Teaching Problem Solving and Critical Thinking Skills in an Inclusion Classroom

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Abstract

Teaching critical thinking and problem solving skills in any classroom is crucial to the success of the students in that classroom. Students need to learn these skills at an early age to be academically and professionally successful in the future. In an inclusion classroom, these skills are even more important for the academic future of every general and special education student. First, teachers must understand the definition of problem solving and critical thinking skills and what these skills look like in an elementary classroom. Then, teachers need to learn different strategies to teach both of these crucial skills in a general and a special education classroom. Lastly, teachers should combine those strategies and try many of them in the classroom. Research in several educational journals and from a variety of gifted teachers shows the variety of strategies to work the best in inclusion and general education classrooms all over the country.

Teaching Problem Solving and Critical Thinking Skills in an Inclusion Classroom

Introduction

Problem solving and critical thinking are two very important skills; yet oftentimes, these skills are overlooked in the public school curriculum around the nation, specifically in inclusion curriculum (Agran et al., 2002). Children are expected to learn these vital abilities without actually being taught how to properly problem solve or critically think. These are not skills that are innate or instinctive, but they are crucial to the learning process for all children (Agran et al., 2002). The best way to ensure that our students are developing these crucial skills is to teach them at a young age, in the elementary classroom. Not only is it important to teach these skills at a young age, but also to continue to hone and cultivate a stronger sense of problem solving and critical thinking right through high school and into college and beyond. These skills should never grow dull or become inactive within any child. The job of the teacher is to sharpen and develop those skills by continually challenging the students and pushing them to strive to be the best they can be in their academic studies.

Yet teachers have another task to tackle. Teachers have disparate groups of students to whom they must teach problem solving and critical think, including typically developing students and students with disabilities or developmental delays. These children are just as important in any classroom as the children who are on grade level or who do not have learning disabilities. Each child matters. So how does a teacher modify instruction to ensure that every single child in his or her classroom can learn these difficult yet necessary lessons? Throughout this thesis, the author will explore the different strategies to teach problem solving and critical thinking in the inclusion

classrooms that are being tested by excellent teachers all over the country. No child will be left behind in these important areas of learning. Every student is important and has the right to be educated in all areas of the curriculum, not just the content of math or history. Children need these skills to better survive in the world around them. Problem solving and critical thinking will impact the future of our industries, our companies, our politics, our diplomacy, and our nation (Cote et al., 2014).

What is Problem Solving and Why is it Important in an Elementary Classroom

Problem solving is a phrase that many have heard, but its meaning is somewhat ambiguous. Some think it is the ability to solve word problems in a mathematics class, but it is so much more than that. It involves the ability to think through a situation and provide a feasible and efficient solution to that problem. Students must narrow the solutions and make the best choice for that particular problem (Giangreco, Cloninger, Dennis, & Edelman, 1994). Problem solving is a very important skill to learn and to have for life. The real question that follows this statement is when and how do teachers teach it? Research suggests that the elementary classroom is an excellent place to begin teaching problem solving skills (Griffin & Jitendra, 2009). Children are sponges at that age and they are ready to accept and soak up any and all information a teacher can offer. Thus, even at a young age teachers should take advantage of these vital stages of development in their students and provide them with the background knowledge and the tools to problem solve.

Woodward et al. (2012) define problem solving as “movement from a given state to a goal state with no obvious way or method for getting from one to the other” (p. 7). This definition does not allow for the aspect of mathematics which includes outlining a

solution. Problem solving is not simply a good use of the "guess and check" method. It does not allow for short-cuts or rote memorization of how to solve a particular problem, nor should its definition. Problem solving does include using reasoning and multiple pathways to arrive at one or more solutions. This definition allows for multiple answers to one problem. It allows students to focus on the process rather than the final product (Woodward et al., 2012).

By combining all of these definitions, the full and inclusive meaning of problem solving can come to light. "Problem solving involves reasoning and analysis, argument construction, and the development of innovative strategies" (Woodward et al., 2012, p. 6). In this definition of problem solving, the skills mentioned relate to many different forms of mathematics that are present from kindergarten through high school and onto the college level. Therefore, it is imperative to teach the skill of problem solving to young students since they will use it for the rest of their academic careers and beyond school into their adult careers as well. According to research done among children throughout the nation, "[s]tudents who develop proficiency in mathematical problem solving early are better prepared for advanced mathematics and other complex problem-solving tasks" (Woodward et al., 2012, p. 6).

When teachers begin to attack the challenge of teaching problem solving in the classroom, they should keep four main ideas in mind. First, this skill can be learned and can also be taught. Second, all children are all unique and learn differently so teaching this skill should be adapted based on the individuals within the classroom. Third, problem solving should be introduced within the context of the curriculum and core content; it is not a stand-alone topic. Fourth, teachers should include many different routes to a

solution, not just one, cookie-cutter routine. Students need to be exposed to the many twists and turns of solving a problem, not just the fastest way to an answer (Woodward et al., 2012). By keeping these four simple truths in mind while teaching the skill of problem solving, teachers can better teach and students can better learn different ways to solve a problem instead of struggling with it later on in their academic or professional careers.

In a typical elementary classroom, the common way to teach problem solving is through the use of word problems. However, using simple word problems does not necessarily teach students how to use the skill of problem solving extremely well. Often, it just reinforces a short-cut or a memorization of rules to solve that particular type of problem. “They are learning to blindly follow direction, to rotely manipulate figures, to ‘mindlessly’ do what they think they’re supposed to do” (Paul, Binker, & Weil, 1995, p. 277). So the teacher’s job is to reinforce the route to the solution instead of the solution itself. Children today are so concerned with getting the right answer or getting a good grade that the process can be overlooked. Without learning the process, the child is missing the crucial element of the word problem. When a real problem presents itself and does not use any key words or have all of the variables laid out in black and white, how will the child be able to solve it? In the elementary classroom, teachers have the amazing opportunity to expose their students to word problems that are not so straightforward. They can learn the skills they need without a job offer on the line or the fate of the world on their shoulders. Students will be able to gain the problem solving skills they need for the future life-and-death situations that will arise as they age.

Problem solving also includes a collaboration aspect that most teachers overlook. In the classroom, students are often asked to solve problems alone. This could be to avoid cheating or to ensure that each student individual is understanding the material. However, in today's world, collaboration is a large part of problem solving. Viewing a problem together and trying different and unique ideas to solve that problem are a crucial part of this skill. Students should be exposed to collaboration at young age, especially in mathematics. They should learn that is not a bad thing to ask others for help or input as they go about studying and learning. The Communication Standard portion of the NCTM insists that students "use communication skills for organizing mathematical thinking, sharing ideas coherently and clearly with others, analyzing and evaluating the mathematical thinking of others, and expressing mathematical ideas precisely" (Berry & Kim, 2008, p. 363). In order to meet this standard, teachers should provide ample opportunity for students to collaborate and share with each other to solve problems that are not typically found in a standard mathematical textbook. Teachers should be challenging their students to delve deeper and work harder to find the answers instead of how to locate key words just to get the correct answer. Problem solving is a crucial skill for all ages. If the teachers equip their students at a young age to think meticulously and critically through problems at a lower level, they will be better prepared in the future to ace academic testing, pass painful college exams, and thrive through all of life's callous crises.

What is critical thinking and Why it is Important in an Elementary Classroom

Critical thinking is another buzzword in the world of education. State and national standards urge teachers to create and foster an environment where students can learn to

think critically about the content in their lessons and about the world around them. But what does this mean? Critical thinking is a skill that involves analyzing and evaluating data about a certain subject and creating a valid opinion or judgment about that data. Children are not born with an innate ability to do this difficult task, so it is up to the teachers to provide them with the skills, knowledge, and training. However, today in the schools, teachers tend to avoid this subject, especially in the lower grades, because of the challenge that accompanies teaching it. Teachers in high schools might assume that the students can already think critically so they do not spend the class time to teach it (Cotton, 1991). Most of the time, the children learn this skill in high school or even college. They use a misguided or misconstrued version of critical thinking for most of their lives. Instead of forcing them to learn this skill in a matter of months in high school, teachers should focus on teaching critical thinking in the elementary grades. Yes, it would be a simplified version, but it will get the students into the practice of approaching a problem by thinking through all the factors, facets, and consequences before arriving a valid solution.

The definition of critical thinking is a very fluid one. It includes many parts and is constantly changing. Many define it as the ability to use the higher levels of Bloom's Taxonomy which include analysis, synthesis, and evaluation of information (Armstrong, 2016). Some define it as the ability to use evidence to support beliefs and conclusions (Cotton, 1991). While all of these definitions are part of critical thinking, it goes beyond simple evidence or analyzing information. Critical thinking is "[t]he process of determining the authenticity, accuracy, or value of something; characterized by the ability to seek reasons and alternatives, perceive the total situation, and change one's view based

on evidence. Also called "logical" thinking and "analytical" thinking" (Cotton, 1991, p. 2). This definition incorporates all aspects of thinking and uses of the mind. It includes the use of logic and evidence, as well as the synthesis and analysis of data or information.

Teachers often struggle with the concept of critical thinking at the elementary level. They believe it is too hard to teach or too complex for children in the elementary age group to understand. However, a closer inspection of the skills under the umbrella of critical thinking leads researchers and teachers to think again. Instead of being able to understand the material, the teachers struggle with how to apply the skills within their curriculum. Ideally, teachers should model critical thinking to their students instead of focusing on teaching the skill itself. "[T]eachers who think critically about their own instruction and use their own critiques to develop remodeled lessons that foster critical thinking" (Paul, 1995, p. 446) should be the goal in every classroom.

Critical thinking also goes hand-in-hand with problem solving. When given a problem, students should be thinking critically about the solution. Problems force children to analyze and evaluate the data that has been presented in order to come up with a viable solution (Schneider, 2002). By learning this skill at an early age, it will equip them for better problem solving in the rest of their lives. Yet just like problem solving, critical thinking skills should be taught alongside the content, not out of context. Critical thinking is not a formula to follow or a skill that is placed on a résumé, it is a combination of metacognition and problem solving skills that are learned in the proper context of content and the curriculum as a whole (Schneider, 2002).

Another large component of critical thinking is communication (Mărcuţ, 2005). Students should be able to verbalize and explain their thinking processes. When

presented with a problem, students need to communicate with one another, with the teacher, and ultimately with themselves to fully understand the process of reaching the solution, not just the solution itself. Some children have exceptional math minds while others tend to struggle with the abstract concepts. In a group situation, the stronger ones can help the weaker ones. They manipulate the data together and help each other to reach a solution. Collaboration and communication are a crucial part in critical thinking and are both easily understood at a young age. The sooner teachers can get their students to collaborate and communicate, the stronger those students will be as they grow older and more difficult problems arise (Mărcuţ, 2005).

Critical thinking is a crucial component of the elementary classroom (Cotton, 1991). Children are not too young or too underdeveloped to learn this vital skill. By providing well-worded problems and strategic challenges, students can learn to use their minds to evaluate and analyze information without ever hearing the words “critical thinking.” Teachers should challenge their students to think outside the box, to experiment, and to explore every possibility. Group work and a variety of examples can help children at all developmental stages grow and learn to communicate their ideas to each other and back to the teacher. They will use these skills of collaboration, communication, and critical thinking for the rest of their academic careers. It is beneficial to the students to learn this skill early. Standardized tests are loaded with problems carefully selected to weed out the individuals who did not learn critical thinking and problem solving. The main goal of teaching should be to better each student and prepare them for the world that they will face when they graduate. The lessons students learn at a young age are more likely to stick with them and follow them wherever they go in the

future. Teachers should seek to prepare the future doctors and lawyers, designers and laborers, dentists and lunch ladies, to critically think in every situation.

The Push for Inclusion Classrooms Today

Today, in the U.S., the push for classrooms to become inclusion classrooms is greater than ever. Legislation toward this end is becoming ingrained in laws all over the country, in different states as well as at the federal level. All children can learn and all children have the right to learn. For many years, children who were "different" were pushed off to the side or enrolled in "special schools" where the teachers were not as well trained in differentiated instruction and the students were deprived of a decent and free education. Today, the schools are desegregated, allowing both whites and blacks to be educated together. Girls and boys are allowed into the same classrooms and are given the same education. Foreigners and aliens who are not U.S. citizens are welcomed into the public school systems and given equal opportunity to learn and grow. The only group left out was the children with disabilities. For years, these children were shipped off to restrictive care facilities or put into a resource room for the entire school day, isolated from their peers and forced into a restrictive environment. Educators and advocates worked diligently to get these children the help and education they deserved. Legislation was passed called the Individuals with Disabilities Education Act. Now, children with learning disabilities are being placed into the general education classroom. IDEA states that:

> children with disabilities and the families of such children [should have] access to a free appropriate public education and [to] improving educational results for children with disabilities…Almost 30 years of research and experience has

> demonstrated that the education of children with disabilities can be made more effective by— having high expectations for such children and ensuring their access to the general education curriculum in the regular classroom, to the maximum extent possible, in order to— meet developmental goals and, to the maximum extent possible, the challenging expectations that have been established for all children (IDEA, 2004).

However, the sad truth is that many teachers are not prepared to teach and modify instruction for these children. They are left out, pushed off to the side of the room, or handed along to the next teacher or the next classroom without getting the proper instruction and education that they need. But teachers can put a stop to this. By teaching every student critical thinking and problem solving skills, they will not be leaving these children behind. “Inclusion is based on the philosophy that all students with a disability have a right to be educated in the general education setting with appropriate support and services to enable them to succeed” (Green & Casale-Giannola, 2011, p. 3).

There are many advantages to having an inclusion classroom for children with disabilities. They are most exposed to different academic activities. They are more engaged and more likely to engage in academic instruction when placed into a classroom with their non-disabled peers. Typically developing children can also be role models to their peers with disabilities. They can correctly model academic and social behavior. Inclusion also helps to break down the stigmas and labels associated with children with special needs. They have the opportunity to grow and develop alongside other children. No longer are they isolated and left to learn alone (Lock, 2015).

There are also many advantages for children who are general education students. Inclusion helps to erase the differences and make the children more familiar with the disabilities and the people underneath the label. It can help ease the fear or anxiety of dealing with another child with a disability. Inclusion can also bring about more classroom leadership and mentoring challenges to the general education students. They can learn more about being in the real world and how to deal with all different types of people (Berg, 2004).

Teachers also can benefit from an inclusion style classroom. They can become more aware and knowledgeable about the different disabilities and can help to overcome prejudice and stereotypes. They can also learn the value and importance of teamwork and collaboration as they work with the special education teachers, therapists, and others involved in that child's education. Overall, there are many advantages to inclusion for all parties involved in the classroom (Berg, 2004).

However, there are some difficulties for the students and teachers in an inclusion classroom. For some students, the social aspect of inclusion takes precedent over the academic or educational aspect. Children can get caught up in playing or goofing around throughout the day instead of focusing on their studies. There are more distractions within a general education classroom that can be more detrimental than beneficial to students with disabilities. They also may not get the amount of one-on-one attention from the teacher that they require because of their disability. The class sizes tend to be larger and allow for more individual learning in a regular education classroom. Also, because of the stigma, children with disabilities can be easy targets for bullies or teasing. This can be

harmful for any student and can lead to depression, anxiety, bad grades, or emotional suffering (Berg, 2004).

Some problems for the regular education students manifest themselves as well. Regular education students may have to sacrifice the attention of the classroom teacher who may have to attend to the children with special needs. There can be resentment or hatred towards these children because of the special attention or help that they might receive. Inclusion can also lead to disruption within the classroom depending on the child and the disability. Sometimes it can be more a distraction than a helpful endeavor for all students (Berg, 2004).

Teachers can also struggle within inclusion classrooms. Fear often manifests itself in teachers because they feel they are not well trained or that they might do more damage than good for the child. Many teachers are also not ready to collaborate or give up their classrooms to other teachers or assistants. It can be hard to change after many years of teaching one way. Sometimes, there is also a lack of resources, training, or proper assistance in the classroom to fully support inclusion (Berg, 2004).

Inclusion does have disadvantages and advantages and teachers need to be prepared to deal with all of them. Since most classrooms are following an inclusion format, teachers need to be able to modify and adapt their curriculum, instruction, and delivery to reach every child in their classrooms (Obiakor, et al., 2012). This modification includes teaching problem solving and critical thinking skills to children with special needs. Both of those skills are crucial to the academic success of children with disabilities. If they are able to learn these skills, not only will they do well academically, but they will also succeed socially and at higher academic levels.

How to teach these skills in an elementary classroom

There are many different lines of thought on how to teach problem solving and critical thinking in an elementary classroom. These skills are crucial, especially in the mathematics courses. Math builds on itself as the children advance to the next grade levels. Without these basic skills, students will fall to the wayside, unable to continue or understand math as they move on into high school and beyond. Many children and adults struggle with math, simply because they were never taught how to think critically about a problem or walk step by step through the challenge to come up with a viable solution. Several different strategies are being implemented in classrooms around the U.S. that are based on evidence and research. Each strategy has been tested and proved helpful for students in all different stages of development and areas of content. These strategies listed and described below are used most commonly for mathematical problem solving and critical thinking. However, if implemented correctly, the concepts and ideas can be used across the different content areas.

Scaffolding is helping a child to make the transition between what they can already do or already know to learning new information or new methods. There are currently two methods that help teachers better understand scaffolding and better help the students make that transition. One method is the knowledge transmission model. This model believes that students are empty vessels into which the teacher must pour knowledge of content and competence. Teachers have the responsibility of directly instructing students in the content and how to analyze the content. The other method is the instructional conservation model. This model focuses on teacher-student collaboration and interactive learning models to ensure that students do a majority of the learning on

their own. Instead of focusing on the cut-and-dry content, this model explores "how" to learn instead of "what" to learn. Strategic competence allows the student to take what he or she has learned in the classroom and transfer it to the real world and real life situations (Silliman, et al., 2000).

Classroom environment plays a major role in teaching the skills of critical thinking and problem solving. If the students are not provided with opportunities to practice or learn these skills, they will not be good critical thinkers or problem solvers. In order to foster a thinking-friendly classroom environment, teachers must make their classroom a safe space where children can ask questions without fear or anxiety. Teachers should encourage scenarios that allow for more than one correct answer and more than one solution to a problem. Instructional practices over multiple subjects and in multiple contexts allow students to problem solve and critically think within the safety of the classroom. In the same way, teachers should ask good questions that make students think instead of reciting answers. Teachers should encourage students to look for patterns and identify links throughout the content and across subject lines. If children are able to do this, they will be able to link their newfound knowledge to real world situations (Mathews & Lowe, 2011).

A great tool to connect the concepts and ideas taught in the classroom is the word problem. A good strategy to develop good critical thinkers and problem solver is to use both routine and non-routine story problems in the classroom. Routine story problems use familiar methods or can be solved by using certain step-by-step processes. Non-routine story problems are not as predictable and force students to think outside the box in order to solve them. By using both of these types of problems, teachers can facilitate an

environment of collaboration and critical thinking in the classroom as well as at home. Students are able to learn how to solve a straightforward problem, but also be stretched and challenged to look for their own patterns or hidden meanings in the problems. (Woodward et al., 2012)

Sometimes, a simple remodel is all a teacher needs to implement critical thinking or problem solving into an already existing lesson. By including a time for asking critical questions or allowing the students to make inferences at the end of the lesson, students are practicing using their critical thinking skills. They should make the most of those teachable moments. A teacher can monopolize on any opportunity to use critical thinking or problem solving skills. Teachers can model how to infer correctly and incorrectly instead of waiting for a student to make a mistake. Modeling correct critical thinking or problem solving skills is a great teaching moment. Role play is an excellent way to model these concepts for students. Teachers can make up common learning situations and walk the students carefully through them. Students can be included in these role plays by offering suggestions to fix the problems or even coming up with different scenarios for the teacher to discuss. Incorporating a discussion of real world events connected to the topic at hand is a clever way to slip critical thinking into any lesson plan (Paul, 1995).

Another great strategy to use in the classroom is active learning. “Active Learning is the intentional opportunity for students to engage in the learning process. It connects learners to the content through movement, reflection, or discussion, making students the center of the learning process as they take the initiative to learn. It can be behavioral and/or cognitive, supporting a variety of instructional objectives from recall through synthesis” (Green & Casale-Giannola, 2011, p. 4-5). This approach put the students in the

driver's seat and allows them to do the problem solving and critical thinking mostly on their own with little to no help from the teacher. However, the teacher must provide the active learning experience that will test and challenge the students to use those skills. Students are most apt to remember and to engage if they are doing an activity or moving around the classroom instead of listening to a lecture. This model urges teachers to push students past the lower levels of Bloom's Taxonomy like knowledge or understanding to explore the higher orders of thinking like analysis, synthesis, and evaluation (Armstrong, 2016). In order for active learning to become a helpful strategy to teach these skills, the activities must be connected to specific learning objectives within the content areas (Green & Casale-Giannola, 2011).

A simple way for young children to learn to critically think is the use of brainstorming. Children can look at pictures or covers of books and make inferences about the book. They can draw conclusions and look for patterns in math worksheets. Thinking out loud as a group can always facilitate a discussion about why they think the things they do. Even at a young age, brainstorming is a gateway for critical thinking (Schneider, 2002). Students can also learn critical thinking and problem solving by simply comparing and contrasting. "Encourage students to look closely at details and to think about the purpose and significance of each one" (p. 2). Brainstorming allows children to begin to notice patterns and think logically and critically about how things are alike and different. Categorizing items also helps children learn to critically think. They can pinpoint which thing is not like the others and explain why to show that they are thinking about the details of each object.

Encouraging creativity is a great way to increase critical thinking and problem solving in young children. Teachers should provide a variety of choices for the children during activities or experiments and have them choose which they think will work best. Allow for trial and error so that the children can learn from their mistakes. "[Students] must consider the possibilities and limitations of the materials provided. They must consider and evaluation their own fine motor strengths and weaknesses. They must make a plan, test it, and come up with a solution" (Schneider, 2002, p. 2). Teachers should allow students to delve into the activity on their own and allow them to make up their own activities or change the original. Creativity and inquisitiveness often foster a good critical thinker and problem solver (Schneider, 2002).

When going through the different types of problems, teachers should be prompting the students in the right direction at first. They can help by asking the right types of questions to get the students thinking. Soon, the students will be asking these questions on their own and monitoring their own progress through the difficult solutions steps. Walking the students through examples and modeling good critical thinking can also help them better understand what it looks like to solve problems well. Constantly asking students to explain their actions will better their communication as well as force them to think before they act on or solve problems.

A great way to help children become better problem solvers is to teach students how to use different types of visual representations. By drawing a diagram or making a graph, the data can be easily seen and the patterns can be easily identified. However, the teacher should make sure that the students know when to use different visual representations. Showing change over time in a bar graph does not work, but neither does

displaying categories in a line graph. Students also need to be able to convert the visual representation back into mathematical notation so that their conclusions can be understood by all. These simple strategies help students to communicate their critical thinking to others around them (Woodward et al., 2012).

The best way to ensure that students are good critical thinkers is by introducing them to the different methods for arriving at a solution. Teachers should take one problem and solve it using different methods in front of the class to show that some problems can be solved using different strategies. If students use different methods to solve a homework problem, show how both are correct. Students can then see that as long as they think through the problem and defend with mathematical reasoning and logic, they can also get the right answer and the same answer as a different classmate. Sometimes, students will try to use a method that does not work, even though it seems logical to them. Teachers should use this opportunity to teach the correct logic, or prove the method wrong by showing a counterexample. Students like to find "short cuts" and many times the short cut will only yield a correct answer sometimes. By using counter examples, students can see where their logic was flawed and will think critically next time a problem manifests itself. Using various methods to solve a problem also encourages collaboration and introduces several ways to check an answer once one solution has been reached (Woodward et al., 2012).

Lastly, teachers should show students how to recognize and articulate mathematical concept and notation. As children get older, the mathematical notations and concepts get harder and more complex. Students need to be confident in their notation at a young age. By asking children to explain themselves and then put that explanation in

mathematical notations, the teachers are actually pushing them to be better critical thinkers (Woodward et al., 2012).

Strategies for teaching problem solving to children with disabilities

While all of these strategies can be useful in a general education classroom, the push for inclusion leaves teachers searching for new and different ways to teach problem solving and critical thinking to children with disabilities that are new to their classrooms. These children are often left behind or struggle in school as they get older and the content becomes more rigorous. Teachers should spend the time to differentiate instruction to ensure that these students are getting the skills and the tools that they need so that they will better succeed in all of their educational endeavors in the future. This will definitely look different for every child, but there are strategies that are being implemented by teachers in the general curriculum and in the special education curriculum that would be worth investigating. Problem solving, especially, is a valuable skill, one that the students can build on and use for the rest of their lives. By ensuring that these children with disabilities are equipped with the skill to problem solve, teachers are giving them a key to a door that is full of opportunities. Yes, their brains work and process differently, but that does not mean that they cannot learn.

Word problems always enhance problem solving skills. However, the structure of the word problems needs to be altered to accommodate children with disabilities. Research suggests that strategy instruction helps students to become more successful in higher order thinking skills, which includes problem solving (Griffin & Jitenda, 2009). Children who have trouble problem solving can learn how to become better by exploring the different strategies instead of focusing on the solution. “Instructional strategies that

researchers have found to be consistently effective for teaching students who experience learning difficulties in mathematics include depicting problems visually and graphically, teaching math concepts and principles by using explicit instruction, and using peer-assisted learning activities during mathematics instruction" (Griffin & Jitenda, 2009, p. 188). Mathematics textbooks often focus on simple word problems that follow general strategic instruction. This theory is based on Pólya's four step problem solving procedure. Students should understand the problem, devise a plan, carry out the plan, and then look back and reflect (Griffin & Jitendra, 2009). By using these steps, children are able to break down a complex problem into smaller and easier to understand pieces. Students should make visual representations of the data to make it easier to digest and understand. Research shows that strategic instruction can help children with disabilities to become better problem solvers (Griffin & Jitendra, 2009).

Teacher talk is another helpful strategy in teaching problem solving to children with disabilities. A study performed by Baxter, Woodward, Voorhies, and Wong in 2002 focused on the impact of teacher and student discourse in the subject of mathematics on students with disabilities. "Over time, the teacher's discourse changed from mostly managing behavior and lesson flow to prompting mathematical reflections. Results for students with disabilities included increased participation in small groups and increased reporting out activities" (Berry & Kim, 2008, p. 365). Another study investigated the benefits of teaching the same content in different ways throughout the day. The results showed "significant differences in frequency of use for three categories: eliciting/questioning, responding, and evaluating" (Berry & Kim, 2008, p. 367). Teachers who ask more questions and evaluate often are more likely to see change and engagement

in children with disabilities. Asking questions and waiting for engagement are standard procedure in any classroom. However, in an inclusion classroom, questions are more likely to get all children to think and problem solve alongside the teacher.

Active learning is another great way to turn children with disabilities into good problem solvers. “Research has confirmed that student-centered, hands-on experiences improve construction of knowledge, comprehension, and the retention of content information” (Green & Casale-Giannola, 2011, p. 5). Children with disabilities can easily be distracted or unfocused because of the new and chaotic environment of a general education classroom. By incorporating many different opportunities to be hands-on in the learning process, the students will be engaged and maintain focus for longer periods of time, especially if the activity appeals to the student’s interests or curiosities. “Techniques include role playing, constructing, interpreting, preparing exhibits, processing, group work, and games. Active learning may also apply to inquiry modes of learning, which include such techniques as drawing conclusions, asking questions, and stating hypotheses” (Green & Casale-Giannola, 2011, p. 5). Even though activities are a great way to learn, teachers must be selective in the activities they choose. Several factors come into play when choosing the proper activity for a subject. Studies show that teachers should use cooperative, competitive, and individual activities. However, “[g]rade level, subject area, and characteristics of the teacher including years of teaching experience, focus on students’ interesting and development, and subjective experience of teaching all related to which individual activities were selected” (Durik & Eccles, 2006, p. 37). Teachers should take into account the needs of the students in their classrooms, both general and special education children and cater to each child’s need.

Brain-based learning is different for every child. This method focuses on the way that individual students process and learn new information. Since children with disabilities process information differently than the average learner in a general education classroom, it is imperative to differentiate based on the way that his or her brain works. For example, if a child struggles to make connections to abstract concepts, teachers can pair a physical activity or movement with a key word or phrase to ensure a connection is made. Teachers should allow students to teach each other and learn on their own. "Many of these [brain-based] strategies involve movement, which can cause the brain to release dopamine and noradrenalin, neurotransmitters that help learners feel better, increase energy levels, and assist their brain to store and retrieve information" (Green & Casale-Giannola, 2011, p. 40). These strategies are helpful in teaching in general education as well as inclusion style classrooms.

Another helpful method is station teaching. Station teaching allows small groups of student to work together and learn from each other. Each station has a different topic, game, or lesson for the children to do on their own. The teacher is simply the facilitator. Children with disabilities can be very engaged when given a hands-on activity, but this method also gives them a chance to learn from their peers and for their peers to help them (Schneider, 2002). Group work is crucial in understanding the value of collaboration in problem solving. "While working on it, the members of each group talked together, helped one another and appealed to the teacher when they needed help. Their endeavors and interest in understanding both the data and the requirements of the problem could be noticed, and they were all preoccupied by the understanding of the solution" (Marçut, 2005, p. 64). Stronger students can help weaker students and focus on the process rather

than the answer. They learn from each other and then can ultimately share their conclusions with the whole class.

Lastly, the step-by-step problem solving method can make a complex problem a little easier for a child with a disability while still teaching him or her how to correctly problem solve. Locke (2015) mentions that some recommend 6 steps, while others recommend 10. However, the consistency of finding routine or pattern builds a child's confidence when he or she is faced with solving the problem on his or her own. It is highly recommended that teachers walk through the steps with the child and have the child keep track of each step as the teacher goes through the problem. This makes the child feel included and also helps them to practice and memorize the steps (Lock, 2015). Also, teachers can simplify the original problems by "[a]ltering the type or amount of information presented to a student such as giving the student the answers to a story problem and allowing the student to explain how the answers were obtained" (para.17). This still teaches the child with disabilities how to problem solve, but in a different way than their general education peers.

These are just a few of tried and true strategies to incorporate problem solving skills into an everyday lesson in an inclusion classroom. By differentiating instruction and catering to the student's needs, students with disabilities can still learn and understand the value and importance of problem solving and carry it with them into the high school and college levels. Teachers need to know their students and try out many different methods before settling on one strategy. The mark of a good teacher is flexibility: when one strategy does not work, they must try, try again. Research suggests that "students identified problems, brainstormed possible solutions, self-set goals, and

maintained goals. This research emphasizes the importance of educators teaching students with autism how to problem solve starting at a young age" (Cote et al., 2014, p. 198). It is critical for children with disabilities to learn how to problem solve at a young age to help them become successful in the future.

Strategies for teaching critical thinking to children with disabilities

Critical thinking is just as important as problem solving. Without critical thinking, there would be no problem solving, so the two go hand-in-hand. Children with disabilities need to learn both of these skills in order to succeed in school and in life. Math is a great way to implement these skills. One must think critically when solving math problems. By focusing and honing educational instruction, children can be better adapted and prepared to think critically about a problem. These children must be taught and it is the teacher's job to impart this skill and concept to every single child in his or her classroom. No one is to be left behind, no one is to be forgotten, no one is to be neglected. Teaching critical thinking to a child with a disability is not going to be an easy task. His or her brain is a different universe to doctors, parents, and teachers. Yet, we cannot leave them behind. They have the abilities to learn and to think. God has given them the ability to reason and to think logically, it just might look different to everyone else. However, as a future teacher, I want to be prepared to teach every single child that could walk through my classroom door. It begins with learning simple strategies to ensure that no child is forgotten and that every child gets a chance to learn, to think, to dream, and to succeed.

While many teachers believe that the only way to teach critical thinking is through writing, many students struggle with expressing themselves through the written

word. Teachers are left to decipher critical thinking in other ways. Yet children with disabilities pose a whole new problem. Some cannot write or speak. However, just because a student cannot write or speak does not mean they cannot think critically. Teachers should diversify their methods of evaluation. Multiple choice is a great way to measure critical thinking. Often, multiple choice is viewed a recall-oriented form of evaluation, however it can be used to begin the critical thinking process. Professor Molly Bassett (2016) believes that students can show critical thinking by answering multiple choice questions and then explaining why they chose that particular answer. Students with disabilities often can get the correct answer but may struggle with verbalizing the why behind their answer choice. Teachers can give the student a platform to jump off of into a deeper thought process. While students may not be able to speak or write, they can still critically think and explain what is going on in their heads either through the use of a computer, an aid, or through another means of communication. The point of multiple choice is to reach the child where he or she is at and encourage the student to think critically about their answers.

Remodeling lesson plans to incorporate critical thinking components is another great strategy for children with disabilities. “The solution is to switch from formula-based instruction to problem-based instruction, making sure the problems come from real life situations and that they require mathematical thinking. Even primary grade students can begin to discover the important mathematical concepts” (Paul et al., 1995, p. 277). By changing the instruction or lesson plan to include more problem based learning, students will be forced to think critically and use their minds to solve problems instead of follow after a simple formula or procedure. Ultimately, the goal of a remodeled lesson is to get

students accustomed to thinking outside of the box to solve a problem instead of searching for key words or highlighted phrases. Critical thinking in math especially requires opportunity to practice it. “When students begin to learn to think mathematically, they have begun to acquire powerful tools for making sense of the world” (Paul et al., 1995, p. 277).

These strategies can be used to teach critical thinking in an inclusion classroom. However, most of the strategies to teach problem solving in the classroom can be tweaked or altered to teach critical thinking skills as well. Since the two are so closely related, the strategies tend to overlap. Teachers should use as many strategies as often as possible to ensure that the students are getting the practice and guidance they need to perfect these skills within the classroom.

Conclusion

Students of all ages need to learn problem solving and critical thinking skills in order to be successful in school and in the real world that follows. Without these vital skills, they will struggle to thrive in today’s competitive business world. For children with disabilities, the competition is even harder. Their brains do not process the same way and this can make tasks more difficult for them. However, this does not mean that they cannot problem solve or think critically about problems. They must be taught from a young age how to properly problem solve and how to step-by-step think critically about any problem that may arise. Several strategies can be used to teach both typically and atypically developing students these vital skills. Teachers should do their best to teach problem solving and critical thinking in every area of the curriculum and should take advantage of any teachable moment that presents itself. Critical thinking and problem

solving are not innate and should be taught starting in kindergarten. The sooner they learn these skills, the more they will get to practice and perfect their problem solving. Teachers need to use all of these strategies at different times throughout the year and throughout the curriculum. Those students are depending on you, the teacher, to equip them with the tools they need to be powerful executives, passionate health care providers, and persevering scientists. Every student matters and teachers should give each one the opportunity to be great.

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