

Time with Demana/Waits

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Abstract

The author explores the extensive contributions of Bert Waits and Frank Demana to mathematics education at both the state and national levels. It highlights their pioneering efforts in promoting graphing calculators, professional development programs, and a neuroscience-based approach to teaching algebra. The article also discusses the impact of programs such as the Ohio Early College Mathematics Placement Testing (EMPT) Program and the College Short Course Program, which improved mathematics preparedness for thousands of students and provided professional development opportunities for educators. Personal anecdotes provide additional insights into the deep professional and personal relationships shared by the author with Waits and Demana.

Keywords: Ohio Early College Mathematics Placement Testing (EMPT), Graphing Calculators, Professional Development

Connections

The author's connections to Bert Waits and Frank Demana are through the Ohio State University math department's NSF summer institute as a student, through giving graphing calculator sessions at various conferences with Bert, through working for them as the titles above describe, and finally, as a friend to Bert spending time together at our Florida homes.

Ohio Journal of School Mathematics

When the author became co-editor of the *Ohio Journal of School Mathematics* in 1999, it was Bert who scheduled a meeting with Margaret Raub Hunt (who was then the OCTM Executive Director) to discuss the look of, and content in, the *Ohio Journal*. It was at this point that the Journal took on a new look and expanded the call for articles nationally. The expanded call for articles was successful because being the associate director of the Demana/Waits College Short Course Program and EMPT Program gave the author access to emails of high school math teachers in Ohio, and thousands of math professors on a national level. *Why is this important?* In the course of business, the author emailed thousands of teachers promoting Short Courses or the EMPT Program. His email signature offered the call for papers saying "Editor, *Ohio Journal of School Mathematics* (Ask me about writing an article!)." As a result, the *Ohio Journal* published articles from authors in many states.

Ohio EMPT

While Dr. Schultz mentioned The Ohio Early College Mathematics Placement Testing Program, it needs further explanation. That is, how did the work of Demana/Waits impact Ohio mathematics education? The Ohio Board of Regents paid for the program with the intent of encouraging high school juniors to take a math class as seniors, (which was not required at the time) with the intended outcome of bypassing mathematical remediation in college.

In a program evaluation, we showed that students:

- had a higher mathematics placement level upon enrollment at the Ohio State University and were less likely to have remedial placement;
- took more years of college preparatory mathematics;
- enrolled in a senior-level mathematics course;
- enrolled in a higher-level mathematics course his/her senior year;
- performed better in class than a high school student who has not participated in the program.

During the course of the EMPT Program, Demana/Waits improved the academic preparedness of over 750,000 Ohio high school students because they took more mathematics courses in high school and avoided remedial courses in college. The EMPT Program further implemented a senior test allowing schools to check student readiness for calculus in college. We later added a sophomore test and professional development for Ohio high school mathematics teachers. While Demana/Waits positively influenced mathematics education on an international level, they did not forget Ohio teachers.

Bert was also responsible for expanding the EMPT concept to many other states. We sent our tests to those states that adopted the EMPT concept thus expanding the influence of their work. When the author became the director, we were still consulted by several states. However, other states started using the EMPT idea on a university level instead of a state level due to funding issues.

Teachers Teaching with Technology College Short Course Program

The author took early retirement as a mathematics professor to work for Demana/Waits at Ohio State University. This professional development (PD) program was funded by Texas Instruments and provided free PD to college math faculty in the United States and in such exotic places as Saipan, Aruba, and Saint Martin. In addition, we held free short courses for K-12 preservice mathematics teachers from across the country, while giving each student a free graphing calculator or an elementary level calculator. The CSC Program typically provided PD to 50-70 colleges per year.

The CSC Program was founded by Dr. Waits and included around 30 instructors from across the USA, and the author as the director/organizer/facilitator/instructor of the courses. Like other Demana/Waits work, once again the influence on mathematics education through PD for math professors (and preservice teachers) was considerable.

Bert the Math Terrorist

Bert, Frank, and the author were giving talks at the 1999 T3 Japan Conference in Tokyo, and Bert's keynote address was getting rather lively as he raised his voice to nearly shouting while he ranted on about the TI technology in teaching mathematics. While doing so, a TI person overheard a participant whisper to another that he thought Bert acted like a mathematics terrorist. Later, in our office in Dallas, a TI'er posted a picture of Bert in his canoe near his Seabrook Island home and labeled it "Mathematics Terrorist" to the amusement of all.

Friend & Colleague

Over the years Bert and I grew closer due to life's circumstances. For example, we both had homes in the same development in Longwood, Florida, and as such, spent time together talking. He did like to talk about financial issues and we were partial to talking over breakfast.

In addition, while still at OSU he stopped suggesting I get cheap airfares when giving talks or attending meetings. I figured I had crossed over from colleague to friend at this point. As for being a colleague, I knew I had arrived when the Demana/Waits's biggest textbook critic started using Demana/Waits/Laughbaum in his very public negative tirades.

Learning with the Graphing Calculator

My academic views leaned toward using neuroscience research to guide how an algebra textbook should be structured and what approach should be used as the driving force to apply the science to learning and teaching. As for being a colleague, one thing stands out about Bert. He was always supportive of my work.

During my 15 years at The Ohio State University, I used Bert Waits's office. As such, my wall contained the Demana/Waits poster saying "The Power of Visualizations." This was meaningful to me as a user of their textbooks. Given that Bert fully supported my work (as he did for many), the author will finish the article with a quick look at what causes learning in the form of a physiological action in the brain – one component is visualizations, another is generalizing by students that Demana/Waits embraced.

There are four common processes that will lead to learning, they are: associations (connections), meaning through contextual situations, visualizations, and pattern recognition to a generalization (Laughbaum, 2011). Note that Demana/Waits were almost correct on the use of visualizations when they said that visualizations should support paper and pencil manipulations. Neuroscience research suggests the visualizations should come first in teaching a lesson as this will improve memory over using confirming visualizations after symbolic processes are used. As for correctly implementing generalizations, it must be the students who must generalize a concept or skill as compared to the teacher making a generalization.

The learning structures include the following:

- Inherent connections between function representation/behavior and all algebraic content,
- Visualizations used early and daily,
- Meaning and connections added through contextual situations used at the beginning of a lesson, and
- Pattern building to a generalization implemented through guided discovery graphing calculator-based activities.

Bert Waits and Frank Demana were spot on considering how little science research on learning was available at the time. It was my pleasure to be connected to them.

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Edward D. Laughbaum is an emeritus professor of mathematics who dedicated his career to improving algebra education through technology. He taught for over 23 years at Columbus State Community College and later directed the Ohio Early College Mathematics Placement Testing Program and the College Short Course Program at The Ohio State University, focusing on enhancing understanding and long-term retention of algebra concepts.