



STEMD²

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 2: Authentic Social Learning, A New Inclusive Teaching Model

Lecture 4:

The ASLM Strategies for Implementing Inclusive STEM Education

The ASLM strategies were designed to provide you with an outline for your lessons and provide a systematic approach for implementing the ASLM. The ASLM strategies were derived from the interaction analysis model presented by Gunawardena et al. (1997) and the four stages of online learning by Downes (2010). These pedagogical strategies can be used as a systematic guide for implementing authentic social learning in your K-12 classroom but allow you enough teacher autonomy to be able to customize the model to your classroom and your students. When you use these strategies, you are implementing the pedagogical strategies of the ASLM and teaching 21st-century skills, without having to try to focus on all of the components (connectivism, authentic learning, inclusive mathematics, and formative assessment) separately.

The four ASLM strategies are social exploration, social ideation, social experimentation, and social validation. The strategies involve acquiring and sharing information that is reliable and relevant to the problem (social exploration), processing the information to generate potential solutions (social ideation), critiquing, evaluating, and testing the solutions (social experimentation), and presenting the solutions with outside groups for feedback (social validation). Social exploration helps the students understand why they need to learn specific mathematical concepts. In social ideation, the students understand what they need to learn to solve a specific problem. During social experimentation, the students discover how to learn. Finally, through social validation, the students understand how to improve their learning.

Social Exploration

Social exploration focuses your students on the “why” of learning rather than just on accumulating knowledge. Social exploration is the first step of authentic learning where students explore problems, research information, accumulate knowledge, and use that information to develop solutions. After you have assigned an authentic learning task your students use social exploration to think and learn about their problem. Using social exploration, your students find and process information to gain knowledge about their topic. They share their new knowledge with other students through social learning.

Social exploration, when integrated into middle school math classrooms, results in students who are more self-regulated and take ownership of their learning. Learning should not be confined to the classroom walls in social exploration. Students should use social technologies and online resources such as discussion forums, social media, and public repositories to extend learning beyond the classroom.

Although the goal of social exploration is autonomous learning where your students use research to gain knowledge that they will assimilate to create new knowledge, you still have a very important role to play. Your students probably use Google for everything, so teachers tend to assume that they are capable of doing complex research without help. But it is unlikely your students are knowledgeable about using keywords for research. Most students simply type in the question they want an answer verbatim and then are shocked when their search does not produce valuable results. Your role in social exploration is to help your students learn how to research to produce valuable results and how to determine which results are from credible sources and are important to their research. The exchanges between you and your students are not as an informant to the listener, but as active participants on both sides. Listen to your students and guide their learning through questioning and formative assessment. As your students use social exploration to learn about a problem, you are helping them make connections between content and application of that content to their authentic problem.

An Example of Teaching the Skills Needed for Social Exploration:

During an authentic learning task, your students will use social exploration to research specific topics to gain information to solve a problem. Your students will need to master two specific skills. First, your students need to develop the ability to navigate and filter the abundance of information online. Second, your students will need to be able to effectively share the information they learned. Take time to teach your students these skills beforehand. Prepare your lesson by researching various topics. Find a simple research topic that gives results that are a mix of credible and noncredible sources. An example of such a topic could be: O’ahu Island has a housing and homelessness crisis. What are the important factors that led to this? But, with this example and any topic, be

sensitive to your students' life situations. Some students might not want to discuss things like homelessness or cancer if they're experiencing it. Once you find a topic that works for your classroom, ask your students to research that specific topic. Their research will expose them to information and misinformation online. Use their authentic research to open discussions about how to evaluate the content on the internet and determine credibility. Include discussions about what information would be useful for their topic of study and which information is extraneous and should be filtered out. Then, teach your students how to share their knowledge effectively. You can do this by asking the students to share their learning. Provide feedback to help the students improve these skills. Ask their classmates to provide kind, but critical feedback.

Social Ideation

Social ideation is the stage where your students determine what they need to learn to solve their authentic learning problem. Social ideation allows your students to synthesize the information gathered during social exploration and develop different solutions. During social ideation, your students brainstorm a variety of strategies to come up with a set of possible solutions using the knowledge they acquired through social exploration. The students discuss their solutions, provide critical feedback, and refine their ideas. Social ideation enables your students to connect different subjects and collaboratively ideate to address existing and emergent problems related to authentic learning. Your students may compete in proposing better solutions, but at the same time, they collaborate to critically analyze their own or others' ideas. Your students are exposed to a diversity of ideas from others and they have to think critically about those ideas as well as their own. Students can collaborate across classrooms, subjects, and even schools. The NKH 2.0 math curriculum has many examples for this, especially the grade 6, unit 6 "Let's Go from Mauka to Makai". The students can use the NKH 2.0 website to collaborate with life science or botany classrooms or school groundskeepers. They could also

Your role in social ideation is to support collaborative learning and teach your students strategies for thinking critically about the ideas shared by their peers and providing effective and constructive feedback. Incorporate social ideation in your class by asking your students to share their ideas through social technologies or face-to-face with their peers to get feedback. Ask them to analyze the solutions of other students and provide feedback. Social ideation, while focusing on collaboration, increases individual achievement. When one student proposes an idea, all of the students analyze that suggestion. Then other students will propose their ideas. Your students are critically analyzing their ideas and the ideas of others to solve problems. While students are working on solutions, you have the opportunity to work with individuals or groups to correct misconceptions or teach skills that students are missing.

An Example of Teaching the Skills Needed for Social Ideation:

During social ideation, your students will need to master two specific skills. First, the students need to think critically about the information their peers share with them. Second, your students will need to provide constructive feedback to their peers. You can model these in the classroom to guide your students' learning. Ask your students to work in groups to research a fairly simple topic; each group should research a different topic. For example, you could ask one group of students to research the number of Kamehameha butterflies remaining in the wild and develop two simple solutions for improving their numbers. Provide different topics for each group. Give the students 20-30 minutes to complete their task. Walk around and help groups who are struggling. At the end of their time, ask the students to share their knowledge and solutions. Model for the students how to critically assess the knowledge they share. Ask questions about their research sources and if they were able to verify their information with multiple sources. Then, model how to provide feedback on their solutions. Show the students how to be kind, but critical in their feedback. Remind them that the end goal is to produce the best possible solutions, so feedback and revision will be required.

Social Experimentation

Social experimentation is the stage that helps your students learn how to learn. Social experimentation allows students to apply their learning to different problems or situations. Your students critically evaluate their ideas and refine them as necessary. Social experimentation allows your students to make predictions and collaboratively test and evaluate their hypotheses or solutions before submission. The purpose of this phase is for your students to apply the knowledge gained during social exploration and the critical analysis and feedback from social ideation to evaluate their solutions and develop a final solution. Your students test the ideas or solutions they developed during social ideation to see if they are viable. In this phase, your students focus on their thinking and how they arrived at their solution. Your students can share and discuss solutions using social technologies or meeting face-to-face so they can make adjustments before the final solution is submitted.

Your role is to help the students determine the validity of their solutions through formative assessment and collaborative discussions. Once your students have arrived at a solution, ask them to represent their thinking in a way that proves its practicality or accuracy. In this phase, your students should also focus on their thinking and how they arrived at the solution, not just the answer. You can share and discuss solutions with the class and help students think critically about their solutions so they can make adjustments before the final solution is submitted.

An Example of Teaching the Skills Needed for Social Experimentation:

Social experimentation is dependent on your students' ability to analyze solutions and provide feedback to refine the solutions. You will need to teach the students both of these skills. One way to do this is to present your students with a problem that is simple and relatable. For example, the lines in the cafeteria are too long during lunch. Next, present your students with 4-5 solutions that you developed to solve the problem. Two of the solutions could be non-feasible. Two of the solutions could be feasible but complex and one solution could be simple and feasible. Possible solutions could include: modified/staggered lunch schedules, eliminating school-provided lunches, building a second cafeteria, or "fast pass" lines for students with good grades. Ask the students to analyze the solutions in their groups. Teach the students to analyze solutions by asking them to answer questions. Are the solutions feasible? Could the solutions be improved? If so, how? Then, ask each group to share their feedback with you. Focus specifically on ways to improve the solutions. After sharing their feedback, ask your students to collaborate to refine the solutions and develop one final solution to the problem. Work with the students through this process to model it for them.

Social Validation

Social validation is the students' opportunity to improve their learning. Social validation occurs after social experimentation when students publicly present their ideas for validation and feedback. Your students publicly present their final solutions and solicit feedback from the teacher, other students, community members, or experts in the field. Have your students share their solutions with external individuals (e.g. other teachers or students in other classrooms, school administration, community members, or professionals). Encourage the audience to provide critical and constructive feedback. If you are using social technologies, you can ask your students to present their ideas on a proper social platform and solicit feedback. Help your students be mindful of where they post and how to deal with online sharing issues such as privacy, bullying, content stealing, etc. You can also use social technologies to connect with students in higher grades who may mentor a group of your students. Or, connect with local experts and government officials so your students can share their ideas. If your authentic learning problem was a true community-based problem, professionals and government officials will be excited to hear their ideas. Sharing ideas across diverse domains increases the engagement of the students and will create learners who are excited to share knowledge and feel confident enough to do so. Social validation teaches students skills that they will need to be successful in the future.

An Example of Teaching the Skills Needed for Social Validation:

During social validation, your students are presenting the final solution to their problem. So, your students will need to have strong presentation skills so they can articulate their

solutions. Teach your students basic presentation skills like eye contact, voice inflection, not fidgeting, etc. Just as important as presentation skills, your students need to know how to design their presentation specifically for their audience. To teach this, give your students a simple topic they are going to present, like how to make their favorite snack. Ask the students to prepare two presentations. The first presentation will be designed for their classmates. The second presentation will be designed for a panel of judges who work for a food company and are looking to market their snacks. Help the students understand how a change in the audience requires a change in tone, language, and format. Ask the students to give both presentations. The students in the audience should provide kind, but critical feedback.

An example of the ASLM strategies to solve a problem

Present the problem to your students that the school needs to repaint a building. Using *social exploration*, students get valid information about the different methods and materials for painting and their costs, the size of the building(s) to be painted, and other needs of the school related to this paint (e.g. high reflective markers, or accessible indicators, etc.). In *social ideation*, students create several plans with detailed budgets of materials and labor. They could include information about the different durations of different painting methods, or the toxicity of different types of paint, or the time that the building will be inaccessible to the school personnel and students. During *social experimentation*, students can share each plan and discuss the pros, cons, and possible improvements. They can then weigh each plan against each other and against their own values. For example, some paints will have a lower environmental impact but may take longer to apply and cost more. In *social validation*, students can present their solution to other classrooms in the building and then to the principal and custodians.

Using the ASLM to Satisfy the Principles of Connectivism

The ASLM is based on social learning, a construct of connectivism. A major tenet of connectivism is that learning occurs in networks. Students collaborate more effectively within social networks and outperform students who do not work within networks (Ardito, 2015). Chung and Paredes (2015) found that highly effective social networks had a greater influence on learning than individual student performance. Students who communicated more frequently within their learning networks demonstrated higher levels of learning. Still, social learning has not been widely implemented in K-12 classrooms because there are few models for implementation (Smidt et al., 2017). The ASLM provides social learning strategies for implementation based on previous research in online collaboration and learning (Downes, 2010; Gunawardena, Lowe, & Anderson, 1997). According to Downes (2010), the best teachers first

teach their students how to learn using social learning and then empower and encourage the students to manage their learning. Social learning in connectivist classrooms is more effective than traditional collaborative groups because they share four key components of healthy networks: autonomy, resource openness, diversity, and connectivity (Downes, 2012). The ASLM strategies utilize these connectivist social learning components to empower students to manage their learning. The four components of healthy networks can be used to operationalize and implement inclusive social learning through autonomy, diversity, resource openness, and connectivity to teach students how to learn.

Autonomy

Autonomy is achieved when students feel a sense of freedom and control over their learning. Providing students with choices about their education increases the students' sense of control and improves motivation. The principle of autonomy is used for social learning in the ASLM. The ASLM encourages teachers to allow students to choose their autonomous learning networks that are different from teacher-selected collaborative groups and are an essential part of social learning. Social learning occurs in networks when students choose and maintain their networks (Siemens, 2005). Rice (2018) found that when students were given the freedom to create and maintain their networks, they showed an increase in collaboration, motivation, and academic performance. The ASLM also encourages teachers to allow students to choose their resources and utilize their networks in *social exploration*, *social ideation*, *social experimentation*, and *social validation*. *Social exploration* utilizes and encourages autonomy by allowing students to creatively develop their ideas and explore various options for solving problems. During *social ideation*, *social experimentation*, and *social validation*, students have the autonomy to devise, revise, and present their ideas and solutions for a problem.

Diversity

Diversity of opinions is achieved when students have the opportunity to work with diverse individuals with differing opinions and perspectives. Teachers utilize the principle of diversity in the ASLM. Abhari (2017) stated that social learning allows students to learn to work with students with diverse backgrounds to achieve a common goal. Diverse networks expose students to different ways of learning and problem-solving (Abhari, 2017). Alonso et al. (2015) stated that innovative solutions are the result of creative ideas that develop from complex interactions within a diverse group of individuals. The ASLM encourages students to access a diversity of opinions during social exploration. Social ideation and social experimentation provide the opportunity for students to develop new ideas and creative solutions through discussion. Each student in the network contributes to the learning objective by sharing their ideas and unique interpretations. During social validation, students seek opinions and feedback from others. Students in social networks learn about and accept differing opinions and perspectives when using the ASLM strategies.

Resource Openness

Resource openness is achieved when students have access to a variety of technological and social resources for learning. Alonso et al. (2015) stated that students need to combine information from multiple sources and social exchanges to learn. According to Abhari (2017), resource openness is enhanced when students have access to a variety of technological and social resources and can share ideas with other students and experts. However, exposure to information through the internet and other individuals does not increase learning unless it is meaningful to the student, so the teacher has to guide the acquisition of knowledge to meaningful activities (Gillard, Gillard, & Pratt, 2015). The ASLM encourages students to access a variety of resources for learning, including other individuals and online resources. Different networks can exchange ideas and receive information from one another. *Social exploration*, *social ideation*, *social experimentation*, and *social validation* are all based on the principle of resource openness. Students are encouraged to access a wide variety of resources during *social exploration* and use those resources to develop and revise their ideas during *social ideation*, *social experimentation*, and *social validation*. The ASLM incorporates opportunities for students to access and learn from a variety of resources.

Connectedness

Connectedness is achieved when students connect with other students and resources and use those connections to learn. According to Chung and Paredes (2015), when students have stronger connections with one another, knowledge exchange is better. Students in collaborative groups are connected and interact with one another, but networks are different in that the interaction between members does not just send information from one person to another, but it creates new knowledge that did not exist before the interaction (Downes, 2012). The ASLM allows students to make connections between fields of study, ideas, and concepts to create meaningful knowledge. Students gather and assimilate information in their networks to create new knowledge that is shared among the group members. Using the ASLM, students work in social networks to create knowledge and use that knowledge to make connections with and solve real-world problems. *Social exploration*, *social ideation*, *social experimentation*, and *social validation* are all based on the principle of connectedness because students connect with one another, their teacher, and experts to connect their learning with real-world concepts.

An Example for Implementing the ASLM in STEM

The ASLM can be used in any content area in K-12 education. The following example shows one example of how to use the ASLM. For this example, the students will work to solve a real-world problem facing Hawai'i. Hawai'i is running out of landfill space and is quickly approaching a serious problem of how to manage its waste. In addition to its own waste, Hawai'i has seen an influx of trash from the ocean being washed up onto the beaches; Hawai'i has to dispose of this waste as well. Like most authentic learning problems, this problem is

cross-curricular and requires skills in language arts, science, social studies, and math to solve it. The following example shows how the ASLM strategies can be applied to solve this problem in a mathematics class. However, these strategies could easily be adapted by any subject area or grade level. To start, the teacher should ensure that they are teaching the required standards that apply to their grade level.

For this example, the students are asked to design a facility that would replace the landfill on their island without taking up additional space on the island. The facility should have some advanced technology for handling waste efficiently. To solve the problem of waste management in Hawai'i, the teacher first has to get the students interested by introducing the problem using videos, news articles, or social media. This is a great opportunity to open a discussion about researching with caution and care by discussing with the students why the material you provided is valid. It is unreasonable to expect younger students to solve the problem for the entire state, so the teacher can choose to focus on how to solve the problems in their school, neighborhood, or island.

To solve this problem, the students should employ the ASLM strategies. Using *social exploration*, the students should research the problem and any possible solutions that have already been suggested by experts. If the students have to replace an existing landfill, they first have to research the location, size, and capacity (volume) of the existing landfill. The students should research ideas that experts have posed as possible solutions and, if possible, talk to local experts in person or using social technologies. To encourage social learning, each student should research and explore one possible solution posed by the experts and bring their knowledge back to the team to discuss it. The students should then discuss the solutions that have already been posed and start to develop their own solutions using *social ideation*. The students work together to brainstorm ideas for their new facility and each student presents an idea for discussion. The team provides feedback and builds on one another's ideas to develop their final solution to the problem. During *social experimentation*, the students collaborate to design their new facility. The students have to determine the new location, size, and capacity for their facility. The students create a scaled drawing of their facility and a 3-D rendition using free online 3-D software. The team calculates the area the facility needs and the volume of trash it holds. During this process, the students may discover errors in their planning and have to revise their original plan several times. The team of students then presents their new facility to the class, teacher, and local experts during *social validation*. Students would receive feedback on their facility plans from other students and have the opportunity to make revisions before they present their ideas to local experts. These students learn mathematics content, mathematical practices including problem-solving, and 21st-century skills using the ASLM.

This authentic learning problem, like most authentic problems, could be expanded into all curricular areas. The following is an example shows how a team of teachers from different

content areas could work with the math teacher on this project and work with their students to solve the area that applies to their content. Each teacher should ensure that they are teaching the required standards that apply to their grade level and subject. After applying grade-level standards, the science teacher could focus on the scientific process of waste management and innovative technologies that the students could use to solve the problem. The language arts teacher could focus on the research and writing portions of the project and help the students with their presentation development. The social studies teacher could focus on the social issues presented by the problem and by any possible solutions. Looking at the tradeoffs and repercussions of their proposed solutions is an important part of any authentic learning task.

Possible Pitfalls to Avoid in Implementing the ASLM in STEM Classrooms

Do not expect to be an expert right away.

ASLM classrooms are different from traditional classrooms. If you have been teaching for a while you will have to learn how to shift from a teacher-centered to a student-centered environment. Give yourself time to implement the strategies slowly. Start with teaching your students to work within social networks and use the ASLM strategies. Then teach your students to find reliable resources and online help. Then move on to social technologies. If the idea of changing too much at once causes you stress or anxiety your students will sense it. The goal is to create a comfortable environment for you and your students, so go at a pace that you are comfortable with.

Do not expect your students to be experts right away.

Social learning will increase student achievement because it increases motivation and self-regulation. It is a better method for teaching 21st-century learners, but they still need time to adjust to becoming independent learners. Your students will likely be uncomfortable at first. They are probably used to being told how to solve the problem and they just follow the procedure without any real understanding. You are going to ask them to solve a problem in multiple ways to develop a conceptual understanding and they will have to engage in productive struggle. Talk to your students about why this is a better way of learning and help them work through their frustration. The struggle at the beginning is well worth the success at the end.

Do not expect to never have to give direct instruction.

Your students need to be taught skills to be successful in an ASLM classroom. It is unlikely that your students are ever going to arrive at the formula for the Pythagorean Theorem by themselves, so you will have to give them some instruction first. Your goal is to limit your direct instruction to only what the students need to be provided. For

example, after you give them the formula for Pythagorean Theorem, ask them to prove it works instead of just applying that to a problem. Don't tell the students at first that it only applies to right triangles. Ask your students to draw two triangles on their paper; one should be a right triangle and the other an obtuse or acute triangle. Ask your students to measure their triangles and see if the Pythagorean Theorem works. Lead a discussion about when it does and does not work.

Allow your students an opportunity to problem solve for themselves

The freedom to be a self-directed learner through social learning can be both liberating and frustrating for your students. Siemens (2008) writes that the “ambiguity, even confusion,” is a necessary part of effective learning. Your students need to be able to struggle with math concepts to develop a true understanding of the concepts. However, teachers tend to want to bail their students out and just give them the shortcut or the answer which is detrimental to motivation and learning. A study of interventions in a mixed-ethnicity, public high school algebra class found that student-initiated interventions, support, criticism, questions, closed questions, and compliments all improved student engagement. The same study found that excessive teacher interventions decreased motivation (Chiu, 1998). If your students are not struggling with math concepts, they are not learning. Students cannot learn through passive absorption, so they need to engage and work through the problems. This training will show you how to ensure that their struggle is productive and help make sure they eventually arrive at the solution before reaching a high level of frustration.

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