



IMPressions

SPRING 2001

A NEWSLETTER ABOUT THE INTERACTIVE MATHEMATICS PROGRAM®

Former IMP Student to Attend Top Medical School.... *With Time Out as Miss California* by Janice Bussey

Rita Ng, a 1996 *IMP* graduate from Tracy High School in Tracy, California, was crowned Miss California last fall and went on to be named second runner up during the October 14 Miss America Pageant.

After graduating from Tracy High, Rita went directly to Stanford University to major in pre-med. She will be attending UCSF Medical School after finishing her stint as Miss California. When asked how her high school *IMP* experience might have prepared her for her major in medicine, Rita replied, "Medicine is the integration of science and its ultimate application to the human form; much like the relationship between *IMP* versus the pure study of traditional mathematical theories. I don't necessarily enjoy studying science or conducting pure research – I am a much more people oriented person and like how every scientific discovery ties into a human application. I think that *IMP* taught me the relevance behind the research."

Rita never saw herself as the beauty pageant type. As a matter of fact, in many of her interviews as Miss California, she jokes about learning to apply make-up. She never wore make-up before and found the ordeal often times more challenging than a chemistry exam. So what made Rita even think to go down this road of evening gowns and swim suits with heels? She explains, "Quite honestly, I entered more on a whim than anything. I had been selected by *Glamour Magazine* as one of the "Top



Rita Ng, former *IMP* student, Miss California

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How to Help with Math Homework When the Answers Aren't in the Book

by William Blatner, IMP teacher

IMP 4 students and their teacher at South Hadley High School (SHHS) in western Massachusetts have produced a 12-page booklet titled, *How to Help With Math Homework When the Answers Aren't in the Book, A Guide for Students, Families and Friends*. Seniors Jeremiah Beaudry and Jackie Rigali work as assistants to *IMP* teacher Bill Blatner through SHHS's School-to-Work Connections Program. Beaudry, who recently sold his first web page design company and is now building his second, designed the booklet

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OBSERVABLE BEHAVIORS IN A STUDENT CENTERED CLASSROOM

by Nora Ramirez, Director IMP Arizona

This list of observable student and teacher behaviors was first developed for a group of principals who asked for some assistance in knowing what to look for in mathematics classrooms of today. It is now also being used by teachers to plan instruction and to reflect on the extent that their classrooms are student centered.

Student behaviors:

- Actively participating in class activities;
- Acting independently and interacting with each other;
- Communicating mathematical/scientific ideas with one another;
- Working with groups to test solutions/hypotheses;
- Using a variety of materials and resources;
- Using prior knowledge to make sense of new situations;
- Applying mathematics and/or science to real life problems;
- Using multiple approaches to solve problems;
- Explaining and/or defending processes or solutions with mathematical/scientific evidence;
- Seeking information from sources other than the teacher;
- Demonstrating knowledge with a variety of media; and
- Collecting, organizing, and analyzing data.

Teacher behaviors:

- Assigning meaningful tasks that require both group and individual effort;
- Raising questions that encourage all students to explore different solutions;
- Encouraging all students to raise original questions;
- Stressing understanding and problem solving skills;
- Promoting discussions where students share their perceptions and observations;
- Encouraging and modeling inquiry, as well as curiosity and skepticism;
- Asking for justification and clarification from students;
- Using students' collective experiences and explanations to introduce concepts and terms;
- Using a variety of methods for on-going assessment;
- Keeping all students engaged and on task;
- Recognizing and responding to student diversity (cultural, learning styles and stages, experiences, etc.); and
- Challenging all students to accept and share responsibility for their own learning. ■

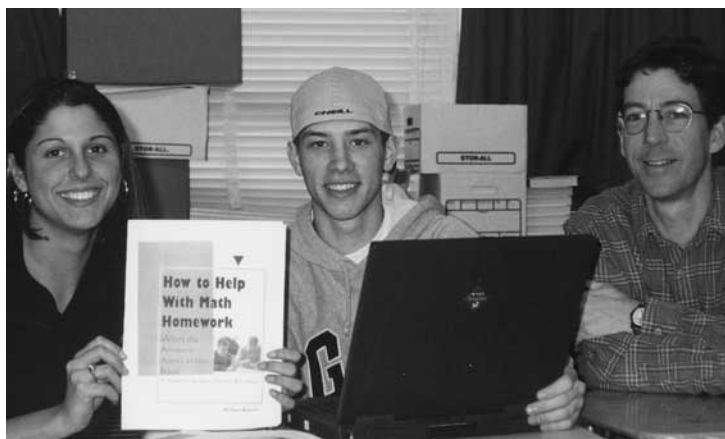
How to Help with Math Homework...

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using MS Publisher software, and worked out many of the technical problems involved in actually getting the booklet printed. Rigali took many of the photos in the booklet and is working with Blatner on distributing it to families and others.

The booklet was inspired by discussions over a year ago between Blatner and now Principal Dan Smith about parents' concerns that they couldn't help with homework because the *IMP* text doesn't contain worked out examples or an answer key in the back. It explains how the role of homework in *IMP* differs from that in a traditional mathematics curriculum. The booklet gives suggestions and problem solving strategies that can be used to help students wrestle with homework problems. Also included is a sample discussion between a parent and student working on the *IMP 1 Problem of the Week (POW)*, *The Broken Eggs*. Blatner organized a Family *IMP* night to launch the booklet, which contains many photos of *IMP* students at SHHS working together in class. "Kids and parents really like to see pictures of themselves doing math," said Blatner.

Blatner and Beaudry are working with Key Curriculum Press to get the booklet on the *IMP* website (www.mathimp.org) soon. In the meantime, anyone who would like a hard copy should send a stamped, self-addressed envelope with your request to Bill Blatner, South Hadley High School, Newton Road, South Hadley MA 01075. The booklet is copywrited but Blatner allows unlimited reproduction with attribution. ■



Tying More Knots

In *Year 2's Problem of the Week #2*, in the unit *Solve It!*, students are asked to determine certain probabilities related to a fictional ritual that is performed by couples wanting to get married.

In this ritual, the prospective bride holds six identical strings in her fist, with one end of each string sticking out above her fist, and the other end of each string sticking out below her fist, as in the first diagram.

Next, the prospective groom ties the tops of the strings together, two at a time, making three knots as in the second diagram. Finally, the Queen ties the bottoms of the strings together, two at a time. It is essential that the Queen choose at random which pairs of strings to tie together. When she is done, there are now three knots above the prospective bride's fist and three knots below her fist, as in the final diagram.

The important part of the ritual is what happens when the prospective bride opens her hand. As you will discover if you carry out the process several times, there are three possible outcomes:

- * The strings can form three small loops.
- * The strings can form one small loop and one medium loop.
- * The strings can form one large loop.

The first of these possibilities occurs if the strings are paired below exactly as they were paired above. The other outcomes occur with different matchings of the strings.

The task in the *Problem of the Week* is to determine the probability for each of the three possible outcomes. This is important in the ritual because, according to the fictional tradition, the prospective couple can get married only if the strings end up forming one large loop. Although students are encouraged to do some experiments to estimate the probabilities, their write-up must include discussion of the theoretical probability for each result, and not just experimental evidence.

Variations

The fictional wedding ritual described in this *POW* can actually be carried out with any even number of strings. If there are only two strings, then there are no choices to be made, and the outcome will always be a single loop. But for four strings, the outcome can be either two small loops or one large loop. You may want to investigate to find the probability for each of these two possible outcomes.

When you consider cases involving more than six strings, you will need to answer these two questions:

- * What are all the different possible outcomes for the strings?
- * What is the probability for each possible outcome?

These are very challenging problems. Since we've already answered the first question for the cases of four strings and six strings, we suggest that you begin your own investigation by answering the second question for these two cases. You might then plunge bravely into both questions for the case of eight strings.

Happy knotting!



Regional IMPressions

CALIFORNIA

IMP teachers are often recognized with awards and honors for their excellent teaching. They also are known to take on new roles and leadership positions. Two such California teachers are Sandie Gilliam and Judy Strauss.

Sandie Gilliam teaches at San Lorenzo Valley High School in Felton and has recently been awarded the Mathematics Certificate for Adolescence and Young Adulthood by the National Board for Professional Teaching Standards. Since the National Board was created in 1987, only 521 teachers have earned this certificate in mathematics. Sandie notes that the application process is extensive and requires 200 hours of work. A key component of the application is the portfolio, which must include videos of the teacher working with the whole class and with small groups and analyses of several types of student work. Teachers also submit descriptions and documentation of activities and accomplishments that illustrate their commitment to their students and to the teaching profession. Sandie thinks that *IMP* teachers would be especially comfortable with the application process since the National Board Standards focus on teachers having an extensive base of pedagogical knowledge, creating a rich learning environment, helping students to think and reason mathematically, and using a variety of assessments. Sandie says that developing the portfolio “gave me a chance to look back at my teaching and think about where I have been and where I am going in my career.”

Judy Strauss has been teaching *IMP* at Los Altos High School in Silicon Valley and often leads *IMP* inservices. This year she is on leave from her district and has taken a two-fold position at Stanford University. She is a university supervisor of student teachers and a social science research associate working with Dr. Jo Boaler, author of *Experiencing School Mathematics*. Judy works with four of Stanford’s seven student teachers and finds her years of teaching *IMP* to be very valuable in guiding these students. As a research associate, Judy is a member of a team that will be following students through their four years of high school. These students are taking a variety of high school mathematics programs. The focus of the research is on the teaching of mathematics and includes a video study to illustrate how students are learning mathematics and their attitudes toward mathematics. Judy said her many conversations with teachers are always interesting and powerful as they discuss how to bring meaning to the mathematics, improve questioning techniques, and work with small groups. Judy also stated that this year has been “fun, hard, and a great learning experience.”

HAWAII

The NCTM (National Council of Teachers of Mathematics) *Principles and Standards for School Mathematics* and the Hawaii

Content and Performance Standards are parallel in scope. The *Interactive Mathematics Program* supports students’ meeting Hawaii’s Content and Performance Standards and General Learner Outcomes very well. The alignment of *IMP* to the Hawaii Content Standards shows that all grades 9-12 benchmarks (except one – “Analyze and apply coordinate systems on a sphere”) are met in Years 1, 2, and 3. Student work from *IMP* was used by our teachers to demonstrate “How good is good enough?” as teachers worked hard to build the Performance Standards, a composite of performance indicators, student work, and commentary for all Content Standards. We raised our standards (Hawaii Content Standards II) and through curricula such as *IMP*, we are working towards living up to them (Performance Standards)!

Equally important to learning academic content is developing the knowledge, skills, and attitudes that all students need to lead full and productive lives. *IMP* lends itself well to helping teachers contribute to the attainment of Hawaii’s General Learner Outcomes by all of our students. Through presentations and portfolios, working together in groups, working on *Problems of the Week* (*POWs*), and creating rubrics and using them to critique each other, students are doing more than learning important mathematics. They are also

- developing their ability to be responsible for their own learning,
- understanding that it is essential for human beings to work together,
- developing their ability to be involved in complex thinking and problem solving, and
- developing their ability to recognize and produce quality performance and quality products.

IMP also prepares students for Hawaii’s newly developed state test where students are expected to explain answers on the short-constructed and extended response portions.

Kapolei High School, newly opened this year on Oahu, is a showcase for other schools, integrating *IMP* and technology. Diana Agor and Michael Long combine their classes in a large room with four television monitors. A camera is used to project student-led presentations (from their desks) as well as teacher-led discussions. Awesome!

ILLINOIS

The newest school in Chicago to select the *Interactive Mathematics Program* as the core secondary mathematics curriculum is the Young Women’s Leadership Charter School (YWLCS) of Chicago. Located on the campus of the Illinois Institute of Technology, YWLCS will eventually have a 6-12th grade college preparatory curriculum, offering students seven years of math, science, and technology, in addition to an integrated humanities experience. Currently there are seventy-five 9th and seventy-five 6th graders. The middle school

students are using the Connected Mathematics Program that will eventually prepare them for *IMP 1* in the 8th grade.

Margaret Small, a co-director of Chicago Regional *IMP*, is one of two co-directors of YWLCS. Her involvement with *IMP* for the past 8 years serves as experience to support faculty and students as they become familiar with the problem-centered, integrated approach to mathematics characteristic of *IMP*. YWLCS will hire additional teachers for the next three years as the student body grows to 525 students.

As a public charter school, YWLCS has no admissions criteria beyond residence in Chicago. The initial student body represents the diversity of the Chicago Public Schools in the cultural and income range of students. There are 70% African American, 20% Latino and 10% European American students. Extra study sessions exist for students whose preparation is weak and who need additional support. Students have been surprised at the amount of writing involved in *IMP* and often wish that the teacher would “tell us how to do it.” As the students have become more experienced in the role of investigation in all learning across the curriculum, they are producing high quality *POWs*.

MIDWEST

The big *IMP* news in Minnesota is the adoption of *IMP* in the Anoka-Hennepin School District, the second largest district in the state. Anoka has four large high schools, all on a four period day. *IMP* will be an option at all high schools. The first cadre of teachers has already begun training with experienced Minneapolis *IMP* teachers and attended TOPS (*IMP*'s National Leadership Training Retreat) in February in California.

Congratulations to two more Minneapolis *IMP* teachers who earned their National Board Certification in Mathematics. Sara VanDerWerf and Mary Moreira, both *IMP* teachers at Patrick Henry High School, received word in December that their applications met the standard. They join Carol Borne and Jane Kostik at Patrick Henry and Eileen Aberman Wells at Washburn High School as the five NBPTS certified high school mathematics teachers in the Minneapolis Public Schools. All five give much credit to the strength of the *IMP* curriculum in helping them prepare to meet this rigorous standard.

The MASP project (NSF-funded collaboration of school districts in the Minneapolis-St. Paul area) was awarded a supplement to study student performance in the new integrated mathematics curricula in the 6-12 program. A study similar in design to the one reported in the Fall 2000 issue of *IMP*ressions will be used.

NEW ENGLAND

IMP teachers expand their influence by becoming involved in many professional activities beyond their own schools. More than 25 New England *IMP* teachers assist or co-lead the training

workshops both during the summer and during the academic year. Nancy Burns, of Cambridge Rindge and Latin High School, is working with the Noyce Foundation project as a coach for middle school teachers implementing the Connected Math Project in urban systems. As a coach she spends four days a week in a school, supporting teachers by planning, co-teaching, reflecting on progress, and providing whatever other supports are needed.

John Bookston, of Brookline High School, is engaged this year in a similar project in the Boston Public Schools. Bill Blatner, of South Hadley High School, was asked to do a presentation for his School Committee. He asked a student to present a problem from *The Overland Trail*. In response to the superintendent's question as to what was good about *IMP*, she said, “It's harder. The problems really make you think.”

Kevan O'Donnell and Emily Goldsmith were invited to give a 20-minute talk at the Rotary Club in Brattleboro, VT. They brought a student with them, who capped off their well-received presentation with a statement that *IMP* does much more than just math...you learn about your own thinking and communication skills. She said she will always be grateful to Marcus Dunkalot and others she has “met” this year for the role they play in her life.

Priscilla Burbank-Schmitt, of Brookline High School, is Massachusetts' Math Teacher of the Year. Perhaps she will get a chance to tell us all about the new President when she goes to Washington.

NORTHWEST

A parent from one of the *IMP*-NW schools was recently talking about how much his daughter was enjoying *IMP* and how glad he was that she was given it as an option. When asked to put something in writing, he responded with the following letter:

To Whom it May Concern:

It is always a difficult decision in helping your child decide what classes to take at the high school level. As a parent, you are suddenly put into a position where your kid may be taking classes at a level out of reach of your ability to help. That idea crossed my mind as my kids got along with their math classes in school.

*When my daughter entered Tigard High, she was offered the choice of traditional math or the *IMP* program. Based on my own experience (back in the olden days...), I was thinking she would take the traditional math program—even though we had a history of struggling through middle school math. Fortunately for my daughter, she is strong-willed, and charted her course through the *IMP* series.*

*She is now in her third year of *IMP*math. Both math curricula will successfully teach kids math. I have observed that the *IMP* program differs in the way that math is presented. In our case, we have seen the stark difference between a kid that disliked and minimized math, to*

Regional IMPressions

one that is enthused about the discovery of math concepts, and the direct and timely application of those new-found concepts in figuring out complex problems. I recall from my own days at school how much better I learned if a subject was presented in an interesting and stimulating way—versus a dry lecture. The upshot for us is that our daughter now likes math, and is successful at it.

I quickly came to realize that the biggest obstacle to the IMP series is the fear of the unknown—by both parents and students. IMP is not “Math Lite”; kids will finish the program with skills and capabilities equal to those that complete the traditional program. From an adult perspective, I have also observed that IMP teaches kids to apply math as needed in a real workplace environment. (In my work history, I have yet for a boss to hand me a math equation to solve. Instead, typically, a situation arises—and you need to decide if and how to apply math as necessary to create a solution.) I see IMP as an ideal fit for kids that plan to go on to college, and for those that move directly into the work world.

Don't overlook IMP as a viable path for your child's math education. I recommend this program without reservation. Take the time to talk to the Tigard High math teachers to learn more.

*Don Foster
Parent*

During last August's Summer Institute, schools were encouraged to create Parent Help brochures that they could give to parents at Family IMP Nights. The vision was that this would be a resource parents could use to help their students be successful in IMP.

A copy of Rogue River School District's Parent Brochure will soon be on the IMP web site (www.mathimp.org) under Resources.

PENNSYLVANIA

Strath Haven High School, in the Wallingford/Swarthmore School District, a suburb of Philadelphia, and Pennsylvania's first 100% IMP high school, just achieved the distinction of being the highest scoring comprehensive high school in the state of Pennsylvania on the 11th grade math portion of Pennsylvania System of School Assessment (PSSA).

Eleventh graders throughout the state take this high stakes test. This was the first time in a Philadelphia area high school that every eleventh grader was an IMP student, including Honors track students. The teachers at Wallingford/Swarthmore are especially proud of the fact that out of slightly more than 250 11th grade students who took the PSSA, 161 of their students scored in the top quartile, while only nine scored in the bottom quartile.

Barbara Stankus, a veteran Wallingford/Swarthmore IMP teacher (currently on special assignment with the Greater Philadelphia Secondary Mathematics Project) was told by her students that they were eager to take more math because of how math was presented in IMP. Indeed, during the current academic year, there are 1400

enrollments in math courses—for a high school with only 1200 students!

In the past year, a growing number of other Philadelphia suburban school districts have adopted IMP for all their students including 8th grade Honors students who are enrolled in IMP 1. These districts are also implementing NSF-sponsored middle school curricula that will eventually articulate with IMP in high school, thus providing districts with an exemplary secondary mathematics program.

ROCKY MOUNTAIN

Through our six years of experience in supporting schools implementing IMP, we have learned that a focus on developing teachers who are knowledgeable in mathematics and pedagogy, while necessary, does not guarantee the successful implementation of a reform mathematics program. Issues such as ongoing professional development and enlisting support from administrators, counselors, parents, and the school community are all a part of keeping reform alive.

IMP-RMR is currently continuing to support schools in Colorado, Kansas, New Mexico, and Wyoming to make sustainable improvement in mathematics education through a National Science Foundation-funded grant entitled Rocky Mountain Mathematics Leadership Collaborative (RMMLC). The primary goal of RMMLC is to create school leadership teams in middle schools and high schools implementing a reform mathematics curriculum.

Leadership teams from thirty schools in the Rocky Mountain Region attended a two-day Leadership Summit in summer 2000. These teams, consisting of the principal, a parent, a counselor, the mathematics department chairperson, and mathematics teacher leaders identified and examined the implementation issues relevant to their school and then created an effective leadership plan to address these issues. Teams meet monthly during the school year and are supported by visits from RMMLC staff.

Teacher leaders attended a four-day Cognitive Coaching workshop during the summer and are participating in Developing and Facilitating Collaborative Groups during this academic year. These workshops focus on supporting teacher leaders in conducting effective meetings, facilitating group decision-making, and mentoring their peers using the cognitive coaching model.

We continue to offer our summer and academic-year IMP workshops to provide high school mathematics teachers in RMMLC an opportunity to expand and deepen their understanding of mathematics content, instruction, pedagogy, and assessment.

IMP National and Regional Centers Contact List

Summer 2001 Inservices for the Interactive Mathematics Program

Arizona Regional Center

IMP 1-4 July 9-13 (tentative)

California Regional Center

IMP 1-4 June 18-22 (Berkeley)
IMP 1, IMP 2 August 13-17 (Oxnard)
AP Calculus
& AP Statistics
Using Student Data August 15-17 (Berkeley)

Chicago Regional Center

IMP 1 July 23-27
IMP 2 July 3-August 3
IMP 3 August 6-10
IMP 4 July 23-27

Rocky Mountain Regional Center

IMP 1 June 18-29
IMP 2 June 18-22
IMP 3 June 25-29
IMP 4 June 25-29

Hawaii Regional Center

IMP 1-4 June 12-16 (tentative)

Midwest Regional Center

IMP 1, IMP 3, IMP 4 August 6-10
IMP 2 August 13-17

New England Regional Center

Leadership Institute June 25-29
IMP 1 August 13-17 (Vermont)
August 13-17
IMP 2 June 25-29
August 13-17 (Vermont)
IMP 3 July 9-13
August 20-24
IMP 4 July 9-13
August 20-24
Linear Programming using the Graphing Calculator:
Bakers Choice July 9-11
Hands on Geometry July 12-13
Introduction to the Graphing Calculator: Applications in Algebra
August 20-23
Strategies for Open-Ended Problem Solving
August 20-23
Introduction to the Graphing Calculator: Applications in Statistics
August 24-25
Writing in the Math Classroom
August 25-25

New York Regional Center

IMP 1, IMP 2 August 27-29

Northwest Regional Center

IMP 1-4 July 30-August 3

Pennsylvania Regional Center

IMP 2, IMP 3 June 18-22
AP Statistics June 18-22
IMP 1, IMP 4 June 25-29
AP Calculus June 25-29
IMP 1, IMP 2 (repeat) August 20-24

Please see phillymath.org for inservices in suburban districts.

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10' college women in America and started modeling in New York and LA. After appearing in *Glamour*, an agency from New York called me and asked if I would be interested in modeling for Procter and Gamble's Global Beauty Care Print Ad Campaign. So, at one of my New York shoots, the photographer mentioned the Miss America Program to me and asked if I would ever be interested in something like that (since it offered scholarship money for school). I didn't put much thought into it . . . Later that year, at Stanford, it was a rainy night and I had the flu at home. My sister Ruby found a flyer on campus that said 'your sister or roommate could be the next Miss America' with the information about the local Los Altos program. Ruby convinced me to go to the orientation meeting to hear more about the program. I entered never expecting to win, much less become Miss California. I have always been one to formulate my own opinions about matters and yes—I certainly have heard all the stereotypes about these pageants and had a hard time reconciling what I thought these programs should be about versus the common perception of the 'beauty' pageant."

Nevertheless, Rita did go on to become Miss Los Altos and then Miss California. She will take a break from school this year to travel and to serve as Miss California with her platform on children's health issues. After her year is up, she will enter medical school with much of her tuition paid for by her pageant scholarship money.

Rita has stated in the past that even though her math courses at Stanford were lecture-oriented, the content reminded her of *IMP*. Her calculus book focused heavily on the applications of derivatives and integrals to problems in physics and economics. "It reminded me a lot of *IMP*'s emphasis on word/application problems." But Rita felt that *IMP* prepared her for even more. She believes that *IMP* supported group activities and presentations and feels that this was "absolutely essential for many critical projects and reports at Stanford." She went on to say that at first glance, the *IMP* curriculum is "better suited and geared towards students that are more outspoken and outgoing by the sheer nature and format of the curriculum . . . group projects, presentations, writings (those *POW*s I will NEVER forget!), etc. However, even for the shy student, I think that the program is valuable because it encourages people to come out of their shells."

Well, we can certainly say that Rita is out of her shell, traveling the world, giving speeches and presentations.



Key Comments

CYBER PROGRESS

Under the tireless and creative direction of Kirk Mills, Key Curriculum Press Web Master and architect of *IMP*'s own www.mathimp.org, changes are on the rise. Keep visiting the site and experience its new look at an Internet near you. Also, don't forget that you can take a second look at past issues of this newsletter on the site as well.



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