

1 Up Votes | 0 Down Votes | 1 Net Votes

STEM is not the answer if leads to repetitive unemployment resulting from unstable markets. This topic really about labor markets because all the education, training and accessibility is for naught if jobs are limited or not available.

It has been a firefight to stay employed in a STEM career. I started my career as a nurse but was not allowed to get licensed due to newly legislated physical requirements. Timing as today many of those physical requirements do not exist.

I Changed careers in (S) Science and move into chemistry but soon those jobs moved offshore and many chemists in the US were out of work. As a person with a disability it is difficult at best to compete for jobs when an industry is stable so when the industry workforce becomes unstable via off-shoring or other labor cost cutting measures, it is almost impossible to secure a job.

I changed careers a third time and moved into the (T) Technology field and eventually acquired another degree. That job field was gutted and continues to be gutted by the off-shoring or on-shoring with foreign workers for technology jobs. Many qualified candidates have left this field in droves.

I have considered changing careers a fourth time possibly moving into Engineering (E) but those jobs have been heavily impacted by off-shoring as well. I know of one PWD who committed suicide because they could not find work as an engineer.

### **Top Ideas Submitted for the Topic “Accessible Workplace Settings”:**

#### **Top Accessible Workplace Settings Idea #1: Use Project SEARCH's methods!**

8 Up Votes | 0 Down Votes | 8 Net Votes

Use Project SEARCH's methods!

#### **Top Accessible Workplace Settings Idea #2: Employers need education on the ADA**

8 Up Votes | 0 Down Votes | 8 Net Votes

I am writing on behalf of one of my students with disabilities. He says that one of the barriers to getting a job is that the employers are unfamiliar with ADA requirements, and that some of the paperwork for ADA says that anyone with a disability has to have adaptive equipment to fulfill the requirement for the job. Many employers are unaware of this, do not have the paperwork, or are unwilling to provide the assistive technology, according to this student.

Therefore, the recommendation would be to tie some sort of benefit to successful completion of ADA awareness by employers. Most have good hearts, and want to help, but don't know how, and ADA education for employers would be a good thing, according to this student.

He noticed that when he went in for interviews, some would ask after they interviewed him, how they could help him. (Note by Sharon Austin: This is not specific to STEM, but it is a first step. To make an employer a good candidate for STEM jobs, the employer would have to take an additional step of ensuring that STEM-specific software is also accessible...no small feat).

#### **Top Accessible Workplace Settings Idea #3: Employment System**

7 Up Votes | 0 Down Votes | 7 Net Votes

The problem is that employment full time and with benefits is hard to find in some areas. There is a preconceive that people with disabilities are not employable and government will provide for them. If a person is disabled seeking full time employment is taking a job away from non-disabled. Also the workplace accommodations are going be super expensive. In some cases this true but most it is not.

For example I applied at a company with locations in the United States and Canada. I check back with the company the positions for the most part under consideration are positions in Canada.

In all honesty Canada has the desired infrastructure such as universal health care, mass transit, and support systems and comparing to that the US falls short.

If US is serious about STEM it needs to invest in Infrastructure that benefits the disabled and non-disabled. As tech area US has shown no interest in employing disabled and has always looking for cheap source of labor. The piecemeal approach will end up hurting the United States.

Looking at lawsuits that women in IT brought up against the Silicon Valley. Lawsuit about the Visa cards to work in IT vacuum.

#### **Top Accessible Workplace Settings Idea #4: Adjust Work Schedule**

7 Up Votes | 0 Down Votes | 7 Net Votes

There are many talented PWD, educated in STEM fields, who can work, but not for eight hours at a time. Very often work is physically demanding because of attendant illnesses. If a work schedule could be adjusted, that alone would provide an environment by which a PWD could be employed.

For example, my student says that sometimes, while working, he will encounter spasms, and has to stop work. If schedules could be accommodated, then that alone would enable PWD employment.

#### **Top Accessible Workplace Settings Idea #5: Employers Partnering with Advocacy Groups**

6 Up Votes | 0 Down Votes | 6 Net Votes

This is an article about a startup, Ultra Testing, a software-testing firm. Some excerpts from the article:

"ULTRA Testing was founded in 2012 by a pair of former MIT roommates, Rajesh Anandan and Art Sheckman. Anandan, who also works as SVP of strategic partnerships for the global charity UNICEF, has always believed that people with disabilities are likely to have hidden talents that others fail to notice.

"Even in a best-case scenario where you have a protective family and an inclusive education system, when kids age out, there are no jobs, there is no opportunity, and if you're not from an affluent family, it's really bad news," Anandan said.

Anandan and Sheckman founded ULTRA Testing on the belief that many of the same attributes that make traditional workplace settings difficult for members of its talent pool also make them the perfect candidates for quality assurance jobs, where finding something out of place is not a nuisance but an essential part of the job."

They post job openings with advocacy groups like the Asperger Syndrome Training & Employment Partnership (ASTEP). Might this be an idea to encourage the employment of people with disabilities in STEM?

[http://www.slate.com/blogs/business\\_insider/2014/07/27/ultra\\_testing\\_an\\_mit\\_graduate\\_founded\\_software\\_testing\\_startup\\_hires\\_autistic.html](http://www.slate.com/blogs/business_insider/2014/07/27/ultra_testing_an_mit_graduate_founded_software_testing_startup_hires_autistic.html)

**Idea under the Topic “Additional Input”:**

**Idea: LET'S GET REAL**

For whatever the reason for your disability is not important- you are a person. If you keep on living your body is going to change if it has not already. This is not for a select group of people this is for everybody who has a breath in them. If you are young you are voted for your time as an older adult.....if you are older than you are voting for the here and now. We have family and friends who need a decent job and holding them back because of a disability is insane. We need the latest technology and real training so we can participate in the professional world; in whatever field we would like to be in. Whatever is out there help us with it; and let us show you who we really are!!!

## **Conclusion**

Through the *“Encouraging People with Disabilities to Pursue Careers in STEM (Science, Technology, Engineering and Mathematics)”* online dialogue, NCD and ODEP successfully leveraged leading-edge crowdsourcing tools to engage the stakeholder community and citizens and gather ideas to help improve the support and accessibility of STEM opportunities for people with disabilities. Through idea submission, commenting and voting, this community driven event allowed individuals with disabilities, educators, employers and others, to contribute to the conversation and also served as an outreach and awareness tool for the issue of disability employment.

This modernized approach to gathering stakeholder feedback encouraged resourceful thinking and will help NCD and ODEP share creative ways to support and encourage the growth of STEM opportunities for everyone, including people with disabilities, as well as to further collaborate with stakeholders to opportunities exist in the STEM fields. This metrics report simply summarizes the online dialogue’s results; the input and responses of the participants are now being analyzed by the NCD-ODEP Team.