



Ne'epapa Ka Hana (NKH) 2.0 | Professional Development Program

Authentic Social Learning

An Inclusive Teaching Model to Support Diverse Learners in Hawai'i

Module 1: Introduction to Inclusive Teaching in the 21st-Century

Lecture 2:

The Need for Inclusive STEM Classrooms

An Introduction to Inclusion in STEM

The Individuals with Disabilities Education Improvement Act (IDEA) was created to ensure that students with disabilities have the same access to education as students without disabilities. Since IDEA was updated in 2006, most students with disabilities are educated in general education classrooms and education has shifted to a model of inclusion. In Hawai'i, the Department of Education set a goal for 2020 to have 51% of special education students receiving their education in general education classes for at least 80% of their day. It is vitally important that teachers adapt their classrooms to create an environment of inclusion and success for all students.

In the United States, inclusive education is commonly understood as teaching students with and without disabilities together in the same classroom. This training guide adopts the much broader UNESCO definition of inclusion that all students have the right to have access to education. Ainscow, Slee, and Best (2019) state that UNESCO seeks inclusive education that provides equitable educational opportunities to students who have been excluded such as “children from the poorest households, ethnic and linguistic minorities, indigenous people, and persons with disabilities” (Ainscow et al., 2019, p. 11). Inclusion as a process of learning from differences, removing barriers, and encouraging the presence, participation, and achievement of all students (Ainscow, 2005).

The ASLM is designed to encourage and celebrate diversity while providing high-quality education for all students, especially in STEM education. Inclusion in STEM education means all students, regardless of race, ethnic group, gender, socioeconomic status, geographic location, age, language, disability, or prior mathematics achievement, deserve equitable access to challenging and meaningful STEM learning opportunities. Educators and community members are beginning to recognize that most students, including a disproportionate number of females, minorities, and the poor, leave school without the mathematical skills they need to thrive in an increasingly complex, 21st century global economy. Inclusive STEM teachers utilize inclusive practices to help all of their students feel successful so they have the mathematical skills they need to be successful. The NKH 2.0 training provides you with strategies for inclusive STEM instruction that aims to broaden participation for students who are marginalized in the classroom. Using the ASLM will help you to improve mathematical reasoning, conceptual understanding, and discourse for all your students by developing an inclusive environment. The ASLM utilizes strategies that are suggested for inclusive education, so, by implementing the strategies provided in this NKH 2.0 training, you are also implementing inclusion strategies. The ASLM encourages you to incorporate authentic learning and culturally responsive education strategies to engage all students, even those who have traditionally been unmotivated in mathematics.

Pedagogical Strategies and Characteristics of Inclusive Mathematics Teachers

Bonner (2014) researched the pedagogical practices of the most successful math teachers who taught in classrooms with high populations of underserved students. The researcher categorized these inclusive teachers as culturally-responsive and found that they shared the following six common strategies.

1. Inclusive math teachers build trusting relationships with their students.
2. Inclusive math teachers are experts in their content knowledge and have a lot of cultural knowledge.
3. Inclusive math teachers use culturally-relevant strategies to communicate mathematics concepts.
4. Inclusive math teachers reflect on their math lessons and revise their strategies to meet the needs of their students.
5. Inclusive math teachers have high expectations for their students' learning and behavior.
6. Inclusive math teachers empower their students by sharing power in the classroom.

Practical Strategies and Examples for Implementing Inclusive Mathematics Instruction

The following practical strategies for implementing inclusive math instructions are based on the six strategies that Bonner (2014) identified successful math teachers used. They include suggestions for creating inclusive classrooms from The National Center on Intensive

Intervention at the American Institute for Research and the National Council of Teachers of Mathematics (2014). Use the following simple but effective strategies for implementing inclusive mathematics practices.

Strategy 1: Focus on building trusting relationships with your students.

One of the best ways to create an inclusive STEM classroom is to focus on building relationships in the classroom. Inclusive math classrooms are student-centered and focus on building relationships that value the contributions of the students. Student-teacher relationships impact student motivation, attitude, and achievement (Bernstein-Yamashiro & Noam, 2013). When you form relationships with your students and interact through two-way dialogue, it results in improved learning. Inclusive classrooms have strong teacher-student relationships as well as strong student-student relationships. Use the following strategies to build and improve classroom relationships.

Build and nurture student-teacher relationships.

Take the time to learn about your students' lives outside of the classroom. Time is limited in the mathematics classroom, but if you take the time to let your students share their lives with you, the time is well spent. When your students know you care about them, they will work harder in the classroom and they will increase their achievement.

Build and nurture student-student relationships.

Encourage your students to collaborate with students of diverse ability, age, gender, socioeconomic status, and cultural backgrounds to build strong student-student relationships. Strong student-student relationships increase the participation and achievement of your students from underserved groups. Modules 2 and 3 of this training will provide you with strategies for social learning to build strong student-student bonds.

Find ways for your students to feel successful in math and communicate your belief in their abilities.

Maintain a belief that all of your students can be successful in the math classroom. Share your belief in your students' abilities with them frequently. If you expect great things from your students, they will deliver. Provide open-ended problems that your students can solve in their own way to increase success. Small victories and successes lead to larger victories and achievements.

Example:

Give assignments in your class that allow your students to tell you about their lives. Many teachers think that "writing assignments" are only for the language arts class, but

your students want and need the opportunity to share their lives with you. Often you will get more personal information from students in written format, especially if you assure them that the information is confidential. Use the information to find commonalities with your students that you can use to form strong bonds. Start conversations with your students about shared interests. Don't think of this as time spent away from math; you will get more productivity from students if you have a bond with them, so the time invested is worth the payoff.

One way to apply this strategy could be taken straight from the NKH student curriculum, where, at the end of each math activity, the students are given an opportunity to reflect on how the topic of the math activity applies to their lives. Providing you with information about your students' likes and dislikes as well as giving your students the opportunity to share their lives and interests with you.

In the 7th grade curriculum *Let's Take Care of the Lo'i*, Unit 6, Cumulative Activity 2, uses plate lunch to explore different menu combinations and their relation to theoretical probabilities.

The activity ends with the following question: "Which of the menu combinations would you prefer? Share with a partner or in the online comment section."

Strategy 2: Increase both your content knowledge and cultural knowledge.

You have already taken the first step in increasing your content and cultural knowledge by taking this NKH 2.0 course. The best educators are life-long students who never stop learning and improving, so keep increasing your knowledge of mathematics. To increase your cultural knowledge, recognize that your students are the experts on their own lives and cultural identities, and value their expertise. Learn about your students so you can create an environment that incorporates their interests and cultural backgrounds. Value the diverse experiences of the students and increase academic success while maintaining the cultural integrity of your students (Woodley, Hernandez, Parra, & Negash, 2017). Use the following strategies to increase your cultural knowledge.

Recognize that your students are the experts of their own lives and shared experiences.

Gain knowledge about your students' culture. Ask your students to teach you and their other classmates about their culture. Allow your students to create their own understanding through their experiences. Be willing and eager to learn from your students, and allow them to be the expert in this aspect. Create opportunities for your students to be able to share their expertise. Bridge home and school experiences by

embedding relevant cultural references into academic concepts. Incorporate multicultural content into your lessons and activities.

Example:

During your lecture, ask your students to think of context examples of the same mathematical concept from their own lives. For example, if you are teaching about ratios and comparing girls to boys in the classroom, you could also ask the students to describe their families using ratios (e.g. boys to girls, adults to children, etc.) and explain how the ratios define their lifestyle.

Learn about your students' culture and mathematical thinking.

Think of diversity as a resource, not an obstacle, for the learning of mathematics. Recognize home languages and culture as resources for reasoning, sense-making, and communicating. Be aware and accepting of differences. Seek to understand and appreciate differences in your students' traditions, values, interests, and experiences. These differences will inevitably affect their learning process, demeanor, attitude, and communication styles. Use your students' heritage as a source of content for lessons and activities. Ask your students to explain a mathematical concept to you. You will learn a lot about your students' understanding and the connections they are making by listening to their thought processes. Use that information to build a deeper understanding or correct misunderstanding. Ask your students to rewrite a few of the math problems in their curriculum to focus on their interests or culture. Use their examples to learn how to adapt your curriculum to your unique classroom environment.

Take the time to learn about your students' culture. Seek out opportunities to go to local cultural events and gatherings. When students see you in the community, it helps build strong relationships and respect. If possible, attend events when your students invite you. For your students who are unfamiliar with the Hawaiian culture, allow their classmates to be available resources to help them learn about other cultures and diversity. Let your students teach their classmates who are unfamiliar with their culture. It is much more authentic coming from the students who live in that culture. You can use the resources provided with this training to bridge your students' home experiences and school.

Increase your cultural self-awareness and the cultural-awareness of your students.

Understand how your own culture influences your perceptions and behavior. Anticipate sensitive topics and possible sites of miscommunication and plan strategies to address your students' cultural differences. Teach your students to respect and appreciate each

other's culture. Understand that learner variability exists in every group of students, and plan for them accordingly.

Example:

You will often see math activities in textbooks that ask the students to calculate how much money they would need to purchase various things. However, activities about money and land may be sensitive to some populations, and teachers who are aware of this may be able to modify the activity to be about fundraising for a beach cleanup to remove large areas of invasive algae.

Strategy 3: Incorporate culturally-relevant strategies to communicate mathematics concepts.

Provide educational experiences that build on your students' cultures, languages, home experiences, and identities. Use authentic learning to provide your students with mathematical projects that are meaningful and motivating. Build on your students' prior knowledge by focusing on connections and providing contextual meaning to abstract mathematical concepts. Present mathematical concepts in contexts that are meaningful and understandable to your students. Further examples and in-depth explanations are provided in Module 3.

The curriculum resources provided with this NKH 2.0 training will help you connect math to the interests and cultural backgrounds of your students. Use the following strategies to incorporate culturally-relevant strategies for communicating mathematics.

Use culturally-relevant examples of math concepts to increase understanding.

Support your students who are developing an understanding of mathematical concepts by using many different culturally-relevant representations of the math concept such as oral and written explanations, illustrations, and demonstrations. When teaching ratios, you can use a written explanation, a pie chart illustration, and a demonstration of girls and boys in the room. Encourage your students to show their thinking with manipulatives or diagrams. Help your students connect visual, physical, symbolic, verbal, and contextual representations of mathematical problems with concepts from their everyday life.

Using symbols that represent the interests of your students will help them remain interested and engaged in the lesson and the topics shared in class. Lessons aided by contextual and verbal representations allow for mathematical lessons to become more practical and realistic while still engaging with their interests (Hattie et. al, 2016). Ask

your students about their hobbies and interests, and imbed the information you're given into class activities. Use multiple representations in your teaching and explanations.

Focus on your students' mathematical reasoning, not accuracy in using language, when you are introducing new vocabulary and concepts, especially for ELL students.

Eventually, you want all of your students to use correct math vocabulary, but you will have to build toward that by allowing your students to explain their understanding in their own words first. Help students to feel successful by focusing on math concepts, rather than any language barriers they may have. As their mathematical understanding increases, then it becomes time to transition to correct mathematical terminology. Use formative assessment to focus on uncovering, hearing, and supporting your students' mathematical reasoning and help them progress with the correct vocabulary. When you introduce a new concept, always introduce the new vocabulary in culturally-relevant contexts. Ask your students to solve a problem and explain their mathematical thinking to you. At first, allow them to explain their thinking using the language(s) that they are most comfortable expressing themselves in. Afterward, provide them with the correct mathematical terminology and ask them to re-explain it using the correct vocabulary. You may have to do this for several days or weeks depending on the student's fluency level. Eventually, you will get to the point where you will want to stop your students if they do not use correct vocabulary and ask them to restate the idea with correct vocabulary. Just remember that it is a process and each student will progress at different rates, so adjust your expectations on an individual basis.

Example:

If you were teaching proportional reasoning, first you want to connect proportions to the concept of ratios that students should understand. Then you could give an example like, it costs \$16.00 for lunch for yourself and 3 friends. How much more would it cost if 2 more friends decided to come along? Ask your students to solve the problem. In their solutions, ask your students to show the quantities with manipulatives and create a drawing showing their equivalency. Then, ask the students to explain their solutions to you. Very likely they will use common language that does not explain the process they used because they have a hard time verbalizing their mathematical process. After they explain it to you, let them know that their thinking was correct and then ask them how they could explain it using math terminology. Give the students time to think and discuss it with their teammates then ask them to explain again. Correct any incorrect terms and discuss any missing terms they could have used in their explanations. For students in Hawai'i, use concepts and objects they see in their everyday lives and that they already understand the

quantity of. The resources provided with this NKH 2.0 training provide several culturally-relevant examples for mathematics.

Strategy 4: Reflect on inclusive teaching practices.

Self-reflection is the most valuable tool you have for improving your teaching practices. You are the most valuable evaluator of your teaching. You likely spend hours planning your lessons for your students, but, it is equally as important to spend time after the lesson evaluating your strategies and your students' progress. Use the following strategies to help you reflect on your teaching.

Examine your assignments and assessments for inclusive practices.

After every lesson, take time to reflect on your teaching practices. Did you use strategies that allowed all students to participate and be successful? Before you give an assessment, check to see if there are any non-relevant examples or questions. Ask another teacher to look at your assessments after you create them. They may notice cultural bias that you do not. Be aware of your own cultural perspectives, implicit bias, or background that may not make sense to your students. Ask yourself if all of your students were actively engaged in the lesson. If they were not, implement new strategies to engage the students in the next lesson. Reaching out to another teacher or professional allows you to understand different perspectives and to implement new and fresh ideas into your curriculum.

Recognize the expertise of your students and ask for their input on ways to improve math instruction.

Your focus should be on the students and what they need to be successful, so ask their opinions. Your students are the only people who observe your teaching every day which makes them experts on your teaching practices. It takes a brave and strong teacher to be willing to listen to their students' feedback. But, if you truly want to improve, your students can help you do just that. Ask your students to provide input on confusing topics. Ask them what they do not understand; their answers will shed some light on what your lesson was missing to help them succeed. Then, work to avoid the same problems in the future.

Example:

In a lesson on solving systems of linear equations, the process looks a lot more intimidating than it actually is, but after doing a few problems, it becomes a lot less intimidating and makes more sense. A teacher can preface their class with this knowledge, then ask which they prefer to see first, the application, or the actual

algorithm. When working through the process, the teacher should regularly stop to check the students' understanding and be ready to spend more time on any specific step. When coming up with applications, ask if they are ready for a complex example or want an easier one. Teachers should also prepare a visual and numerical interpretation of what's going on. The teacher can show these multiple representations if they request a different point of view or the teacher can focus on specific details if the amount of information is overwhelming according to the students' feedback.

Strategy 5: Maintain high content and behavior expectations for all of your students.

Students behave how their teachers expect them to behave. Bonner (2014) found that highly successful math teachers had high expectations for performance and behavior. In fact, mathematics performance and behavior expectations were intertwined. The study found that successful teachers did not have extensive behavior plans and consequences. They simply use pedagogical practices that encompass classroom management strategies. In other words, if your students are engaged and empowered in the classroom, they will have no reason or time to misbehave. Students who typically exhibited behavior problems are disengaged from learning either because they struggle in the classroom and do not understand or because they are not being challenged and are bored. Focus on providing challenging math topics and using inclusive strategies so all students are engaged and successful, and you will find that you focus much less on behavior management. Use the following strategies to implement high expectations for your students.

Hold all of your students to the same behavior and content expectations.

Recognize and celebrate diversity but maintain high expectations for all students. Embed high expectations into every lesson. Express your belief that all students can be successful by holding all of your students to the same high expectations. Use inclusive strategies that provide a pathway to success for all of your students. Your students will hold one another to your high expectations if you set up a culture of success. Teach your students respectful ways to correct one another so everyone can achieve success.

Give challenging tasks to teach mathematics.

Inclusion means that all students have access to challenging math and they can be successful. Do not assume that just because a student has an IEP, a 504, or a language barrier, they cannot be successful with challenging math tasks. The inclusive strategies thus far aim to help those students be successful with challenging tasks. Provide pathways for all students to be challenged, valued, and successful in mathematics.

Example:

When you start your school year, begin with planning lessons that are challenging and engaging for all students. Focus on implementing pedagogical practices for inclusion. If you focus your energy on creating the classroom environment you want, you should not have to spend a lot of energy focusing on your behavior plan or consequences. Start with the belief that all of your students are capable of solving complex, multi-step problems. They are also capable of behaving in your classroom. Reflect on your own biases and get rid of any doubt that you have in your students' abilities. Verbalize your belief in your students' abilities to them. Tell them that you know they are capable of meeting your high expectations. Let your students know that you expect them to follow the rules and procedures of your classroom without being reminded. Do not make exceptions for any students. Allow your students to hold one another accountable to your high standards. Then, use ASLM strategies that you will learn in the next module to provide complex authentic learning tasks to challenge your students and then watch them soar beyond your expectations.

Strategy 6: Empower your mathematics students.

In a traditional classroom, the teacher maintains most of the decision-making power. Whereas, in inclusive classrooms, power is shared between the teacher and the students, creating a stronger student-teacher relationship while also giving the students ownership over their learning (Bonner, 2014). In order to create a shared power dynamic in your classroom; encourage open dialogue with your students to help build relationships. Ask questions to include the students in the classroom discussion. Allow students to share their opinions and take ownership of their learning, including their successes and challenges. Support your students as they are building relationships with one another in the classroom and through their social networks. Use the following strategies to empower your students.

Be willing to share the power in your classroom.

Be intentional about sharing power by telling your students that you recognize and respect their opinions. Listening to your students' opinions helps build strong teacher-student relationships. Encourage open dialogue by asking for your students' opinions on how they like to learn. Hold "town hall" meetings or have an anonymous "dropbox" to receive feedback from your students. Ask the students for feedback about how the class is going, what's working well, what needs to be improved on, etc. Show your students that you value their opinions and want to create an environment of mutual respect. Sharing power in the classroom will result in students who work harder and

achieve more because they are active participants in their learning. Giving your students a voice in the classroom will result in students who work harder and achieve more because they are active participants in their learning.

Allow and encourage students to make mistakes and view their failures as valuable learning experiences.

Students remember things better and longer if they are given challenging tasks that permit them to fail and then re-evaluate their solutions. In a series of experiments, Kornell and colleagues (2009) showed that if students make an unsuccessful attempt to retrieve information before receiving an answer, they remember the information better than in a control condition in which they simply study the information. Trying and failing is helpful in learning. Encourage your students to accept failure as a learning experience. Implement tasks that promote reasoning and problem-solving. Identify and encourage multiple levels of reasoning to solve open-ended problems. Remind them that being brave and wrong better serves them in learning than being quiet or giving up. Giving students the freedom to fail and try again makes them brave and empowers them to keep trying. Celebrate failure as much as you celebrate success!

Example:

The students are focused head down in their handout assignments with ten minutes left before the end of class. A student in the back raises his hand and you walk over to help. They point to a problem and ask if they are supposed to divide the numbers in the problem. You want to make sure that they understand the problem so you answer with a question, “what would dividing the number mean in this problem and would it solve what is being asked?” By counter questioning the student, even if he is right, you gain insight to his mathematical understanding and he gets an opportunity to justify his thinking and solidify his understanding. If he is wrong, by asking him to reflect on his answer and his strategy. You could ask questions like: “That is a good guess, how did you come up with it?”, “How could you check your guess?”, and “Would your strategy work in all situations?”

Possible Pitfalls to Avoid in Implementing Inclusive Mathematics Instruction

Never perpetuate cultural stereotypes.

Sometimes teachers have the best intentions and try to incorporate their students’ culture into their classroom, but they do so on a level that might introduce stereotypes. For example, if you are a teacher in Hawai‘i, you might apply an example based on the assumption that all your students like pineapples. By using your own cultural

assumptions, rather than the students' experiences, you might accidentally create a stereotypical activity rather than a culturally-responsive activity. Remember that your students are the experts on their cultures and backgrounds. Instead of introducing your understanding of their culture, allow your students to share information about their culture. Culturally-responsive education goes deeper than introducing the language and food from a certain culture. You want to use your students' expertise to create an understanding of the lived experiences of the members of the culture.

Forming relationships with your students does not mean you share your authority.

Students who feel connected to their teachers are more successful in school. However, you are still more so their teacher and less so their friend. Students need to have positive and supportive relationships with adults. Let your students know that you care about them, but maintain a professional distance and level of authority.

Don't give assignments that are too easy in an attempt to help your students feel successful.

You want your students to know you believe in them and believe they can be successful. But, don't give them assignments that are too easy just so they can feel successful. This will backfire and they might think that you do not have faith in their math abilities. Instead, encourage your students to find success even in challenging situations. Help them to learn from mistakes to make improvements and then celebrate the improvements.

Fair does not mean equal.

As an educator, your job is to make sure that all of your students have access to the educational curriculum. Maintain high expectations for all of your students but recognize that those high expectations are different for different students. You wouldn't expect a student who is four feet tall to reach as high as a student who is six feet tall. Be aware of your students' abilities and expect their personal best. Teach your students that fair is not equal. Communicate openly with your students and let them know your expectations are based on their unique abilities and may not be the same for all of their classmates.

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