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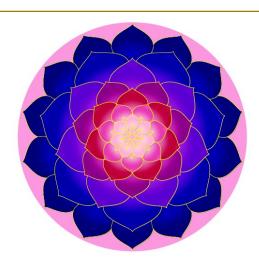
OF MATHEMATICS( (ICTM)

OF TEACHERS

OF THE IDAHO COUNCIL

THE PINNACLE NEWSLETTER

# **SUMMER READINESS**



## SPRING/SUMMER2015 VOLUME XVII, ISSUE 9

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We are on the web: www.idahoctm.org

## REGIONAL REPORTS

Mount Holyoke College's Professional and Graduate Education department (Growing Math Minds)

The more I know, the more I don't know! I was able to attend the NCTM Annual Meeting in San Francisco this past April. It was an amazing conference attended by people from literally around the globe whose focus for three days was on all facets of mathematics. I came back from the conference ready to revitalize my classroom and encourage others to be excited about math.

If you have never attended a math conference – please make plans to attend one close to you! (Remember the Super Conference in Boise in October. J) The days at the meeting were filled with gems of information that grow our minds as teachers – and in turn lead us to encourage students to believe in themselves as mathematicians. My trip was largely funded by a grant from the Mathematics Education Trust. *Check out incredible grant opportunities at nctm.org*.

Robert Kaplinsky is developing and collecting a tremendous bank of rich mathematical tasks that span all grade levels. These rigorous tasks offer students the opportunity to be challenged and to gain a "deep authentic command" of concepts. Check them out at *robertkaplinsky.com*.

Remember Sesame Street? *Which One Doesn't Belong?* is inspired by Christopher Danielson, and this website offers a myriad of math puzzles that have no "correct" answer, but encourage rich discussions about which part of the puzzle doesn't belong, and for what reasons. Find many puzzles for all ages and enliven discussions in your classroom and around your dinner table by visiting *wodb.ca*.

Jo Boaler, with Stanford University, presented her findings that fingers are to be considered a viable math tool — which is an interesting viewpoint that has not always been encouraged. Read about this and more on her free site: *youcubed.org*.

Boaler also has a new book out, <u>Mathematical Mindsets: Unleashing Students'</u> <u>Potential Through Creative Math, Inspiring Messages and Innovative Teaching.</u> We all need to work to believe EVERYONE is a mathematician!

Along with great speakers and amazing resources, the common threads that could be seen and heard were "growth mindset", "making sense", "productive struggle', "asking questions", "explaining thinking", and much more. It is our challenge and mission to encourage students and teachers to be open to rich mathematical tasks and many ways of thinking. Join the math revolution! I'm all in....are you?

Donna Wommack

ICTM Region 2 Representative dwommack@sd282.org



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# ICTM ON FACEBOOK

We are on FACEBOOK. Visit the page and like us. Need information, follow us on FACEBOOK.





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# Lifetime ICTM Membership Newly Retired or Retiring Soon?

You are eligible for lifetime ICTM membership if you have been a member for 5+ years and are retired. If you have retired in the last year, or plan to retire this year, please let Leora White (<a href="mailto:lwhite@nsd131.org">lwhite@nsd131.org</a>) know that you are eligible.

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## Region 3 Happenings:

The third annual Idaho Conference on Undergraduate Research will be held at Boise State University July 27th and 28th. You can find more information at <a href="https://academics.boisestate.edu/icur/">https://academics.boisestate.edu/icur/</a>. Last year's conference is described below.

Boise State University hosted the second annual Idaho Conference on Undergraduate Research July 29<sup>th</sup> and 30<sup>th</sup>. The program included keynote speakers, plenary talks, and break-out sessions focusing on STEM education and opportunities. The last day culminated in the presentation of over 150 research projects by undergraduate students from across the country.

John Bernardo, the Sustainability Strategist for Idaho Power, kicked off the conference with examples of sustainable innovations implemented by various businesses in the past few decades. One such company, Albertsons, replaced their wax coated cardboard boxes used for shipping produce, which could not be recycled, to unwaxed cardboard boxes that are 100% recyclable. This Common Footprint Produce Box is being adopted by other stores as well. These boxes, and similar innovations that improve sustainability, benefit a company's profits and environmental stewardship as well. Bernardo ended his talk with advice for the young scientists in the audience; defy authority respectfully, ask questions, don't limit your thinking, don't always choose instant gratification, and sound business operations promote financial, environmental, and social benefits.

Break-out sessions were offered for three audiences: University faculty, undergraduate students, and high school teachers. A brief summary of the high school sessions follows.

## **Encouraging Diversity in STEM**

Donna Llewellyn, Boise State University

A student is more likely to engage with STEM if they see others like themselves already established in those fields. Educators can encourage and support diversity by attending to the Five A's: Access, Awareness, Academic background, Academic strategies for instructors, Academic strategies for students, Attitudes of instructors and administrators. It is critical for teachers and administrators to advocate for their non-traditional STEM students.

<u>Taking Classrooms to the Field and the Field to the Classroom Through the IdahoWatch Program</u>
Dr. Jennifer Forbey, Boise State University

Dr. Forbey, in conjunction with IdahoWatch, worked with middle school students to apply what they learned in the classroom to field work with Piute ground squirrels and Pygmy rabbits in southwest Idaho. IdahoWatch works with teachers to provide student-led research based on topics relevant to Idaho. Through IdahoWatch, students network with university faculty thus providing them with access to and awareness of scientists conducting research locally. More information is available at: <a href="http://theidahowatch.wix.com/idahowatch">https://news.boisestate.edu/update/2015/05/14/boise-state-students-bring-science-to-life-for-meridian-seventh-graders/">https://news.boisestate.edu/update/2015/05/14/boise-state-students-bring-science-to-life-for-meridian-seventh-graders/</a>

## Climate and Weather through Open-Source Electronics

Dr. Alejandro Flores, Boise State University

Lindsey Lockwood and Guy Falconer, Sage International School

Dr. Flores established The Idaho Literacy Project at Boise State to involve Idaho k-12 students in climate study. Lindsey Lockwood and Guy Falconer provided information about resources to build a classroom weather station for about \$60 using open-source hardware. This weather station could be used to compare variations in data between local conditions and professionally projected conditions, generate models of local weather, or apply statistics to weather data. One source of professional data is available through Dr. Flores'

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work in the Dry Creek Watershed north of Boise. More information can be found at:

http://idahoclimateliteracyproject.org/

http://leaf.boisestate.edu/

Creating an Intentional Web Presence

Dr. Patrick Lowenthal, Boise State University

Your digital footprint is your resume! Be sure to control and shape your digital footprint to accurately represent yourself. Dr. Lowenthal suggests creating a personal website, aside from your website at school. Keep this website up to date with your professional accomplishments and education. As in real estate, curb appeal matters, so keep your page clean and attractive. Outside of your website, Dr. Lowenthal encourages professionals to engage with social networks to share ideas (facebook, likedin, twitter, etc.) and create resources relevant to your field (wiki, tumbler, etc.). Be sure others can find you quickly in a search by naming contributions clearly, using keywords strategically, completing all profiles, creating alerts, and following others. Don't forget to track and adjust your website at least once a year. Google Analytics provides useful tracking data.

## *Humanities* + *STEM* = *Student Engagement*

Dr. Darryl Butt, Boise State University

Dr. Leslie Madsen-Brooks, Boise State University

Dr. Steve Olsen-Smith, Boise State University

Dr. Butt described his work with reverse engineering the materials used in ancient art and artifacts. Students in his class Preservation and Reverse Engineering of Cultural Heritage come from various disciplines, especially the humanities and science. Students have applied material science to examining the constituents in a mummy's sarcophagus, paintings, and other works of art. This blending of humanities and STEM has broken the traditional barriers normally found in these fields. The result is an exciting course that benefits from the expertise of each participant.

Dr. Olsen-Smith is an English professor who is especially interested in the authors Herman Melville and Walt Whitman. His particular research in regards to Melville deals with identifying his extensive library and writings that were sold off after his death. Melville often penciled notations in the margins of his library books. When these books fell into the hands of others, many of the notations were erased. Through collaboration with material scientists, Dr. Olsen-Smith has been able to not only authenticate editions previously owned by Melville, but also recover the text of many of his notations. Scientists are able to reverse the erasures to uncover the original writings. Again, the pairing of Humanities and STEM has led to new discoveries that are compelling to both.

More about this work can be seen at http://melvillesmarginalia.org/front.php.

Dr. Madsen-Brooks provided resources and advice for collaborative work between disciplines. Blogs and group work can easily be handled using wordpress.com. This site is best for simple collaboration. Students are told to keep a portfolio of posts to the blog, then, at the end of the course, the teacher can have the students submit 3-5 of their best posts, that have been polished for submission, for a grade. For more complex collaboration, Dr. Madsen-Brooks suggests using wikispaces. If students use Chromebooks, the teacher can monitor their activity on a wikispace. An example of published collaborative work using wordpress.com can be found at <a href="http://crafting.idahohistory.org">http://crafting.idahohistory.org</a>. The Library of Congress was mentioned as a great resource for primary and secondary sources for research purposes <a href="http://www.loc.gov">http://www.loc.gov</a>.

The final plenary talk was given by Dr. Andrew Holland. Dr. Holland outlined the extensive research needed to uncover how a microwave increases and speeds catalyzation versus catalyzation using a tradi-

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tional oil bath. The research undertaken by undergraduates over many years was crucial and necessary to understand the mechanisms at work. Undergraduate research not only benefits scientists, but provides students important experience and appreciation of the tediousness that sometimes can accompany scientific work. Conducting significant research while still an undergraduate can help to solidify a student's commitment to STEM.

## What do you Mean: I POGIL?

Dr. Shawn Simonson, Boise State University

Process Oriented Guided Inquiry Learning (POGIL) is a student-centered, guided learning approach that engages students in content while simultaneously developing process skills. Through carefully constructed activities, students are involved in problem solving, creating and testing hypotheses, interpersonal communication, and critical thinking. The teacher acts as facilitator as the students work in small groups with specific assigned roles. POGIL was first developed in college chemistry classes, but the framework can be applied in many subjects and is adaptable to various audiences. Learn more about this cooperative learning strategy at <a href="https://pogil.org">https://pogil.org</a>.

The conference ended with poster presentations by the numerous undergraduates who were the focus of this conference. Mathematical research presented included:

Generalizations and Algebraic Structures of the Grøstl-Based Primitives

Dmitriy Khripkov, University of California – Berkeley

Nicholas Lacasse, University of Maine at Farmington

Bai Lin, University of Rochester

Michelle Mastrianni, Carleton College

Dr. Liljana Babinkostova (Mentor), Boise State University

## A Study of Games Over Finite Groups

Dan Kondratyuk, Boise State University

Scott Navert, Boise State University

Stephanie Potter, Boise State University

Dr. Liljana Babinkostova (Mentor), Boise State University

Dr. Samuel Coskey (Mentor), Boise State University

Dr. Marion Scheepers (Mentor), Boise State University

## Two-sided Cayley Graphs

Garrett Smith, Idaho State University

Taylor Sandow, Idaho State University

Yun Teck Lee, Idaho State University

Dr. Cathy Kriloff (Mentor), Idaho State University

Dr. Briana Foster-Greenwood (Mentor), Idaho State University

#### Combinatorial Search and Computational Complexity

Gabriel Currier, Pomona College

Colin Okasaki, Harvey Mudd College

Dr. Liljana Babinkostova (Mentor), Boise State University

Dr. Marion Scheepers (Mentor), Boise State University

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## Game of Greed

I got this game at an AP Statistics conference, but this game could be used with any grade when learning about probability. It helps students understand the difference between observed and theoretical probability. The student love this game, they really get into it.

Everyone stands up.

Toss a single die. If it lands on 1, 3, 4, 5, or 6, the student gets that number of points. Keep tossing. For each toss each student adds the number of points rolled to their total.

Students may sit down at any time before the next roll. If they sit down, they keep the total points they have at that time. They should write this down.

If a 2 is rolled, all students standing at that time lose all their points. This is the end of a round.

Complete 5 rounds (or more if you have time).

Students add their points.

The winner with the highest total is the winner.

In addition to the above rules I have implemented the following

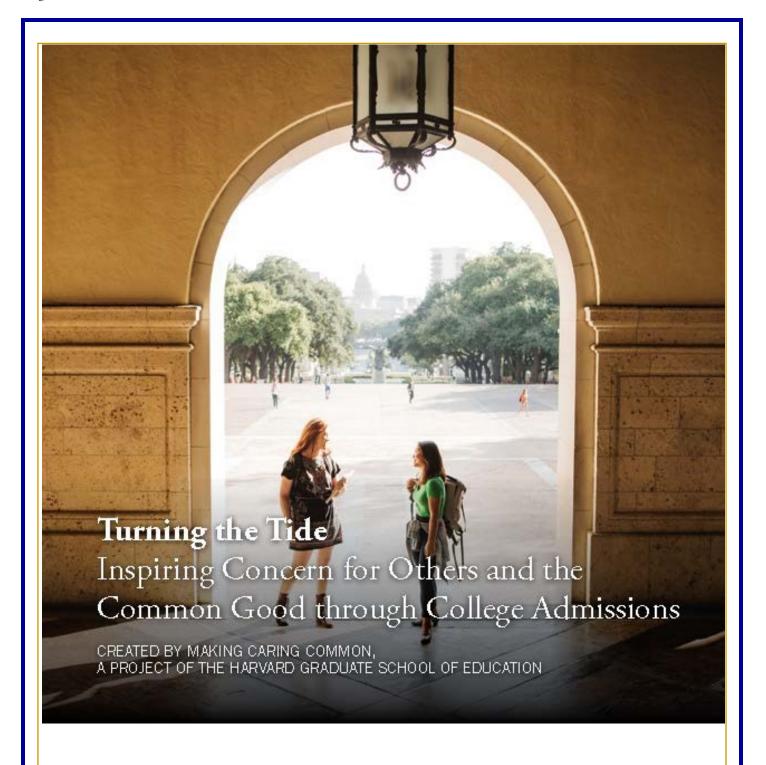
If a 2 shows up within the first 3 rolls, students do not lose their points, but can keep the 2 points. So the first three rolls are safe.

I ALWAYS give extra credit – not much, but just enough to have students push their greediness.

I have played this with a 8-sided, 12-sided and 30-sided die. The student have to rethink their strategies when I switch die.

Submitted by: Penny Smeltzer Westwood HS

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This report stems from an exploratory meeting hosted by the Making Caring Common project at the Harvard Graduate School of Education. Participants included college admissions officers, university administrators, school guidance counselors and principals, character education experts, individuals representing national organizations of school guidance counselors, admission professionals, and independent schools as well as other key stakeholders. The purpose of the meeting was to consider how to improve the role of the college admissions process in promoting and assessing ethical and intellectual engagement. The recommendations here emerged from that meeting and have been revised in subsequent conversations with admissions deans. A list of those who have endorsed this report is included at the end of this document and online at www.makingcaringcommon.org. Several of these endorsers have already made changes in their admissions materials or practices as the result of this report. Making Caring Common, in collaboration with the Education Conservancy, will work with college admissions officers and other key stakeholders—including parents, high school guidance counselors, and high school and college administrators—over the next two years to far more widely implement the report recommendations

Turning the Tide was written by Richard Weissbourd, Senior Lecturer and Co-director of the Making Caring Common project at the Harvard Graduate School of Education, in collaboration with Lloyd Thacker, Executive Director of the Education Conservancy, and the Making Caring Common team including Trisha Ross Anderson, Alison Cashin, Luba Falk Feigenberg, and Jennifer Kahn.



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# **Executive Summary**

oo often, today's culture sends young people messages that emphasize personal success rather than concern for others and the common good (Konrath, O'Brien, & Hsing, 2011; Putnam, 2005; Putnam, 2014; Weissbourd & Jones, 2014). And too often the college admissions process—a process that involves admissions offices, guidance counselors, parents and many other stakeholders—contributes to this problem. As a rite of passage for many students and a major focus for many parents, the college admissions process is powerfully positioned to send different messages that help young people become more generous and humane in ways that benefit not only society but students themselves. Yet high school students often perceive colleges as simply valuing their achievements, not their responsibility for others and their communities. While some colleges have diligently sought to convey to applicants the importance of concern for others and the common good, many other colleges have not. The messages that colleges do send about concern for others are commonly drowned out by the power and frequency of messages from parents and the larger culture emphasizing individual achievement. Further, even when students and parents receive the message that contributions and service to others do count, they often seek to "game" service.

This report advances a new, widely shared vision of college admissions that seeks to respond to this deeply concerning problem. It makes the case that college admissions can send compelling messages that both ethical engagement—especially concern for others and the common good—and intellectual engagement are highly important. Colleges can powerfully collaborate to send different messages to high school students about what colleges value. This report, endorsed by over 80 key stakeholders in college admissions, represents such a collaboration.

More specifically, this report takes up three challenges. First, it describes how college admissions can motivate high school students to contribute to others and their communities in more authentic and meaningful ways that promote in them genuine investment in the collective good and deeper understanding of and respect for others, especially those different from them in background and character. Second, it demonstrates how the admissions process can more accurately and meaningfully assess young people's contributions to others and their communities, especially students who vary widely by race, culture and class.

College admissions can send compelling messages that both ethical engagement—especially concern for others and the common good—and intellectual engagement are highly important.

Promoting ethical and intellectual development via college admissions requires taking up two other related goals. In some communities students suffer from a lack of academic resources and opportunities. In other communities pervasive pressure to perform academically at high levels and to enter selective colleges takes an emotional toll on students and often squeezes out the time and energy students have to consider and contribute to others. A healthy and fair admissions process cannot simply encourage students to devote more time to others: It needs simultaneously to reward those who demonstrate true citizenship, deflate undue academic performance pressure and redefine achievement in ways that create greater equity and access for economically diverse students.

The following report offers specific recommendations for reshaping the admissions process in each of the following three areas:

Promoting more meaningful contributions to others, community service and engagement with the public good.

Assessing students' ethical engagement and contributions to others in ways that reflect varying types of family and community contributions across race, culture and class.

Redefining achievement in ways that both level the playing field for economically diverse students and reduce excessive achievement pressure.

For a fuller discussion of each of these recommendations, including suggestions for specific changes in application essay questions and recommendations, please see the full report. Additional resources are available at www.makingcaringcommonorg.

# RECOMMENDATIONS FOR COMMUNITY ENGAGEMENT AND SERVICE

The admissions process should both clearly signal that concern for others and the common good are highly valued in admissions and describe what kinds of service, contributions and engagement are most likely to lead to responsible work, caring relationships and ethical citizenship.



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# Recommendation #1: Meaningful, Sustained Community Service

We recommend that students engage in forms of service that are authentically chosen—that emerge from a student's particular passions and interests that are consistent and well-structured, and that provide opportunity for reflection both individually and with peers and adults. We also recommend that students undertake at least a year of sustained service or community engagement (see below for description of "community engagement"). This service can take the form of substantial and sustained contributions to one's family, such as working outside the home to provide needed Income. Just as important, it's vital that the admissions process squarely challenges misconceptions about what types of service are valued in admissions. Some students seek to "game" service by taking up high-profile or exotic forms of community service, sometimes in faraway places, that have little meaning to them but appear to demonstrate their entrepreneurial spirit and leadership. The admissions process should clearly convey that what counts is not whether service occurred locally or in some distant place or whether students were leaders, but whether students immersed themselves in an experience and the emotional and ethical awareness and skills generated by that experience.

# Recommendation #2: Collective Action that Takes on Community Challenges

While individual service can be valuable, we also encourage young people to consider various forms of community engagement, including working in groups on community problems, whether the problem is a local park that needs attention, bullying in their schools or

communities or some form of environmental degradation. These types of activities can help young people develop key emotional and ethical capacities, including problem-solving skills and group awareness, as well as greater understanding of and investment in the common good.

# Recommendation #3: Authentic, Meaningful Experiences with Diversity

We encourage students to undertake community service and engagement that deepens their appreciation of diversity. Too often, current forms of service are patronizing to recipients and don't spark in those providing service a deeper understanding of social structures and inequalities. Rather than students "doing for" students from different backgrounds, for example, we encourage students to "do with"—to work in diverse groups for sustained periods of time on school and community challenges, groups in which students learn from one another. Importantly, these experiences of diversity should be carefully constructed and facilitated.

# Recommendation #4: Service that Develops Gratitude and a Sense of Responsibility for the Future

We encourage students to take up forms of community engagement, service and reflection that help them appreciate the contributions of the generations before them—how their lives are built on the service of others—and their responsibility to their descendants. Working within a tradition, whether religious or secular, such as 4H clubs, can help generate this kind of gratitude and responsibility.

RECOMMENDATIONS FOR ASSESSING ETHICAL ENGAGEMENT AND CONTRIBUTIONS TO OTHERS ACROSS RACE, CULTURE AND CLASS

# Recommendation #1: Contributions to One's Family

The admissions process should clearly send the message to students, parents and other caregivers that not only community engagement and service, but also students' family contributions, such as caring for younger siblings, taking on major household duties or working outside the home to provide needed income, are highly valued in the admissions process. Far too often there is a perception that high-profile, brief forms of service tend to count in admissions, while these far more consistent, demanding, and deeper family contributions are overlooked. Students should have clear opportunities to report these family contributions on their applications.

# Recommendation #2: Assessing Students' Daily Awareness of and Contributions to Others

The admissions process should seek to assess more effectively whether students are ethically responsible and concerned for others and their communities in their daily lives. The nature of students' day-to-day conduct should be weighed more heavily in admissions than the nature of students' stints of service.



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RECOMMENDATIONS FOR REDUCING UNDUE ACHIEVEMENT PRESSURE, REDEFINING ACHIEVEMENT, AND LEVELING THE PLAYING FIELD FOR ECONOMICALLY DIVERSE STUDENTS

# Recommendation #1: Prioritizing Quality—Not Quantity—of Activities

Admissions offices should send a clear message that numerous extracurricular activities or long "brag sheets" do not increase students' chances of admission.

Applications should state plainly that students should feel no pressure to report more than two or three substantive extracurricular activities and should discourage students from reporting activities that have not been meaningful to them. Applications should provide room to list perhaps no more than four activities or should simply ask students to describe two or three meaningful activities narratively. Applications should underscore the importance of the quality and not the quantity of students' extracurricular activities. Admissions offices should define students' potential for achievement in terms of the depth of students' intellectual and ethical engagement and potential.

# Recommendation #2: Awareness of Overloading on AP/IB Courses

Admissions offices should convey to students that simply taking large numbers of AP or IB courses per year is often not as valuable as sustained achievement in a limited number of areas. While some students can benefit from and handle large numbers of AP/IB courses, many students benefit from taking smaller numbers of advanced courses. Too often there is the perception that these students are penalized in the admissions process.

At the same time, it's vital to increase access to advanced courses for large numbers of students in schools without access to adequately challenging courses.

# Recommendation #3: Discouraging "Overcoaching"

Admissions offices should warn students and parents that applications that are "overcoached" can jeopardize desired admission outcomes. Admissions officers, guidance counselors and other stakeholders should remind parents and students that authenticity, confidence, and honesty are best reflected in the student's original voice. Admission officers should consider inviting students (and families) to reflect on the ethical challenges they faced during the application process.

# Recommendation #4: Options for Reducing Test Pressure

Admissions offices should work to relieve undue pressure associated with admission tests (SAT and ACT). Options for reducing this pressure include: making these tests optional, clearly describing to applicants how much these tests actually "count" and how they are considered in the admissions process, and discouraging students from taking an admissions test more than twice. Colleges should tell students that taking the test more than twice is very unlikely to meaningfully improve students' scores. Colleges should also be asked to justify the use of admissions tests by providing data that indicates how scores are related to academic performance at their particular institution.

# Endorsers

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James Youniss, Wylma R. & James R. Curtin Professor Emeritus, THE CATHOLIC UNIVERSITY OF AMERICA

Jeff Young, Superintendent, CAMBRIDGE PUBLIC SCHOOLS

Vicki Zakrzewski, Education Director,

GREATER GOOD SCIENCE CENTER AT UC BERKELEY

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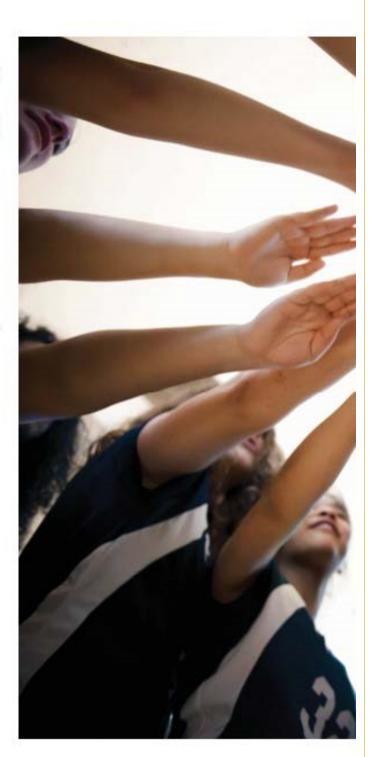
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# **Activities Galore**

(press the Control an hover over the Links to activate libks)

<u>HERE</u> is a file of multiple probability activities and assignments that I created/assembled last year for the Boise School District to use. It's a TON of activies and assignments with keys. I can't vouch that it's completely error free, but I spent my entire Christmas break creating it, so it should be pretty clean.

"Looking for some quality activies and assignments for your High School CCSSM probability standards? Well, look no further! <u>HERE</u> is 104 pages chock full of material that is print-ready and kid-tested, courtesy of Tatia Totorica at Boise State University. Let her know if you find any typos that need to be fixed by emailing tatiatotorica@boisestate.edu."

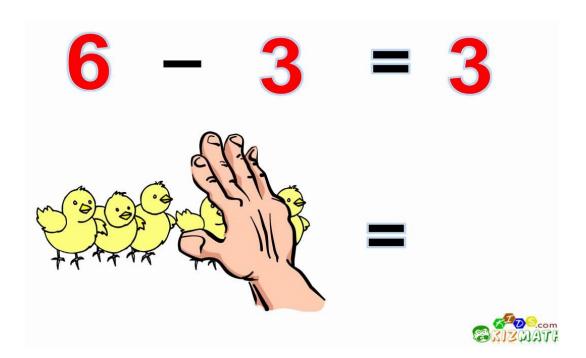
This activity is designed to build students' familiarity with limits near "problem" points caused by division by zero. All too often, calculus students assume that division by zero in a function creates an asymptote or a removable discontinuity in that function's graph. Exposing them to situations where alternate graphical phenomena occur can stretch their conceptual understanding of (a) how functions behave near points of discontinuity and (b) their assumptions about the left- and right-hand limits near these points. This activity is designed to challenge students' propensity to generalize without carefully attending to the properties of number and to help them understand algebraically why the graphical representations their calculators generate make sense.

<u>Here's</u> a division modeling resource that I wrote and have since shared with multiple elementary teachers. It's long, but has LOTS of modeling examples for division problems. I've tried to make the document navigable by providing hyperlinks to the specific types of questions that teachers may wish to explore. Will it work for my pinnacle article that's due by May 31?

I know it's not the hyperbola resource I promised, but I thought it might be applicable for a wider audience of teachers.

Tatia Totorica

P.S. <u>HERE</u> is the link to a slew of resources I (and other math and science colleagues of mine) have assembled over the past few years, in case you want to add it to the website.



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# Excerpt from Algebra Unplugged (with skit suggestions)

Learning math is a lot like learning

a new language, (student & teacher conversing/studying book in another language)

how to drive a car, (4 people simulating a driver and 3 passengers in a car)

how to swim, (people in flippers, snorkel mask and blowing bubbles)

or how to ride a bike. (bike riders)

You must learn **concepts** at the same time you are developing **skills**.

There are grammatical rules, pedals to push, gears to shift, lights to turn on and off, turn signals to manipulate, a steering mechanism with which to wrestle, and motions to make. These are skills—things you do.

There are also important concepts to learn. Concepts such as don't inhale under water, what the brake pedal does, why you need to use your turn signals, what the clutch is good for, and which direction to steer when the car begins to skid. Concepts are ideas, thoughts, and knowledge.

It is important to practice using the skills and concepts. You can't learn

a new language, (student & teacher conversing/studying book in another language)

to drive a car, (4 people simulating a driver and 3 passengers in a car)

ride a bike, (bike riders)

or swim (people in flippers, snorkel mask and blowing bubbles)

without practicing. Skills improve with practice. Concepts are reinforced with practice. You can't learn math without practicing either. So please remember to do your homework!

Loats, Jim, and Kenn Amdahl. Algebra Unplugged. N.p.: Clearwater, 2010. Print.

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# **Success in Math Education**

Success—what is it? It is mysterious, evasive, and can feel elusive--just out of reach. We research methods; we seek results; we stalk success. We live for when students have those "aha" moments—to teachers that is success.

One dictionary defines success as the favorable or prosperous termination of attempts or endeavors. Termination? Not in education. In our world, success is germination—we plant seeds, but we may not see the flower.

Finding success in mathematics may seem daunting. After all, the very word comes from the Greek for "all things worth knowing." That's a lot! Mathematics (from Greek  $\mu \dot{\alpha} \theta \eta \mu \alpha$  máthēma, "knowledge, study, learning") arises wherever there are difficult problems that involve quantity, structure, space, patterns, change, logic, set theory, applied mathematics, and even uncertainty. At first these problems were found in commerce, land measurement and later astronomy. Today, science suggests problems studied by mathematicians, and many problems arise within mathematics itself. (Science includes engineering, medicine, finance, the social sciences, natural science—biology, physics, Earth science, chemistry, astronomy)

The major disciplines within mathematics first arose out of the need to do calculations in commerce, to understand the relationships between numbers, to measure land, and to predict astronomical events. These four needs can be roughly related to the broad subdivision of mathematics into the study of quantity, structure, space, and change (i.e., arithmetic, algebra, geometry, and analysis). In addition to these main concerns, there are also subdivisions dedicated to exploring links from the heart of mathematics to other fields: to logic, to set theory (foundations), to the empirical mathematics of the various sciences (applied mathematics), and more recently to the rigorous study of uncertainty.

Galileo Galilei (1564–1642) said, "The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth."<sup>[1]</sup>

At different times and in different cultures and countries, mathematics education has attempted to achieve a variety of different objectives. These objectives have included:

- \* The teaching of basic numeracy skills to all pupils
- \* The teaching of practical mathematics (arithmetic, elementary algebra, plane and solid geometry, trigonometry) to most pupils, to equip them to follow a trade or craft
  - \* The teaching of abstract mathematical concepts (such as set and function)
- \* The teaching of selected areas of mathematics (such as Euclidean geometry) as an example of an axiomatic system and a model of deductive reasoning
- \* The teaching of selected areas of mathematics (such as calculus) as an example of the intellectual achievements of the modern world
  - \* The teaching of advanced mathematics to pupils who wish to follow a career in science
  - \* The teaching of heuristics and other problem-solving strategies to solve non- routine problems.

Methods of teaching mathematics have varied in line with changing objectives.

**Conventional approach**: the gradual and systematic guiding through the hierarchy of mathematical notions, ideas and techniques.

Classical education: the teaching of mathematics as a paradigm of deductive reasoning.

Rote learning: the teaching of mathematical results, definitions and concepts by repetition and memorization typically without meaning or supported by mathematical reasoning.

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**Exercises**: the reinforcement of mathematical skills by completing large numbers of exercises of a similar type.

**Problem solving**: the cultivation of mathematical ingenuity, creativity and heuristic thinking by setting students open-ended, unusual, and sometimes unsolved problems.

**New Math**: a method of teaching mathematics which focuses on abstract concepts such as set theory, functions and bases other than ten.

**Historical method**: teaching the development of mathematics within an historical, social and cultural context. [2]

**Standards-based mathematics**: a vision for pre-college mathematics education, focused on deepening student understanding of mathematical ideas and procedures.

**Relational approach**: Uses class topics to solve everyday problems and relates the topic to current events. This approach focuses on the many uses of mathematics and helps students understand why they need to know it as well as helping them to apply mathematics to real world situations outside of the classroom. <sup>[3]</sup>

**Recreational mathematics**: Mathematical problems that are fun can motivate students to learn mathematics and can increase enjoyment of mathematics. <sup>[4]</sup>

**Computer-based math** an approach based around use of mathematical software as the primary tool of computation.

If, as Sir Winston Churchill said, "Success is the ability to go from one failure to another with no loss of enthusiasm", then educators are by their very nature successful. We react to student needs—seeking solutions year after year, rejuvenated each fall with the thought of the lives we will touch. We seek to use a variety of approaches, we search for best practices, and we are driven to raise the appreciation of mathematics and to lower math anxiety. We are Math Teachers!

- [1] Marcus du Sautoy, <u>A Brief History of Mathematics</u>: 1. Newton and Leibniz, BBC Radio 4, September 27, 2010.
- <sup>[2]</sup> Sriraman, Bharath (2012). Crossroads in the History of Mathematics and Mathematics Education. Monograph Series in Mathematics Education 12. IAP. <u>ISBN 978-1-61735-704-6</u>.
  <sup>[3]</sup> <a href="http://www.math.unl.edu/~s-kfield1/203currentevent.htm%20">http://www.math.unl.edu/~s-kfield1/203currentevent.htm%20</a>
- [4] <u>Singmaster, David</u> (7 September 1993). <u>"The Unreasonable Utility of Recreational Mathematics"</u>. For First European Congress of Mathematics, Paris, July, 1992.



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# Tips for Differentiating in the Math Classroom

Region 3 Rep - Sue Darden, 6<sup>th</sup> Grade, Galileo STEM Academy, Eagle, ID

Contact Information: <u>Darden.sue@westada.org</u>

## **Steps and Tips for Differentiation**

Pre-assessment

Determine what standard(s) you want the students to master

Determine what skills and concepts the students need to know to master the standard(s)

Create (or find) and administer a pre-assessment that includes all the pre-requisite skills needed Grouping

Using data from the pre-assessment, place students in ability groups depending on what skills/concepts they need to master

Establish 3-6 different ability levels (the fewer the easier it is)

2-5 students per group, even if some groups are working at the same ability level

## Assignments

Create a list of assignments/activities to help the students progress from where they are to mastery of the standards

Use video lessons, practice sheets, group activities, etc.

Include bare problems and contextual problems

Give students a calendar of their assignments with exact due dates though they may work ahead

Keep the time frame to accomplish the entire list to no more than three weeks, but one or two weeks was more preferable

Provide keys so that students can check their own work for accuracy.

Students must write why they missed any problems before they turn in their work

**Teacher Time in Class** 

Work with students in groups or individually

Do frequent checks for understanding (small white boards work great!)

Whole group activities when appropriate

Formative Assessment

Assess every week or two (at the end of each unit of skill instruction) to determine if mastery has been reached

#### **Time Management Tips**

All assignments are kept in folders that students have easy access to

Students correct their own assignments with keys provided

Keys are kept in page protectors which prevents them accidentally being marked on and also makes them easy to find in the folder

Daily assignments are checked for completion only

## Recommended Technology (having at least a few devices can help so you can assign video lessons)

Learnzillion.com – free video lessons based on the CCSS. Lessons are available that demonstrate different strategies, not just standard algorithms. Only the teacher needs an account. When you select the video you want the students to watch, you receive a Quickcode. Students log on and enter their Quickcode and are immediately shown the video.

Great to send home with homework in case the parents have questions.

Can be viewed multiple times by the student

Multiple videos per standard

Also includes teacher lessons plans for some standards

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Khan Academy

Think Through Math

ALEKS.com- research based, individualized, adaptive online program that precisely identifies a student's knowledge and delivers targeted instruction on the exact topics a student is most ready to learn. (currently \$35 per student per year in a public school)

Idaho contact: Cindy Kincer

Idaho contact: Cindy Kince Email: ckincer@aleks.com Phone: (619)669-3698

3 month free trial may be available



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# **Serving Unit Circle Trigonometry on a Paper Plate**

Memorizing the unit circle in trigonometry isn't hard to do, it just doesn't make the connections in my class that I really wanted. I was introduced to this activity at the NCTM convention in Salt Lake City in 20012 and have used it ever since. I have made some changes and adjustments to fit my own classes and preferences.

I have my students put the coordinates onto the stickers and the angle measurements in degrees and radians on the plate. I also allow students to put some notes on the back of their paper plate and use them on quizzes and tests. We do not have room in our small high school for a trig class so it is taught in conjunction with pre-calculus and we rarely have the time we need to do this discipline justice. So I combat that with less memorization.

HINT: Teachers - practice cutting a few of these before you do them in class. It will save you some time in knowing some of the cutting errors which students make (because they will and so will you:) When cutting out the triangles, have students hold the folded side of circle with their non-cutting hand and make sure the "point" not the rounded side is towards the ceiling. You will have less cutting errors this way.

This is a great tool for trig students and I have had several tell me they took their "paper plate" with them to college where they have continued to use it.

**ENJOY!** 

\*\*\*\*\*

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Presented at the 2008 NCTM National Conference, SLC, Ut by Vicki Lyons and Todd Vawdrey: Lone Peak High School, Highland, Utah

Time needed: About 1 ½ class periods to create triangles, label and find degree and radian measurements.

Materials: cheap paper plate; 3 sheets of different colored paper with a circle of 14.5 cm diameter copied on each paper; ruler, glue stick, scissors, and either 4 colors of markers OR stickers (if using stickers you'll need 4 different colors, 4 of each color + 1 extra of one of the colors = 17) It works really well if 3 of the stickers/markers match the colored paper.

DIRECTIONS for placing the x and y axis and for cutting the 45, 30, and 60 triangles are found on the 2nd attached document.

Also included is image of paper plate

You may find more lesson ideas and assignments at this webquest address.

http://zunal.com/webquest.php?w=169095

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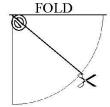
# Serving Unit-Circle Trigonometry on a Paper Plate

Directions:

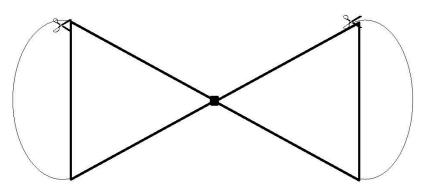
Trace one circle in the center of your paper plate. Draw in the x & y axis through the center of the circle on the paper plate using a ruler.

1) Create 45 degree piece:

a) Fold in half, in half again, and in half again. Unfold.



b) Refold so you have a quarter circle. You will see one bisecting fold. Hold so that the solid folded edge is up and the open flaps down, cut along the fold <u>almost</u> to the point, then angle your scissors upwards and cut off the upper half. This will leave a little connecting piece. (When you unfold, and it will look like a bow tie with a tiny center.) Use a ruler to drop a perpendicular from one outside corner down to the radius, and cut off the curved part of the circle, so it looks like a true triangle.



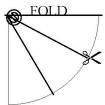
If we call the hypotenuse length = 1, what is the length of the legs of the triangle? Rationalize the denominator.

c) Glue the "bow tie" onto the center of the paper plate, so the x axis is going through the length of the bowtie. Redraw the x-axis so you can see it. On the paper plate, label the (x,y) points in each quadrant at the edges of the bow tie, using the distances found. (NOTE: Write close to the bow tie, later you will be writing (or using stickers) to label the radian measurements, so need space on rippling edges of the paper plate.)

#### 2) Create 60 degree piece:

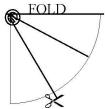
a) Fold second colored circle in half. CAREFULLY make two more folds, dividing the half circle into 1/3 sections (ice cream cone). It works best if you fold one section forward and one section back. Fold the ice cream cone in half. Page 27 Spring/Summer 2016

b) Refold into a quarter circle. You will see two trisecting folds. Hold the quarter circle so the solid fold is up and the flaps are down. Cut along the upper fold <u>almost</u> to the center, then angle the scissors up and cut off the upper 1/3 of the paper, leaving a little connecting piece. (If you unfolded it, it would be a bowtie.)



Using a ruler, drop a perpendicular from perimeter of the upper cut-off fold, down to the radius. Cut off the perpendicular, removing curved part of the circle.

- c) What type of triangle is this? (30-60-90) Which edge is the radius of the original circle? If the length of the hypotenuse is 1, what are the lengths of each of the legs?
- d) Unfold, and glue the bow tie on to the paper plate. Label the (x, y) points on the bow tie, using the lengths of the legs of the triangle. Redraw the x-axis.
- 3) **Create the 30 degree angle piece:** Follow directions as above. Instead of cutting on the top fold, cut on the lower fold. Be sure to leave a small connecting piece for the bow tie. Glue to paper plate and label the (x, y) points of the bow tie.



Finish by adding degree markings at each axis and in each quadrant, on the very outer edges of the plate. Leave room to add radians on the ribbed part of the plate.

#### Radians

When ready to discuss radian measurements, use stickers to label the radian measurements on the outer edge of the paper plate. Use four stickers at the 0 - 360, 90, 180, 260 positions.



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# **PROFESSIONAL OPPORTUNITIES**

# **Idaho Council of Teachers of Mathematics (ICTM)**

October 6-7 2016 Boise Idaho



# **National Council of Teachers of Mathematics (NCTM)**

**National Conference** 

April 5-8, 2017 San Antonio, TX



## **National Council of Teachers of Mathematics (NCTM) Regional Conferences 2015**

Chicago, Illinois Hyatt Regency Chicago March 10-12, 2017



2017 T<sup>3</sup> Interna Chicago, IL Hyatt Regency March 10–12, 2



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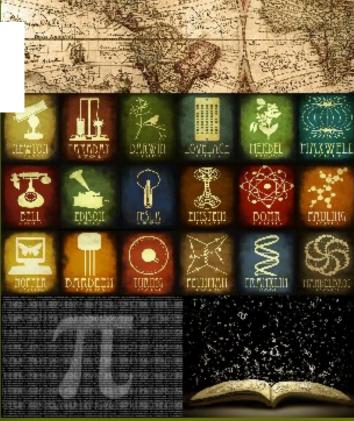
# LEARNING AGROSS ALL DIMENSIONS

Oct. 6-7, 2016

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tional Conference

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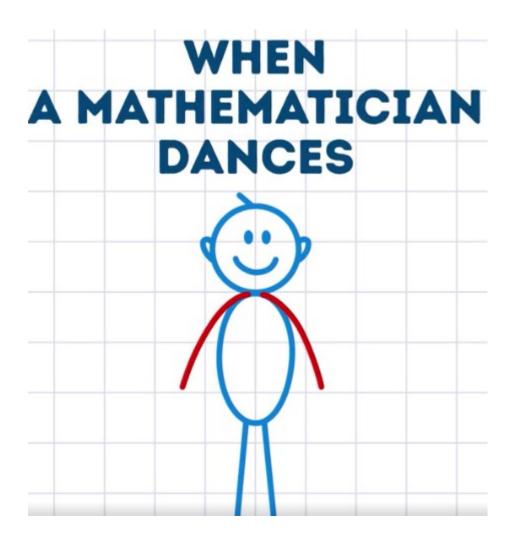
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http://appchronicles.com/category/apps-gone-free/



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This is perfect for all of the work we do with functions and parent functions.



https://www.facebook.com/MathematicsVisionProject/?fref=ts

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# **USEFUL WEBSITES**

## **PhET**

PhET: Free online physics, chemistry, biology, earth science and math simulations <a href="https://phet.colorado.edu/">https://phet.colorado.edu/</a>

## Class Flow

Send quizzes, polls and open-ended activities to student computers and tablets. https://classflow.com/

## Polls Everywhere

Collect data while interacting with your students. It is a simple text messaging voting application. The poll is embedded within the presentation or web page and will update in real time. http://www.polleverywhere.com/

### Socrative

Through the use of real time questioning teachers can gauge the whole class' understanding of content throughtablets, laptops and smartphones.

http://b.socrative.com/login/student/

## Quizlet

Quizlet's online flashcards, tests, and study games make learning fun and engaging for students of all ages.

http://quizlet.com/

## QuizStar

Quizstar is a free, online quiz maker that allows you to manage your classes, assign quizzes, and generate reports of quiz scores and student performance.

http://quizstar.4teachers.org/

## Kahoot

Create and play quizzes, discussions or even surveys (which are called Kahoots) using any device with a web browser... including a laptop, iDevice, Android, or PC's https://getkahoot.com/

## Kathy Schrock's Guide to Everything Website

Looking for great rubrics and additional assessment links? Check out Kathy Schrock's Guide to Everything Website

http://www.schrockguide.net/assessment-and-rubrics.html

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# ICTM Board Addresses

ICTM BOARD	Name	Address	City, State, ZIP	Phone	E-mail
President	Ashley Henderson Sage International School	2929 Nez Perce	Boise, ID 83705		ashley.henderson@ sageinternationalschool.org
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<b>Region 3A</b> 2012-2017	Brenda Gardunia CWI	103 W. Orcutt Lane	Nampa, ID 83686	559-7952	brendagardunia@gmail.com
<b>Region 3A</b> 2015-2019	Sue Darden Galileo STEM Acadey	1858 W. Santa Clara St 4735 W Saguaro D	Meridians, ID 83642 Eagle, ID 83616	869-8522 350-410d	dardenseu@masn.com arden.sue@westada.org
<b>Region 3B</b> 2015-2019					
<b>Region 3B</b> 2015–2019	Penny Burleson Cascade Jr./Sr. HS				penny@cascadeschools.org
Region 4 2001-2017	Terri Matthews Burley High	30 West 208 South 2100 Parke Avenue	Burley, ID 83318 Burley, ID 83318	678-8696 878-6606	ter410@pmt.org matterri@scasslasschools.org
Region 4 2015-2019		DO D. 4516	GL L VD COATA		
<b>Region 5</b> 2012-2019 <b>Region 5</b>	Penny Bassett Bear Lake Middle School Kathy Grumbein	PO Box 274 St. 633 Washington St.	Charles, ID 83272 Montpelier, ID 83254	847-2255	pennybassett@ymail.com pbassett@blsd.net
2015-2019 <b>Region 6</b>	Hawthorne MS Lourene Praeder	3770 E. 200 N.	Rigby, Idaho 83442	521-8376	grumbeka@sd25.us louranaw@yahoo.com
2007-2017 <b>Region 6</b> 2013-2017	Rigby High School Susan Sterzer Ririe High School	290 N 3800 E 3800 E. 25 N.	Rigby, ID 83442 Rexburg, ID 83442	745-7704 745-6661	lpraeder@sd251.org ssterzer@ririe252.org
College Private	Richard Pieper	976 McJon Lane BYU Idaho	Rexburg, ID 83440		pieperr@byui.edu
College Public	Jonathan Brendefur	Boise State University 1910 University Dr.	Boise, Id 83725	426-2468	jbrendef@boisestate.edu
College Public	Tatia Totorica	Boise State University 1910 University Dr.	Boise, Id 83725	867-6736	tatia.totorica@gmail.com

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Gone for the summer!



