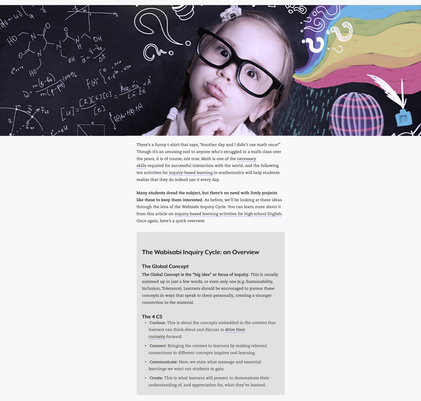
INQUIRY LEARNING

10 Ways to Use Inquiry-Based Learning in Mathematics

Teachers can use these inquiry-based learning activities to help learners like Math



There's a funny t-shirt that says, "Another day and I didn't use math once!" Though it's an amusing nod to anyone who's struggled in a math class over the years, it is of course, not true. Math is one of the necessary skills required for successful interaction with the world, and the following ten activities for inquiry-based learning in mathematics will help students realize that they do indeed use it every day.

Many students dread the subject, but there's no need with lively projects like these to keep them motivated. As before, we'll be drawing on ideas through the lens of the Wabisabi Inquiry Cycle. You can learn more about it from this article on inquiry-based learning activities for high school English. Once again, here's a quick overview.

The Wabisabi Inquiry Cycle: an Overview

The Global Concept

The Global Concept is the "big idea" or focus of inquiry. This is usually summed up in just a few words, or even only one (e.g. Sustainability, Inclusion, Tolerance). Learners should be encouraged to pursue these concepts in ways that speak to them personally, creating a stronger connection to the material.

The 4 Cs

- **Curious:** This is about the concepts embedded in the content that learners can think about and discuss to drive their curiosity forward.
- **Convert:** Bringing the content to learners by making relevant connections to different concepts inspires real learning.
- **Communicate:** Here, we state what message and essential learnings we want our students to gain.
- **Create:** This is what learners will present to demonstrate their understanding of, and appreciation for, what they've learned.

For each activity, we'll provide a Global Concept as well as a 4 C cycle of Inquiry. Sift through them to see how you can begin developing your own.

Classroom General Store

Setting up a classroom store can help younger students understand the value of everyday items. Your 'store' can be kept in a special cabinet, drawer, or even in a plastic bin and can contain useful items (pens, pencils, and erasers) or reward items (stickers, crayons, and bookmarks).

The point of a classroom store is to give students a chance to interact with money, to learn the value of coins and bills, and to help them learn how to save for the things they want or need. Provide students with a weekly pretend "allowance" and teach them they are responsible for deciding how to spend it. If they spend all their allowance on something fun at the start of the week, they may not have enough left to purchase something they need by the end of the week.

Global Concept: Responsibility

Cycle of Inquiry: Learners are inspired to be **curious** about fiscal responsibility and **connect** examples of interacting with money to examples of daily transactions to **communicate** the value of understanding how money works by **creating** a classroom store where such exchanges can take place in a practical environment.

Balancing Act

Older students will benefit greatly from learning how to apply basic math in tracking the different expenses that are deducted from a bank account each month. Balancing chequebooks is a dying art, but one that still holds value in today's world. **Debit cards make it easy to spend without having to see the money coming from the account.** As such, younger kids can fall into the false belief they are pulling funds out of some always-replenishing coffer.

Teach students how to track their expenses by guiding them into routinely checking their accounts and learning to deduct any funds they know will soon be withdrawn. **This activity will help them establish responsible financial habits and demonstrate how to avoid being overdrawn.**

Global Concept: Responsibility

Cycle of Inquiry: Learners are inspired to be **curious** about expense tracking and **connect** math concepts to balancing a bank account to **communicate** the importance of tracking expenses responsibly by **creating** scenarios to perform these calculations with their own personal accounts.

Budget or Bust

One of the pitfalls of using a debit card was already discussed in the previous paragraph. However, there is another issue that goes along with it. **Debit cards involve only the online movement of money; no actual cash changes hands.** This can encourage overspending. To avoid this, students should learn the math involved in setting a budget.

Give your class a list of everyday expenses (rent, utilities, phone, food, entertainment, savings, etc.) as well as an average young adult income for your area. Students should set up a budget using the information given to see if their theoretical income can cover their expenses. If not, they will need to adjust their monthly budget until they can live within their means. This teaches them how to apply basic math as well as percentages, fractions, and ratios, to their daily lives.

Global Concept: Responsibility

Cycle of Inquiry: Learners are inspired to be **curious** about budgeting and **connect** math concepts to responsibly allocating personal funds to **communicate** the importance of tracking expenses responsibly by **creating** scenarios in which they can perform actual budget calculations.

Name That Shape

Elementary school students are taught basic geometry regarding 2-D and 3-D shapes as well as how to determine a shape's volume, mass, area, and perimeter. **To help younger children genuinely grasp the nature of shapes, take them on a walk around the inside and outside of the school.** Have them bring a shape-identifying card as well as a small notebook and pencil with them.

Next, they can compose the shapes on the card to the contours of the real-life objects around them. For example, can they find a cylinder somewhere on the school grounds? How frequently does the triangle-shape come up in nature? Have them sketch the items they see and write down their shapes.

Global Concept: Awareness

Cycle of Inquiry: Learners are inspired to be **curious** about geometry and **connect** understanding shapes to the world around them to **communicate** how shapes contribute to the structure of our environment by **creating** a shape-finding venture around and outside the school.

Scavenger Hunt

This activity can be used with any grade, and the level of math incorporated will depend on the class. Provide students with a list of locations they must check off on their scavenger hunt, **but instead of giving them physical directions, provide them with math problems.** Use clues that tell them how many steps, feet, yards, etc. they will need to advance to make it to their next destination.

If the students do the math incorrectly and come up with the wrong answer, they will end up at the wrong location and won't find the next clue. This activity is a fun way for students to engage on a whole new level with the math they've been learning.

Global Concept: Mathematics in Travel

Cycle of Inquiry: Learners are inspired to be **curious** about distance and location and **connect** this to the mathematical concepts used to determine them to **communicate** how math is utilized in pinpointing direction and distance by **creating** a scavenger hunt using math formulas to replace conventional directions.

Connect the Dots

This activity improves graphing skills in a fun and engaging way. It starts with students drawing or printing a simple picture on a plain piece of white paper. The student's job is then to transfer that image to graph paper, recording the x- and y-coordinates for each main point of the image. The students then trade their lists of coordinates with other students who try and discover the image by plotting those points themselves on a new piece of graph paper.

At the end of the activity, have all the students return the list of coordinates along with their finished pictures to the student who originally created them. Then have the pairs determine if the picture was plotted correctly and if not, what went wrong.

Global Concept: Picture Graphing

Cycle of Inquiry: Learners are inspired to be **curious** about mathematical graphing and **connect** this to visual images to **communicate** the role graphing can play in creative activities and design by **creating** a graph that plots key points along the lines of an image.

Cool Coordinates

Similar to the scavenger hunt, **this activity familiarizes students with longitude and latitude and helps them discover how to find coordinates correctly.** Students can use a GPS system to correctly enter the coordinates and then follow the directions to reach a pre-determined cache site. If they have done it correctly, they will arrive at a location that contains the next set of coordinates.

This activity helps them understand the nature of longitude and latitude and will familiarize them with how each coordinate is expressed.

Global Concept: Geocaching

Cycle of Inquiry: Learners are inspired to be **curious** about longitude and latitude and **connect** this to the pastime of geocaching to **communicate** how coordinates are expressed by **creating** a cache that they treat them find using longitudinal and latitudinal coordinates with a GPS.

Secret Word Puzzles

This activity can work for almost all grades. For younger students, **provide them with a riddle or question as well as with an answer key where a different number represents each letter of the alphabet.** Then give students a set of math problems they must correctly solve in order to obtain the answer to the question. Different versions of the question should be made to avoid students simply copying from each other.

Global Concept: Cross-Curricular Connections

Cycle of Inquiry: Learners are inspired to be **curious** about decoding messages and **connect** this to using math to represent letters to **communicate** how cross-curricular activities can enhance learning by **creating** a coded message that requires math problems to be solved to reveal certain letters.

Military Math

This activity would be appropriate for older students and gaming fanatics and would require them to envision real-life scenarios. **Tell your students they are preparing missile trajectories which will be launched at the heart of an alien invasion, zombie apocalypse, or some other fictitious event.** Tell them they only have one shot and if they fail to hit their targets, the world will be lost.

Put students in small groups of 3 or 4 and give them some constants—distance to their target, shell size, etc.—then have them come up with a list of other factors that may also need to be included (e.g. earth curvature, wind speed, air resistance, and launch velocity). This activity will help them simulate real-life military math situations.

Global Concept: Conflict/Defence

Cycle of Inquiry: Learners are inspired to be **curious** about trajectory and **connect** this to using math formulas in plotting simulated attack locations to **communicate** how math could be used in defence and conflict situations by **creating** an imaginary scenario in which math must be used to stave off a planetary invasion.

Bake-Off

Provide your students with a cake or brownie mix and a variety of unmarked containers of various sizes. Make sure to know the capacity of the containers you provide. For example, if you use a home container, know how many cups it contains. You also need to give each group one measuring utensil that provides a correct measurement.

Students will have to use conversions based on this tool to determine what the sizes of the rest of their containers are. Once they think they know the measurements, have the students attempt to mix their batter by following the directions on the box. If they have been incorrect in assigning the correct measurements to their containers, their batter will show it!

Global Concept: Volume and Conversion

Cycle of Inquiry: Learners are inspired to be **curious** about conversion equations and **connect** this to making proper recipe calculations to **communicate** how math is used in baking by **creating** a series of conversions for determining unknown quantities of ingredients in a recipe.

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