The 2016 Innovative Practices in Developmental Mathematics Conference would not have been possible without the contributions of many people. We are pleased to express our gratitude to the following people:

Dr. Gail O. Mellow, President, LaGuardia Community College, Dr. Paul Arcario, Provost and Senior Vice President for Academic Affairs, and Associate Deans Bret Eynon, Ann Feibel, and Howard Wach for the leadership and support they provide for exploring new approaches to pedagogy as well as professional development at LaGuardia.

Dr. Abderrazak Belkharraz, Chair of the Mathematics, Engineering, and Computer Science Department, whose interest in providing students with new and accelerated pathways through developmental mathematics has been instrumental in our efforts to both improve our pedagogies and provide our students with opportunities for success in mathematics and beyond.

Our keynote speakers, Chris Hulleman and Nikki Edgecombe, who engage us in an examination of our work as math teachers, and invite us to continue our explorations of ways to improve our pedagogy and our services to students.

Dr. Mari Watanabe-Rose, Director of Undergraduate Study, CUNY Central for organizing a multi-campus panel, and for offering her help to make this event a success.

The staff of the Mathematics, Engineering, and Computer Science Department and the LaGuardia Center for Teaching and Learning who supported the conference in many ways and worked hard to ensure smooth operations. Special thanks to Ros Orgel for coordinating support, Abdellah Ait Elmouden (MEC) for designing the conference website, and to Oscar Cortes and Priscilla Stadler (CTL), designers of the conference program.

Karen McKeon and the Events Office staff without whose expertise, generosity, and active involvement, this conference would not succeed. We thank them for their efforts on our behalf.

Our colleagues in Buildings and Grounds, the LaGuardia Print Center, and Media Services whose daily labor contributes to the well-being of all of us, and whose extra efforts for this event have been crucial.

Primary funding for this conference was provided to LaGuardia by the Developing Hispanic-Serving Institutions Program - Title V of the U.S. Department of Education. We are pleased to have an opportunity to thank the Department and the Title V program for their generous support.

LaGuardia Community College is excited to host the first Innovative Practices in Developmental Mathematics Conference. The aim of this conference is to bring together experts and practitioners in the field of developmental mathematics to discuss best practices that address students’ needs holistically. As you go through the program, you will see that the talks cover a range of topics from accelerated/integrated models to topics in social psychology to interventions that boost student motivation and achievements. Additionally, a panel will discuss the alignment and streamlining of quantitative requirements at community colleges.

This is the first year that we are hosting such a conference. We hope to continue the conversation about developmental mathematics in the future. Possible focus areas for future conferences include the teaching of critical thinking skills, developing a holistic view towards student success in developmental math and in other areas of students’ lives, studies, and career plans, and applying the principles of scholarly teaching to developmental mathematics.
Dr. Nikki Edgecombe
Senior Research Associate
Community College Research Center, Columbia University

Dr. Nikki Edgecombe is a Senior Research Associate at the Community College Research Center at Teachers College, Columbia University, where her primary research focus is developmental education. She leads the Analysis of Statewide Developmental Education Reform, a four-year examination of the implementation and early outcomes of the redesigns of developmental education in Virginia and North Carolina. Dr. Edgecombe also oversees the implementation analysis of an evaluation of the CUNY Start pre-matriculation remedial program, which is being conducted in partnership with MDRC. Previously, Dr. Edgecombe led the Scaling Innovation in the Community College project as well as work on Accelerated Developmental Education Models, Student Success Courses, and Online Courses in Community Colleges. She holds a PhD in Education from the University of Pennsylvania and a B.A. in Urban Studies–Economics from Columbia University.

Dr. Chris S. Hulleman
Research Associate Professor, Center for Advanced Study of Teaching & Learning (CASTL), Curry School of Education, University of Virginia

Dr. Chris Hulleman is Research Associate Professor in the Department of Educational Leadership, Policy, and Foundations in the Curry School of Education at the University of Virginia. He is also a Fellow at the Carnegie Foundation for the Advancement of Teaching, co-director of the Motivation Research Institute, and an adjunct faculty member in the Department of Psychology at James Madison University. His research has been published in journals such as Science, Psychological Bulletin, Psychological Science, Journal of Educational Psychology, Journal of Research on Educational Effectiveness, and American Journal of Evaluation. Dr. Hulleman received his PhD in Experimental Social and Personality Psychology from the University of Wisconsin-Madison in 2007.

MTH01-05: AN ACCELERATED SEQUENCE - ROOM M151
Karen Taylor and Eva Antonakos (Bronx Community College)
Presenters will discuss the results of three years of piloting an accelerated MTH01-05 sequence at Bronx Community College. We will describe the format of the accelerated sequence, the passing rates, and our reflections about teaching remedial math in a compressed format. We will also discuss the logistical difficulties of running a course in an alternative format.

HANDS-ON ACTIVITIES IN DEVELOPMENTAL MATH - ROOM M152
Malgorzata Marciniak (LaGuardia Community College)
Developmental math classes bring unusual challenges such as students’ attitudes, levels of preparation, and past experiences. During Spring and Fall 2015, I developed and revised sequential hands-on activities for Elementary Algebra classes which built upon students’ prior knowledge, emphasized interconnections between topics, and encouraged keeping neat notes for each class. Most meetings consisted of lectures blended with activities, but some meetings contained only activities or only lectures. It was always a difficult decision how much lecturing would be most appropriate for a particular topic on a particular day. Using hands-on activities helped resolve common problems with students like late arrivals or missed classes. Often students realized how much material they had missed only after receiving a pile of activities; however, at the same time they got a clear outline of studies and immediate feedback on their progress. Within the Spring and Fall 2015 semesters, many modifications of the activities and lectures were encouraged and suggested by the Taking Teaching Seriously posts and participants.

EXPLORING PROPORTIONAL REASONING AND GENTRIFICATION THROUGH GAME-BASED LEARNING - ROOM M110
Forest Fisher and Jared Warner (Guttman Community College)
In a remedial and interdisciplinary course focused on the gentrification of New York City, we designed and employed a board game to help students explore ratios and proportional reasoning while simultaneously engaging the social issue of neighborhood change. In the game, 3-4 students assume the roles of New York City urban planners with competing agendas, and are asked to build buildings and populate them in order to satisfy their own desired ratio requirements (which differ from
player to player). The game is designed with three phases so that a player observes a gentrifying New York City during gameplay. In this talk we’ll describe the simple rules of the game and invite audience members to play one round in small groups. We’ll finish by discussing our experience in implementing the game in the classroom, highlighting potential challenges and helpful group discussion topics to address in class.

### 9:45 - 10:15 Concurrent Sessions

#### RECLAIMING MATHEMATICAL LIVES OF STUDENTS AT LAGUARDIA: THE MAT119/STATWAY COURSE FOR NON-STEM STUDENTS - ROOM M151
Prabha Betne, Steve Cosares, Milena Cuellar, Glenn Henshaw, Marina Nechayeva, and Shenglan Yuan (LaGuardia Community College)

We describe the MAT119-Statway course, an integrative experience based upon the framework developed and supported by the Carnegie Foundation for the Advancement of Teaching’s Community College Pathway Program. This program allows students needing developmental math to succeed with college level Statistics. The Foundation has developed a collaborative network of teachers, web resources, and support services to help instructors conduct the course. The Statway course contains unique components to foster a set of behaviors involving the tenacity and good strategies students need to be academically successful, known as “Productive Persistence.” Interventions are designed to challenge preconceptions that many developmental math students share, e.g., negative feelings towards math, a perception of not belonging in college, and detachment from class content. In this session, we describe our experiences implementing Statway at LaGuardia and discuss the challenges and results of this alternative to the traditional “remedial-first” math sequence. The Statway course reduces the time to earn college credit while providing innovative content and student-centered pedagogy for developmental mathematics, especially for non-STEM majors. Participants will explore the materials students use in class and activities suggested for instructors to encourage “Productive Persistence”. We describe the challenges of scaling Statway at LaGuardia with the support of LaGuardia’s Center for Teaching and Learning, discuss how it may fit within the CUNY System, and how this experience has shaped us as instructors.

#### ACCESSING A CONCEPTUAL APPROACH TO RATIONAL NUMBERS -ROOM M152
Jae Ki Lee, Susan Licwinko, and Matthew Meangru (Borough of Manhattan Community College)

This study demonstrates teaching fractions using group discussion and student-centered instructional methods. This analysis compares students’ engagement and academic performance between control and research groups. In addition, the study researches student satisfaction with group study and student-centered settings.

#### PRACTICE DOES NOT ALWAYS MAKE YOU PERFECT
ROOM M110
Alioune Khoulé (LaGuardia Community College)

The study investigated the impact that conceptual understanding has on the mathematics achievement of remedial mathematics students in an urban community college. The study sample consisted of 105 remedial mathematics students from four Elementary Algebra courses. Two of these four courses were under conceptual treatment. The other two courses were under procedural treatment and served as the control group. To measure subjects’ conceptual and procedural knowledge, the participants completed two quizzes (a conceptual quiz and a procedural quiz) a week before the final exam. To measure mathematics achievement, participants’ final exam scores were also collected from course instructors. The study found that the conceptual treatment group performed better on both quizzes, despite the fact that the procedural group practiced more procedural problems than the conceptual group and was exposed to a procedural treatment. The relationship between the procedural quiz and mathematics anxiety was not statistically significant. However, the ANOVA test revealed that the relationship between the conceptual quiz, the procedural quiz, and the final examination (response variable) was statistically significant. The final examination score mean for the conceptual group was higher than the one for the procedural group.
REMEDIAL MATHEMATICS AND BEYOND: A FACULTY-LED PROJECT FOR CURRICULUM ALIGNMENT AND STREAMLINING OF QUANTITATIVE REQUIREMENTS AT COMMUNITY COLLEGES
Drs. Alexandra W. Logue (Graduate Center), Mari Watanabe-Rose (CUNY Central Office), Susan Licwinko, Ross Tippit (Borough of Manhattan Community College), Rebecca Walker, Alia Tyner-Mullings (Guttman Community College), Kate Wolfe, and Olen Dias (Hostos Community College)

Remedial mathematics has been described as the single largest academic barrier to college students' success. Logue, Watanabe-Rose, and Douglas (2015) demonstrated, using a randomized controlled trial at three CUNY community colleges, that non-STEM majors assessed as needing remedial mathematics (Elementary Algebra) were more likely to pass a college-level, credit-bearing introductory Statistics course with extra support (a weekly workshop; 56% pass rate) than traditional Elementary Algebra (39% pass rate), or than traditional Elementary Algebra with extra support (a weekly workshop; 45% pass rate). In addition, follow-up data collected one year after the end of the experiment showed that students who were assigned to the Statistics group have continued to accumulate more credits than students in the two Elementary Algebra groups. Although it is clear that placing students into Statistics rather than remedial mathematics results in a higher pass rate and increases student success, questions still remain. For example, which topics of Elementary Algebra are necessary for college-level quantitative and science courses that students will take, including Statistics? Further, how might the answers to this question differ for STEM and non-STEM majors? To investigate these issues, we launched a new project called PRIME (Project for Relevant and Improved Mathematics Education). The project, led by mathematics and science faculty at three CUNY community colleges, aims to develop clear, efficient, aligned, and evidence-based quantitative paths to increase student success. The panel, consisting of leading participants in the project, will describe PRIME’s completed activities for the planning period (2015) and its projected activities for the implementation period (2016-2019), including the use of a new metric (minimum contact hours per credit) developed by PRIME participants for measurement of quantitative course path efficiency.

THE CUNY ELEMENTARY ALGEBRA FINAL EXAM: CHANGES AND CHALLENGES
Dr. Michael Guy (CUNY Central OAA and Queensborough Community College)
Since its rollout in Fall 2012, the CUNY Elementary Algebra Final Exam (CEAFE) has been a challenge for student progress in mathematics. In Fall 2015, new items were piloted with a revision expected by Fall 2016. I will start with an overview of the forthcoming changes to the CEAFe. Then, based on the data from the pilot, I will describe opportunities to improve student outcomes on the new and existing items. I will also display the (wrong) choices students selected on key items, and consider their significance for student learning.

MINDING THE MIND: WHY MATH INSTRUCTORS SHOULD CARE ABOUT STUDENTS’ LEARNING MINDSETS
Dr. Chris Hulleman, Research Associate Professor, Center for Advanced Study of Teaching and Learning (CASTL), Curry School of Education, University of Virginia

An emerging body of research in social psychology is producing promising interventions that boost student motivation and achievement. The interventions are brief exercises integrated into the classroom curriculum that have been particularly effective for underperforming and disadvantaged students. Because these psychological interventions focus on students’ thoughts and beliefs about course topics or school in general (i.e., growth mindset, belongingness, utility value), rather than a specific curriculum, they hold great promise for implementation in the classroom. However, these interventions are not magic bullets. Can these brief interventions be successfully exported, and what is necessary for effective implementation? Dr. Hulleman will present case studies of several interventions, and highlight the challenges for effective implementation in classroom settings.
EFFECTIVE CLASSROOM ACTIVITIES SUPPORTED BY BEHAVIORAL PRINCIPLES:
SOME IDEAS FOR INCREASING STUDENT ENGAGEMENT - ROOM M151
Mari Watanabe-Rose (CUNY Central) and G. Michael Guy (CUNY Central OAA and Queensborough Community College)

Behavioral research has repeatedly shown that, to increase a target behavior, a desirable consequence (or positive reinforcer) should immediately follow the behavior. For example, the frequency of one’s gym visit (i.e., target behavior) may increase if s/he sees its positive outcomes, such as weight loss and increased energy, sooner rather than later. The authors suggest the use of this principle in the classroom. In the presentation, several examples for increasing student engagement and performance are introduced. For instance, one Elementary Algebra course was designed to follow the principle of immediate positive reinforcers, in terms of the delivery of assessments (i.e., quizzes and exams) and feedback by the instructors. The pass rate for this course was 57%, as opposed to 36% for a traditional Elementary Algebra course. Even though these examples and results are derived from a remedial mathematics course, the procedures could be applied in advanced courses, and also in courses in other disciplines. In addition, the authors discuss how the immediacy of positive reinforcers can be utilized when student orientation and module-based courses are designed. The presentation will be useful for instructors, as well as for support staff and administrators.

USE “TEXTING” TO INCREASE ON-TIME HOMEWORK SUBMISSION RATE
ROOM M152
Tanvir Prince (Hostos Community College)

An experiment regarding the effects of “texting” was conducted in two mathematics courses (Elementary Algebra and Calculus I) during the Spring 2014 and Fall 2014 semesters. Students were constantly reminded about the homework throughout the semester using texting technology. A separate “contact group” was created in Microsoft Outlook for each class where students’ cell phones were used to send text messages from email. The methods and techniques will be explained in detail in this presentation. It was found that the rate of on-time homework submission rate almost tripled in the Elementary Algebra class and doubled in the Calculus class as compared to a regular class where this technique was not used.

EXPERIMENTING WITH ACCELERATED DEVELOPMENTAL MATH EDUCATION
ROOM M110
Jeanne Funk, Milena Cuellar, and Dong Wook Won (LaGuardia Community College)

Over 60 percent of the nation’s 14 million community college students are required to take at least one developmental math course before they can be enrolled in a college-credit course (American Association of Colleges, 2014). At LaGCC, 87 percent of incoming students were placed in developmental math courses. Basic skills mathematics is recognized as a significant barrier for community college students between enrollment and degree completion. Nationwide and at LaGuardia, 80 percent of the students who are initially placed in developmental math do not succeed in any college-level math courses within the next three years (Achieving the Dream, 2006, Baily et. al, 2010). To address the significant attrition of students with developmental math needs, LaGuardia’s Mathematics, Engineering, and Computer Science Department has been experimenting with accelerated models of developmental math education wherein the path to proficiency is shortened and the number of courses required is reduced. Acceleration programs do not, in general, increase student success by watering down learning objectives or decreasing expectations.

In this session, we describe the development and implementation timeline for three accelerated model courses at varying stages of development. MAT099 (Pre-Algebra and Elementary Algebra), to be piloted in Fall 2016, is designed to help students complete remediation in one term so they can enroll more quickly in college-level math. In MAT119 (Elementary Statistics), a permanent course since Fall 2015, and MAT117 (College Algebra and Trigonometry), in pilot mode since Fall 2015, students who have been recommended for math skills remediation are placed in a course with learning outcomes equivalent to those of a college level course. Each accelerated course has extra contact hours and integrated basic skills material to support the learning process of weaker students. Participants will hear an overview of LaGuardia’s experience with acceleration in basic skills mathematics, including curricula, faculty development, and student outcomes.
CONTEXTUALIZING ELEMENTARY ALGEBRA ACROSS DISCIPLINES - ROOM M151
Karan Puri and Jonathan Cornick (Queensborough Community College)
At Queensborough Community College, the remedial sequence has been reduced to a single Elementary Algebra course. We have implemented a contextualized and student-centered approach that has significantly increased student success. To support these methods, we authored an Open Educational Resource (OER) textbook and supporting materials that are in alignment with CUNY’s Elementary Algebra Learning Objectives. Subsequently, we have initiated collaborations with faculty in other disciplines, and have aligned the mathematics with the quantitative needs of their introductory courses. In this talk, we will discuss some specific topics and the supporting OER materials that we have created for these courses. In Introduction to Sociology, this includes percentages/proportions, linear graphs, and linear inequalities. These are integrated into modules on deviance, poverty and educational achievement, and shifting demographics. In Fundamentals of Chemistry, this includes scientific notation, proportions, and solving linear equations. These are aligned and contextualized into modules on molar mass, unit conversion, and balancing chemical equations. While this is a work in progress, we will discuss our planned measures of success, both in mathematics, and in sociology and chemistry, and more generally in progress towards degree-completion.

USING PEER INSTRUCTION TO PROMOTE STUDENT SUCCESS IN MATHEMATICS ROOM M152
Joyce Ship Zaritsky, Andi Toce, Reem Jafar, Daryl Davis, Joseph Mahmud, Enkeleid Hasko, and Anastacia Pal (LaGuardia Community College)
Supplemental Instruction (SI), known at LaGuardia as Academic Peer Instruction (API), is an academic support program. Its purpose is to assist students enrolled in “high risk” college level courses using peer tutors who provide several group tutoring sessions each week. Founded and pioneered at the University of Missouri (Martin, el al., 1983), SI has been in existence since 1973 having been. In 1993, we piloted the program with three tutors targeting three course sections and have grown substantially ever since: In the 2014-2015 academic year, API targeted 122 sections of entry level in psychology, physics, chemistry, mathematics and nursing. In 2011, we expanded the program to include support for remedial mathematics courses. During the Fall 2015 semester, 60% of the 43 courses targeted were remedial mathematics courses. This has been a real challenge since the students enrolled in these courses have many issues ranging from poor preparation, extensive outside responsibilities such as work and/or family, and math anxiety. In this presentation, we will first describe our program, detail our tutors’ role, and share data showing how API has improved success and reduced failure in mathematics courses. We believe that our success has to do with many factors including hiring and training excellent tutors. We will share some of our training materials and techniques that we have found to be most helpful in training our tutors to assist these reluctant learners. In addition, we will share copies of our training manual with those interested in starting their own SI programs. To assist us in this presentation, we will invite some of our most experienced mathematics tutors to present their methodology and techniques for: (1) encouraging their developmental mathematics students to attend their study sessions and (2) sharing the techniques that they have found to be most successful in helping their students overcome their difficulties and in so doing improve their performance.

DO SELF-REGULATION STRATEGIES WORK BETTER FOR STUDENTS WITH LEARNING DISABILITIES (LD) TAKING REMEDIAL MATHEMATICS CLASSES AT LAGUARDIA COMMUNITY COLLEGE? - ROOM M151
Salvatore Sommella (LaGuardia Community College)
This presentation will examine strategies to improve problem solving capabilities for students with various degrees of learning disabilities (LD). A review of research in this area will focus upon the self-regulation component. Elementary Algebra (MAT96) data – first and second chance scores - will be analyzed to determine what actions could have been taken to ensure that a student would pass the CUNY final without specific support resources (e.g., technology, tutoring, and calculators). It is hoped that the analysis will not only answer the question but recommend steps to increase the student success rate.

RESEARCH AT THE SOURCE: INQUIRY AND PROBLEM SOLVING APPROACHES IN ELEMENTARY ALGEBRA AND BEYOND - ROOM M152
Mangala Kothari, Steven Cosares, and Marina Nechayeva (LaGuardia Community College)
Devising innovative instructional methods and reforming curriculum is especially challenging for remedial math courses because of the charge to help students master a dense set of basic mathematical skills and because instructor norms and students’ attitudes often subvert the need for a student to persevere in courses, despite periodic setbacks. Thus, it is essential to enrich the course to make it more engaging and more closely related to students’ out of classroom experiences, while
maintaining focus on the explicit skill-building aspects of the course. To this end, we have developed and tested several classroom activities designed to promote the learning of fundamental concepts and skills, while exploring significant civic issues, like social trends, public health, and government policy. We hope this approach will allow students to be empowered to do research about significant, real questions and develop their inquiry and problem solving competencies while successfully meeting course milestones. The sample activities we developed are inspired by the SENCER principles (Science Education for New Civic Engagements and Responsibilities) which aim to make data driven research an integral part of learning experience at any level of academic proficiency, including the very basic. We describe some sample activities for the Elementary Algebra course and share our experience with piloting them. Particularly noteworthy features are the use of actual data and the requirement that students reflect, in writing, about their experiences. We describe our ambition to promote a culture of research by creating a SOURCE (Student Oriented Unified Research Center), a one stop hub where students could come for guidance with their projects and work with experienced professionals to help them with the different phases: topic selection; data gathering; data processing and analysis; writing about their experiences and effectively expressing their conclusions and/or recommendations.

PEDAGOGICAL IMPLICATIONS OF USING LIMESPRING TECHNOLOGY TO TEACH DEVELOPMENTAL MATHEMATICS - ROOM M110
Clara Wajngurt, Michael Guy and Margot Edlin (Queensborough Community College)
We suggest that computer-based instruction using the LimeSpring technology is one way to yield higher passing rates in developmental mathematics. Instructors who teach such courses must look for non-traditional methods of instruction that encourage a student-centered, problem-based approach, so that more students will relate to the mathematics concepts, and eventually achieve higher passing rates. This discussion is the result of research compiled as a pilot study using the LimeSpring approach to teaching developmental mathematics during the Spring 2015 and Fall 2015 semesters at Queensborough Community College.

4:15 - 4:30
E Bldg Atrium
DR. GAIL O. MELLOW: CLOSING REMARKS

4:30 - 5:00
E Bldg Atrium
RECEPTION