



Conventional teaching tends to focus on product-based learning, which requires memorization of specific facts and skills at each grade level. Their comprehension is then measured by standardized testing, which can make information retention difficult. Brandon Rutherford, a progressive elementary schoolteacher in Illinois, believes using this system exclusively is not enough for most students and is one of the major reasons that public schools are failing low income students.

Conventional classroom curriculum can be especially irrelevant to low-income students and their lower academic achievement can consequently create a discouraging cycle. Alternatively, Rutherford has a revolutionary vision of starting a process-based learning movement in education and making aquaria an educational mainstay.

Process-based learning focuses on teaching *how* to learn, or '*learning strategies*', and emphasizes intellectual & cognitive development rather than standardized testing. Students are required to perform complex, long-term, open-ended intellectual challenges, which can involve solving various smaller problems. This encourages the development of abstract conceptual skills that are invaluable but also difficult to explicitly teach (e.g. making inferences, leadership). Self-reflection is also an integral part of the process, where students learn to evaluate and improve upon themselves.

Brandon kickstarted his process-based learning curriculum by giving his third grade class full control with the aquarium. For example, performing a successful water change may seem like a mundane chore but this became a complex learning opportunity for the students. They brainstormed for solutions, including carrying buckets in small groups, creating carts to transport the buckets, and even trying a pulley system. Brandon knew the students could learn much more by tackling the situation themselves (teamwork, problem solving, and critical thinking).

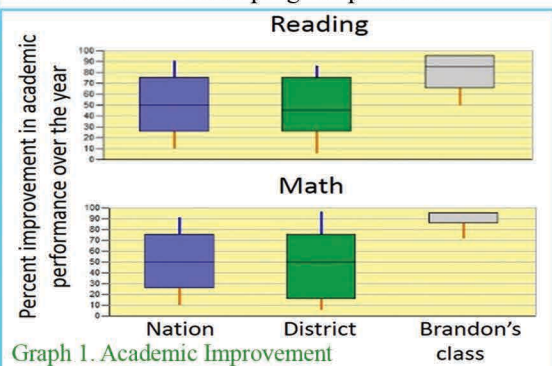
The success of Brandon's '*Aquatic Classroom Learning*' has encouraged several teachers to start focusing on process-based learning. **Graph 1** depicts the success of the aquatic program by comparing the test scores of Brandon's class to the district and the nation. His students scored the highest, even though he spent less time directly teaching 3rd grade academic concepts.

This aquatic learning program exposes students to an entire ecosystem they have never been exposed to. The students loved the program so much that even the skeptical fifth graders would forfeit their recess and stay indoors to feed the anemones.

Students took the project seriously and committed their participation because they were ultimately responsible for the tanks' health and well-being. The teacher merely played a supervisory role, allowing them to make and learn from their own mistakes. This feeling of responsibility empowered them to try new things and exhibit dedication beyond their age. Because of their belief in the project, the students also wanted to share the experience with other classrooms. The students also spearheaded the fundraising efforts, which made the entire program possible.



Classroom Tank Inhabitants © Ben Zimmerman
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Graph 1. Academic Improvement