KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York

CURRICULUM TRANSMITTAL COVER PAGE

Department: Behavioral Sciences **Date:** 7/19/22

Title Of Course/Degree/Concentration/Certificate: Elementary Science, Technology and Mathematics Education

Change(s) Initiated: (Please check)

- ☐ Closing of Degree
- ☐ Closing of Certificate
- ☐ New Certificate Proposal
- ☐ New Degree Proposal
- ☒ New Course
- ☐ New 82 Course (Pilot Course)
- ☐ Deletion of Course(s)
- ☐ Change in Degree or Certificate
- ☐ Change in Degree: Adding Concentration
- ☐ Change in Degree: Deleting Concentration
- ☐ Change in Prerequisite, Corequisite, and/or Pre/Co-requisite
- ☐ Change in Course Designation
- ☐ Change in Course Description
- ☐ Change in Course Title, Number, Credits and/or Hours
- ☐ Change in Academic Policy
- ☐ Pathways Submission:
  - ☐ Life and Physical Science
  - ☐ Math and Quantitative Reasoning
  - ☐ A. World Cultures and Global Issues
  - ☐ B. U.S. Experience in its Diversity
  - ☐ C. Creative Expression
  - ☐ D. Individual and Society
  - ☐ E. Scientific World
- ☐ Change in Program Learning Outcomes
- ☐ Other (please describe): ____________

PLEASE ATTACH MATERIAL TO ILLUSTRATE AND EXPLAIN ALL CHANGES

DEPARTMENTAL ACTION

Action by Department and/or Departmental Committee, if required:

Date Approved: 8/22/22 **Signature, Committee Chairperson:** Stuart Parker

If submitted Curriculum Action affects another Department, signature of the affected Department(s) is required:

Date Approved: ____________ **Signature, Department Chairperson:** ____________

Date Approved: ____________ **Signature, Department Chairperson:** ____________

I have reviewed the attached material/proposal

Signature, Department Chairperson: Stuart Parker

Revised/Augl.2018/AK

KINGSBOROUGH
COMMUNITY COLLEGE
★ DREAMS BEGIN HERE ★

TO:	Fall 2022 Curriculum Committee
FROM:	Stuart Parker, Chair, Department of Behavioral Sciences
	Denise Farrelly, Program Director, Education Program
DATE:	February 4, 2022
RE:	New course proposal for EDC 2900 – Elementary Science, Technology and Mathematics Education

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The Department of Behavioral Sciences is proposing a new course proposal for EDC 2900 – Elementary Science, Technology and Mathematics Education.

Rationale for Course Proposal:

This course fills a need for a STEM course in the Education Studies 1st-6th Grade concentration. The 1st-6th Grade concentration did not previously offer a STEM course requirement, which is misrepresentative of the needs of today's teaching workforce. It is crucial for teachers to have a strong understanding of the methods for integrating science and mathematics with technology in contemporary classrooms.

This course will transfer to Brooklyn College as the Childhood Bilingual and Special Education (CBSE) department's required 3-credit course, CBSE 3203: Education and Science/Math/Technology.

New Course Proposal Form

*This form is **NOT** intended for Internships or Field Work

1. Complete the requested course information in the table below. Indicate "**NONE**" where applicable.
   *For Assignment of New Course Number, contact **Academic Scheduling**.

Department:	BEH
Course Designation/Prefix:	EDC
***Course Number:**	2900
Course Title:	Elementary Science, Technology and Mathematics Education
Course Description: **(Note: Description should include language similar to Course Learning Outcomes.)**	This course integrates the study of sciences, mathematics, technology, and education in the current and historical social context. Students explore materials and methods to facilitate scientific investigation through progressive models of instruction, such as cooperative learning and inquiry-based learning while following national, state, and local mathematics, science, and technology teaching and curriculum standards. The course explores the influence of attitudes toward science and mathematics on learning. Weekly use of the internet and digital tools are incorporated.
Prerequisite(s):	EDC 5000, EDC 2500 with a minimum grade of C.
Corequisite(s):	None
Pre-/Co-requisite(s):	None
Open ONLY to Select students (Specify Population):	Education Studies 1st-6th Grade concentration
Frequency course is to be offered (Select All that Apply)	X Fall ☐ Winter X Spring ☐ Summer
Suggested Class Limit:	25
Indicate if a special space, such as a lab, and/or special equipment will be required:	None

2. Credits and Hours based on MSCHE Guidelines for *College Credits Assigned for Instructional Hours* -***Hours are based on hours per week in a typical 12-week semester** (Please check **ONE** box based on credits):

1-credit:	☐ 1 hour lecture

	☐ 2 hours lab/field/gym

2-credits:	☐ 2 hours lecture ☐ 1 hour lecture, 2 hours lab/field ☐ 4 hours lab/field

3-credits:	X 3 hours lecture ☐ 2 hours lecture, 2 hours lab/field ☐ 1 hour lecture, 4 hours lab/field ☐ 6 hours lab/field

4-credits:	☐ 4 hours lecture ☐ 3 hours lecture, 2 hours lab/field ☐ 2 hours lecture, 4 hours lab/field ☐ 1 hour lecture, 6 hours lab/field ☐ 8 hours lab/field

More than 4-credits: ☐ Number of credits: ____ (explain mix lecture/lab below)

___ Lecture ____Lab

Explanation:____

3. **Where** does this course fit? Select from the following:

X Degree Program(s)/Certificate(s)*	**List Degree Program(s)/Certificate(s):** 1. Education Studies 1st-6th Grade concentration
☐ General Education/Pathways	**Select ONE of the following:** ☐ Life and Physical Science (LPS) ☐ Math and Quantitative Reasoning (MQR) ☐ World Cultures and Global Issues (Group A) ☐ U.S. Experience in its Diversity (Group B) ☐ Creative Expression (Group C) ☐ Individual and Society (Group D) ☐ Scientific World (Group E)

☐ **82XX** Pilot/Experimental Course	**If proposed as a "real" course, where will this course fit?** Select from the following: **List Degree Program(s)/Certificate(s):** 1. 2. **Select ONE of the following:** ☐ Life and Physical Science (LPS) ☐ Math and Quantitative Reasoning (MQR) ☐ World Cultures and Global Issues (Group A) ☐ U.S. Experience in its Diversity (Group B) ☐ Creative Expression (Group C) ☐ Individual and Society (Group D) ☐ Scientific World (Group E)

***If Degree Program/Certificate is Selected:**

- Include an updated **Curricular** Map (Program Learning Outcomes) for each Degree Program/Certificate listed above.
- Include an updated Degree Map (semester-by-semester course sequence) for each Degree Program/Certificate listed above. For Degree Map template, contact Amanda Kalin, ext. 4611, Amanda.Kalin@kbcc.cuny.edu

The Following NYSED Guidelines must be adhered to for **ALL** Degree Programs:
45 credits of Liberal Arts (General Education) course work for an Associate of Arts Degree (AA)
30 credits of Liberal Arts (General Education) course work for an Associate of Science Degree (AS)
20 credits of Liberal Arts (General Education) course work for an Applied Associate of Science (AAS)

Additional Separate Submissions Required:

1. Curriculum Transmittal Cover Page indicating a "Change in Degree or Certificate"
2. Memo with rationale for inclusion of the course within the curriculum
3. "Current" Degree with all proposed deletions (strikeouts) and additions (bolded) clearly indicated
4. "Proposed" Degree, which displays the degree as it will appear in the *College Catalog*

For a copy of the most up-to-date Degree/Certificate requirements contact Amanda Kalin, ext. 4611, Amanda.Kalin@kbcc.cuny.edu

If General Education/Pathways is Selected:

- Please refer to NYSED Guidelines for courses that are considered Liberal Arts (General Education).
- Pilot/Experimental/82XX courses CANNOT be submitted for Pathways until they are submitted as a "**real**" course.

Additional Separate Submissions Required:

1. Curriculum Transmittal Cover Page indicating BOTH "New Course" and "Pathways"
2. CUNY Common Core Pathways Submission Form

4. **List the Course Learning Outcomes** – Course Learning Outcomes are measureable/demonstrable, containing "**action verbs**" (Blooms Taxonomy). If proposed to PATHWAYS, the Course Learning Outcomes should significantly align with the Pathways Learning Outcomes (refer to the Pathways Common Core Submission Form for Pathways Learning Outcomes). If proposed for a Degree program, the course should align with the Program Learning Outcomes (PLOs). **REMINDER** – Course Learning Outcomes are consistent for **ALL sections** of the same course and **MUST** be included on the syllabus.

Course Learning Outcomes Students will:
1. Examine mathematics, science, and technology in the current and historical social context.
2. Analyze the processes of scientific investigation.
3. Develop the ability to make effective use of materials and investigative experiences in teaching.
4. Explore models of instruction, such as cooperative learning and inquiry-based learning.
5. Consider the influence of attitudes towards science and mathematics on learning.
6. Develop proficiency in using the Internet and computer software in education.
7. Plan curriculum based on national, state, and local mathematics, science, and technology standards.

4. **Assessment of Course Learning Outcomes**: The Course Learning Outcomes are measurable/demonstrable through the below listed sample assignments/activities. Include percentage breakdown for grading. **REMINDER** - Assessment of Course Learning Outcomes are based on a **Common Syllabu**s – to allow for **any** qualified instructor to teach the course.

Course Learning Outcome	**Percentage of Grade**	**Measurement of Learning Outcome (Artifact/Assignment/Activity)**
1. Examine mathematics, science, and technology in the current and historical social context.	15%	Subject Matter Competency Improvement Plan
2. Analyze the processes of scientific investigation.	10%	Powtoon
3. Develop the ability to make effective use of materials and investigative experiences in teaching.	15%	MST Unit Plan
4. Explore models of instruction, such as cooperative learning and inquiry-based learning.	10%	CITE project

5. Consider the influence of attitudes towards science and mathematics on learning.	10%	Canva – Science & Mathematics
6. Develop proficiency in using the Internet and computer software in education.	20%	CITE project
7. Plan curriculum based on national, state, and local mathematics, science, and technology standards.	20%	MST Unit Plan

5. **Who** is expected to enroll in this course? Please provide details for the student population(s), degree program(s)/certificate(s), and applicable concentration(s), this course is expected to include.

Students enrolled in the Education Studies major with a concentration in 1st-6th Grade will be required to take this course as part of the degree requirements.

6. Explain **why** this course is a necessary addition to the curriculum. **REMINDER** – Explain the course's role within the selected Pathways Group or Degree program – How does this course meet the Program Learning Outcomes (PLOs)? Was the course a recommendation from a recent Annual Program Review (APR), Advisory Board, Accrediting Body, etc.? How might this course help students seeking to transfer to a 4-yr college or transition into a career after KCC?

This course fills a need for a STEM course in the Education Studies 1st-6th Grade concentration. This concentration did not previously offer a STEM course requirement, which is misrepresentative of the needs of today's teaching workforce. It is crucial for teachers to have a strong understanding of the methods for integrating science and mathematics with technology in contemporary classrooms.

7. Upon transfer, does this course meet a specified requirement for a degree at a 4-year institution? If so, please include the institution and degree program. It is recommended you review your current Articulation Agreements.

This course will transfer to Brooklyn College as the Childhood Bilingual and Special Education department's required 3-credit course, CBSE 3203: Education and Science/Math/Technology.

8. Will adding the course potentially **conflict** with other courses – in content or subject matter – offered in either your Department or in *another* Department? If it will, please explain **how** and indicate **why** the course is still necessary.

There are no anticipated conflicts between this course and any other courses.

9. Proposed textbook(s) and/or other required instructional material(s), including open educational resources (OER)– Please include any supplemental/recommended materials/texts to allow for **any** qualified instructor to teach the course:

Adams, D., Hamm, M. (2014). *Teaching math, science, and technology in schools today: Guidelines for engaging both eager and reluctant learners (2nd ed.).* Rowman & Littlefield.

Burns, M. (2014). *About teaching mathematics (4th ed.).* Heinemann.

10. **Attach a Common Syllabus** that includes the Topical Course Outline for the 12-week semester. This should be specific and explicit regarding the topics covered and should contain the detailed sample assignments/activities being used to measure the Course Learning Outcomes. **REMINDER** – be mindful to focus on the Course Learning Outcomes, Course Content, and Assessment.

Common Syllabus
EDC 2900: Elementary Science, Technology and Mathematics Education

Week	Topic	Readings/Assignments
Module 1: Mathematics Instruction		
1	❑ Syllabus: Course Overview and Introduction ❑ Read: Math Person by Jo Boaler ❑ Class Activity: EdPuzzle and Google Classroom	Read: Solving NYC's Math Problem TASK 1: Early-Grades Science: The First Key STEM Opportunity Discussion
2	❑ Creating an Effective Mathematics Environment ❑ Growth Mindset ❑ Class Activity: Google Suites	Read: Burns Part 1 Read: What Does Good Math Instruction Look Like? TASK 2: Google Suite assignment
3	❑ The Role of Language in the Elementary Mathematics Classroom ❑ Overview of the MST Inquiry Unit, Lesson Plan and Rubric ❑ Overview of NYS CCLS for Mathematics ❑ Class Activity: Subject-Matter Competency Self-Assessment	Read: Burns Part 2 Watch: Talk Moves video TASK 3: Choose grade and topic for MST Inquiry Unit Assignment 1: Subject Matter Competency Improvement Plan
4	❑ Engaging Diverse Learners in Language-Based Problem-Solving ❑ Class Activity: Problem-Solving Strategies	Read: Adams & Hamm Chap. 3 TASK 4: Quizizz Mathematics Assignment 2: Canva – Science & Mathematics
5	❑ Conceptual vs. Procedural Mathematics ❑ The Math-CT Connection ❑ Mathematics Through Programming in Elementary Grades ❑ Class Activity: Math+C Microworlds in Snap!	Read: Burns Part 3 Read: What is Conceptual Understanding? Read: Math + Programming TASK 5: Padlet – Choose mathematics standard
Module 2: Science Instruction		
6	❑ Why Teach Science? ❑ Inquiry-Based Learning & Inventive Thinking ❑ Overview of Standards: NYS PK-8 Science Scope and Sequence 2018	Read: Adams & Hamm Chap. 2 Assignment 3: Powtoon

	❑ Class Activity: Science and Engineering Practices	
7	❑ Using Cross-Cutting Concepts ❑ Active Involvement & Collaborative Inquiry	Read: Adams & Hamm Chap. 4 Read: Cross-Cutting Concepts Read: NGSS: What Are the Seven Cross-Cutting Concepts? Watch: NGSS: Core Ideas and Cross-Cutting Concepts TASK 6: Submit a draft lesson plan for peer review at the next class.
8	❑ Differentiating Instruction to Meet Individual Needs	Read: Differentiating With Technology TASK 7: Lesson plan revision
Module 3: Integrative Computing – CUNY CITE Project		
9	❑ Determining the "Best Buy" Using Math, Science and Technology: An Inquiry-Based, Integrated Project	Read: Adams & Hamm Chap. 5 TASK 8: Submit a Unit Plan draft for peer review at the next class.
10	❑ Using Conceptual Math & Manipulatives to Generate & Organize Data in Google Sheets	TASK 9: Incorporate technology into Unit Plan
11	❑ Using Google Sheets & CODAP to Analyze, Visualize & Interpret Learner-Generated Data	
12	Final Presentations – MST Inquiry Unit	Assignment: MST Inquiry Unit Due

Sample Assignments

CITE (Computing Integrated Teacher Education) Project: Using Google Sheets & Canva to Organize, Visualize & Interpret Learner-Generated Data

"Everything is so expensive these days!" I bet you've heard this recently or have said it yourself. From gas to Uber rides to plastic bags, prices across the nation have skyrocketed. How can you tell whether you're getting a good deal while shopping? Developing an understanding of scale, proportion and quantity, one of the cross-cutting science concepts (NSTA Framework, 2014), can help you make informed decisions to help you get the best buy!

For this project, you and your team will conduct a blind experiment to determine which paper towel brand is the best buy. What makes an experiment blind? What's the purpose? What does the best buy mean when it comes to paper towels? Do you already have an idea in mind about which paper towel is the best buy? You will answer all of these questions and more through your collaborative, hands-on work for this project.

Your team will need to:

- Discuss and decide upon at least 2 ways of defining "best buy."
- After examining the different brands, start with a hypothesis to answer the question: *"Which paper towel brand is the best buy?"* (It's ok if you don't agree just yet)
- Discuss and decide upon an action plan to measure these variables
- Use algorithmic thinking to collect your data
- Use Google Sheets to organize a table to record your data
- Use a function in Google Sheets to calculate the mean for each variable
- Use Canva to create at least 2 visuals of your data
- Present your findings and conclusion to the class
- Debrief by discussing terms (debugging, abstraction, algorithmic thinking), mathematical thinking, scientific process, and metacognitive aspects of the lesson.

Integrated Lesson Plan & MST Inquiry Unit

For this assignment, you will work in a group of 3-4 to integrate science and technology in a particular mathematics unit taught at the elementary level (e.g. 1st-6th grade). Each group will be responsible for a different unit. You will work as a collaborative group of preservice teachers whose goal is to fully integrate technology into this course. You will find, modify, and create technology-integrated lessons that can be used to replace units from a traditional textbook (one that is not specifically designed for technology use). The intent of this project is for you to be fully prepared to integrate technology in at least one math unit when you leave our program.

Materials: NCTM Standards, New York State Standards, Textbooks (several), Internet Resources (e.g., online lessons), journal articles

Assignment Guidelines: Your goal is to appropriately integrate science and technology in this math unit, which should consist of 5 lessons. The technology should be used to INTRODUCE/DEVELOP or ENHANCE the teaching and learning of the intended topic. It should NOT be used to reinforce an idea that has already been taught. The goal is to develop students' conceptual understanding of the subject matter.

Each technology-integrated lesson in the unit you develop must include objectives (mathematics, science & technology), an outline of the lesson (procedures – what should occur, particularly as it related to the use of technology), the list of needed materials, developed assignment worksheets for the activity, and applicable assessments. The group members should agree on a lesson plan format that will be used for the project.

Mathematics Objective: What mathematics do you want students to learn and understand?
Science Objective: What science concepts do you want students to learn and understand?

Technology Objective: How will the technology be used to enhance students' understanding of those particular mathematics and science concepts?

11. Selected Bibliography and Source materials:

Protheroe, N. (2007). What does good math instruction look like? *Principal*, pp. 51-54. Retrieved from https://www.naesp.org/sites/default/files/resources/2/Principal/2007/S-Op51.pdf

Stanford, P., Crowe, M., Flice, H. (2010). Differentiating with technology. *Teaching Exceptional Children Plus, 6*(4). Retrieved from https://files.eric.ed.gov/fulltext/EJ907030.pdf

Tashlik, P. (2022). Solving NYC's math problem. *NY Daily News*. Retrieved from https://www.nydailynews.com/opinion/ny-oped-solving-nyc-math-problem-20220704-k5l7uzwqhzdnlinw4mcwntnzoe-story.html

What is conceptual understanding?