NCSSSMST Journal

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On the Cover
Students attending the 2007 NCSSSMST Student Conference on the lawn in Washington, DC.

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Editor's Note

Reflections on Change

by Ron Laugen

"Change" seems to be on the lips of all of our politicians as we move into the middle of the primary season. Change from inside vs. throw the rascals out. Pretty exciting if you believe in change. Not so much so if you've been around a while and seen a few "changes" come and go. Especially in education. As a professor of mine once said, "the mutterers will rise again." Truthfully, I didn't understand it at the time. Now I do.

Me? I just retired after over forty years in science education, as a teacher, an administrator, and also as sort of a "change agent" working in university-based curriculum development projects. So I have seen all the "changes" – from PSSC to NCLB.

It seems there are two approaches to change – systemic and individual. As curriculum development projects we got big bucks to make systemic changes in science education. That approach to change was measured by changing a lot of people a little bit- how big was the final adoption/penetration of the market??

Some of the professors I had the privilege to work with took an opposite approach. They worked on a much smaller scale, effecting major changes on just a few people at a time. "Constructivism" comes to mind – did each teacher become constructivist?

But it wasn't until I became the administrator of a small magnet program for science that I really understood how personal and difficult change really is. Working closely with teachers, students, and parents helped me truly understand how we all become vested in the system we have. I learned what kinds of people are open to change and what kinds aren't. And, finally, how resistant (impervious) to change the "system" really is (perhaps more so in Texas than elsewhere, but that's another column).

The "mutterers" are rising again, by the way. The times seem eerily similar to the crisis in science education after Sputnik. Then it was the Soviets. Now it is the whole "flat" world. So new money pours in and the advocates for change have their new approaches.

My money is on the system. It really won't change – rather, it, and the teachers who are a part of it will adapt. That, I think, is what NCSSSMST is about. Helping people change – what they do and how they do it - by connecting them. We call it synergy. This Journal, of which I am honored to be the new co-editor, is a part of the process. See you in Dallas!!

Ron Laugen, PhD, is Co-Editor of the NCSSSMST Journal and the 2005-2006 NCSSSMST President.

President's Message

Janet Hugo, PhD, is Director of Arkansas School for Mathematics, Sciences, and the Arts and current President of NCSSSMST.

For the past two years, I have served as the president of NCSSSMST. I recall standing in front of the membership at the business meeting during the 2006 Professional Conference and promising that I would move this organization to the national stage. People in positions of leadership often make promises that are impossible to keep or that they have no intention of keeping.

That did not happen in my case because I trusted the support network that exists in the Consortium. I had the good fortune to be the president of an organization that thrives on hard work and solves problems as a team. Your NCSSSMST Board of Directors is a group committed to supporting the work that each of you engages in daily. Board members believe in the mission and vision of this organization and are willing to fight for the opportunities that schools like ours provide for students.

When I first became involved with NCSSSMST, we had just begun to address the issue of diversity in our schools. Our Executive Director, Dr. Cheryl Lindeman, the Board of Directors, and Dr. Joan Barber from the North Carolina School for Science and Mathematics, liaised with the Alfred P. Sloan Foundation to allow us to offer rich and varied summer math and science opportunities for underrepresented student groups. These students were exposed to the amazing world of science and the possibilities that studying at a Consortium school could bring to their futures. This program is still in existence with the Siemens Foundation lending additional support. It has expanded to include pre-service teachers working along side these students, and the program is now being offered in a different region each summer.

The NCSSSMST/Sloan partnership was the true beginning of national partnering, which became my mantra. Our organization needed to grow beyond being a direct service provider to one with a national voice and the ability to influence national policy. As we forged new partnerships and began to realize the potential or our organization, it was as though we had all been holding our collective breaths and waiting to exhale.

In 2006, we invited Dr. Rob Atkinson, president of the Information Technology and Innovation Foundation (ITIF), to our quarterly Board meeting in Washington, DC, to talk about co-authoring a white paper on specialized high schools for mathematics, science, and technology. Two of our former presidents, Dr. Marty Shapiro and Dennis Lundgren, our current vice president, Dr. Jay Thomas, and I spent time writing and editing and finally publishing this paper. Dr. Thomas and Dr. Atkinson launched this paper on Capitol Hill in March of 2007 with the support of several United States Congressmen. We have been told that the section on creating additional specialized secondary STEM schools is included in the America COMPETES Act in part because of this paper.

We have also had a focus article about our schools published in Education Week this past year. We are working with the Koshland Science Museum, part of the National Academy of Sciences, to develop a collaborative research challenge for our students which will focus on the connection between science and public policy. Neumont University is in the process of creating a web-based program that will enable Consortium teachers to connect with one another by sharing curricular ideas through the NCSSSMST website.

Further, we are assessing our impact on students through a partnership with the American

Psychological Association (APA) on a study that we hope will be funded by the National Science Foundation. The Keystone Science School has expanded our partnership by now offering two student policy summits each summer. Western Kentucky University and APA are working with the Consortium to offer a summer institute on giftedness. And the list goes on.

We seem to accomplish more when we work together, whether on student projects, team planning, or partnerships. Collaboration makes NCSSSMST work.

This year's Professional Conference in Dallas, Celebrating Consortium Connections (C3), is no exception. We are partnering with Texas Instruments T3 division to offer our membership a two-for-one conference experience. Both T3 and NCSSSMST are celebrating our 20th anniversaries. What a wonderful collaboration this will be. Our keynote speaker for our celebration dinner will be Dr. Stephanie Pace Marshall, founding president of NCSSSMST and President Emeritus of the Illinois Mathematics and Science Academy. Dr. Charles Vonder Embse, well known to anyone in the field of mathematics, will be our luncheon speaker on Friday, February 29, thanks to the generosity of TI.

I have had a wonderful and interesting two years as your president. I am grateful for the opportunity to serve you and to play a small part in keeping the 20 year old dream alive. The next 20 will be even better.

2007 Youth Policy Summit Summary

By Ellen Reid, Annemarie Fussell and Elizabeth Templin

The NCSSSMST and Keystone Science School co-sponsored two Youth Policy Summits during the summer of 2007. 40 students represented 10 high schools from across the country at each Summit, meeting for a week in June and August at Keystone Science School and The Keystone Center in Keystone, Colorado to discuss Obesity in America and Energy Efficiency in America. The purpose of the Summits was to give students an opportunity to debate, discuss and recommend solutions to problems that currently affect the nation.

Keystone Science School and The Center for Science and Public Policy blend hands on learning in the natural world with on the ground mediation and conflict resolution skills. These two separate divisions of The Keystone Center partnered with NCSSSMST in 2004 after realizing that the hands on education of youth needed to incorporate more than just science. Tomorrow's leaders need the experiential tools of conflict resolution to find solutions to issues they have adopted from previous generations. The Summits have awakened the student participants to a world of problem solving that incorporates critical thinking and consensus instead of the courtroom.

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Annemarie Fussell is the Program Director for School Groups and Youth Policy Summit at Keystone Science School and can be reached at afussell@keystone.org.

Obesity in America

During the Obesity Summit, students brainstormed ways to reduce obesity over the next 10 years, including providing the public with additional information on healthy lifestyles, developing educational strategies to disseminate information about healthy lifestyles and brainstorming additional methods or programs to motivate change. Students also suggested potential research areas to increase information about obesity.

Student participants looked at obesity from different points-of-view and came up with solutions that would involve the government, the food industry, medical professions, educators and the public health community. For their final proposal, the Summit members considered trends in food consumption, the role of physical activity, government dietary guidance, commercial and social marketing, nutrition standards and the emotional and psychological impact of obesity.

The Summit proposed several strategies to reduce obesity in the United States. Recommendations included reaching youth at schools by providing healthy food and beverage choices in public school vending machines and cafeterias. Students also suggested that schools increase nutrition education by offering more nutrition and health courses for K-12 students. The final proposal also recommends the implementation of a monthly Health Day in public schools as well as using active video gaming, such as Dance Dance Revolution, to get kids to increase physical activity. Other suggestions the summit had for increasing activity at schools was to require daily physical education classes at elementary and

middle schools, to build intramural sports programs at schools and to create a group for students that focuses on healthy lifestyles called Students Opposing Unhealthy Lifestyles (SOUL).

The Summit also wanted to increase public awareness of nutrition resources and the importance of physical activities. Two proposed methods to increase awareness include the creation of an education campaign that would teach the public about how to read food labels. Students also would bolster the government's MyPyramid campaign by hanging mypyramid posters with nutrition guidelines in grocery stores and doctors' offices and advertising the mypyramid Website online.
The students included a plan for decreasing cases of obesity in adults. A proposed marketing program would make public health and nutrition information available in the work place, through memos, in doctors' offices and in the media. Media advertising campaigns would include television, radio, billboards, online ads, magazines and public service announcements to name a few.

Finally, the students brainstormed new research areas to improve the available information on healthy lifestyles. The Summit suggested an increase in the following areas: the psychological effects of obesity, effective methods of mass communication, medical research, diet pills and the production of healthy foods by food corporations.

Energy Efficiency in America
Similar to the Obesity Summit, students from across the country met for a week at the Keystone Center in August 2007 to discuss and make recommendations to significantly reduce the consumption of energy in America with the hopes of reducing carbon emissions over the next 50 years. The Energy Summit focused on three primary areas: standards and measurement of energy use, incentives and dissemination of information on energy reduction.

The Energy proposal included several changes in energy standards and measurement. The students suggested the creation of a Carbon Cap and Trade

Authority (CCTA) that would monitor national carbon emissions and distribute carbon emission credits to states based on the state's recorded carbon emissions compared with the rest of the nation. The CCTA would then place a national cap on carbon emissions by 2.5% in 2012 and 4% in 2032. Each state would be responsible for distributing and enforcing its allotment of carbon emission credits. The Summit also proposed changes in building and electricity standards that would encourage new buildings to be energy efficient and promote efficiency in electricity transmission from power plants to consumers.

The students also brainstormed incentives that would encourage organizations and individuals to reduce energy use and carbon emission. Among these incentives was the creation of Smart Growth communities that would encourage public transit and pedestrian traffic. Additionally the proposal included a tax on fossil fuels to encourage consumers to try alternative fuels and energy efficient vehicles. The creation of an Energy Week that would coincide with Earth Day would allow for the tax-free sale of Energy Star appliances. The Summit recommended tax rebates for "green" buildings, suggested making government loans available to anyone who would like to invest in energy efficient change but cannot afford to do so, and proposed a tax on incandescent light bulbs.

Finally, the Energy Summit considered ways to increase education on energy efficiency. Students suggested that non-profit organizations and corporations could be encouraged to create informational videos and promotional material as well as public service announcements. Teachers could be trained in methods of energy conservation in order to pass on information to students and parents. The Summit also would add information about energy efficiency to driver's handbooks and suggested the creation of a National Energy Conservation Society (NECS) that would promote leadership and environmental awareness.

The participants from both Summits believe strongly in their final policy recommendations and included an agreement signed by each participating student to support this conviction. These young minds represent the future leaders of America and feel that obesity and energy issues can be greatly reduced within our nation by implementing the proposed changes.

Thank you to the following financial sponsors of the 2007 Keystone Science School Youth Policy:

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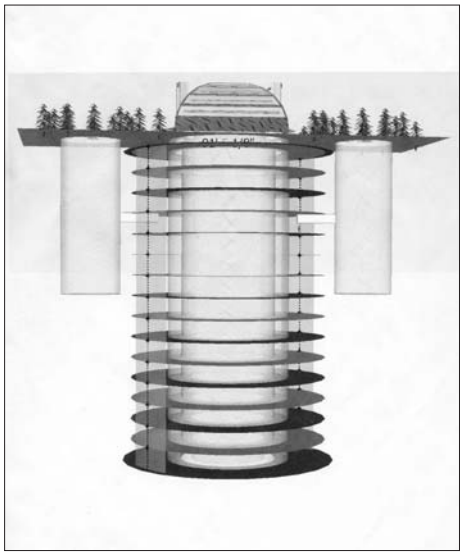
The First Annual NCTripleSMST Google Competition

Launched at the 2007 Student Conference

The contest, "NCTripleSMST Google Competition," involved designing an environmentally-friendly school, using Google's free, downloadable program, Sketch-Up.

- These student-designed schools focus on a number of environmental issues, as well as aesthetics, practicality, and creativity.
- Each school must be placed in a real-world-geo-located-space within that school's geographical school district and accommodate 2000 students.
- By focusing on multiple aspects of the design process, we hope to engage students in ways that highlight their academic studies.



The winning school received a "Google Day," during which Google employees will present their latest technology to faculty and students, along with some special surprises. Students from the winning school who are attended the conference received their own Google goodie bag with all kinds of fun Google merchandise.

The winning school was Brooklyn Technical High School. The winning project was submitted by BTHS as part of a class project from Mr. Richard Wanliss' class. Mack Meas' work was part of the winning submission. Congrats!

Special thanks to Thomas Jefferson HS alum, Mica Boster of Google for making this happen!

Promoting Bio-Ethanol in the United States by Incorporating Lessons from Brazil's National Alcohol Program

Student paper by Yangbo Du

Abstract

Current U.S. energy policy supports increasing the use of bio-ethanol as a gasoline substitute, which Brazil first produced on a large scale in response to the 1970s energy crises. Brazil's National Alcohol Program stood out among its contemporaries regarding its success at displacing a third of Brazil's gasoline requirements, primarily due to favorable market conditions and government support. Similar to the Brazilian experience, future progress towards displacing gasoline with fuel ethanol in the U.S. will depend largely upon political support and economic circumstances in the agricultural and energy sectors and markets. Accounting for differences in aggregate gasoline usage and feedstock availability compared to Brazil, the United States would have to speed up commercialization of cellulose ethanol technology in order to achieve a similar degree of success as Brazil, support co-production of biomass derivatives along with fuel ethanol production, and maintain profitability of innovation in the bio-ethanol sector, among other initiatives.

Introduction

Recently, the U.S. government has expressed strong interest in fuel ethanol due to prospects of declining petroleum supply in conjunction with increasing global energy demand. Among countries with active bio-fuels programs, Brazil was exceptional among them given that its government incorporated bio-fuels as a significant component of its energy portfolio. The success of its alcohol fuels program, *Programa Nacional do Alcool* (eng. the National Alcohol Program, also known as PNA or Proàlcool), has depended largely upon government, private, and other economic incentives. Heavy governmental involvement in Brazil's economy facilitated means of achieving the PNA's objectives, even when economic circumstances did not prove conducive towards bio-fuel implementation. Brazil's successes and failures with promoting alcohol fuels during the 1970s and 1980s serve to guide American development in sustainable energy sources in the near future. In the United States, ethanol production targets would have to increase by greater margins than the currently mandated increases, which would mean speeding up commercialization of biomass ethanol technology in addition to increasing corn yields and ethanol production efficiency. Meanwhile, building bio-refineries that produce marketable co-products along with ethanol would reduce production costs, enabling ethanol to compete more effectively against gasoline.

Summary of Brazil's experience with alcohol fuels

Brazil's PNA has demonstrated through its National Alcohol Program that increasing bio-fuel production and usage is feasible, though uneconomical except when petrol prices rise high enough. High feedstock costs, which accounted for 57.0 percent of the total cost of producing alcohol from sugarcane, also reduced economic viability of bio-fuels (Rothman, 1983, 114). As sugar prices increased through the 1980s and late 1990s, converting cane into ethanol yielded less foreign exchange savings from energy import substitution than the surplus gained from sugar exports. Presently, high petroleum prices and speculation of higher prices in the future are providing incentive for both the Brazilian and U.S. governments to support their bio-fuel sectors.

Recent developments in the U.S. ethanol sector and comparison with Brazil's ethanol industry

Background

Even with similar policies compared to Brazil's under its military regime, the United States must

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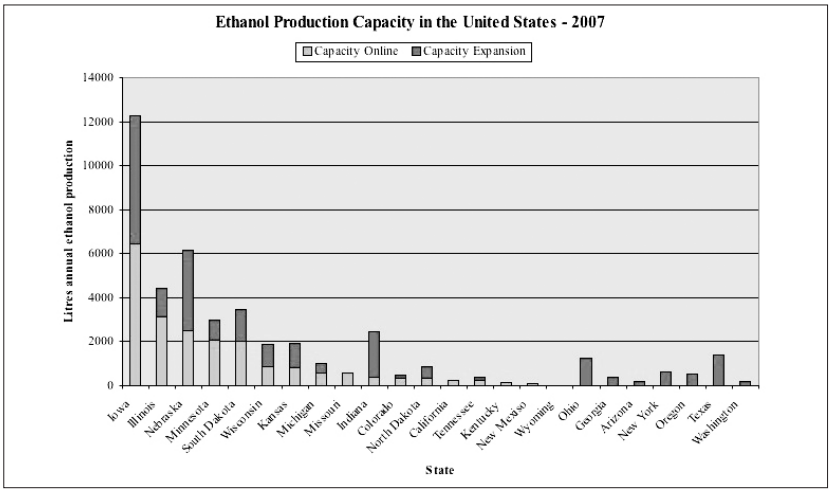
apply more effort to achieve a similar degree of success at displacing petroleum. This is because annual gasoline consumption in the United States, which was 516 billion liters as of 2004, dwarfs Brazilian gasoline consumption by 20-fold (Yacobucci, 8; Des Moines Register). Unlike Brazil's situation, use of sugarcane to produce bio-fuels in the United States would result in selling prices too high to compete with petrol, without heavy subsidization. Sugar tariffs against foreign producers contributes to heightened costs of producing ethanol from sugar in the United States, rendering ethanol production from sugar uncompetitive against both corn ethanol production and petroleum imports at low-season prices.[1] Furthermore, importing cheaper cane-based ethanol from Brazil would undermine the efficacy of import substitution policy, which Brazil pursued with its commitment to bio-ethanol. Instead of reducing total energy imports, the United States would be merely transferring its foreign energy dependency from Middle Eastern petroleum companies to Brazilian sugar interests.

Energy market conditions

Though they have declined from near record highs during the summers of 2005 and 2006, current and projected future petroleum prices are high enough for ethanol to be price-competitive. This includes higher-cost ethanol produced in the United States, where tariffs against foreign producers except for Caribbean Basin Initiative members have kept low-cost ethanol from Brazil and other developing nations out of the U.S. liquid fuels market. Brazilian ethanol exports, for instance, receives a 20 cent import duty that increases its final price to levels comparable with those of U.S. domestic corn ethanol. However, in 2006, the U.S. Renewable Fuels Association reported that the United States imported nearly two billion liters of ethanol, two-fifths of which originated from Brazil (18). Demand had been sufficiently high enough to provide foreign ethanol producers a competitive export market.

The ethanol industry is among the fastest growing of all renewable energy industries, and its growth has shown no signs of abating. Existing plant expansion and new plant construction will nearly double ethanol production capacity by 2009, as illustrated in Figure 1.

Fig. 1



Source: RFA (2007), 3.

In the meantime, prospects of carbon emission caps and taxes in the near future should make investment in bio-fuels more lucrative. Comparatively, combustion of E10 gasoline produces 6 to 10 percent less greenhouse gas (GHG) emissions compared to combustion of pure gasoline, and combustion of E85 produces up to 80 percent less GHG emissions, depending upon how much fossil fuel was used for its production and transport.

Recommendations for future fuel ethanol policy

Currently, ethanol pump prices undercut gasoline prices by 25 percent, accounting for government subsidies and tax exemptions. However, a sudden drop in petroleum prices would diminish the competitiveness of fuel ethanol; this would likely occur as gasoline demand drops in response to increased availability of inexpensive bio-fuels. Keeping ethanol prices low enough to compete with petroleum at low import prices will prove crucial to maintaining a high production growth rate. In conjunction with lowering ethanol costs through innovation in processing technology, diversification of ethanol feedstock will dampen the volatility of ethanol prices, as they will not lose competitive-

ness against crude oil prices solely due corn price fluctuations.

Challenges to implementation of current ethanol production technology

Among the most pressing issues facing expansion of the corn-ethanol industry, diverting corn production towards the manufacture of fuel ethanol may raise food prices. Though production of sweeteners and other corn-based foodstuffs utilizes only 13 percent of U.S. corn output, over 50 percent of current output goes toward feeding livestock, especially beef cattle. To illustrate the great likelihood that continuing a corn-based fuel ethanol program would raise food (particularly meat) prices, ethanol plants consume 12 percent of current U.S. corn production for displacing three percent of the 560 billion liters of motor gasoline consumed in the United States annually. High corn prices would also raise ethanol prices, thus diminishing its competitive advantages over petroleum as feedstock costs account for nearly 80 percent of its selling price.

Initiatives

Increasing blending ratio of ethanol to gasoline

E85 or pure ethanol would substantially reduce foreign energy imports only if ethanol distribution facilities become widespread. To limit expense due to infrastructure adjustment, refiners should substitute ethanol-blended gasoline for pure gasoline, increasing ethanol volume percentage as ethanol production increases.[2] Gasoline engines without modification are capable of running on ethanol-gasoline mixtures of up to 25 percent ethanol by volume, without significant detriment to performance.[3] In Brazil, such mixtures are the standard for dispensing at all filling stations. Blending ethanol into gasoline by a 1:3 ratio would ensure displacement of a quarter of U.S. gasoline demand, without great need to modify infrastructure. At current prices, a 25 percent ethanol blended fuel would cost roughly the same as pure gasoline per unit energy; widespread availability of biomass ethanol would reduce costs relative to pure gasoline.

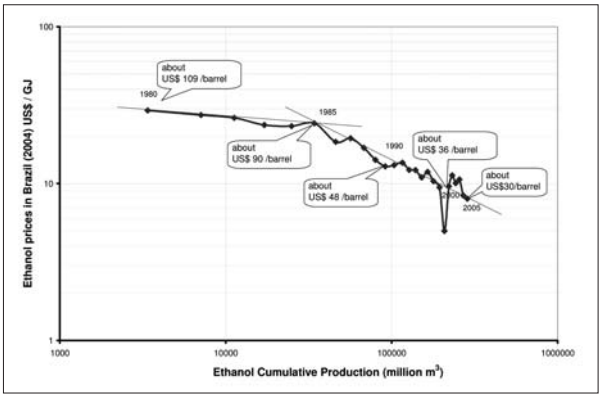
Accelerating commercialization of biomass ethanol

Crop residue and other cellulose plant matter, when converted into ethanol, have the potential to displace the entire current U.S. gasoline requirements. United States Department of Agriculture and Department of Energy [DOE] estimates deem a 30 to 40 percent displacement as a realistic target. A major drawback, present costs for cellulose conversion run over 60 cents per liter of ethanol, more than twice the cost of producing ethanol from corn. However, the DOE is aiming to reduce production costs to below 16 cents per liter by 2015 (DiPardo, 2002, 1). Such production costs will create an economic advantage for ethanol against petroleum at prices as low as 25 USD per barrel, probable once availability of biofuels is able to reduce petroleum demand significantly.

Implementation of biomass ethanol, however, will not be without significant risk as in the case of Brazil's PNA in its early years.[4] Sudden shifts in government policy due to fluctuations in the energy market, especially drops in petrol prices, could render a bio-refinery economically nonviable. At present, high costs of producing ethanol from biomass would compound difficulties wrought on by significant declines in the price of crude oil. Therefore, only when biomass technology matures should the U.S. government consider incentive reductions, with maturity defined as having successfully become a major permanent component (supplying 20 to 50 percent of transport fuels) of the U.S. transport fuels portfolio. This would mirror the subsidy cuts of the Brazilian government when ethanol maintained its 30 to 40 percent contribution to Brazil's transport fuel requirements. Lack of subsidies has not prevented the now-mature Brazilian ethanol industry from experiencing steady growth in recent years; production increased from about 15 billion liters in 2003 to 17 billion liters by 2006 (Martines-Filho, 2006, 91; RFA, 2006, 16; 2007, 18). In Brazil, ethanol prices actually declined at a faster annually compounded rate after direct industry subsidies ended in 1985 while production continued at a relatively stable volume between 11 and 14 billion liters annually, as shown in

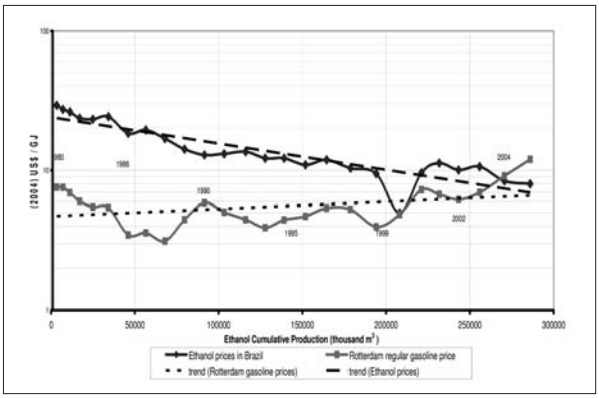
Figures 2 and 3. As of 2005, ethanol prices in Brazil significantly undercut gasoline prices for the first time since the early 1980s, this time with less subsidization.

Fig. 2:
Ethanol prices in Brazil by gigajoules (GJ) energy and volume from 1980 to 2005.



Source: Goldemberg et al (2003), 5, as cited in Goldemberg.

Fig. 3:
Ethanol prices in comparison with gasoline prices in Brazil



Source: Goldemberg et al (2003), 8, as cited in Goldemberg.

When direct subsidies for ethanol producers in Brazil fell out of favor in 1985, the Brazilian ethanol industry had already succeeded in displacing over a third of gasoline demand. It no longer depended on government support as high consumer demand sustained sales even without subsidies (though pump price controls were still in place), while ethanol motor vehicles had saturated the new vehicle market, accounting for over 90 percent of new passenger auto sales. In addition, dismantling the National Alcohol Program would have proven prohibitively expensive, as cane distilleries had become an integral component of Brazil's energy, agricultural, and chemical production landscape. Contrarily, U.S. ethanol output has displaced barely five percent of gasoline demand. Given that it is still an emerging industry whose progress would be largely determined by future government policy and energy prices rather than a "permanent" energy products sector, government financial support is still necessary to ensure future economic viability.

Regardless of whether fermentation technology for cellulose ethanol advances quickly enough for a high degree of market penetration in the near-term, increasing the efficiency of refining processes will improve market penetration by reducing the process margin and thus the selling price for ethanol (NREL, 2005, 21). Process margin includes all variable costs other than purchased external energy and feedstock costs, such as waste disposal, labor, and overhead costs. Again, an increase in R&D funding for bio-fuels will provide refiners the ability to adopt processing technologies that are more efficient but demand a greater initial investment compared to existing technologies.

Cogeneration

Since the 1980s, Brazil's bio-fuels industry has been taking advantage of ethanol distillery by-products to maximize returns on investment. For example, the direct burning of bagasse, fibrous cane residue after juice extraction, has powered distillery processes and therefore reduced distilleries' need to use fossil fuels. This has augmented Brazil's efforts to curb dependency on imported petroleum and to reduce greenhouse gas emissions, which would be an estimated 25 percent greater than at present without a bio-ethanol program.

Power generation applications would also function well for U.S. ethanol bio-refineries. Fermentation

residues could replace fuel oil and natural gas that currently power refinery processes, which would both augment substitution of imported fuel and reduce net greenhouse gas emissions from fossil fuel combustion. Powering refineries with electricity from wastes will reduce processing cost of ethanol by at least 10 cents per gallon, or 2.6 cents per liter (Lynd et al, 2005, 10). This cost advantage, determined from 2002 energy price data, has since increased due to rising external energy prices. Moreover, increases in biomass-to-ethanol conversion efficiency would permit greater peak processing capacity for the same total energy consumption. As a result, savings from cogeneration, in proportion to cost of producing ethanol only, will increase from 20 percent to nearly 40 percent of production costs.

Co-products as a means of cost reduction

The United States ethanol industry has adopted and should continue to adopt the use of by-products and wastes in lowering production costs. Government subsidies and incentives not necessary in this regard, as sales of ethanol co-products will add to the cost advantage of ethanol against petroleum fuels.[5] Sugarcane distilleries in Brazil produce wastes known as vinhoto, plant residue left over after alcoholic fermentation of sugarcane. In the past, this waste was routinely dumped into waterways, but it now serves as a fertilizer for sugarcane plantations (Oliveira, 2002, 136).[6] Likewise, U.S. ethanol producers have been selling corn grinding and fermentation wastes as livestock feed to generate the most revenue per unit feedstock. While its by-products prove valuable to agriculture, production of ethanol also produces co-products valued by chemical manufacturers, such as succinic acid, lactic acid, and furfural. Selling ilimited quantities of these high-value chemicals generates significant revenue that will permit lower selling prices for ethanol.

Diversifying the product slate for ethanol production will help ensure economic viability for refiners in the event of market downturn. In Brazil, where producers could switch between sugar and ethanol production at annexed distilleries, ethanol market downturn in the 1990s led distillery operators to shift towards sugar production; sugar prices were also more favorable to ethanol prices at that time. Petroleum refineries already incorporate a diversified product slate selection, producing more gasoline in summer months in response to high driving demand and more fuel oil in winter months in response to high heating demand (Lynd et al, 2005, 22).

Conclusions

Through policies that support ethanol industry innovation and enlargement, the United States is capable of achieving comparable success to that of Brazil in displacing petroleum consumption. However, the United States must conduct such an endeavor on a scale never before attempted. With steadily increasing demand for gasoline, already the highest in the world on a per capita basis and over ten times that of Brazil, more rapid advances in bio-fuel production and technology shall prove necessary in the future. Despite this crucial difference, U.S. consumption of fuel ethanol and other bio-fuels will increase appreciably if costs of these fuels undercut costs of petroleum, especially without heavy subsidization. This situation of favorable costs, already present today but less certain past the immediate future, can be maintained via following key policies undertaken in Brazil in the aftermath of the 1970s energy crises. Until the U.S. ethanol industry penetrates the liquid fuels market sufficiently so that it becomes a permanent component of its transport energy portfolio, like the current situation in Brazil, at least some degree of government support to encourage innovation by the private sector will be important to the industry's long-term survival.

Footnotes

1. Producing ethanol from sugarcane or sugar beets would be profitable when gasoline sells for over 0.75 USD/liter, now typical for pump prices during summer months. At respective costs of 63 cents/L and 62 cents/L, however, cane or beet ethanol production would still cost twice as much as corn ethanol production (Shapouri, 2006, iv.).

2. By 2015, corn ethanol production of 57 billion liters per year will ensure adequate supply for

blending ethanol into all gasoline sold (10 percent by volume, same as the present ratio).

3. Ethanol only provides about 60-70 percent of the energy provided by gasoline but generates more power per energy unit equivalent due to leaner fuel-air ratios and greater octane values. Fuel intensity, or amount of fuel used per unit distance, does not correlate directly with an increase in ethanol's proportion of a gasoline-ethanol fuel mixture; E85 provides 30 percent less energy per unit volume compared to gasoline, but fuel intensity of vehicles running on E85 increases less than is what is expected based on energy density difference alone.

4. During the late 1970s in Brazil, the Ministry of Mines, national financial institutions, and Petrobras, then the sole distributor of liquid fuels, opposed the National Alcohol Program due to concern over high costs of producing ethanol in comparison to petroleum refining costs.

5. No regulation that mandates a minimum amount of waste re-use exists on the federal level in the United States.

6. Cane plant residue will cause soil contamination if applied on plantations other than its plantation of origin.

Acknowledgements

I would like to thank my mentor, Dr. Joshua Linn of the Department of Economics at the University of Illinois at Chicago, for his support of the work reported herein. For a complete bibliography, contact the author at yangbodu@imsa.edu.

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NCSSSMST Student Conferences Helps Students Find Common Ground

Student paper by Meg Barnett

It is Saturday night, and I watch as 350 students and chaperones file past me off of a boat and onto buses. They glance casually at my worn sign, following its pointed, red arrow down the brick sidewalk and into the black night. For the last time, they follow my voice; listen to my directions but, ultimately, they walk out of my life. To the students and chaperones, I've just been a face, a girl in a "Staff" t-shirt telling them where to go and when to get there. However, for the past three years, these 350 faces have dictated my schedule and consumed my life. As a conference planner for the NCSSSMST Fall 2007 Event "Tomorrow Never Dies" I am a member of a group of 25 students, all charged with the duty of crafting the past three days of these students' lives.

On Thursday, October 17, I watched as the students trudged into the Fairview Marriot Hotel, exhausted after long plane, car, and bus rides. As a designated greeter, I spoke to each student personally, asking about their background and hometown. How many students go to your school? Do you have sports teams? What kinds of classes are you taking? I'm not sure what I was expecting, but I was overwhelmed with the variety of replies fired back at me. While some schools harbored thousands of bustling students, others taught fewer than two hundred. Although we were all part of this National Consortium, I fought to find common ground with these new kids.

Their sleepy dispositions soon disappeared as we whisked them onto buses to the George Mason University (GMU). We had planned the conference to start with a night full of activity, including presentations, dinner, a panel discussion, a talent show and a t-shirt exchange. Although the students were shy to meet one another, they soon laughed and joked, trading their high school's t-shirts for those with exotic names or designs. As the students filed back onto their respective buses to return to the hotel, the students smiled, exhausted but excited for the next few days.

Friday began with a series of presentations and lectures at GMU. Students had signed up for specific topics, ranging from the nature of popular music to water filtration systems. Each individual focused on a topic of choice, a specialty in the field of math and science. Although this morning event divided the group, they united again to take a tour of the university. Slowly, our hodgepodge of students from across the nation gained common ground and shared common experiences. We are all applying, or will soon apply, to various colleges, a universal stress. Slowly, the differences between the magnet schools began to shrink as the similarities between the students emerged.

That afternoon, the group traveled back to Thomas Jefferson High School for Science and Technology, to listen to a few more presentations and take a tour of technology laboratories. Staffers had the chance to showcase our projects, our talents and our home. While the students cruised down the high school hallways, we bustled around the building, working.

After returning from Thomas Jefferson High School, the students relaxed in their hotel rooms for a few hours, lazily watching television or taking a nap. Staffers hustled and bustled about the hotel, preparing for the next leg of our journey: a trip to the Cannon Building of the Capitol for a panel discussion on greenhouse gases. If this event went well, everything else would fall into place. As a member of this advance team, I arrived early at the building. For a few hours, we rushed to make sure the evening would run smoothly. We

Meg Barnett, class of 2008, is a student at Thomas Jefferson HS for Science and Technology.

cleaned chairs and set up microphones. We frantically waited for caterers, praying they would arrive before our hoards of students. Despite the chaos of the set-up period, everything was ready by the time the buses reached the building. Our panelists included scientists and politicians, each providing a different spin on the issue of climate change. The panelists agreed and disagreed, applauded each other and debated with one another. Although the students only had time to ask a few questions, the panelists worked to engage everyone and present relatable information to the group. Despite any initial set-backs, the night proceeded without a hitch. As the Capitol sweeps team of staff members drove back to the hotel at the end of the night, I felt a surge of pride for my fellow planners.

On Saturday morning, the subject matter shifted from science to history. The students enjoyed presentations about the U2 incident and the CIA, and then students explored the Spy Museum in Washington, DC. They toured the Capitol building, as well as the National Mall. The students perused the various museums, enjoying the opportunity to relax outside in the sun.

For the staffers, our job was nowhere near done. We arranged a scavenger hunt for groups of participating students, leading them to various DC museums. Afterwards, we loaded onto our buses one last time – for a moonlight cruise along the Potomac River. Although we watched the monuments as they passed us on the horizon, we finally kicked back and shed our academic focus. For the first time, we were no longer members of magnet schools across the nation but simply kids. We ate, talked, laughed and danced. We finally knew each other as more than students; we became friends.

And now, here I am, watching as the students file off of the boat. I no longer see them as nameless blurs, but as individual faces and people. In the darkness, I see a blotch of red along the horizon, nearing me every moment – a hoard of 25 students, each wearing the same red "Staff" t-shirt. I smile, knowing this is the last time we will all be together, wearing our shirts, united under a common goal. We all come from different groups of friends and different backgrounds, but over the past three years of conference planning, we have become a family. Each of these students has helped make this event happen and contributed in a unique way. As staffers wave good-bye to me, hurrying onto their buses to shepherd the students back to the hotel, I silently thank them for their dedication and determination. Finally, I turn away, walking back to the reality of my everyday life, but knowing that I am part of something bigger.

Affiliate Forum: Globalization of College Campuses — Enriching our Lives

By Judi Marino

With this issue, the NCSSSMST Journal introduces the Affiliate Forum column. As NCSSSMST institutional and affiliate memberships grow, this new feature offers college and university affiliates to articulate and address questions and issues from a post-secondary perspective: college admissions, research opportunities, selecting a major, and so forth.

According to the Open Doors report from the Institute of International Education, more than a half million international students are currently studying in the United States.

Over half of the international students are from Asia, both the subcontinent (India is the leading sending nation of students) and the Far East (China, Korea, and Japan leading in numbers sent). Following Asia, 13% of our international students are from Europe, 12% from Latin America, 6% from Africa, 6% from the Middle East, and 1 % from Oceania.

Open Doors reports that international students contribute over $13 billion to the U.S. economy. I believe that the contributions of these students are much more far-reaching than monetary, however. Their respectful manner, their appreciation of the opportunities presented to them, their work ethic, their intelligence, their talent! Their names! The foods they prepare and share with us, the gifts they bring (I could write a book alone on the gifts I've received!), the stories they tell.

On the campus of Florida Institute of Technology (FIT), we find many international students willing to share and contribute and become active in our academic community. They are active in clubs and organizations and begin many new campus organizations to share their culture and their heritage. They are amazing musicians with interesting instruments, delightful dancers with native dances, pure, sweet singing voices, thespians, writers, playwrights. They are mathematicians, scientists, computer whizzes, historians, activists, humanitarians, global thinkers and doers. There are their native outfits, works of art, and other visual delights that show our differences yet make us smile.

We are blessed to have our lives enriched by other cultures and our minds broadened by insightful students. Probably all of us have stories about compelling, perspective-changing experiences by or with international students. Let me share a few of the students that enrich my life every day.

My young Malaysian student, who walked right up to my table at a college fair in Penang with her parents and informed me that her psychic told her she would attend FIT. She attended, thrived, and eventually earned her doctorate in genetic engineering, and married a student of ours from Puerto Rico.

My student assistant from Bogota, Colombia maintains a 4.0 GPA in aerospace engineering. He spent Thanksgiving with his girlfriend's family on the island of Puerto Rico. She and he fight about the fact that he speaks Spanish but no one in Puerto Rico can understand him. He loves mountain biking and comes to school in Florida! Don't you know he joined two biking clubs in the state that somehow find mountains near us to bike?

At a college fair in Barbados, there was an announcement over the public address system for

Judi Marino is the Director of Transfer and International Student Enrollment at Florida Institute of Technology in Melbourne. She has recruited international students from over 50 countries on 5 continents around the world for more than twenty years.

me to come to the registration table for a phone call. It was the mother of a student who had attended and graduated from FIT, but Mom saw my photo in the Barbados newspaper and had to call to say hello and to tell me how wonderful her daughter is doing as a chemist in Connecticut.

There is a student from Trinidad who plays amazing guitar. When visiting Trinidad, his mom and dad picked me up and brought me to their home, where I learned of this boys' talent. Later, we came back to campus and I made him play for me. I would never had known this or heard the boy play had his parents not been so proud.

The Indian student who doesn't want to be an engineer, but the family insists. He started a talk show on campus, has written two plays and loves everything to do with the theatre. The student who insisted I'd like Indian food if I would just give it a chance and go to the place he likes best. It didn't work, but I'll never tell.

Has it been a pleasure to meet students from nations all over the world on our campuses? For me, absolutely! Please don't misunderstand: we deal with amazing, talented and delightful students from our own country on a daily basis. That's just another article for another day!

Technology Focus: Using Technology to Explore Statistical Inference

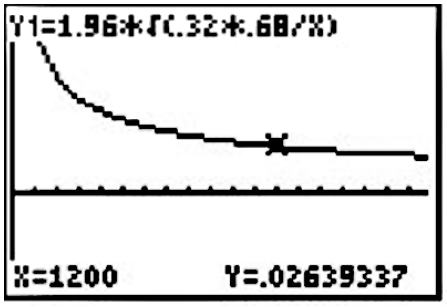
Joe Garofalo and Nicole Juersivich

There is much research that documents what many teachers know, that students struggle with many concepts in probability and statistics. Here are two sample activities we use to help our pre-service teachers develop ideas about how they can use technology to promote their students' ability to understand mathematics and connect their in-school learning to situations outside of school.

Activity 1: Graphing the Margin of Error. We typically present students with actual poll results reported the morning of a class, like the poll results shown below:

A CNN/Opinion Research Corporation poll conducted February 1-3, 2008 asked 1,192 adults nationwide the following question: "Do you approve or disapprove of the way George Bush is handling his job as president?" The pollsters reported that 32% of the respondents approved, while 67 percent of the respondents disapproved, with a margin of error of ±3.

We ask students, most of whom are mathematics majors who completed two courses in probability and statistics, to explain the meaning of a margin of error. Most just respond that a margin of error of ±3 means that the true percentage of adults who approve of Bush's job performance is between 29 and 35%. This interpretation is no different from the interpretations given by adults with little or no formal knowledge of mathematics. Most of these students cannot explain how the pollsters determined this margin, nor can they explain why this sample size is reasonable for a national poll. After some leading questions, many of these students recognize that this is an application of a one-proportion Z-test with a 95% confidence interval. We then suggest that they view the expression for the standard error not as a formula [$1.96\sqrt{(p(1-p)/n)}$], as is typically done, but as a function of sample size. By graphing and tracing this function students can not only verify the margin of error for this poll (±2.6%), but they easily calculate the margin of error for different samples sizes. Furthermore, by just observing the shape of this graph they can see that increasing the sample size past 1200 does not have much of an effect on the margin of error. In fact, tracing the graph shows that one will need to sample about 10,000 adults to have a margin of size of ±1.0%. Students then use this diminishing return to explain why pollsters often sample around 1,100 adults.



These students, like too many others, cannot readily connect their study of mathematics, in this case inferential statistics, to realistic situations, even though they can solve the pseudo-realistic problems found in their textbooks. They need more experiences applying what they are learning in classrooms to situations outside of their classrooms and textbooks. Context matters!

This example demonstrates that it can be instructive for students to think of formulas as functions to be analyzed, rather than just as expressions into which they can plug numbers. Another powerful example of the usefulness of

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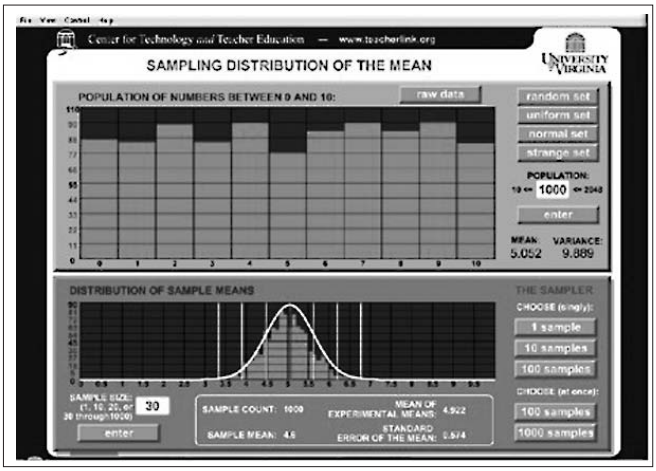
Nicole Jersivich is a graduate student in the Curry School of Education at the Univeristy of Virginia.

taking a "functions approach" to a formula is to analyze the graph of monthly loan payment as a function of the number of months for which money is borrowed. Try this for you own mortgage numbers!

Activity 2: Sampling distribution of the mean

Another reason why many students have difficulty applying statistical inference tests outside of their course and textbook tasks is that too many of them do not understand the underlying conceptual basis of statistical inference. Some students have trouble deriving meaning from static textbook graphs coupled with algebraic representations. To help address this issue, we developed a "Sampling Distribution" Flash tool that allows students to choose samples from a population and observe the distributions of the means of these samples. One can choose from 4 population distributions of numbers from 1 to 10, and vary the population size, number of samples taken from the population, and the size of the samples. The screenshot below shows the distribution of the means of 1000 samples of size 30, taken from a random population of 1000 numbers.



Teachers can use this tool to pose and answer a variety of questions regarding sampling distributions. Students can see, for example, how changes in the number of samples taken and changes in sample size can affect the distribution of sample means. By observing these changes systematically, students are able to answer various "why" and explanation questions, such as: Can you explain why the distributions of means of large samples are narrower than those of smaller? Both Windows and Mac versions of this Flash file can be freely downloaded from our Flash page: www.teacherlink.org/content/math/interactive/flash/home.html.

The above approaches can be used in conjunction with current newspaper, television, and online reports concerning the presidential election and many other issues that pollsters are studying. Tasks like these can help students answer for themselves a recurring question asked by many high school students: Why should we learn this?

Teaching and Learning:
Freedom to Roam

By Cheryl A. Lindeman

As a veteran teacher at a NCSSSMST high school, I take pride in allowing my students to stretch their minds. But as a teacher of gifted juniors and seniors, it has always been a challenge to keep my students up to date with key events in science. How do you keep bright minds ready for action? Can you develop their thirst for knowledge informally, i.e. without developing classroom experiences?

When we teachers first introduced the World Wide Web into our lessons, the buzzwords were web surfing or web quests. This worked fine and helped us bridge the gap with the information age as it swooshed into our classrooms. Now our students are coming to us in high school with a very comfortable attitude about surfing the web. But, as we all have found out, their skills are not at the higher orders of Bloom's Taxonomy. If a web site doesn't have a cool video or graphic, they might not go past the home page. So, it is a challenge to get them "data mining" into web pages to uncover deeper understanding about a topic.

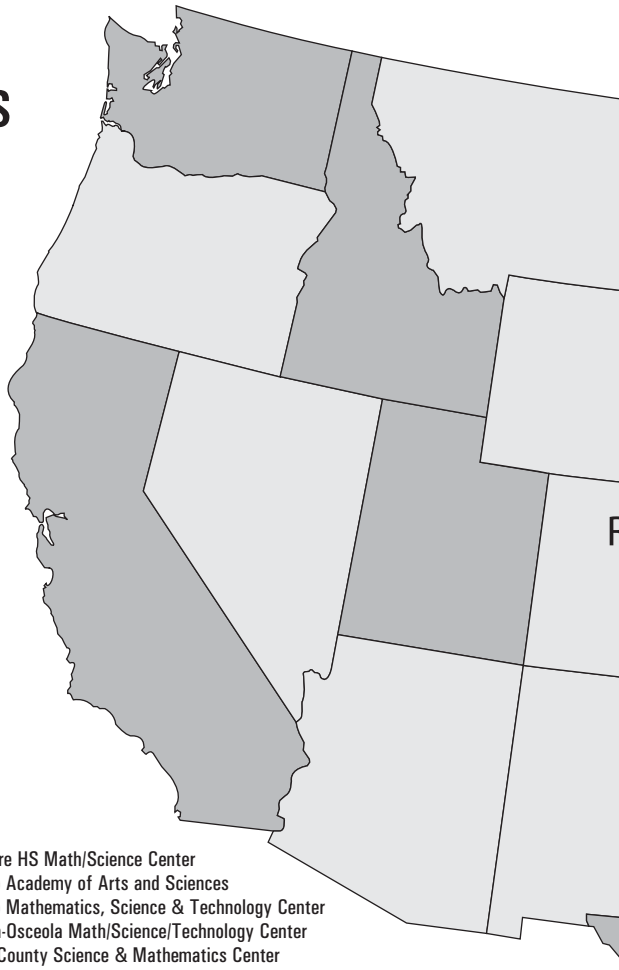
With wireless technology my students can log on to their laptops at any time. Since I decided that my seniors needed to practice their own policing, I allow them to have computers on during our class discussions. For example, sometimes they will make a concept map of our discussions or I'll ask them to type in a topic and see what Congress is doing with the issue.

For my biology lessons, I tend to do my advance searching on topics and see if I can stump them. This fall during my traditional discussion about DNA, I made sure the students got very familiar with Cold Spring Harbor's Web site < http://www.cshl.edu/> and the DNA Learning Center < http://www.dnalc.org/home.html>. (I call it "one stop shopping" for uncovering the latest as well as the historical information about DNA, genomics etc.)

I went on to share my first-hand experiences about going to Cold Spring Harbor Laboratory and meeting James Watson. In the old days I'd bring out my 35 mm slides and share the experience. Instead, I asked, "So what is James Watson doing today?" A few students had some ideas and then a student in the back of the room was scowling over his computer. The rest of the class continued talking and sharing information. The student in the back was really scowling now. So I walked around and looked. He found Watson on YouTube giving a lecture. The student had earphones hidden and was listening to the talk. I stood at his chair and then he announced. "Yes, Watson does have a "slirp" in his speech!" Everyone turned around as he took his earphones out and turned up the volume on the computer. Watson's mannerisms were exactly as I had described them to the students. The student created his own learning space while we were deep in discussion. He didn't bother us but he found a great talk by Watson as everyone listed to it. One young lady muddled as we finished. "Gosh, it was nice to hear someone famous the moment we talked about him—isn't YouTube Great!"

Dr. Cheryl A. Lindeman is a biology instructor and partnership coordinator at Central Virginia Governor's School for Science and Technology in Lynchburg, VA.

Institutional and Associate Members



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Thomas Jefferson HS for Science and Technology

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Conserve School

Members as of November 30, 2007
*Associate schools in planning stages.
**Affiliate School Membership

Journal Author Guidelines
Abridged Version

Complete version located at www.ncsssmst.org/publications

Editorial Scope

The purpose of the journal is to provide a forum for the discussion of innovation in secondary mathematics and science education and to disseminate information about Consortium member institutions.

Objectives

- To publish feature articles related to innovation in secondary mathematics and science education. Topics may include interdisciplinary curriculum; implementation of reform standards; infusion of technology into curriculum; creation of student centered active learning environments; original research of mathematics and science pedagogy; theoretical or conceptual positions; connections between science, mathematics, technology and society; connections between research and practice; discussion of current issues in mathematics and science education; and development of community and higher education partnerships. See feature article summaries on web site.
- To provide a forum for high school faculty members to report innovative classroom practices. See teacher practice summaries on web site.
- To provide a forum for Consortium students to report results of their original research. See student research summaries on web site.

Directions to Contributors

Submit four copies of your manuscript, typed double spaced on 8 1/2 x 11" paper. Manuscripts should be between 12 and 24 pages in length and must conform to the style of the current publication manual of the American Psychological Association available from APA, 1200 Seventeenth Street, N.W., Washington, DC, 20036. Submission of computer readable copy will facilitate the manuscript review and publication process. Please send an electronic version preferably in MS Word format. The name(s) and affiliation(s) of the author(s) email address(es) should appear on a separate cover page. To ensure anonymity in the review process, names of author(s) and affiliation(s) should not appear elsewhere in the manuscript. An abstract of 100-150 words should be typed on a separate page. Manuscripts that do not conform to these specifications will be returned for proper style change.

No manuscript will be considered which has already been published or is being considered for publication by another journal. Authors must include a letter stating that the manuscript they are submitting is original and has not been accepted or published elsewhere. Make sure to download the unabridged guidelines from the web site.

Copyright

Handling of Manuscripts

All manuscripts will be acknowledged upon receipt. The manuscript will be reviewed by at least two members of the Editorial Review Board. See web site for more details.

Tables and Figures

All tables and figures must be submitted in camera-ready form (publication quality). Tables and figures should not be imbedded in the Word document. Authors will be charged a set-up fee of $25.00 if artwork is not acceptable quality. Tables and figures should be prepared on separate sheets at the end of the running text. Indicate in the text where they are to be inserted. Tables and figures should conform to APA guidelines.

Photographs

Photographs are encouraged and welcomed if they are relevant and support the content of the article. See web site for more details.

Submission Check List for Feature Articles and Teacher Partner Summaries

___ Cover page
___ 1 paper copy
___ Electronic version emailed
___ Cover letter signed by all authors
___ APA format used for all citations and references cited

Journal Author Guidelines
Student Research Summaries

Directions to Contributors

The manuscripts should follow the format of a research paper written in an abbreviated form. Manuscripts must include the following sections: Abstract, Introduction (encompassing literature review), Methods, Results, Discussion and Conclusions and Bibliography (APA format). The total number of tables, figures, graphs, pictures, etc., submitted with a manuscript is limited to three.

Manuscripts should be between 6 and 7 double spaced pages in length including tables, figures, and photographs.

Copyright

For publication, manuscripts must include a cover letter from the student and faculty or administration acknowledging the student's research. If necessary, a letter from the student's mentor not associated with the school must be included if research was conducted outside the student's school.

Submission Check List

___ Cover page, including title, students' full name, class year, high school and email address
___ One paper copy with all graphics placed in the document
___ School letter of support including teacher's phone and email address
___ Student author letter stating original work
___ Mentor letter if applicable
___ Photographs if applicable including credit description
___ Tables/figures in separate document but show placement
___ APA format used for all citations and references cited (visit www.apastyle.org)
___ Electronic version emailed to NCSSSMST contact listed below

Notification of manuscript receipt will be sent to the student and teacher. If revisions are needed, the student and teacher will be given instructions.

Complimentary Copies

Upon publication, each author will receive a complimentary copy of the journal issue in which the article appears.

Submission of Manuscripts

Send manuscript to:
Dr. Cheryl Lindeman
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Central Virginia Governor's School for Science and Technology
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Lynchburg, VA 24502
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clindema@cvgs.k12.va.us
www.ncsssmst.org

About NCSSSMST

The National Consortium for Specialized Secondary Schools of Mathematics, Science & Technology (NCSSSMST) was established in 1985 to serve educators and students in the growing number of specialized high schools throughout the United States. NCSSSMST is a forum and clearinghouse for the exchange of information and program ideas among faculty, staff, and students from member schools and affiliated organizations.

The Consortium comprises a network of research and development secondary schools with strong college and university affiliate members. As of November 2007, the 100 member schools and centers located in 29 states enroll more than 37,000 students. Each member school addresses specific needs of its area, and most serve districts or states, depending on their charter. Two associate institutions are in the process of developing new schools. Over 90 colleges and universities are members and participate in program-related activities or sponsor special events.

Brief History

Seeking to increase communication among the mathematics, science, and technology specialized schools, four such schools—the North Carolina School of Science and Mathematics, the Thomas Jefferson High School for Science and Technology (VA), the Louisiana School for Math, Science and the Arts, and the Illinois Mathematics and Science Academy—hosted an organizational meeting in the spring of 1985. Representatives from 15 schools attended, and NCSSSMST was founded to foster growth and interaction among similar programs.

Governance

NCSSSMST is a nonprofit organization with IRS 501(C) (3) tax-exempt status and is incorporated as a non–stock corporation in the Commonwealth of Virginia. The Board of Directors, composed of leadership from institutional members, meets at least four times a year to establish policy and set direction. The fiscal year is July 1 through June 30. NCSSSMST has implemented a strategic plan, and the board serves as the strategic planning team. The institutional membership elects the Board of Directors and officers of the corporation for three-year terms. The Board employs an Assistant to the President to handle day-to-day business.

Membership

NCSSSMST membership is extended to public and private secondary schools, colleges and universities, organizations, and individuals whose primary interests are congruent with the mission of the Consortium.

Institutional Membership —

Categories for membership are as follows:

Associate Membership — Open to specialized secondary schools or schools with specialized centers located in the United States that have nonprofit status and primary objectives congruent with the Consortium's mission.

Affiliate Membership — Open to specialized secondary schools or programs which, upon enrolling students, have primary objectives congruent with the Consortium's mission and will meet the requirements for institutional membership.
Open to colleges and universities, businesses, associations, summer programs and agencies that have demonstrated an interest in and support for the Consortium and whose work furthers the mission of the Consortium. Affiliate member categories include: college and university; nonprofit organization; private business or organization; government agency; school outside of the U.S.; summer science programs; middle school; other school not qualifying as an institutional or associate member.

Individual Membership — Open to persons who have demonstrated an interest in and support for the Consortium or whose work furthers the mission of the Consortium.

The benefits of membership include an annual student conference, annual professional conference, an Issues and Connections conference series, student research symposia hosted by colleges and universities, summer institutes, and the following publications:

- Newsletter — published three times a year
- NCSSSMST Journal — a juried forum (published twice a year)
- Membership Profile — biennial report of the Consortium
- WWW site—www.ncsssmst.org—organization's link on the site

Corporation Business Office

2008 NCSSSMST Student Conference

Global Innovation

October 23 – 26, 2008

Rochester, NY

Sponsored by:

R·I·T

Rochester Institute of Technology

Co-hosted by:

Brooklyn Technical High School

Academy for the Advancement of Science and Technology at Bergen County Academies

Dates to Remember ...

For updated calendar information, visit www.ncsssmst.org or sign on to eNEWS.

February 27 20th Celebration - C3 Celebrating Consortium Connections with Texas Instruments, Dallas, TX

February 29 Annual Corporate Business Meeting, Renaissance Dallas Hotel

March 15 Registration deadline for the Student Research Symposium, June 11-14, 2008, Florida Institute of Technology
www.ncsssmst.org go to Programs < student research symposium

May 1 Registration deadline for Gifted Summer Institute hosted by Western Kentucky University, July 20-24
www.ncsssmst.org go to Programs < summer institutes

June 1 Pre-Registration for Student Conference hosted by Rochester Institute of Technology, October 23-26, 2008
www.ncsssmst.org go to Programs < student conferences

June 14-21 Keystone Summit "The Future of Sustainable Fuels in America"

June 20-22 NCSSSMST Board meeting at George Williams College of Aurora University, Lake Geneva, WI

August 2-9 Keystone Summit "Obesity in America"

NCSSSMST

National Consortium for Specialized Secondary
Schools of Mathematics, Science & Technology

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