

STUDENT SENATE

PUZZLES

SUBWAY SUMMIT

SPECIAL REPORT:
COGNITIVE ISSUE

Issue 3 Vol. 2

HUDN

The HUMAN DEVELOPMENT NEWSLETTER

SPRING 2010

FORGING NEW PATHS: THE HUD ERA

In this issue

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LEVELING THE PLAYING FIELD IN EARLY MATHEMATICS

by Michael Swart

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Our understanding of mathematical concepts, representations and relationships have substantial impact on our performances in both school and the workplace. Not only is mathematical understanding essential for the United States to remain competitive in the increasingly complex global market place, but from a developmental perspective, research has linked mathematical understanding to our abilities to strategize and solve problems. As educators, it is important for us to understand how we can shape pupils' mathematical understandings. According to Dr. Robert Siegler, Teresa Heinz Professor of Cognitive Psychology at Carnegie Mellon University, and this year's Teachers College Tisch visiting professor and lecturer, the problem is still tractable and the opportunity to influence paths of development are easiest to influence.

Research on mathematical abilities among infants reveal no discrepancies between various social groups. However, by age four, differences begin to emerge. Starkey et al. (2004) compared children of middle and low income families and found distinct differences on measures of object counting, next number series, number comparisons, two set addition, shape names and other math-related skills. According to Havnushek and Rivken (2006), by the time children reach first grade, there is a 1 to 1.5 year gap between the children in the top quintile and the bottom quintile on measures of basic mathematics proficiency, and this gap expands throughout the formalized schooling process. These findings echo a 1992 study by the Organization for Economic Cooperation and Development that found lower performances between various social groups for children whose fathers had lower levels of education and lower levels of socio-economic status. Overall, the U.S. shows substantially greater variability (downwards) in the performances between social groups when compared to other countries. Essentially, even though top-performers in mathematics in the U.S. are comparable to top-performers in other countries, low-performing math learners in the U.S. score significantly lower than those in other countries.

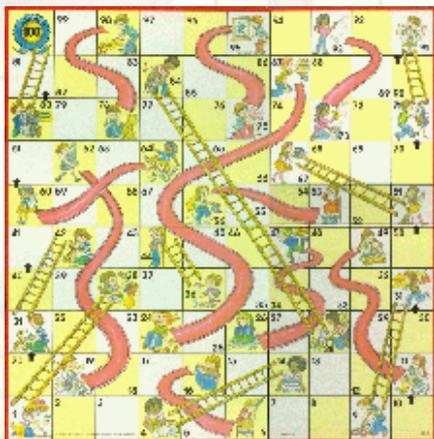
A series of six longitudinal studies by Duncan, Brooks-Gunn and their colleagues (2007), sought to predict how well children perform as they got older based on initial measures of math, reading, attentional control and emotional regulation taken in kindergarten. They found that math performance was more than twice as susceptible to "the issue that if you start behind, you stay behind and if you start ahead, you stay ahead," Siegler noted. The latter part of this statement means there is hope to address this problem. Citing what he calls the "cognitive multiplier effect" and the "motivational multiplier effect," Prof. Siegler stated that the more you know about a subject, the easier to learn more and the more interested you are in the subject, the more motivated you are to learn. Based on these premises, Prof. Siegler's work focuses on how the usage of board games, an activity that children enjoy, greatly improves their understanding of numerical magnitude during preschool years.

Fundamental to children's mathematical understanding is their conceptions of numerical magnitude, which are essentially how well they understand the meanings of numbers and the relationships

Although it seems obvious, adults often overlook how frequently “we use numbers in different ways and we can separate numbers from their magnitudes,” Siegler highlighted. Studies have demonstrated that children often use numbers, for example, learning to count, or singing the number song, without genuine understanding of the meanings or magnitudes of numbers.

Many studies by Siegler and his colleagues (2002, 2004, 2008, *in press*) used tasks of number line, numerosity and measurement estimation to provide evidence for the importance of teaching a “linear representation of numerical magnitudes” to children. These tasks not only provide researchers a transparent assessment of how children align their internal representation of numbers with their notions of magnitude, but are also “ecologically valid,” Siegler added, since number lines are “almost omnipresent in classrooms.” Furthermore, number lines allow for the “representation of all kinds of numbers,” i.e., positive and negative, whole numbers and fractions, rational and irrational numbers, etc. Getting children to produce number magnitude estimates on number lines produces good sets of continuous measures (linearity, slope and percent absolute error) that are good for analysis. Children’s performance demonstrates strong correlations between the different tasks of numerical magnitude representations. Thus, the goal is to help children create a linear representation of numerical magnitudes. Prof. Siegler says its as easy as letting them climb up ladders and slide down chutes.

The game chutes and ladders is based on an old Indian game designed to teach children about the Hindu dieties called Snakes and Ladders. The popular westernized version, Chutes and Ladders, has players making discrete movements, naming numbers and moving their game piece towards the finish. Activity in the game corresponds both in distance and time to numerical magnitude through a convergence of multimodal visuo-spatial, kinesthetic, auditory and temporal cues, providing a rich experience that grounds the meaning of numbers for the players.



Subsequently, Ramani & Seigler conducted studies in 2008 aimed at deciphering the characteristics of board games that contribute to children’s numerical understanding and found that it is indeed the presence of numbers written on the board that solidifies mathematical learning. Playing board games correlated to performance on number line, magnitude, computation, counting and numerical identification tasks. Furthermore, they tested multiple iterations of the boards and found that linear board games are more effective than circular board games on measures of number line estimation and magnitude comparison. Linear representations were also found to facilitate learning of novel addition problems. Perhaps most importantly, low performing groups nearly caught up to higher performing groups in number line estimation. On magnitude comparison tasks and number identification, they closed the gap substantially.

Next, Laski & Siegler (submitted) investigated whether “how” the game is played makes an impact. In all the previous studies, children were required to say the numbers aloud. In this study, children were told to either use a “count-on” (i.e., starting with 5 then 6,7,8...) vs. a “count-from” strategy (i.e., starting with 1 regardless of what number square they were on) and found that the “count-on” strategy performs better on tasks of numerical identification and counting. In fact, Starkey, et al (2004) showed that a curriculum that uses games to expose children to mathematic reduced the gap between low income and middle income children’s performances on object counting, next number identification and numerical magnitude comparisons.

In most pre-kindergarten classrooms, children receive relatively little exposure to math. Clearly, implementing a well designed curricula that exposes children to mathematics can greatly reduce the gap in mathematics between children from varying SES backgrounds in the U.S. Numerical board games are a practical means for reducing SES-related differences for many types of numerical knowledge that are highly effective, relatively inexpensive, and require little training. The benefits of using such games are large, broad and stable. Theoretically motivated experiments can identify game features that are crucial for success; applying existing research findings on a larger scale can help level the playing field in mathematics learning.

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On Saturday, April 24th, Fordham University hosted the third annual Subway Summit Conference for Cognitive Studies in Education. The day included presentations by students and faculty from Teachers College, New York University, CUNY Graduate Center and Fordham University. Each school was given an hour and fifteen minutes to present. Below are summaries of the presentations given by students from Teachers College, Columbia & Barnard. [by Michael Swart](#)

Embodiment and Spatial Ability in Learning 3D Anatomy: Susan Jang, John Black, and Robert Jyung

Cognition is not an amodal system, but rather is intricately linked to perceptions and actions. The now famous study by Shepard & Metzler (1971) found that reaction times for completing mental rotations are longer when the body's biomechanical constraints for performing the rotation are more complex. Later studies by Kosslyn et al. (2001), Schwoebel et al., (2001) and Amorim et al., (2006) on mental rotation found that areas of the brain involved in motor planning are active when we visualize and manipulate 3D objects in our mind. Similarly, educational researchers are learning the importance of using the motor/haptic channel to better process information and using virtual reality (VR) technologies to help learners interact in 3D. "Key views" accompanied by "a little wiggle" (i.e., movement to cue depth perception) have been found to be critical components for learning (Garg et al., 1999, 2001, 2002; Keehner, 2005, 2007, 2008). Too much interactivity, it is hypothesized, can overload the user with information.

In the current study, Jang and her colleagues evaluated medical students' abilities to learn structures in the inner ear (semi circular canals and facial nerve) through an interactive volumetric VR model. In a yoked pairs design, students (n=38) were given 5 minutes to study two specific substructures of the inner ear and then given a drawing post-test assessment. The manipulation condition was more accurate than visual observation condition and performance was also correlated to spatial ability (higher spatial ability = higher performance). Likewise, those with better spatial ability also set up the inner ear structures accurately from the onset and were less haphazard in their approaches. Future research needs to further explore how people used the program – i.e., how wiggling structures provided depth perception; how using simulated annealing serves an optimization technique to introduce noise to the information to improve students search for best learning strategies; and how specific learning goals effect the amount of metacognitive engagement. sj306@columbia.edu

Gestures in Explanation and Learning: Seokmin Kang, John Black, and Barbara Tversky

Different gestures depends on their referent. There are four principle types of gestures: (1) deictic– indicate object with index or hand, (2) iconic– use of gesture to represent aspects of the concept, (3) metaphoric– does not necessarily refer direct to concept, but more abstract and (4) beat (discourse)– converse with people that does not have meaning, but used for emphasis. Gestures are also considered either "on-diagram or off-diagram" which, as the name implies, literally means whether or not they are directed toward the diagram. Furthermore, gestures are considered representational when they contain a semantic content.

In teaching, educators often gesture during instruction by moving their hands during explanations: The focus of this research is to decipher how gestures either help or hinder instruction in order to generate recommendations for gestural techniques that educators can use to deliver better qualified explanations to their students. Schwarts & Black (1996) found that gestures are often useful as a cognitive sketch pad (Baddley, 1986) that people use to represent space. In a recent study by Kang, Black, and Kim (2009) on the construction of imaginary worlds using one's hands, explainers changed gesture patterns to accompany speech for an imaginary listener depending on the listeners' knowledge levels. When talking to novices, their gestures were more iconic, off-diagram, had bigger features and accompanying speech was more oriented towards structural and functional knowledge. Research suggests that gestures may provide better modalities for communicating and helping the listener embody information.

In the current study, Kang and his colleagues looked at how different gestures effect learing. They created instructional videos, all with the same content and the videos varied only by the types of gestures used by the instructor (representational, discourse, or no gesture). Post-tests evaluated retention, near transfer, and far transfer, finding that the representational group improved most best (pre to post test) while the discourse (non representational) group performed the worst, and the control group performing in between the two. After controlling for gender and English proficiency, results revealed that the representation group performed better on the "what if" type of question and investigators concluded that specific gestures may not be a critical factor in understanding of concept, even though representation gestures did lead to learners' deeper understanding and their gleanng more information and grasping key concepts faster. sk2587@columbia.edu

What are the effects of generation errors on memory and learning? Metcalfe and Kornell (2005) found that making errors doesn't really matter as long as you give feedback. Their study looked at the whether or not forcing a student to respond to a question for which they don't know the answer affects learning and found makes no difference on the students' learning— simply generating answers, right or wrong, helps memory. But then the question becomes: Could generating an error reinforce the error? Kornell, Hays and Bjork (2008) looked at the possible positive or negative effects of unsuccessful testing between a feedback versus no feedback condition and concluded that unsuccessful retrieval attempts do enhance learning. But Columbia student Barbie Huelsner and her colleagues were speculative of this finding so they sought to further evaluate different cases of self-generating an errors and its effects on learning and memory.

In the study, students were given questions in one of three conditions: (1) a question with wrong answer (5 seconds), then provided corrective feedback (8 seconds); (2) a question with the correct answer for 13 seconds (long duration, comparable temporally to the first condition); and (3) a question with the correct answer for 8 seconds (short, to assess if length of exposure affects) on performance. In the first experiment, participants were tested using "free weak associates – e.g., whale and mammal" and the results verified earlier findings that error generation with feedback aids performance. Contrastingly, in a second iteration of the experiment, researchers used *unrelated pairs* of words and found that the beneficial effect of testing disappears and instead, simple long exposure to the correct answer (condition 2) shows the best performance and errors from the testing (condition 1) persisted into later assessments. A third iteration used a within participants design and verified both experiments 1 and 2. Evaluating these results, Metcalf hypothesized that their findings showed patterns similar to the Osgood surface (1949), in which similarities arise between studies so that when things are related, an AB – AB' setup (like free weak associates), there is transfer, but for unrelated AB- AC pairs, making errors can be harmful. bjh2135@columbia.edu

Strategy Selection in Math Problem Solving: Yun Jin Rho and James Corter

Previous research by Tatsuoka (1990) proposed a two solution strategy for arithmetic problem solving with fractions. The first strategy, *Method A*, converts a mixed number to an improper fraction, and the second strategy, *Method B*, separates mixed numbers into integers and fractions. Both strategies were developed based on the different set of cognitive requirements relevant to certain types of problems and the cognitive activities underlying their solutions. In previous evaluations of the effectiveness of either method, the CDM, focused on *Method B*, but the question remains: If *Method A* is more conducive for one type of problem and *Method B* for another, isn't it possible that using a *mixture of methods A* and *B* would produce better performances.

In the current study, researchers investigated a flexible strategy choice hypothesis, namely, that people choose solution strategies for their flexibility and optimality. As a result, Rho and Corter proposed a hybrid *Method C* that uses either *Method A* or *B*, depending on the type of problem. A *Q Matrix* developed for *Methods A* and *B* using multiple regression demonstrates which items on a test were better solved by either *Method A* or *B* (R^2 *Method A*: .376; *B*: .804). A further calculation for *Method C* yields an $R^2 = .900$. A mixed effects logistic regression analysis (using the entire data set) under both Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) shows that although *Method B* is better than *A*, *Method C* outperforms both. In terms of a cognitive skill diagnosis, using the NIDA model and including a slip parameter (for mistakes) and guessing parameter, *Method C* is the still the best. Previous CDM research assumes that students employ one strategy, but clearly the hybrid strategy, *Method C*, is the best fit for the mixed fraction subtraction data. yjr2101@columbia.edu

Overstudy and Low Goals: Metacognitive Uncertainty and Learning Decisions: Pantelis P. Analytis and Lisa Son

When we study in the present, how do we assess future performance? Cognitive uncertainty has implications on learning patterns and decisions. In this study, participants were twice presented with 20 word pairs, one pair at a time. Following a math distraction task, participants were asked to estimate the number of word pairs they would correctly recall and then asked to provide likelihood estimates of the probability that they would achieve the number of correct responses that they had estimated. Overall, participants' declared goals that were much lower than their actual performance and their metacognitive judgments were substantially under-confident. Their goal choice had a significant impact on their judgments. Using a simple model of expected utility theory, researchers concluded that as standard error increases, people judge their future performances to be lower. However, as individuals become more experienced, their estimates are less under-confident. Essentially, they employ metacognitive agents to assimilate their uncertainty in the dependent measure (recall), relying on cues and heuristics and often their decisions approach optimality. pp2357@columbia.edu

Why is it so Hard to Diet? Melissa Rodriguez and Lisa Son

Maybe the reason it is so hard to diet is because you just can't seem to get delicious food out of your mind. Thus, researchers asked the question: Are we able to forget when we want to? Using a *directed forgetting paradigm*, students were given lists of words to study, informed that they were given the wrong list of words and to "please forget them," given a new list of either 20, 10 or 5 words to study, a five minute distractor task, and then asked to give a likelihood estimate (scale of 1 to 100) of how many words they would successfully recall followed by a partial cued recall test (the first two letters of words) requiring participants to either recall 40, 30, or 20 items from the second list. Controls studied the second "real" list, asked to give likelihood judgments, and complete the recall task. Overall, the experimental group remembered just as many words from the practice "forget" list as they remembered from the "real" list, an effect that was mediated by the length of the "real" list. These results indicate that when it comes to judgments of forgetting, people should not think about information that they need to forget. mr2601@barnard.edu



HONOREES:

This year, seven Teachers College faculty members were named 2010 Fellows of the American Educational Research Association (AERA). Fellows are recognized for their outstanding scientific or scholarly contributions to education research or contributions in developing research opportunities.

Of the seven named from Teachers College, three are faculty within the Department of Human Development.

Jeanne Brooks-Gunn, Virginia and Leonard Marx Professor of Child Development and Education, Teachers College and College of Physicians and Surgeons, Columbia University; Co-director, National Center for Children and Families; Co-director, Columbia University Institute for Child and Family Policy

Herbert Ginsburg, Jacob H. Schiff Foundations Professor of Psychology and Education

Gary Natriello, Ruth L. Gottesman Professor of Educational Research; Executive Editor, Teachers College Record; Director of the Gottesman Libraries, Teachers College

PRESENTATIONS:

Herbert Ginsburg, together with student researchers, chaired a panel, "Video Analysis as a Method for Developing Preservice Teachers' Beliefs about Teaching and their Understanding of Children, Pedagogy, and Assessment." The panel focused on early childhood teacher preparation in mathematics, including the development of model courses, an extensive video library, and a unique web-based video analysis system to provide preservice teachers with intellectually-stimulating learning experiences that vividly portray the processes of student thinking and the tasks of assessment and teaching.

Stephen Asunka, **Hui Soo Chae** and **Gary Natriello** presented *Supporting and Enhancing Social Scholarship in the Digital Age: The Case of PocketKnowledge*, an article report on a study of the adoption and use of an institutional digital repository and social networking website by the academic community of a graduate school of education in the northeastern United States.

Stephen Asunka, **Hui Soo Chae** and **Gary Natriello** presented *Physical Versus Digital Scholarship: Exploring Academic Resource and Information Access in a Networked Environment*. This study explored some aspects of library use and academic information seeking behaviors of patrons of an academic library in a graduate school of education in the northeastern United States. The study analyzed user activity patterns of the library's physical spaces in conjunction with patronage of the library's digital resources.

Gary Natriello presented *Toward a Sociology of Online Learning: Implications for Learners and Educational Researchers*. This paper explored the social dimensions of youth learning in online environments. As youth around the globe have increasing access to the internet and the growing body of materials, applications, individuals, and social networks available through it, there is a need to understand more fully the contours of the learning opportunities to which they are exposed.

Lawrence De Carlo and **Young Koung Kim** presented *On a Comprehensive Model for Constructed-Response and Multiple-Choice Items in Large-Scale Credit and Placement Exams*. Many exams consist of multiple choice (MC) items and constructed response (CR) items. This raises issues with respect to how to use the items to arrive at a single overall score. This paper explored using a comprehensive model that consists of a signal detection theory (SDT) component for the CR items and an item response theory (IRT) component for the MC items.

Herbert Ginsburg, **Young-Sun Lee** and **Sandra Pappas** presented *Digging Deeper Into K-3 Students' Mathematical Strategy Use Within the mCLASS: Math Assessment System*. This paper explored the relationship between cognitive science, curriculum based measures (CBM), and diagnostic interviews (DI) within a mathematical assessment system. They also presented *What You Might Know by Your Next Birthday: Examining Predictive Validity*, a paper that described the evaluation and analysis of the Early Mathematics Assessment System (EMAS), which assess both performance and cognitive process strategies and conceptual understanding in number, operation, shape, space, and pattern.

John Black and **Priscilla Aguirre** presented *Direct Manipulation Animation for Elucidating Emergent Systems Phenomena*. This study investigated the influence of direct-manipulation animation (DMA) modeling environment for increasing comprehension and transfer of emergent systems phenomena. In an empirical study 103 college students were asked to interact with a NetLogo model of emergent phenomena under one of three conditions: no manipulation animation (NMA), post-manipulation animation (PMA), and direct manipulation animation (DMA). Results showed that participants in the NMA condition showed the most improvement and students' understanding of the phenomena increased most when they used dynamic models that did not incorporate simultaneous interaction of haptic and visual channels.

John Black, **Carol Lu**, **Daoquan Li**, **Seokmin Kang** and **Insook Han** presented "It's Obvious to Tell Why It Is!" A Study of Improving Students' Understanding in Physical Science Concepts via Robot-Based Hands-on Learning Activities. Research on improving students' understanding in physical science concepts, such as speed, force and friction, via robot-based hand-on activities. They were capable of exposing single key concept in a complex multiple variables involved scientific scenario. Through multiple sensible modalities, students were able to play, work and learn on scientific concepts effectively.

John Black will chair *Constructing Learning Through Technology: Where Repetition Ends and Understanding Begins*, a symposium examining the integration of technology into the classroom by exploring five studies that each proposed innovative ways in which technology can be used to extend traditional education. The objective of the session was to present these contemporary developments in the field and to foster an environment where the presenters, the discussant and the audience could further investigate the design and implementation aspects of the technology from the perspective of developers as well as educators.

John Black, with **Chun-Hao Chang**, **Eric Carson**, and **Jonathan Vitale** presented *A.R.I.A. Robo-Simulator: A Tool for Assisting and Assessing Beginning Robotics Students*. With a growing need for students to engage technology as designers and developers, incorporating digital technology that promotes problem-solving in schools is essential. Robotics – a motivating and challenging field – provides such opportunities, but may be difficult for some students to engage initially. The software, detailed in this document, facilitates the learning of robotics in a simple environment with a virtual representation of a robot.



* Every row includes digits 1 to 9 in any order
 * Every column includes digits 1 to 9 in any order
 * Every 3 by 3 subsection includes digits 1 to 9

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sum
green
ideas

Greentreprenur-ship at TC

Michael Swart with Julie Youm

If you are looking for some green ideas, or better yet... if you've got some to share, then you have something in common with Julie Youm, recent dissertation defender, happy married person and insightful entrepreneur of SumGreenIdeas.com. SumGreenIdeas.com is a website created to unite a community of users online who are interested in sharing their green ideas. After working on the site for almost two years, SumGreenIdeas.com officially launched January 1 of this year. Youm and her colleagues hope to combine their passion for technology and education with the growing global consciousness of sustainability in the marketplace and exploration of ways for all of us to live in better harmony with the environment and each other.

The site encourages users to use "to-do" lists of things we want to do, encourages each other to continue working on those things, shares the things that we've already contributed and completed. Less than six months after its debut, the company is already partnering with Amazon to help users find green products that are eco-friendly. Portions of proceeds of every click-thru purchase on the site (that's an industry term akin to the term "transfer" in education) goes to the Arbor Day Foundation. Together with her sister, a TC alumnae, her brother in-law, and two web developers, they hope to create a go-to portal that helps connect the green webmmunity. They utilize social network mediums like Facebook™ and Twitter™ (both profiles are SumGreenIdeas) and they hope that users will create accounts on their site and actively share with each other. They eagerly welcome TC students' participation and feedback.

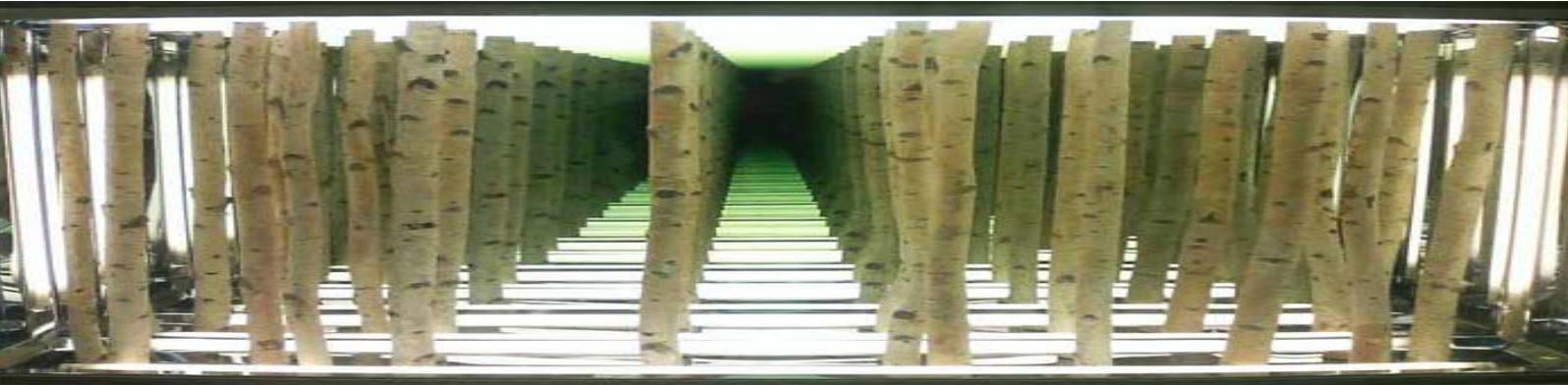


Born in Madison, Wisconsin, Julie grew up in the Washington D.C. area. Julie completed her undergraduate work at Carnegie Mellon University in Pittsburgh in Mechanical Engineering and got her masters from Johns Hopkins University in Computer Science. "After working for some time as a software developer, I became interested in education and how my training in computer science, and more specifically, object-oriented programming influenced the way that information is organized and problems are solved." Julie explained that it could be used as a method of organization for knowledge and to organize it in that manner, as objects, you have to abstract information and group it in ways that force you to delve into its details, and believe that there are benefits to this holistic approach that are beneficial to education and learning.

So, on the heels of her sister, Julie began her Ph.D. in the Department of Human Development in the Cognitive Studies program. "I wanted to better understand how people processed information in order to design better educational software," Julie recalled, "and using ideas based in research, not just on assumptions, to better understand how users interface with programs."

"I think of myself as a technologist more than a psychologist, but the psychology component of my education has really enriched my understanding of how cognition is integral to integrating education and technology."

By the time Julie completed her Ph.D. coursework as a Ben Woods Fellow, Julie's research interest had narrowed down to investigating the effect of training students to focus on functional relationships when they are learning new information to construct a deeper understanding of complex systems. Relevant work in this line of research includes Michael Jacobson of the University of Sydney, Uri Wilensky of Northwestern University, Mitch Resnick of MIT, Cindy Hmelo-Silver of Rutgers and Robert Goldstone of the University of



Indiana (see HUDN, Spring 2009) and this topic has become especially important on account of President Obama's new STEM (Science, Technology, Engineering & Math) initiatives in education and the prevalence of complex systems within these domains.

"My study looked at two complex systems in science: (1) the greenhouse effect [containing implicit functional relationships] and (2) the space elevator [containing explicit functional relationships] and how we can improve students understanding of them." The main research goal was to focus on whether priming students to focus on either functional or causal relationships would help improve their understanding. Recruited TC students, including those from Professor Tversky's Cognition and Learning class, were assigned to one of three groups, functional, causal, or control. Next, they were given an article about these systems and asked to consider key elements and write down their understanding as functional or causal relationships between these elements.

"What we found was that if you are biased to think with functional relationships then you use different reasoning strategies to process the information. Students trained to focus on functional relationships naturally used strategies to think about functions but also engaged more dynamic strategies like mental simulation while additionally demonstrating more metacognitive awareness about the difficulty of what they were doing." Previous research attributed the latter result to deeper engagement in pursuit of greater meaning making (Chi et al., 1989). Students trained in the causal condition paid particular attention to a cause and effect strategy, but did not engage significantly in other types of reasoning. Furthermore, there was some evidence that students in the functional group showed better understanding of what roles different components play within the system. Since previous research (Barbas & Psillos, 2003; Grotzer & Perkins, 2000; Grotzer & Sudbury, 2000) showed that people's natural first tendencies are to define causal models, Julie's research suggested that educators should scaffold functional information about systems in order to generate better understanding for their pupils.



In reflecting on her time here at Teachers College, Julie notes that the Research Methods class with Caryn Block, along with the entire statistics sequence proved invaluable for developing the skills needed to become a good researcher. She also appreciates the feedback received from Dr. Black's research practicum when she presented in past years.

While living here in NYC, Julie enjoyed taking her dog, Madison, to Central Park's Sheep's Meadow to enjoy the greenery. "I got her as a puppy when I began my work here and she's been with me every step of the way, laying next to me as I read, wrote and prepared my dissertation and defense," Julie said with a smile. When asked to comment on how the transition has been from New York to California, Julie said, "I will miss New York but look forward to returning to TC as an alumni." When I asked Madison how the transition has been for her, she said, "Ruff." In the meantime, maybe we can share SumGreenIdeas.com with her along the way!

Julie.youm@columbia.edu



Alumni Profile: Angela Santomero

In her own words

What is your full name? Angela C. Santomero

Where were you born? The Bronx, New York

raised? Harrington Park, New Jersey

What interested you as a child? I loved *Mister Rogers*!

young adult? In college, I worked as a preschool teacher. I was always interested in kids!

Do you have a family? I have a husband and two daughters. Hope is 9 and wants to be an actress who writes and directs and Ella who is 6 who wants to be a famous singer.



What Institution are at currently and what is your official title?

Founding Partner, Out of the Blue Enterprises. I am an Executive Producer, Head Writer, Creator of preschool educational media

How long have you been there? We have had our own company for 5 years.

Were you at any other previous Institutions? Previously I

was at Nickelodeon where I created, Executive Produced and was the Head Writer on *Blue's Clues*.

Tell me about your current labs & research? Grants? Projects? Number of Students/Researchers working for you? We have an in-house research department at Out of the Blue which conducts formative research on the development of all of our television and media projects.

Collaborative Projects? Previous threads of research? We work with different universities on different studies regarding educational television. Our most recent Summative Research was done by Dr. Deb Linebarger out of University of Penn at Annenberg.

When did you start at TC? 1990

Academic Interests while at TC? What focused you? How did you derive your path? I worked with Dr. Rosemarie Truglio learning everything I could about the research on children and television. I also worked with Dr. Herb Ginsburg on child development and the education of young children.



How long were you at TC? 5 years



Thesis work summary? My Master's Thesis was the creative concept and need for a television series and brand that empowers preschoolers to learn to read. It became our hit television series, *Super Why!* on PBS Kids.

Tell me about your life while in New York? Favorite spots? Activities? We loved living in the Upper West Side. It was our own neighborhood where we would frequent many restaurants, the park on Riverside, go to mommy and me classes with the girls...

Tell me about life as a successful academic? Ups? Downs? Ins? Outs? In my work, we use the academic research and apply it to teaching millions of kids at a time through television, online, books, and learning toys. Our formative research clearly shows high points of having statistically significant results on teaching kids how to read with *Super Why?* and kindergarten readiness skills with *Blue's Clues*.

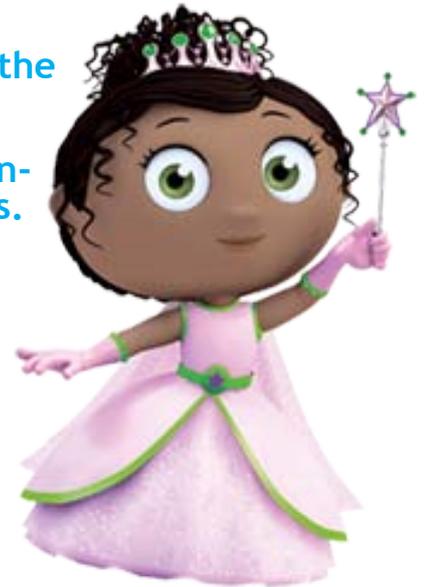
Proudest Accomplishments? Teaching moment Failures? Any "failures" we have in development of a new property gets fixed before the property reaches the kids! My proudest accomplishments have been watching my own two girls grow and prosper, my two shows growing and teaching kids all around the world, and watching my staff grow and develop.

Recent Publications? EDC study which cites *Super Why?* in the classroom.

What does the future hold for you? Your work? I want to continue to raise the bar for quality media for kids and families.

Do you have any wishes? Many! One of them being that I hope to continue to create new ideas for teaching kids through breakthrough, impactful, and significant ways.

Advice for current students working in your field? Read everything and then create your own niche in the world based on your knowledge.



Sentences you will probably never read in a published paper:

"We were totally surprised it worked!"

"We just thought it'd be a neat thing to do."

"I'm only doing this to get tenure."

"Oops."

"Previous work by XXX et al. is actually pretty good!"

"To be honest, we came up with the hypothesis after doing the experiment."

"The results are just 'OK!'"

"Future work will... ah, who are we kidding? We won't get more funding to do this."

Ken-Ken!

In each thick-line "block", the target number in the top left-hand corner is calculated from the digits in all the cells in the "block", using addition (+), subtraction (-), or multiplication (x) as indicated by the symbol by the target number. All the digits 1 to 4 must appear in every row and column.

2 ÷		30x		1-	
12+		14+		8+	
2 ÷			1		15x
	6x		72x		
9+				7+	
2 ÷		2 ÷		6+	

THE MAGIC OF LEARNING

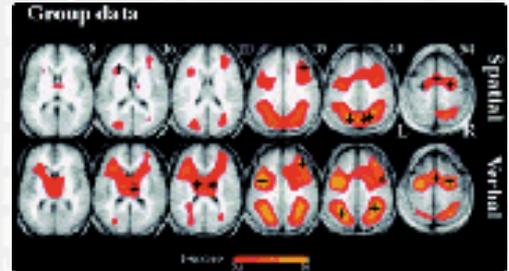
THROUGH EXPERIENCE & SIMULATION

GROUNDING ADAPTIVE LEARNING

This is an active new area of basic Cognitive Science research is Perceptually-Grounded or Embodied Cognition. Learning and understanding involves imagining perceptual simulations in addition to symbolic processing. You don't just "know about" it but you also have a "feel" for it so it becomes a part of you.

Reading Comprehension: John Black

We usually think of reading comprehension as recognizing words and combining them into verbal ideas and linking those ideas. You get spatial effects with skilled readers with sentences like: John was working in the front yard then he went (came) inside. If we teach 2nd graders to read stories about a farm while acting out with farm toys then they understand better. They understand better if they also practice *imagining* moving toys to act out story actions. By doing this, they are imagining perceptual simulation and not just symbolic processing.

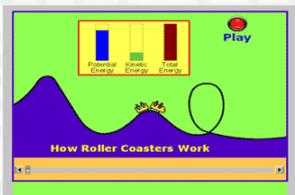


Hands-on-Activities plus Simulations in Science: Dan McVeigh



Hands-on-Activities plus Simulations in Science (SHOW) compares hands-on-activities with small fish tanks in the classroom with added interactive graphic simulation with movement. By adding graphic simulation, memory increased somewhat and problem solving doubled.

Researchers also added a remote link to large fish tanks at Rutgers Ecoplex, but the implementation of this technology only increased learning a little and perhaps a better design would be more effective. A simulation probably aided ability to imagine and mentally simulate the mental model of the ecosystem. This research is being done in schools in the South Bronx.



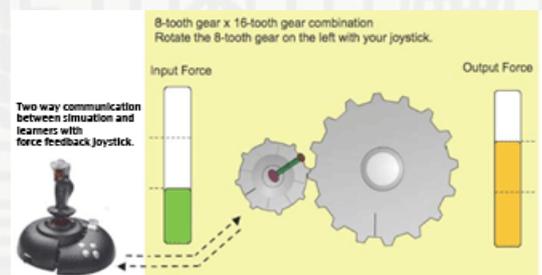
Grounded Embodied Mental Model Simulations: Maggie Chan

Students learn from simple interactive graphic computer simulations in which their movement manipulates one or more variables while a graphic animation shows simultaneous changes in others. Perceptual features of visual graphics, animation, auditory voiceover, movement manipulation and force feedback are combined in simulation games.

Result varies within type of student and system complexity. For simple systems taught to capable students, text is sufficient. For capable students and intermediate systems, text plus diagrams is sufficient. However, complex systems for capable students need direct manipulation animation. Likewise, students with lower capabilities, regardless of system simplicity or complexity, need direct manipulation animation and thus need more embodiment.

Force Feedback Simulation: Insook Han

In schools in the South Bronx, students were given tasks on gear instruction, two examples of gears and inclined planes (ramp loading box into truck). Providing force-feedback and opportunity for movement manipulation was better on measures of memory than graphics and animation. Force-feedback was also best on measures using information in problem solving, inference and transfer.



Learning from Video Games

There has been a lot of hype in recent years about video games being great learning environments with little research evidence (except spatial ability and multiple tracking attention). The Institute for Learning Technologies (ILT) has been investigating the benefits of games with academic content like history and business. Looking at direct learning and preparation for future learning as well as learning in games by themselves and with added educational activities.



A Civilized Game: Civilization: Jessica Hammer

While *Civilization* game experts showed no initial direct learning from their playing of the game compared to non-experts, *Civilization* game experts did show better preparation for future learning on all four knowledge types (facts, procedures, images and mechanisms). Hence, *Civilization* provided embodied experience that improved learning from reading a text – sort of like playing with objects did in the aforementioned farm-story study. Additionally, *Civilization* provided simulation in that could change some aspect of history and see other resulting changes.

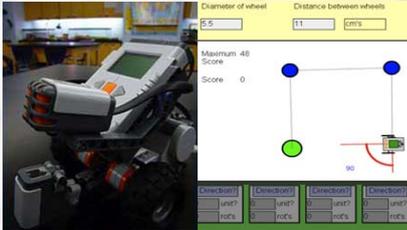
In linking background readings to the simulation gaming experience, we studied the effect of adding two types of reflective questions to business simulation game, *Entrepreneurship*. In this study, college business students read background readings, then played game several times: one group just played game, another was asked about strategies, and another about strategies and how they relate to background readings. In our results, the strategy plus background readings questions led to better learning than the other two conditions.

Imaginary World (iWorld) Project: Cameron Fajdo

In iWorld, students Harlem public after-school programs have the opportunity to embody their understanding (e.g., computer programming, math and science) in a video game they create using the computer programming software, *Scratch*. In *Scratch*, students program by snapping together puzzle (or Lego) pieces representing different programming commands. The students learn to program the Imaginary Worlds into simple video game worlds using the *Scratch* programming language and learning is enhanced with further embodiment provided by acting out what want video game avatars to do.



Associating Real and Imaginary Agents Project (ARIA): Johnathan Vitale



In New York City classrooms, students learn to program robots to follow certain paths using knowledge of proportions and geometric angles through a combination of having students act out the robots movements,



program a graphic simulation of the robot on a computer screen and then lastly programming robots in to move in the physical world. Researchers are finding that having students act out with their own body and use computer simulation to help with imagining results in better learning.

THE MAGIC OF LEARNING THROUGH EXPERIENCE & SIMULATION

Having relevant experiences plus being able to imagine those experiences is a magical combination for Grounded Adaptive Learning. Computer simulations aid by providing experiences and learning to flexibly imagine these perceptual simulations. Most of these projects are done in TC's Institute for Learning Technologies (ILT) and more information is available on them and other projects at the ILT website: www.ilt.columbia.edu

7	8	9	6	4	1	2	3	5
5	2	6	3	8	7	1	4	9
3	4	1	2	9	5	7	6	8
2	9	7	5	3	8	6	1	4
6	1	4	7	2	9	5	8	3
8	3	5	1	6	4	9	7	2
9	6	2	8	1	3	4	5	7
4	5	8	9	7	6	3	2	1
1	7	3	4	5	2	8	9	6

2+	1	2	30x	5	6	1-	3	4
12+	1	3	14+	5	8+	4	2	
2+	4	5	6	1	2	15x	3	
	2	6x	3	1	72x	4	6	5
8+	5	4	2	3	7+	1	6	
2+	3	6	2+	4	2	6+	5	1

Early Math Education:

by Michael Swart

Prof. Ginsburg & Prof. Kagan Report to the NAS

There is a dearth of research on math education in early childhood. While children receive a plethora of social and emotional guidance in early educational programs and there is a continued focus on early reading instruction and language development, the United States continues to fall further behind other countries in math and science education. Consequently, the Obama administration has taken steps to improve the situation. In a joint effort by the Office of Head Start, the Office of Planning and Research, the National Institute of Child Health and Human Development and the Ewing Marion Kaufman Foundation, a committee of math educators, mathematicians, a child development specialist, education policy makers and teaching and professional developers were assembled to present a report to the National Academy of Sciences in 2009. Among those on the committee were HUD's own Jacob H. Schiff Foundations Professor of Psychology and Education, Herbert Ginsburg, and Virginia and Leonard Marx Professor of Early Childhood Policy, Sharon Lynn Kagan. Pouring over 30 years of research, the report concluded that by using developmentally appropriate means, children between the ages of 3-6 can learn math.

Previous conceptions were that early in life, children only hold concrete conceptions of mathematics. Newer research is revealing that children learn mathematical abstraction everyday: making numerical comparisons of less and more, pointing and counting (which are mental representations of number), and even culturally passed activities like singing and clapping. Unfortunately, children from lower SES backgrounds lag behind their higher SES peers, especially in mathematics and verbalization of numerical conception. Teachers in are largely passive and spend little time on math instruction, especially in preschools where the curriculum is dominated by literacy instruction. But this does not mean that children aren't ready and willing to learn. In fact, they are already doing it! The key is to **mathematize** literacy content.

Professor Sharon Lynn Kagan presented a number of sobering demographics on children and families that are “falling under the radar of



policy”. Only 73% of pre-k teachers held a BA and there was a 76% turnover rate among teachers between 1996 and 2000. The resulting unpredictability is linked to many of the poor developmental outcomes. Investigators are finding that many teachers in the workforce are unsure of what type of instruction is needed in math education. From a professional development aspect, researchers and policy makers must focus on the development of a workforce specializing in early childhood education.

Left to Right: Dr. Lynn Kagan, Dr. Herb Ginsburg, and Tanesha Woods

Teachers must create rich environments where children can play and create projects that are infused with intentional math teaching and curriculum that includes math talk, thinking, formal assessments and integrated “math activities”. Conceptions of number (whole numbers, operations and relations) and geometry (spatial relations, measurement and number) can become a large component of literacy instruction. The burden is on teachers to know the math, how to teach it, understand how children learn and develop and to know the relevant pedagogy, curricula and available resources (both analog and digital, including computers).

The National Association for Education of Young Children (NAEYC) called for new in-service support that offers extensive and ongoing training tied to curriculum with follow-up and established learning communities that offer support and coaching to enhance opportunities for hands-on training, discussion and collaboration. According to Kagan, policy must: (1) explicitly declare the importance of early childhood mathematics (something that the Obama administration has done with their “STEM” [Science, Technology, Engineering and Math] education initiative); (2) assiduously look at early development standards of states for math teaching and learning; and (3) revise curriculums that will reflect a new focus on math. The committee recommendations included: (1) establishing coursework and practicum requirements for training teachers that reflect the processes that math invokes, (2) making these essential to early childhood education, and (3) developing partnerships between parents, families, and communities to equip them for working together.

ROCKIN' EARTH DAY EVERYDAY

by Michael Swart

Teachers College may not have been aware of it in Fall 2008, but the entire institution was about to embark down a newer, greener path thanks to the matriculation of one Ms. Natalie Hadad. A masters student in the Developmental Psychology program (graduating this May), Ms. Hadad, together with fellow master's student Jayme Stein, took on the challenge of becoming the first ever co-chairs of the newly formed Go Green Committee, a division of the Teachers College Student Senate. "When we first arrived here, we were like, 'Whoa!' hahahahahahahahahahha! The lack of recycling and efforts towards sustainability and conservation at the institution was in need of attention," Natalie said. "It was imperative to take action and lead the way."

Since that first semester, the Go Green committee presence here on campus and a substantial impact on the community. Working together with the help of people like Vice-President of Finance and Administration Harvey Spec-anger Tom Daly, Vice-President of Community and Diversity Assistant Vice President of Campus and Auxiliary Services Director of Capital Projects Vincent Del Bagno, and early Director of Environmental Health and Safety Chris Diodato, Director of Academic Computing George Schussler and Assistant Director for the Business Services Center Rocky Schwarz, the Go Green committee has transformed into a leader for greening our routine amongst graduate schools in the Columbia System.

It began with simple projects like plastic bag drives where students collected used plastic shopping bags and in return were provided re-usable shopping bags. "We've had a plastic bag drive every semester since Spring of 2009 and our last plastic bag drive collected over 3500 plastic bags." Other preliminary efforts included forums on trash and waste disposal here at the college as well as meetings with administrators and staff to discuss strategies for changing the consumption culture here at TC. "Rocky in duplicating services helped us offer recycled paper for printing as an option for offices around the college and George helped us set the default printing option in the computer labs to duplex (double-sided) printing."

For the 2009-2010 academic year, the institution took on a much more active role. The year began with "The Can Plan" project, an eight week pilot recycling program that ran in Horace Mann in which new recycling stations were installed and students conducted observations every three hours to gauge the effectiveness of the new centers on improving TC's recycling efforts. Upon completion, the program was declared a success and now facilities is in the process of purchasing new recycling centers to install through-

has had a significant Teachers College Provost Tom James, Facilities Man- Janice Robinson, Jim Mitchell, efforts from





throughout the rest of TC. Additionally, departments such as Facilities and Campus Auxillary Services have developed new policies for conservation and sustainability, alleviating many of the duties taken on by the students. New initiatives include energy consumption audits; implementation of new maintenance schedules to improve efficiency; purchasing of Energy Star appliances, lighting and sensors to turn off lights and dormant equipment in empty rooms; water conservation through low-flow washing machines, shower heads, and toilets; and recycling and proper disposal of computers, printers, electronics, batteries.

This spring, the Go Green committee was very active. Teachers College was awarded a \$10,000 Brita GrantForGood to install a rain-garden in the Russell Courtyard thanks to the leadership of Colin Schumacher, a master's student in Elementary Education and instructor at the Rita Gold Center. Teachers College celebrated Earth Week in late April with eight days of programming that included forums, seminars, guest-speakers, a movie screening and activities. The week's activities were principally organized by students Jason Mellon, a master's student in the Peace Education program in the Department of International Education Development and Sophia Li, a doctoral student in the BLANK program in the department of Higher and Postsecondary Education. The week culminated in TC's second annual Rockin' Earth Day Fest.



An all day green fest of live music, green food, green vendors, green art activities and health and wellness programs that included yoga, meditation, seminars and stress-busting massages made this year's festival was a great success. Along with Student Senate President and Cognitive Studies Ph.D. candidate Michael Swart, Ms. Hadad brought in bands from across the United States to celebrate and educate the TC, Harlem and greater NYC community on the importance

of conservation, sustainability and greener living. Kamila Dvorakova, another master's student in the Developmental Psychology program, led a class on meditation. The festival raised money for Charity: Water, The Riverhead Foundation, and Doctors without Borders Haiti Relief Efforts.



As graduation approaches, Ms. Hadad is preparing to begin her Ph.D. work at the University of Florida on a full scholarship as the first-ever Goldman Fellow. Needless to say, Ms. Hadad's tenure here in the department of Human Development will be truly missed and those of us continuing on here at Teachers College must carry on the efforts that she set forth in helping the TC community go green.

Thanks Natalie and best wishes to you!



STUDENT SENATE

TEACHERS COLLEGE COLUMBIA UNIVERSITY

This year, the Student Senate was led by two Cognitive Studies in Education PhD students, President Michael Swart and Communications Officer Josh Warren. Together, they implemented a new plan that sought to re-organize how the senate supports students by listening more directly to their needs. The senate set forth a modest agenda and is proud to have addressed and completed many of their projects. Those still outstanding are already in motion for next year.

Completed Projects

Established a "Stickies" Communication Strategy to get collaborative and real time feedback

Re-established Senate Newsletter to Inform Students of Senate Activities

Coordinated with Facilities to repairing Bike Racks

Coordinated the "Can Plan" with Facilities to installing new recycling centers in Horace Mann

Addressed unused minority scholarship allocations with Office of Financial Aid

Purchase of Rosetta Stone Software for TC Students

Presented a Customer Service Resolution to the Vice-Provost Office that initiated a Institution-Wide Evaluation

Established Semester Ice Cream Socials and Monthly Pizza & Beer Nights for Students

Hosted 6 Comedy Nights featuring professional comics from the NYC area

Hosted 2 Haiti Relief Efforts - Raised Nearly \$700.00 USD

Co-sponsored over \$5,000.00 in student-led organizations' programming

Hosted a series of inter-department socials to encourage collaboration amongst disciplines in coordination with President Fuhrman's "Big Ideas" initiative

Projects in Progress:

Coordinating with Facilities to instal new recycling centers throughout the rest of campus

Coordinating with Facilities to fix water fountains in disrepair

Coordinating with Facilities to possibly installing new water coolers

Academic computing to devoting 4 computer terminals dedicated to language learning for students

Petition for official student input in professor tenuring process

Presented a resolution on institution-wide printing services to the Office of the Vice-Provost on which they are working to unify TC's printing network and will address gratis page-allotment for students in the coming calendar Year

STUDENT SENATE

TEACHERS COLLEGE COLUMBIA UNIVERSITY
EVENTS 2009 - 2010

STUDENT SENATE presents

the Social Social

music drinks food fun

SEPTEMBER 10th, 7:30pm - 11pm
Russell Courtyard

VOLUNTEER!

HELP INSTALL NEW RECYCLING CENTERS

HELP TC Recycle!

THE CAN PLAN

MONDAY, Oct. 5, 2009
140 HORACE MANN, 6-7pm

HELP TC GO GREEN INSTALL NEW CAMPUS RECYCLING CENTERS.
FREE FOOD/BEVERAGE to VOLUNTEERS
For more info, contact: ggogreen@gmail.com

TC Student Senate presents

Comedy Night

Headlining Myq Kaplan
As Seen On COMEDY CENTRAL

October 15 9pm
featuring... Milbank Chapel

TC Student Senate Go Green

Bag Drive 2009

Recycle your plastic bags

RECYCLE PLASTIC BAGS

- * Bring at least 30, and receive either:
 - FREE tote bag
 - OR FREE e-shirt (in honor of people)
- * Bring at least 5, to enter our RAFFLE to win great prizes.

TODAY, Nov. 3rd & TOMORROW, Nov. 11th
2-5 pm, Zankel Hall
(in front of Everett Lounge)

TC Student Senate & OSAP present

THE THURSDAY BEFORE FRIDAY THE 13th!

SCREAM SOCIAL (OSAP)

Ice Cream Hot Chocolate Raffle Prizes Student Forum
Open to Students, Staff & Faculty

THURSDAY, NOVEMBER 12th
EVERETT LOUNGE, 7-10PM

TC Student Senate Presents

Comedy Night

Headlining... Matt Kondabala
As Seen On COMEDY CENTRAL

January 28 9pm
featuring... Milbank Chapel

STUDENT SENATE PRESENTS

POST-ITS: ANSWERED

TC Student Senate Presents

Improv Night

February 18th 9pm
Thompson 136

TC Student Senate Welcomes
New and Returning Students to Teachers College

NOUS AIMONS HAÏTI

Welcome Back TC
Haitian Relief Effort

Thursday, February 4th, 2010
8pm-10pm, TC Cafeteria

The first 75 students or faculty who make a donation of \$25 or greater to help support families affected by the earthquake in Haiti will receive a t-shirt for their support.
Food and refreshments will be provided.

FREE OSAP & Your Student Senate presents

PIZZA & BEVERAGES

LIVE MUSIC FUNTIVITIES

Everett Lounge, 9pm
Wednesday, Feb. 24th

TC Student Senate Presents

Comedy Night

Headlining... Roger Halleas
As Seen On COMEDY CENTRAL

February 25th 9pm
featuring... Milbank Chapel

FROM THE PRODUCERS OF I SCREAM SOCIAL!

I SCREAM SOCIAL TOO!

FURHRMAN & THE TRUSTEES GET THE SCOOP!

EVERETT LOUNGE
THURSDAY, MARCH 11, 2010
5:30pm - 8:00pm

MIX N' MINGLE!
MIX N' MINGLE!

Rockin' Earth Day

ROCKIN' EARTH DAY FEST!

8 ARTISTS
Autodrone, Ayo Awekoko, Elena Vogt, Great Big Phoenix, Greg Holden, Shokozabo, Shanelle Gabriel, & Ultron Sun

LIVE MUSIC! FUN GREENTIVITIES!
YOGA! MEDITATION!
GREEN GOODS! HEALTHY FOOD!

SUNDAY APRIL 25th
11 AM - 6 PM TC's RUSSELL COURTYARD
525 W. 120th Street, Between Broadway & Amsterdam
RAIN LOCATION: Horace Mann & Conyn Center @ TC

FREE OSAP & Your Student Senate presents

PIZZA & BEVERAGES

twice as much pizza this time!

Wednesday, March 24th
Grace Dodge Dining Hall, 9p

TC, CARDS & Your Student Senate

A PARTY... OF SORTS

FREE Water & Snacks

Help Sort TC's TONS OF DONATIONS for HAITI & CHILE

Stop by during your day at TC and give 50% of your items to help a person in need. Items will be given to those in need.

Thurs, April 8th, 11am-7pm
Commuter Lounge Basement of Zankel Hall

Student Senate presents

END OF YEAR BASH

@ the TC Cafeteria

Friday, May 7th
9pm 'till 12am

+ Live DJ!
+ FREE Hors d'Oeuvres
+ FREE BEVERAGES
*Sangria *Margaritas *Brinks

Put on your Dancing Shoes & Get ready to PARTY!

teachers college students build the only snow family at CU
photograph taken on snow day, 2/11 into 2/12

