



DAKOTA STEAM

The 4Cs



CREATIVITY

COLLABORATION

COMMUNICATION

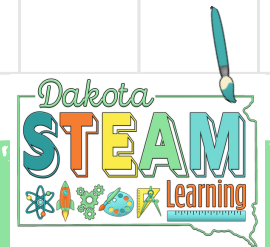
&



CRITICAL THINKING



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DAKOTA STEAM

4Cs Resources



In this document, we expand on the 4Cs of STEAM by explaining their significance and detailing how Dakota STEAM will be implemented in lessons. We explain why the 4Cs are important and describe where and how you will observe Dakota STEAM in action throughout our STEAM challenges and resources.



RECOMMENDED STEAM RESOURCE



Learn more at
www.dakotasteamlearning.com

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The 4Cs of Education



The 4Cs

Building the Skills Children Need to Thrive

The 4Cs are essential life skills that help children succeed in an ever-changing world. Through intentional STEAM experiences, students strengthen their ability to think creatively, work collaboratively, communicate with purpose, and approach challenges with critical thinking. These skills are woven throughout the learning process, helping children become confident, capable individuals who are prepared to navigate both academic and real-world challenges.

- **Creativity** encourages students to generate original ideas, explore possibilities, and try new approaches.
- **Collaboration** helps students learn how to listen, contribute, and work with others toward a shared goal.
- **Communication** empowers children to express ideas clearly, explain their thinking, and offer meaningful feedback.
- **Critical Thinking** guides students to test ideas, reflect on outcomes, make informed decisions, and improve their solutions.

STEAM provides a meaningful setting for children to practice these skills through hands-on learning. As students investigate, create, test, adjust, discuss, and reflect, they learn that challenges are opportunities to grow.

THIS PROCESS BUILDS CONFIDENCE, SELF-ESTEEM, RESILIENCE, AND A GROWTH MINDSET WHILE PREPARING CHILDREN TO SOLVE PROBLEMS AND CONTRIBUTE THOUGHTFULLY IN THE CLASSROOM, THEIR COMMUNITIES, AND THE WORLD BEYOND.

STEAM Guide



Why Creativity?

Creativity

Empowering Children to Create, Innovate, and Think Beyond the Expected

Creativity is far more than simply producing something new; it empowers children to become active creators, imaginative thinkers, and confident innovators.

Through STEAM experiences that prioritize creativity, students move beyond repeating information and begin generating their own ideas, testing possibilities, and taking meaningful risks. They learn to observe their creations carefully, reflect on what is working, and make thoughtful adjustments when challenges arise. This process deepens their engagement with learning while strengthening the critical-thinking and problem-solving skills they need to navigate complex situations.

As children gain confidence in expressing original ideas and exploring new approaches, they begin to recognize that there is often more than one path toward a solution.

Creativity and critical thinking work together to cultivate learners who are empowered to imagine, design, improve, and bring their ideas to life.

DAKOTA STEAM

STEAM Guide



How do we incorporate creativity?

Creativity

Giving Children the Freedom to Design, Decide, and Discover

Creativity is intentionally woven into every stage of the STEAM design process by moving beyond step-by-step recreations and inviting students to make meaningful choices. Rather than asking children to copy an instructor's finished product, each activity provides a supportive framework that leaves room for individual ideas, interpretations, and design decisions.

Even when students are learning a specific art technique or following a sequence of directions, they are encouraged to select colors, shapes, materials, patterns, and solutions that reflect their own vision. This open-ended approach helps learners understand that their ideas have value and that there are many ways to explore a challenge successfully.

By consistently placing students in the role of designer, creator, and decision-maker, STEAM experiences cultivate the confidence and creative thinking children need to approach every new challenge with curiosity and purpose.

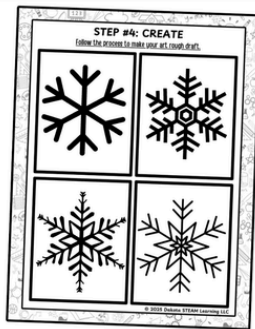
Encourage the next generation of thinkers and creators by allowing creativity to flow in each STEAM challenge!

Creativity

EXAMPLES

CREATE #1

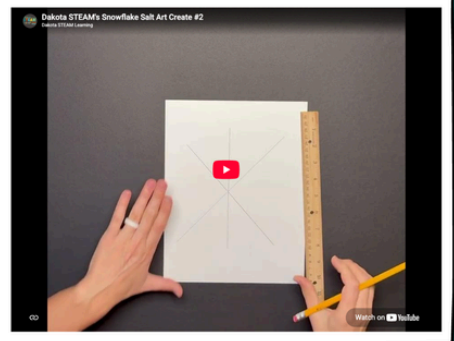
- Design 4 different snowflake designs in your STEAM journal.
- Ensure that each snowflake has six arms and that all arms are symmetrical.
- Choose your favorite design.



During art, examples are shown, but students are the designers. They are never told how to design something.

CREATE #2

- Using your STEAM journal design as inspiration, draw a snowflake with a ruler onto cardstock.
- Trace the design large, leaving enough space between lines so you can trace them with glue.



INSPIRATION

City Skyline Inspiration
Notice how there are no gaps at the bottom of each skyline. This is because the bottom of the city would be filled with other, less distinct buildings. The outlined buildings are not the only structures in the city; they are simply the tallest in their area, leaving their outlines clear.



EXAMPLES

What can this style of art become?

Storm Silhouettes



What can this style of art become?

ART EXAMPLES

PLANT SCULPTURES

ART EXAMPLES



Examples in every art lesson.

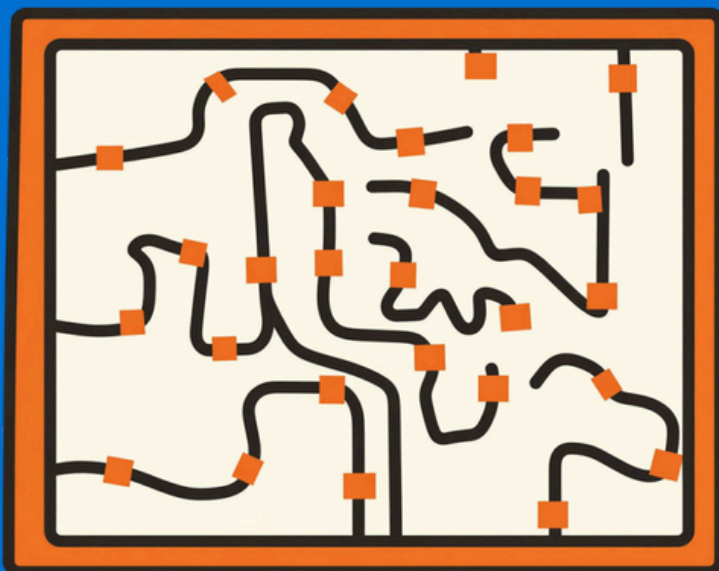
Students are shown real examples of student work that highlight a wide variety of design possibilities.

DAKOTA STEAM

Creativity



DON'T BE
AFRAID
TO
TRY NEW IDEAS



STEAM Guide



Why Collaboration?

Collaboration

Building the Skills to Work, Lead, and Thrive Together

Collaboration is a vital life skill that prepares children to communicate, contribute, and succeed alongside others. Through shared STEAM experiences, students learn that meaningful challenges are often strengthened by different perspectives, ideas, and abilities coming together. They practice listening respectfully, sharing responsibility, expressing their thinking, and working through disagreements with purpose.

These experiences help children understand that being an effective team member means more than simply participating; it means encouraging others, contributing ideas, and helping the group move toward a common goal.

Collaboration is not an ability that develops automatically, but a skill that must be intentionally modeled, practiced, and refined. When children are given consistent opportunities to work as part of a team, they build the confidence and communication skills needed to thrive in classrooms, communities, and future careers.

Students are encouraged to work together to make decisions and creations.

STEAM Guide



How do we incorporate collaboration?

Collaboration

Helping Children Share Ideas, Learn From Others, and Create Together

Collaboration is thoughtfully woven throughout the STEAM design process through opportunities for students to share ideas, offer constructive feedback, and work alongside one another as they bring creations to life.

Children are encouraged to communicate their thinking, listen to different perspectives, and recognize how the ideas of others can strengthen their own learning. A key part of this approach is allowing students time to explore and develop their individual ideas before asking them to build with a partner or group. This ensures that every child has an opportunity to think independently, contribute with confidence, and enter collaborative work with meaningful ideas to share.

For educators seeking engineering lessons with an extended focus on collaboration, the upcoming “FULL LENGTH” engineering lessons will include multiple building opportunities designed to give students time to plan, create, reflect, revise, and work together toward a shared goal. These lessons are designed for approximately 2.5 or more hours of instructional time.

Build stronger classrooms by incorporating more collaboration through hands-on learning!

DAKOTA STEAM

Collaboration



THE FOLLOWING
POSTERS ARE
DESIGNED TO
HELP GUIDE
STUDENTS
THROUGH
CREATING A
GROUP PLAN.



STEAM

Talk like a STEAMer!

COLLABORATION

1

**Tell others your
"What"**

- ⚙️ What is best for the team?
- ⚙️ What will each person do in the group?

"Let's
make

by



2

**Tell others your
"Why"**

- ⚙️ Why do you think your team's idea will work?
 - Think about all the feedback that was discussed in your group.

"This
should
work
because



STEAM

Collaboration

WHAT IF WE HAVE DIFFERENT IDEAS?

OPTION

CHOOSE 1 PERSON'S IDEA!

If you all agree that one plan will work the best, use theirs.

OPTION

COMBINE IDEAS!

Take the most effective parts of each plan and combine them.

OPTION

CREATE A NEW IDEA!

Start again and make a whole new plan together.



DAKOTA STEAM

Collaboration



THE FOLLOWING POSTERS
ARE DESIGNED TO TEACH
DIFFERENT COLLABORATION
STRATEGIES AND
EXPECTATIONS FOR
HELPING THEIR TEAM.

These are
real skills
that children
need to learn.



STEAM

Collaboration Expectations

Stick Together

The team all works together on the same part at the same time.

Each person has a task and uses their strengths to help.

OR

Separate to Achieve

The team works on different parts of the project. Then, they put the pieces together.



No Matter the Strategy, Your Team Needs To:

Talk & listen to each other.

Check-in with each other.

Help each other.

Agree on a plan.



COLLABORATION

How Do I Help My Team?



Manage

Check in with others and help them.

Create

Work together to make your creation.

Praise

Keep a positive attitude and encourage others.

Organize

Keep track of supplies, plans, and time.



Analyze

Collect data and find solutions to problems.

Remember, Everyone Helps!

STEAM

Collaboration Expectations

Focus

Stay on task and keep your focus on your project.

Low

Keep your voices low so that all groups can hear each other.

Help

Use your strengths to help your team.

Stay

Stay in your group's spot. Don't wander!



Remember, Tools Not Toys.

STEAM

Collaboration

Eyes

My eyes are on our project or who I am working with.

Ears

My ears are listening to my team's ideas.

Mouth

My mouth is quietly speaking to my team. Remember, kind words.

Hands

My hands are working on our project. They share supplies with my team.

Feet

My feet stay at our spot. I don't wander.



Remember, Tools Not Toys.

STEAM Guide



Why Communication?

Communication

Helping Children Express Ideas With Confidence and Purpose

Communication is an essential life skill that empowers children to share their thinking, advocate for their ideas, and build meaningful connections with others.

Through STEAM experiences, students learn to communicate in ways that are focused, respectful, and purposeful as they explain their designs, describe their reasoning, and respond to the ideas of others. They move beyond simply sharing an idea by learning how to support it with evidence, observations, and thoughtful explanations. This strengthens learning across academic areas while helping children become more confident in their ability to express themselves clearly.

Effective communication also supports healthy relationships, productive teamwork, and respectful problem-solving. When children are given regular opportunities to speak, listen, explain, and reflect, they develop a powerful skill set that will guide them in the classroom, in their communities, and throughout their lives.

Students are encouraged to express their ideas clearly and provide constructive feedback.

DAKOTA STEAM

STEAM Guide



How do we incorporate communication?

Communication

Creating Confident Communicators Through Sharing and Feedback

Communication skills are intentionally embedded in every STEAM lesson, giving students consistent opportunities to share their ideas, explain their thinking, and listen to others' perspectives.

Children are guided in how to offer feedback that is specific, respectful, and helpful, while also learning how to receive feedback as an opportunity to grow rather than as a personal criticism. These experiences empower students to speak with confidence while normalizing the important habits of asking for input, considering different viewpoints, and improving ideas through reflection. Because feedback can feel challenging, STEAM provides a meaningful and engaging setting where children can practice these skills while focused on a shared design, creation, or problem.

Over time, students build the emotional awareness and communication skills needed to collaborate effectively, express themselves thoughtfully, and approach feedback with resilience and an open mind.

Build stronger classrooms by improving communication.

Communication

These slides help guide students in communicating their plan and justifying their ideas.

EXAMPLE

SHARE IDEAS WITH OTHERS

1 Tell others your "What"

- What will your creation look like?
- What will each part be made of?

I will make my _____ by _____.

2 Tell others your "Why"

- Why do you think your idea will work?
 - Based on your schema?
 - Based on what we saw in the research?

This should work because _____.

STEP #1: Ask STEP #2: Imagine STEP #3: Analyze STEP #4: Plan STEP #5: Create STEP #6: Adapt STEP #7: Evaluate STEP #8: Share

EXAMPLE

GIVING HELPFUL FEEDBACK

Positive Feedback

Try: I think your idea will work well because _____.

Be specific! Focus on a specific aspect of their plan, like materials or structure.

Talk

Negative Feedback

Try: I am concerned that _____ may not work because _____.

Be specific! Focus on a specific aspect of their plan, like materials or structure.

Talk

AGREEMENTS

TRY Do your best to help the other person.

TRY Try not to make it personal by focusing on the idea instead of the person.

TRY Try to speak kindly.

STEP #1: Ask STEP #2: Imagine STEP #3: Analyze STEP #4: Plan STEP #5: Create STEP #6: Adapt STEP #7: Evaluate STEP #8: Share

Students are also taught to both give and receive meaningful feedback.

STEAM

Talk like a STEAMer!

COMMUNICATION

1

**Tell others your
“What”**

- ⚙️ What will your creation look like?
- ⚙️ What will each part be made of?

“I will make my
_____ by
_____.”



2

**Tell others your
“Why”**

- ⚙️ Why do you think your idea will work?
 - Based on your schema?
 - Based on what we saw in the research?

“This should work because
_____.”



STEAM

Communication

GIVING HELPFUL FEEDBACK

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Try: "I think your idea will work well because_____."

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Negative Feedback

Try: "I am concerned that_____ may not work because_____."

Be specific! Focus on a specific aspect of their plan, like materials or structure.

Talk

AGREEMENTS

TRY

Do your best to help the other person.

TRY

Try not to make it personal by focusing on the idea instead of the person.

TRY

Try to speak kindly.



STEAM Guide



How do we incorporate critical thinking?

Critical Thinking Placing Students at the Center of Every Decision

Students are the decision-makers throughout our STEAM experiences, using the information they are given to determine how they will plan, create, test, and move forward. Rather than being directed through every choice, children are encouraged to consider possibilities and make purposeful decisions about their own creations.

Even in guided art and science lessons, students examine examples, analyze information, and make predictions about the processes they will explore. Intentional critical-thinking moments are built into each experience so learners can pause, reflect on what they notice, and connect new ideas to what they already know. These opportunities ensure that students are not simply following directions, but actively engaging with content, evaluating their experiences, and using their thinking to guide the next step.

By consistently positioning children as thoughtful decision-makers, STEAM experiences develop the confidence and reasoning skills they need to approach new challenges with curiosity, independence, and purpose.

Students are empowered to take control of their planning process while receiving support along the way. They lead the creative charge, making decisions, refining their ideas, and continuously evaluating their progress to achieve their vision!

STEAM Guide



Why Critical Thinking?

Critical Thinking

Empowering Children to Analyze, Decide, and Solve With Purpose

Critical thinking is an essential life skill, but it does not develop by chance; children need intentional opportunities to question, analyze, make decisions, and develop their own solutions. Too often, students are told exactly what to do rather than being encouraged to consider possibilities, evaluate information, and determine the best path forward.

STEAM experiences naturally place children in the role of active thinkers and problem-solvers, where each decision must be purposeful, thoughtful, and connected to the challenge at hand. As students plan, test, observe, reflect, and revise, they learn to look closely at what is happening and use evidence to guide their next steps. This process strengthens higher-level thinking in a way that feels engaging, meaningful, and connected to real problem-solving rather than isolated practice.

By consistently inviting children to think deeply and make informed choices, STEAM helps them develop the confidence and reasoning skills needed to approach challenges across all areas of their lives.

Students are encouraged to use diagrams to make a detailed plan every lesson!

Critical Thinking

Students are given support in planning, but make all creation decisions.

ENGINEERING EXAMPLES

1 Brainstorm your idea!

Brainstorm

Pictures are pretty! Diagrams help engineers determine the materials they'll use for different parts of their design.

2 Draw your idea!

Picture

3 Identify what each part of creation will be made out of!

Diagram

Car Shape

What shape will you make your car? Think about air resistance!

Draw Design Label Materials

Wheels

Where will you place the wheels? Will they be balanced?

Draw Design Label Materials

Axes

Where will you place your axles? How will they connect the wheels?

Draw Design Label Materials

Rolling

How will the wheels move? You cannot tape onto a wheel or axle.

Draw Design Label Materials

Driver

Where will the driver sit, and how will you prevent them from falling out?

Draw Design Label Materials

GUIDED DIAGRAM

REMINDED

POSTS NEED BEAMS!

- Posts stand upright.
- Posts require beams to keep them stable and connected.
- Every post should connect to two other posts.
- Beams can be:
 - Across (horizontal)
 - Diagonal (high to low)
 - Double Diagonal (X-shaped)

STEP #1: Ask STEP #2: Imagine STEP #3: Analyze STEP #4: Plan STEP #5: Create STEP #6: Adapt STEP #7: Evaluate STEP #8: Share

How to Diagram

2 Draw your idea.

3 Determine what materials each part of your creation will be made of.

Brainstorm

Picture

Diagram

1 Brainstorm your idea.

Pictures are pretty! Diagrams help engineers determine the materials they'll use for different parts of their designs.

STEP #1: Ask STEP #2: Imagine STEP #3: Analyze STEP #4: Plan STEP #5: Create STEP #6: Adapt STEP #7: Evaluate STEP #8: Share

Critical Thinking

During art and science, they are asked to make predictions and reevaluate after research.

DIAGRAM TIME

ART EXAMPLE



REFLECT

What do you think the process involves to make a piece of artwork in this style?

What did the artist have to do before they finished their final creation?

STEAM JOURNAL



STEP #1: Inspiration STEP #2: Inquiry STEP #3: Connect STEP #4: Create STEP #5: Finalize

ART EXAMPLES

REVISIT DIAGRAM TIME

ART EXAMPLE



REFLECT

Knowing more about the STEAM elements in the art process, do you want to make any changes to your art process predictions?

STEAM JOURNAL



STEP #1: Inspiration STEP #2: Inquiry STEP #3: Connect STEP #4: Create STEP #5: Finalize STEP #6: Reflect

SCIENCE EXAMPLES

How could we design our experiment procedure?



Identify a procedure that tests our question.

Make sure your procedure gathers data about the dependent variable.

Procedure Ideas

Everyone must follow the same procedure for our data to be valid.

The procedure must test the question we are answering.

STEP #1: Inspire STEP #2: Question STEP #3: Research STEP #4: Hypothesize STEP #5: Experiment STEP #6: Conclude STEP #7: Communicate STEP #8: Reflect

CONCLUSIONS

What conclusions can you draw based on our data?



Was your hypothesis correct? Why? Why Not?

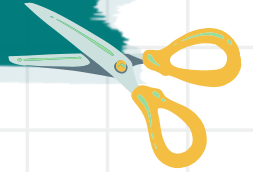
CHOOSE A CONCLUSION

- ☒ Sweet candy caused a chemical reaction when it came into contact with a base.
- ☒ Sour candy caused a chemical reaction when it came into contact with a base.
- ☒ Other conclusion based on scientific data.

STEP #1: Inspire STEP #2: Question STEP #3: Research STEP #4: Hypothesize STEP #5: Experiment STEP #6: Conclude STEP #7: Communicate STEP #8: Reflect

DAKOTA STEAM

Critical Thinking



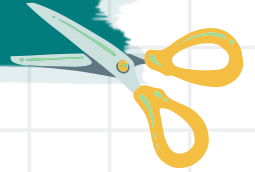
USE MINI-TESTS TO MAKE PREDICTIONS AND CHANGES



We use mini-tests to find *failure points* and determine what needs to change before final testing. Then, during the final test, we can trust *that* our creation will be *successful*.

DAKOTA STEAM

Critical Thinking



USE DIAGRAMS TO MAKE A DETAILED PLAN

