| ***Program Review Cover Page*** | |
|---|---|
| *College* | Richard J. Daley College |
| *District Number* | 508 |
| *Contact Person (name, title, contact information)* | Anne Panomitros<br>Interim Vice President, Student and Academic Affairs<br>773-838-7514, apanomitros@ccc.edu |
| *Fiscal Year Reviewed:* | FY 18 |
| ***Directory of Reviews Submitted*** | |
| *Area Being Reviewed* | *Page Numbers* |
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| *Academic Disciplines* | Page 9 |
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| *Prior Review Supplemental Information* | |
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# *Career & Technical Education*

| | |
|---|---|
| *COLLEGE NAME:* | Richard J. Daley College |
| *FISCAL YEAR IN REVIEW:* | FY13 - FY16 |

## *PROGRAM IDENTIFICATION INFORMATION*

| *PROGRAM TITLE* | *DEGREE OR CERT* | *TOTAL CREDIT HOURS* | *6-DIGIT CIP CODE* | *LIST ALL CERTIFICATE PROGRAMS THAT ARE STACKABLE WITHIN THE PARENT DEGREE* |
|---|---|---|---|---|
| Advanced Certificate in Business Administration - General | Cert | 30 | 52.0201 | |

Address all fields in the template. If there are certificates and/or other stackable credentials within the program, please be sure to specify and sufficiently address all questions regarding each stackable credential.

| | |
|---|---|
| **Program Objectives**<br>What are the overarching objectives/goals of the program? | The goal of the AC in Business Administration – General is to provide students with knowledge of the basic fundamentals of Business Administration that can lead to employment in management positions in business, industry, or government. |
| To what extent are these objectives being achieved? | **The program was discontinued in Summer 2016.** |
| **Past Program Review Action**<br>What action was reported last time the program was reviewed? | Past program review indicated a decline in enrollment and monitoring the viability of the program. It was discontinued in Summer 2016. |

## *CTE PROGRAM REVIEW ANALYSIS*

Complete the following fields and provide concise information where applicable. Please do not insert full data sets but summarize the data to completely answer the questions. Concise tables displaying this data may be attached. The review will be sent back if any of the below fields are left empty or inadequate information is provided.

| | |
|---|---|
| List all pre-requisites for this program (courses, placement scores, etc.). | No pre-requisites or placement score requirement. |

| | |
|---|---|
| Please list or attach all required courses (including titles) for completion of this program including institution required courses (e.g. student success, first year, general education requirements, etc.). | BUSINES111<br>**Introduction To Business** 3<br>BUSINES181<br>**Financial Accounting** 4<br>BUSINES182<br>**Managerial Accounting** 4<br>BUSINES211<br>**Business Law I** 3<br>BUSINES214<br>**The Legal & Social Environment of Business** 3<br>**Computer Information Systems**<br>CIS120<br>**Intro to Microcomputers** 3<br>**Economics**<br>ECON201<br>**Principles Of Economics I** 3<br><br>ELECTIVE PROGRAM REQUIREMENTS<br>**10 CH**<br>*Students should select a minimum of 10 credit hours from the following courses or others as recommended by a College Advisor.*<br>**Business**<br>BUSINES203<br>**Intro Cost Accounting** 3<br>BUSINES204<br>**Computer Applications Intermediate Accounting** 1<br>BUSINES205<br>**Intermediate Accounting** 3<br>BUSINES212<br>**Business Law II** 3<br>BUSINES230<br>**E-Business Marketing** 3<br>BUSINES231<br>**Marketing** 3<br>BUSINES232<br>**Fundamentals of International Business** 3<br>BUSINES241<br>**Introduction To Finance** 3<br>BUSINES269<br>**Principles Of Management** 3<br>**Computer Information Systems**<br>CIS101<br>**Computer Science 101** 3<br>**Economics**<br>ECON201<br>**Principles Of Economics I** 3<br>ECON202<br>**Principles Of Economics II** 3 |

| | |
|---|---|
| | **Entrepreneurship**<br>ENTRE201<br>**Introduction to Entrepreneurship** 3<br>ENTRE202<br>**Opportunity Recognition and Development** 3 |
| Provide a rational for content/credit hours beyond 30 hours for a certificate or 60 hours for a degree. | |
| ***INDICATOR 1: NEED*** | ***RESPONSE*** |
| 1.1 How strong is the occupational demand for the program? | The occupational demand for the program is not strong in the College's immediate area. |
| 1.2 How has demand changed in the past five years and what is the outlook for the next five years? | |
| 1.3 What is the district and/or regional need? | District has centralized the Business Administration program at Harold Washington College which discontinued our certificate program in Summer 2016. |
| 1.4 How are students recruited for this program? | N/A |
| 1.5 Where are students recruited from? | N/A |
| 1.6 Did the review of program need result in actions or modifications? Please explain. | N/A |
| ***INDICATOR 2: COST EFFECTIVENESS*** | ***RESPONSE*** |
| 2.1 What are the costs associated with this program? | Faculty salary and benefits |
| 2.2 How do costs compare to other programs on campus? | Minimal |
| 2.3 How is the college paying for this program and its costs (e.g. grants, etc.)? | Program cost allocated in budget |
| 2.4 If most of the costs are offset by grant funding, is there a sustainability plan in place in the absence of an outside funding source? Please explain. | |

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|---|---|
| 2.5 Did the review of program cost result in any actions or modifications? Please explain. | No |
| ***INDICATOR 3: QUALITY*** | ***RESPONSE*** |
| 3.1 What are the program's strengths? | |
| 3.2 What are the identified or potential weaknesses of the program? | |
| 3.3 What are the delivery methods of this program? (e.g. traditional format/online/hybrid/team-teaching etc.)? | |
| 3.4 How does this program fit into a career pathway? | |
| 3.5 What innovations have been implemented or brought to this program that other colleges would want to learn about? | |
| 3.6 Are there dual credit opportunities? If so please list offerings and the associated high schools. | |
| 3.7 What work-based learning opportunities are available and integrated into the curriculum? | |
| 3.8 Is industry accreditation required for this program (e.g. nursing)? If so, identify the accrediting body. Please also list if the college has chosen to voluntarily seek accreditation (e.g. automotive technology, NATEF). | |
| 3.9 Are industry-recognized credentials offered? If so, please list. | |
| 3.10 Is this an apprenticeship program? If so, please elaborate. | |
| 3.11 If applicable, please list the licensure examination pass rate. | |

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|---|---|
| 3.12 What current articulation or cooperative agreements/initiatives are in place for this program? | |
| 3.13 Have partnerships been formed since the last review that may increase the quality of the program and its courses? If so, with whom? | |
| 3.14 What is the faculty to student ratio for courses in this program? Please provide a range and average. | |
| 3.15 What professional development or training is offered to adjunct and full time faculty that may increase the quality of this program? | |
| 3.16 What is the status of the current technology and equipment used for this program? | |
| 3.17 What assessment methods are used to ensure student success? | |
| 3.18 How satisfied are students with their preparation for employment? | |
| 3.19 How is student satisfaction information collected? | |
| 3.20 How are employers engaged in this program? (e.g. curriculum design, review, placement, work-based learning opportunities) | |
| 3.21 How often does the program advisory committee meet? | |
| 3.22 How satisfied are employers in the preparation of the program's graduates? | |
| 3.23 How is employer satisfaction information collected? | |

| | |
|---|---|
| 3.24 Did the review of program quality result in any actions or modifications? Please explain. | |

## *DATA ANALYSIS FOR CTE PROGRAM REVIEW*

Please complete for each program reviewed. Colleges may report aggregated data from the parent program or report on enrollment and completion data individually for each certificate within the program. Provide the most recent 5 year longitudinal data available.

| | | | | | |
|---|---|---|---|---|---|
| *CTE PROGRAM* | Business | | | | |
| *CIP CODE* | *52.0201* | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *7* | *0* | *N/A* | *N/A* | *N/A* |
| *NUMBER OF COMPLETERS* | *23* | *1* | *N/A* | *N/A* | *N/A* |
| *OTHER (PLEASE IDENTIFY)* | | | *N/A* | *N/A* | *N/A* |
| How does the data support the program goals? Elaborate. | The program was discontinued in Summer 2016. The above data reflects FY 14 and 15. Business program consolidated at Harold Washington College. | | | | |
| What disaggregated data was reviewed? | | | | | |
| Were there gaps in the data? Please explain. | | | | | |
| What is the college doing to overcome any identifiable gaps? | | | | | |
| Are the students served in this program representative of the total student population? Please explain. | | | | | |
| Are the students served in this program representative of the district population? Please explain. | | | | | |

## *REVIEW RESULTS*

| | |
|---|---|
| **Action** | ☐ Continued with Minor Improvements<br>☐ Significantly Modified |

| | |
|---|---|
| | ☐ Placed on Inactive Status<br>☒Discontinued/Eliminated<br>☐ Other (please specify) |
| **Summary Rationale**<br>Please provide a brief rationale for the chosen action. | District discontinued the program in Summer 2016 |
| **Intended Action Steps**<br>What are the action steps resulting from this review? Please detail a timeline and/or dates for each step. | |

| ***Academic Disciplines*** | |
|---|---|
| *COLLEGE NAME:* | Richard J. Daley College |
| *FISCAL YEAR IN REVIEW:* | FY18 |
| *DISCIPLINE AREA:* | Mathematics |
| ***REVIEW SUMMARY***<br>Complete this section to review the Academic Discipline as a whole. Use the Course Specific Review portion of this template for each course reviewed in the Discipline. | |
| **Program Objectives**<br>What are the objectives/goals of the discipline? | 1) To use technology in pedagogically sound ways to enhance the students' learning experiences;<br>2) To provide diverse learning experiences and offering multiple avenues of learning;<br>3) To decrease the number of developmental course offerings needed and increase the number of general education courses |
| To what extent are these objectives being achieved? | 1) Classrooms are equipped with SMART boards to aid in providing a great math experience<br>2) Instructors differentiate their mode of teaching and employ various methods of learning including group work, completing writing assignments, participating in discovery and investigatory exercises, completing take-home activities, and giving presentations |
| How does this discipline contribute to other fields and the mission of the college? | Manufacturing, engineering, within curriculum of business, (other programs at DA) |
| **Prior Review Update**<br>Describe any quality improvements or modifications made since the last review period. | Departmental focus on student success, retention, and promotion of department among current and future students. |
| ***REVIEW ANALYSIS***<br>Complete the following fields and provide concise information where applicable. Please do not insert data sets but summarize the data to completely answer the questions. The review will be sent back if any of the below fields are left empty or inadequate information is provided. | |
| **Indicator 1: Need** | **Response** |

| | |
|---|---|
| 1.1 What mechanisms are in place to determine programmatic needs/changes for AA, AS, AFA, and AES academic programs? How are programmatic needs/changes evaluated by the curriculum review committee and campus academic leadership? | Significant progress has been made in working with all departments to align institutional goals, departmental goals, and course goals for the purpose of improved student and instructor assessment. Concerted effort to analyze data and use it to direct changes within the curriculum. As a result, Foundational Math courses now included embedded tutoring to help with student success and persistence. |
| 1.2 How are students informed or recruited for this program? | The department markets its courses in the college to current and future students via marketing materials, emails, phone calls. |
| ***INDICATOR 2: COST EFFECTIVENESS*** | ***RESPONSE*** |
| 2.1 What are the costs associated with this discipline? | Faculty salaries and benefits<br>Cost per credit<br>Other costs (departmental expenditures) |
| 2.2 What steps can be taken to offer curricula more cost-effectively? | Streamlined/strategic scheduling |
| 2.3 Is there a need for additional resources? | |
| ***INDICATOR 3: QUALITY*** | ***RESPONSE*** |
| 3.1 Are there any alternative delivery methods of this discipline? (e.g. online, flexible-scheduling, accelerated, team teaching, etc.)? | Onsite and hybrid class delivery |
| 3.2 If the college delivers the course in more than one method, does the college compare success rates of each delivery method? If so, how? | It does; however, the hybrid Math courses began in Spring 2018 term and data has not yet been reviewed and analyzed. |
| 3.3 What assessments does the discipline use to measure full-time and adjunct instructor performance in the classroom? | Many of the math courses have mandatory departmental assessments that instructors must administer throughout the semester. These assessments include a pre and post-test, midterm exam and a final exam. The assessments are then given to the course coordinator for each class and can be used to measure the performance of an instructor every semester. If an instructor has several low performing classes, the department chairperson will usually suggest professional development to assist the instructor. |

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| 3.4 How does the discipline identify and support at-risk students? | The math department identifies at-risk students by their overall average in the course, their attendance in class and their scores on class assessments. The math department tries to identify these students as early as possible in the academic semester. To support these students, the math department develops a remediation plan and discusses it with the at-risk student. The goal of this plan is to provide students with the assistance they need to succeed in the course. The remediation plan can include mandatory visits to the instructor's office hours, required tutoring, or additional practice problems on concepts. |
| 3.5 To what extent is the discipline integrated with other instructional programs and services? | The math department works with the other STEM fields (Science, Technology and Engineering) at the college to develop course schedules and activities for students. Since some students are taking multiple STEM courses in the same semester, we make sure students have met the learning outcomes in each math class so they can prepared and successful in their other courses. |
| 3.6 What does the discipline or department review when developing or modifying curriculum? | When modifying curriculum, the math department first reviews the retention and success rates of each course and compares them to the rates at other City Colleges. If the retention or success rates are low, the department meets to discuss any challenges students may face in the course and how the course could be modified to help the students succeed.<br>When developing curriculum, the department looks at the curriculum of other City College or community colleges to determine the best practices for our population of students. |
| 3.7 When a course has low retention and/or success rates, what is the process to address these issues? | If a course has low retention or success rates, the math department takes a few steps to address these concerns:<br>• We meet to discuss the main challenges students face in the course. These issues could range from the number of assignments required for the course to the cost of the materials needed in the class. If possible, we resolve these issues with the help of the publisher.<br>• We consider modifying the curriculum to fit the needs of our student population.<br>• If needed, we develop and pilot new programs that helps students succeed. We then compare the success and retention rates of the pilot program to our tradition methods of teaching.<br>• Utilize the tutors at our school to see how we can work together to assist students. |
| *LIST ANY BARRIERS ENCOUNTERED WHILE IMPLEMENTING THIS DISCIPLINE.* | |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 121 | | | | |
| ***COURSE DESCRIPTION*** | Mathematics for Elementary School Teachers I | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *75* | *51* | *44* | *52* | *64* |
| *CREDIT HOURS PRODUCED* | *292* | *156* | *140* | *196* | *196* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *96%* | *71%* | *73%* | *94%* | *71%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | The big change in data indicated in Year 3 coincides with the shift to specialization areas for each college as a part of District's Reinvention initiative. The shift resulted in an enrollment decline at the College reflected in the General Education courses. | | | | |
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity | | | | |
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data | | | | |
| ***ACADEMIC COURSE REVIEW RESULTS*** | | | | | |
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | Continued monitoring of program outcomes, assessment of course and success rates. | | | | |

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| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | The data demonstrates sound enrollment, success, and review of the course reveals adequate resources and instruction. |
| **Resources Needed** | None |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | Academic Affairs administrators, faculty. |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 122 | | | | |
| ***COURSE DESCRIPTION*** | Mathematics for Elementary School Teachers II | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *48* | *41* | *14* | *31* | *30* |
| *CREDIT HOURS PRODUCED* | *184* | *132* | *56* | *116* | *92* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *94%* | *74%* | *86%* | *70%* | *71%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | *M1903* |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | The large drop in enrollment in year 3 coincides with the shift to specialization areas for each college as part of District's Reinvention initiative. The shift resulted in an enrollment decline at the College's reflected in the General Education courses. | | | | |
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data. | | | | |
| ***ACADEMIC COURSE REVIEW RESULTS*** | | | | | |

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| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | Continue to meet with industry partners to ensure transferability and SLOs meet the need for Math teachers. (Ongoing) |
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | There is no need to modify this course at this time. |
| **Resources Needed** | |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 140 | | | | |
| ***COURSE DESCRIPTION*** | College Algebra | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *102* | *136* | *135* | *158* | *167* |
| *CREDIT HOURS PRODUCED* | *368* | *348* | *444* | *496* | *520* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *84%* | *60%* | *78%* | *71%* | *63%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | The data suggests that the change in specialization of the college that occurred in year 3 helped to increase enrollment indicated by the increase in enrollment in Year 4. | | | | |
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated Headcount, Class success rate, credits completed, gender, ethnicity | | | | |
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data. | | | | |
| ***ACADEMIC COURSE REVIEW RESULTS*** | | | | | |

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|---|---|
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | 1. Continue to monitor progress and course success rates; (ongoing)<br>2. Increase the use of student support services such as advising and tutoring to improve course success (Fall 2018-ongoing);<br>3. Increase the number of formative assessments to give students immediate feedback (Spring 2019). |
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | This course meets the needs to get students into higher-level math courses. We would like higher course success rates to enable students to take upper level math courses. Formative assessments will assist students with determining their weaknesses to improve upon. |
| **Resources Needed** | Faculty training, tutoring, marketing of student supports. |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | Academic Affairs administration, faculty. |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 141 | | | | |
| ***COURSE DESCRIPTION*** | *PLANE TRIGONOMETRY* | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *61* | *38* | *49* | *37* | *39* |
| *CREDIT HOURS PRODUCED* | *153* | *90* | *114* | *96* | *66* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *70%* | *74%* | *72%* | *82%* | *45%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | The data indicates a decline in the course success rate and credit hours produced in year 5. There is also a decline in enrollment between year 1 and year 5 that coincides with the decline of the course success. | | | | |
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |

| | |
|---|---|
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data. |
| ***ACADEMIC COURSE REVIEW RESULTS*** | |
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | 1. Provide subject specific tutoring and academic supports for students (Fall2018- ongoing)<br>2. Academic advisors contact students with a "C" or lower at midterm (fall 2018-ongoing)<br>3. Increase formative assessments for students. |
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | Students are not meeting the outcomes of the course; more academic supports need to be in place to assist students with meeting the course outcomes. |
| **Resources Needed** | Tutors |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | Academic Support Services, Academic Affairs administration, faculty. |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 143 | | | | |
| ***COURSE DESCRIPTION*** | PreCalculus | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *207* | *249* | *197* | *191* | *135* |
| *CREDIT HOURS PRODUCED* | *900* | *966* | *870* | *852* | *570* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *62%* | *48%* | *65%* | *63%* | *64%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | The data suggests that the change in specialization of the College that occurred in year 3 decreased enrollment and credit hours. | | | | |
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |

| | |
|---|---|
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data. |

| ***ACADEMIC COURSE REVIEW RESULTS*** | |
|---|---|
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | 1. Improve formative assessments to help students determine areas of weakness.<br>2. Provide specialized tutoring to assist in course success. |
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | Students are generally meeting SLOs and assessments indicate as such; more work to improve course success rates include:<br>1. Increase formative assessment<br>2. Specialized tutoring |
| **Resources Needed** | Faculty training, tutors |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | Academic Support Services, Academic Affairs administration, faculty. |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 144 | | | | |
| ***COURSE DESCRIPTION*** | Finite Mathematics | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *N/A* | *N/A* | *N/A* | *N/A* | *11* |
| *CREDIT HOURS PRODUCED* | *N/A* | *N/A* | *N/A* | *N/A* | *40* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *N/A* | *N/A* | *N/A* | *N/A* | *91%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | *M1906* |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | Year 5 is the first time this course is offered at the College | | | | |

| | |
|---|---|
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. |
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data. |
| ***ACADEMIC COURSE REVIEW RESULTS*** | |
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | *N/A* |
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | *N/A* |
| **Resources Needed** | *N/A* |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | *N/A* |

| ***DATA ANALYSIS FOR ACADEMIC DISCIPLINES***<br>Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***ACADEMIC DISCIPLINE AREA*** | Mathematics-General | | | | |
| ***COURSE TITLE*** | Math 146 | | | | |
| ***COURSE DESCRIPTION*** | Discrete Mathematics | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *N/A* | *N/A* | *N/A* | *11* | *22* |
| *CREDIT HOURS PRODUCED* | *N/A* | *N/A* | *N/A* | *44* | *72* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *N/A* | *N/A* | *N/A* | *100%* | *82%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | *CS915* |

| | |
|---|---|
| *How does the data support the course goals? Elaborate.* | Year 4 is the first year the course was offered a the College. Enrollment has increased while the success has decreased slightly. |
| *What disaggregated data was reviewed?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. |
| *Were there identifiable gaps in the data? Please explain.* | No identifiable gaps in the data. |
| ***Academic Course Review Results*** | |
| **Intended Action Steps** Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | No action determined at this time. |
| **Rationale** Provide a brief summary of the review findings and a rationale for any future modifications. | Enrollment increasing and course success rates high. |
| **Resources Needed** | None |
| **Responsibility** Who is responsible for completing or implementing the modifications? | |

| ***Data Analysis for Academic Disciplines*** Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***Academic Discipline Area*** | Mathematics-General | | | | |
| ***Course Title*** | Math 207 | | | | |
| ***Course Description*** | Calculus and Analytic Geometry I | | | | |
| | *Year 1* | *Year 2* | *Year 3* | *Year 4* | *Year 5* |
| *Number of Students Enrolled* | *100* | *177* | *163* | *190* | *152* |
| *Credit Hours Produced* | *310* | *610* | *660* | *695* | *595* |

| | | | | | |
|---|---|---|---|---|---|
| *Success Rate (% C or better) at the end of the course, excluding Withdrawals and Audit students* | *47%* | *55%* | *77%* | *67%* | *74%* |
| *IAI Status (list code) or Form 13 Status (list signature dates and institutions)* | | | | | *M1900* |
| *How does the data support the course goals? Elaborate.* | The specialization of the College to engineering and manufacturing contributed to the increase in enrollment and course success rate through the 5 year period | | | | |
| *What disaggregated data was reviewed?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |
| *Were there identifiable gaps in the data? Please explain.* | No identifiable gaps in the data. | | | | |
| ***Academic Course Review Results*** | | | | | |
| **Intended Action Steps** Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | Course review indicated that there are no identified action steps. Continue ongoing review for course/assessment improvement. | | | | |
| **Rationale** Provide a brief summary of the review findings and a rationale for any future modifications. | *N/A* | | | | |
| **Resources Needed** | *N/A* | | | | |
| **Responsibility** Who is responsible for completing or implementing the modifications? | *N/A* | | | | |

| ***Data Analysis for Academic Disciplines*** Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***Academic Discipline Area*** | Mathematics-General | | | | |
| ***Course Title*** | Math 208 | | | | |
| ***Course Description*** | Calculus and Analytic Geometry II | | | | |
| | *Year 1* | *Year 2* | *Year 3* | *Year 4* | *Year 5* |
| *Number of Students Enrolled* | *27* | *60* | *49* | *54* | *152* |

| | | | | | |
|---|---|---|---|---|---|
| *Credit Hours Produced* | *95* | *245* | *114* | *245* | *595* |
| *Success Rate (% C or better) at the end of the course, excluding Withdrawals and Audit students* | *68%* | *74%* | *72%* | *91%* | *74%* |
| *IAI Status (list code) or Form 13 Status (list signature dates and institutions)* | | | | | *M1900-2* |
| *How does the data support the course goals? Elaborate.* | The specialization of the College to engineering and manufacturing contributed to the increase in enrollment and course success rate through the 5 year period | | | | |
| *What disaggregated data was reviewed?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |
| *Were there identifiable gaps in the data? Please explain.* | No identifiable gaps in the data. | | | | |
| ***Academic Course Review Results*** | | | | | |
| **Intended Action Steps** Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | Continue ongoing review for improvement, increasing enrollment, and matching with demands for advanced manufacturing and engineering fields. - ongoing | | | | |
| **Rationale** Provide a brief summary of the review findings and a rationale for any future modifications. | The review determined excellent course SLOs, assessment, student success and matriculation. | | | | |
| **Resources Needed** | *N/A* | | | | |
| **Responsibility** Who is responsible for completing or implementing the modifications? | *N/A* | | | | |

| ***Data Analysis for Academic Disciplines*** Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | | | | | |
|---|---|---|---|---|---|
| ***Academic Discipline Area*** | Mathematics-General | | | | |
| ***Course Title*** | Math 209 | | | | |
| ***Course Description*** | Calculus and Analytic Geometry III | | | | |
| | *Year 1* | *Year 2* | *Year 3* | *Year 4* | *Year 5* |

| | | | | | |
|---|---|---|---|---|---|
| *Number of Students Enrolled* | *27* | *23* | *25* | *18* | *29* |
| *Credit Hours Produced* | *95* | *100* | *120* | *70* | *130* |
| *Success Rate (% C or better) at the end of the course, excluding Withdrawals and Audit students* | *68%* | *83%* | *96%* | *78%* | *90%* |
| *IAI Status (list code) or Form 13 Status (list signature dates and institutions)* | | | | | *M1900-3* |
| *How does the data support the course goals? Elaborate.* | The specialization of the College to engineering and manufacturing contributed to the increase in enrollment and course success rate through the 5 year period | | | | |
| *What disaggregated data was reviewed?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |
| *Were there identifiable gaps in the data? Please explain.* | No identifiable gaps in the data. | | | | |
| ***Academic Course Review Results*** | | | | | |
| **Intended Action Steps** Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | Continue the practices implemented; the college is pleased with the course success rates, enrollment, and supports. | | | | |
| **Rationale** Provide a brief summary of the review findings and a rationale for any future modifications. | Enrollment is steady, and course success rates satisfactory. | | | | |
| **Resources Needed** | None | | | | |
| **Responsibility** Who is responsible for completing or implementing the modifications? | *N/A* | | | | |

| ***Data Analysis for Academic Disciplines*** Please complete for **each course** reviewed in the Academic Discipline. Provide the most recent 5 year longitudinal data available. | |
|---|---|
| ***Academic Discipline Area*** | Mathematics-General |
| ***Course Title*** | Math 125 |

| ***COURSE DESCRIPTION*** | Introductory Statistics | | | | |
|---|---|---|---|---|---|
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *254* | *298* | *305* | *286* | *336* |
| *CREDIT HOURS PRODUCED* | *860* | *1068* | *1032* | *908* | *1088* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *72%* | *76%* | *75%* | *70%* | *68%* |
| *IAI STATUS (LIST CODE) OR FORM 13 STATUS (LIST SIGNATURE DATES AND INSTITUTIONS)* | | | | | |
| *HOW DOES THE DATA SUPPORT THE COURSE GOALS? ELABORATE.* | | | | | |
| *WHAT DISAGGREGATED DATA WAS REVIEWED?* | Unduplicated headcount, class success rate, credits completed, gender, ethnicity. | | | | |
| *WERE THERE IDENTIFIABLE GAPS IN THE DATA? PLEASE EXPLAIN.* | No identifiable gaps in the data. | | | | |
| ***ACADEMIC COURSE REVIEW RESULTS*** | | | | | |
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | Continued review of course, no action needed at this time. | | | | |
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | The course review revealed that there were no modifications needed at this time. | | | | |
| **Resources Needed** | *N/A* | | | | |
| **Responsibility**<br>Who is responsible for completing or implementing the modifications? | *N/A* | | | | |

| ***Remedial Math*** | |
|---|---|
| *COLLEGE NAME:* | Richard J. Daley College |
| *FISCAL YEAR IN REVIEW:* | FY18 |
| ***REVIEW SUMMARY*** | |
| **Program Objectives**<br>What are the objectives or goals of the program/discipline? | Remedial math is part of the mathematics department. The Mathematics department has adopted the following objectives:<br>1) To use technology in pedagogically sound ways to enhance the students' learning experiences;<br>2) To provide diverse learning experiences and offering multiple avenues of learning;<br>3) To decrease the number of developmental course offerings needed and increase the number of general education courses<br>The overall objective of the developmental math program is to prepare students to successfully transition to college-level math courses with basic algebra, geometry, and numeracy skills. |
| To what extent are these objectives or goals being achieved? | To meet the overall mathematics department objectives, the following is implemented:<br>1) Classrooms are equipped with SMART boards to aid in providing a great math experience<br>2) Instructors differentiate their mode of teaching and employ various methods of learning including group work, completing writing assignments, participating in discovery and investigatory exercises, completing take-home activities, and giving presentations |
| How does this program contribute to other fields and the mission of the college? | This program prepares students for college-level courses within manufacturing, engineering, business, sciences, and math. |
| **Prior Review Update**<br>Describe any quality improvements or modifications made since the last review period. | Departmental focus on student success, retention, and promotion of the department among current and future students. Further, this fiscal year, the math department piloted a new method of teaching developmental education courses that includes contextualized learning and embedded tutors. |

| ***REVIEW ANALYSIS***<br>Complete the following fields and provide concise information where applicable. Please do not insert data sets but summarize the data to completely answer the questions. Review will be sent back if any of the below fields are left empty or inadequate information is provided. | |
|---|---|
| **Indicator 1: Need** | **Response** |
| 1.1 Detail how the offerings are sufficient and aligned to meet the needs of students across all programs served and supportive academic programs (e.g. tutoring, co-requisite, summer bridge, AE-ICAPS, foundational mathematics). | The college has a variety of courses, initiatives, and support services available to meet the needs of students. Embedded tutoring is offered to assist with increasing course success rates. |
| ***INDICATOR 2: COST EFFECTIVENESS*** | ***RESPONSE*** |
| 2.1 What are the costs associated with this program? | The annual budget for mathematics department is $1.3Million. This includes all math faculty, supplies, professional development, since the mathematics department oversees the remedial math program. |
| 2.2 How is the college paying for this program and its costs (e.g. grants, etc.)? | The college's budget supports the developmental math education program. |
| 2.3 If most of the costs are offset by grant funding, is there a sustainability plan in place in the absence of an outside funding source? If so, please elaborate. | The college is not currently utilizing grant funds for developmental education. |
| 2.4 Based upon this review, what steps are being taken to offer curricula more cost-effectively? | The goal is to transition students to college level math classes as quickly as possible. |
| 2.5 Are there needs for additional resources? If so, what are they? | Currently, more math tutors are needed; the developmental math program is housed within the math department. |
| ***INDICATOR 3: QUALITY*** | ***RESPONSE*** |
| 3.1 How is the college working with high schools to reduce remedial needs? | Faculty and tutors work with area high schools to align curriculum. Further, high school students may visit the tutoring center at no cost to them, to gain assistance with math placement testing. Some faculty in the department serve as mentors to teachers in surrounding high schools to ensure their students will be prepared to take college-level courses at Daley. |

| | |
|---|---|
| 3.2 What is the college doing to develop and implement co-requisite or pathway models to ensure students placing into development education finish the sequence within one academic year? | All the City College of Chicago offer several models for students to move through the developmental courses as quickly as possible. Our Foundational Studies Math (Math 3001 and Math 3002) combine two remedial courses into one academic semester.<br><br>The following courses combine a General Education course with a co-requisite course that covers the foundational math skills necessary to be successful in the credit-level course. These are one –semester courses.<br>- Math 018 and Math 118<br>- Math 025 and Math 125<br>- Math 040 and Math 140<br><br>We also offer Beginning and Intermediate Algebra (Math 98 and Math 99) as a combined course that can be completed in one academic year. |
| 3.3 Provide a description of the remedial/developmental sequence. Colleges may attach a graphic representation. | See attached document labeled Math Course Map. |
| 3.4 Are there any alternative delivery methods of this program? (online, flexible-scheduling, team-teaching, accelerated, etc.)? | Developmental Math Course are offered in different formats to fit our student's schedules.<br>- Traditional ( 16 weeks, face-to-face, meets twice a week)<br>- Weekly ( 16 weeks, face-to-face, meets once a week)<br>- Accelerated (12 weeks, face-to-face, meets twice a week)<br>- Blended (face-to-face times with online material using the Keystone Approach) |
| 3.5 What innovation has been implemented or brought to this program? | In 2011 The Developmental Education Initiative (D.E.I.) was implemented in all developmental math classes. The program helped students to prepare for college level courses through a process of mandatory, supplemental instruction and socialization.<br><br>In 2018 The Keystone Approach (see attached paper) was piloted in 5 sections, and then fully implemented in remedial math courses. This approach uses cooperative learning and technology to encourage active learning in the classroom. |
| 3.6 To what extent is the program integrated with other instructional programs and services? | The remedial math program encourages students to use the tutoring services throughout the semester. The Math department works with tutoring to develop and conduct workshops to prepare students for midterm and final exams. Students are also encouraged to visit their academic advisor at least once each semester. The program also works with the testing center to discuss software and cut-off scores for classes. |

| | |
|---|---|
| 3.7 Have partnerships been formed since the last review that may increase the quality of the program and its courses? If so, with whom? | The remedial programs works closely with some of the textbook publishers (Pearson and McGraw Hill) to determine the textbooks/software best fits the needs of our students. The department has adopted courseware from these publishers ( My Math Lab and ALEKS) that engages students and assists them outside of the classroom. |
| 3.8 How well are completers of remedial/developmental courses doing in related college-level courses? | Completers of remedial courses do very well in their college-level courses because they have the foundational knowledge of math. The students will typically take the same teacher they had for the remedial course(s) since they are familiar with that teacher's style. |
| 3.9 What professional development or training is offered to instructors and/or staff to ensure quality programming? | Full-time faculty participate in professional development activities throughout the academic year, including Faculty Development Week and in workshops. Part-time faculty participate in adjunct orientations at the beginning of the fall and spring semesters. The college provides a separate orientation for the Keystone method. |

***LIST ANY BARRIERS ENCOUNTERED WHILE IMPLEMENTING THE PROGRAM.***

Budget constraints.

## *DATA ANALYSIS FOR REMEDIAL MATH*

Please complete for each course reviewed as part of the Remedial Math, Cross-Disciplinary Review. Provide the most recent 5 year longitudinal data available.

| | | | | | |
|---|---|---|---|---|---|
| *COURSE TITLE* | *MATHEMATICS 99* | | | | |
| *COURSE DESCRIPTION* | *INTERMEDIATE ALGEBRA WITH GEOMETRY* | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *1051* | *899* | *842* | *775* | *491* |
| *CREDIT HOURS PRODUCED* | *3820* | *3130* | *3030* | *285* | *1365* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *60%* | *58%* | *59%* | *58%* | *53%* |

## *REVIEW RESULTS*

| | |
|---|---|
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | The data suggests that less students were placed into Math 99 indicated by the drop in enrollment from 2013 to 2018. This drop coincides with a change in the math placement exam district wide. The goal is to increase course success rates. |

| | |
|---|---|
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | 1. Implement embedded tutors in classrooms to assist students with concepts. (every semesters weeks 2-15)<br>2. Provide conceptualized math learning (Keystone method) (Spring 2018-present).<br>**3.** Placement testing to occur on campus to ensure integrity of the testing process and proper placement (Fall 2018-present) |

| ***DATA ANALYSIS FOR REMEDIAL MATH*** | | | | | |
|---|---|---|---|---|---|
| Please complete for each course reviewed as part of the Remedial Math, Cross-Disciplinary Review. Provide the most recent 5 year longitudinal data available. | | | | | |
| *COURSE TITLE* | Mathematics 98 | | | | |
| *COURSE DESCRIPTION* | Beginning Algebra with Geometry | | | | |
| | *YEAR 1* | *YEAR 2* | *YEAR 3* | *YEAR 4* | *YEAR 5* |
| *NUMBER OF STUDENTS ENROLLED* | *763* | *610* | *527* | *452* | *294* |
| *CREDIT HOURS PRODUCED* | *1952* | *1484* | *1476* | *1160* | *792* |
| *SUCCESS RATE (% C OR BETTER) AT THE END OF THE COURSE, EXCLUDING WITHDRAWALS AND AUDIT STUDENTS* | *49%* | *49%* | *57%* | *54%* | *57%* |

| ***REVIEW RESULTS*** | |
|---|---|
| **Rationale**<br>Provide a brief summary of the review findings and a rationale for any future modifications. | The data suggests that less students were placed into Math 98 indicated by the drop in enrollment from 2013 to 2018. This drop coincides with change in math placement exam district wide. The goal is to increase course success rates. |
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | 1. Implement embedded tutors in classrooms to assist students with concepts. (every semesters weeks 2-15)<br>2. Provide conceptualized math learning (Keystone method) (Spring 2018-present).<br>**3.** Placement testing to occur on campus to ensure integrity of the testing process and proper placement (Fall 2018-present) |

# *Student and Academic Support Services*

The ICCB Program Review requires each college to submit a statement of the review of student and academic support services that the college completed during the year. A completed and comprehensive review will likely be between **4 – 8 pages in length**.

| | |
|---|---|
| *COLLEGE NAME:* | Richard J. Daley College |
| *FISCAL YEAR IN REVIEW:* | FY18 |
| *REVIEW AREA:* | Learning and Tutoring Centers |
| **Program Summary**<br>Please provide a brief summary of the function of the program. | Richard J. Daley College offers tutoring through its Academic Support Services Center at both, Daley College (main campus) and at our satellite campus, Arturo Velasquez Institute. The Tutoring Center offers discipline-specific academic support services to Adult Education and Credit students throughout the semester on a walk-in/drop-in (first come-first served) basis. Students receive one-on-one, or small group tutoring, as well as course specific review sessions to help student understand concepts covered in class. Tutors also help with homework and basic research and study skills.<br><br>Professional tutors are available in the following subjects: biology, chemistry, computer information systems, English/reading, math, physics, and Spanish. Faculty and advisors recommend tutoring to students who are flagged at-risk (obtaining a grade of "C" or below).<br><br>To ensure students are receiving the supports and reinforcement needed to successfully complete assignments, students encouraged to attend tutoring as needed. |

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|---|---|
| **Prior Review Update**<br>Describe any quality improvements or modifications made since the last review period. | Since 2018, the tutoring center has relocated to the main building which is much more convenient for our students. Previously, the tutoring center was in a modular pre-fab building on campus.<br><br>More recently, the Academic Support Services Center has added an embedded tutoring option for Aligned Reading and Composition (ARC) 96 courses.<br>Tutoring has collaborated with faculty to provide embedded tutoring in pre-credit classes. Preliminary data indicates that courses with embedded tutors, versus the same course without has a 12% higher course success rate. Other benefits to the embedded tutoring: fosters a supportive learning community via small group activities, motivates small group discussion and it exposes students to tutoring, who may not seek it otherwise.<br><br>**<u>Reporting Platform: GradesFirst</u>**<br>A new scheduling system allows students to access tutoring schedules in real time across CCC. Data collected via GF is used for several purposes, as it helps the Director track utilization of tutoring supports, and it has allowed us to communicate with students that have been flagged "at risk" during grade campaigns.<br><br>Additionally, when students withdraw, or are dropped from a course, there is a blank report in the "scheduled course" for the student. As Directors, we often reverse engineer and can re-label the student as a Credit or ADED student, this is quite time consuming. |

| | |
|---|---|
| What are the identified or potential weaknesses of the program? | **<u>Scheduling</u>**<br>Developing permanent schedules during optimal times has been an ongoing challenge. Tutor schedules are based on a number of factors, including and not limited to previous (year) and current class size reports, GradesFirst utilization reports and tutor availability. *Limitations:* tutors are not always available during optimal time frames, and therefore, GF reports will show underutilization of tutors. Tutors are expected to assist in our center with day to day activities during their down time, including student intake and triage, outreach via telephone and on the ground class visits, pop-up marketing in high traffic areas that does not get reported, nor recorded in GF.<br><br>**<u>Budget</u>**<br>Funding of Tutoring centers continue to decrease every year. As a result, our center is unable to hire and retain staff, and ultimately, we are unable to provide a fully staffed center to our evening students (this is very important because our student population is commuter). District Offices review utilization reports generated from GradesFirst, however, those reports do not capture voids in tutoring services and it becomes difficult to justify new hires. As a result, we have been unable to secure new hires in key discipline areas.<br><br>**<u>Computer Lab</u>**<br>Our center is equipped with 30 desktops, however, the computers are very slow to load. Students become impatient and leave our center to utilize computers in the Library. We often hear students complain that our computers are too slow, and they wished they were as fast as the computers we used to have in building 200.<br><br>**<u>Embedded Tutoring</u>**<br>We do not have the bandwidth to offer additional supports to high risk courses, we do not have enough tutors to provide supports in the class, and in our center simultaneously.<br><br>**<u>Student Feedback Surveys</u>**<br>Students are asked to provide feedback regarding their experience, however, only about 3% of our tutees complete a satisfaction survey. |

| | |
|---|---|
| What are the program's strengths? | **<u>Impact</u>**<br>Students that utilize our tutoring services 5 or more times per semester, are more likely to pass their course, compared to those that do not seek out tutoring supports.<br><br>**<u>Student Feedback Surveys</u>**<br>Students are asked to provide feedback regarding their experience, and although only 3% of our tutees complete a satisfaction survey, over 90% of the responses give us a positive review. |
| **Rationale**<br>Detail all major findings resulting from the current review. | Many factors contribute as to whether or not students will seek out tutoring supports. We have found that when Faculty encourage and remind students of our services (and incentivize it through recovery points after a test, or major assignment and/or participation points), students will seek out our services more willingly. We will work more closely with Faculty to ensure we are meeting the needs of students via on-demand, pop-up tutoring, and review sessions.<br><br>Regarding utilization, we will continue to monitor GradesFirst reports to identify Early Alert students and progress reports for student that have received a grade of a "C" and below. We will also identify peak times, and provide additional supports based on demand.<br><br>Our center will be more intentional in collecting student feedback to improve services.<br><br>The Director will continue to advocate for additional supports from DO by demonstrating need. The Director will expand and grow our embedded tutoring and will explore peer tutoring models. |

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| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | To increase student participation and utilization of our services, we will continue to work with Faculty and Advising to ensure students alerted to be "at-risk" receive the tutoring support they need to recover from a failing grade. We will continue to conduct in class roadshows, offer on-demand tutoring as well as pop-up tutoring in the Library during peak times.<br><br>A new initiative we will be implementing this semester, is one in which students can email us their English paper, any time (day or night), and students will receive a free printout, along with general feedback for improvement. The student will be encouraged to work with a tutor for an in-depth tutoring consultation. This initiative will expose students to tutoring, who may not seek it otherwise.<br><br>Increase Embedded tutoring offerings in high-risk subjects with the funding support from District Office.<br><br>To address the student feedback issue, tutors will be mandated to provide a hard copy of the student evaluation form to each student they tutor. We will make comment boxes available within student reach. |

| ***Student and Academic Support Services***<br>The ICCB Program Review requires each college to submit a statement of the review of student and academic support services that the college completed during the year. A completed and comprehensive review will likely be between **4 – 8 pages in length**. | |
|---|---|
| *COLLEGE NAME:* | Richard J. Daley |
| *FISCAL YEAR IN REVIEW:* | FY18 |
| *REVIEW AREA:* | *CAREER PLANNING AND PLACEMENT* |
| **Program Summary**<br>Please provide a brief summary of the function of the program. | Career Planning and Placement Center seeks to increase career readiness , exposure, and self-efficacy of all Daley College students and alumni by providing workshops to prepare students for career success in the workforce<br>Students who engage with the career center will learn:<br>• Employment resources and opportunity on-line and on campus<br>• Resume construction and the parts of a resume<br>• Write a professional cover letter<br>• Create a plan towards post-college career placement Professional market their personal brand<br>The previous three (3) years the career center has served the following number of unduplicated students:<br>FY15- 117<br>FY 16- 300<br>FY17- 820<br><br>The previous three (3) years the career center has assisted the following number of students in employment<br>FY15- 87<br>FY16- 249<br>FY 17- 363 |
| **Prior Review Update**<br>Describe any quality improvements or modifications made since the last review period. | N/A |

| | |
|---|---|
| What are the identified or potential weaknesses of the program? | • Limited staff capacity to meet increasing student demand to serve all CTEs and students<br>• Partial campus staff knowledge and awareness of services provided by career services<br>• Career Services metrics has changed from centralized to decentralized targets and expectations due to the continuous administrative changes that requires the focus of the career center to pivot directions and methodologies to hitting targets.<br>• Unrefined management system that allows for tracking student job placement or employer satisfaction<br>• Dedicated career center with a central location for accessibility to all students<br>Student participation in workshops is insufficient because of the awareness of resources, misunderstanding of services provided, and value the campus places on career services for student success. |
| What are the program's strengths? | Career Planning and Placement has collaborated with the following departments/programs for career exposure, employer highlights, or dedicated workshops to assist students with career readiness:<br>• Child Development<br>• Computer Information Services<br>• Criminal Justice<br>• Advanced Manufacturing<br>• Business<br><br>Career Planning and Placement has partnered with other support services across campus including:<br>• Transfer Center<br>• DAC<br>• Academic Support Services<br>• Veterans Affairs<br><br>Increased workshops and in-class presentations with a captive audience during class time that is built into the course and curriculum<br><br>Supportive Technology: Career Network is an on-line job board for City Colleges of Chicago students and alumni.<br><br>Increased buy-in and engagement from faculty have been recognized as an element of successful student programming. It takes faculty ownership and support from co-curricular departments in order for a student to be successful. |

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|---|---|
| **Rationale**<br>Detail all major findings resulting from the current review. | • The Career Planning and Placement Center continues to make an impact on Daley College by providing an essential service that all students can benefit.<br>• Daley has staff that are strong in soft skills workshops, since employers are seeking a workforce with soft skills. |
| **Intended Action Steps**<br>Please detail action steps to be completed in the future based on this review with a timeline and/or anticipated dates. | The Career Planning and Placement Center will improve its assessment methods relation to workshops and in-class presentations offered to gauge our impact with students and to modify services to meet the needs of the students.<br><br>Career Planning and Placement will collaborate with CTE programs to have targeted hiring fairs or career exposure events with students. While the career center staff is verse in multiple industries, the career center realized that it takes CTE program content experts to engage partners in the industry to assist with student employment<br><br>Collaborate with faculty with internships and practicums built into the program to prepare students for post-college career placement and success |

Appendix A

# The Keystone Approach: Integration of Methodology and Technology

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Richard J. Daley College

## Introduction

This article is the result of a comprehensive research study investigating the impact of computer-learning technology as well as the impact of a synergistic teaching approach (Keystone Method) on developmental mathematics classes at the college level.

The study focused on mathematics skills of elementary and intermediate algebra students and measured their performance on departmentally designed common midterm and final exams as well as on a national standardized test (COMPASS). An analysis of the data for the period of study shows that students in experimental classes employing the synergistic approach attained higher performance outcomes compared with students taught under traditional methods with the use of technology. The higher outcomes in the experimental classes were not achieved with the attrition of weaker students. Moreover, investigating the impact of technology on traditional teaching in elementary algebra classes, the study found no significant gains in student learning outcomes in classes incorporating technology compared to those that did not use technology.

In recent years, there has been a vast and growing demand for remedial mathematics education among arriving students in colleges and universities across the nation (U.S. Department of Education, 2008). As such, successful mathematics remediation of students has become an important and challenging task for a large number of colleges and universities in the country. A newly published report confirms the alarming statistics that students who enroll in remedial classes at the college are far more likely to drop out than those who do not (Strong American Schools, 2008). Tracking first-time college students from a national survey's 2002 cohort in colleges with disproportionately high enrollments of low-income and minority students, researchers found that upon entry, 72% of students needed at least one remedial math course. And after three years, only 23% of those students had successfully completed the remedial math sequence (McClenney, 2009). These facts pose serious questions about the effectiveness of traditional methods of remediation of students in developmental math courses at the college.

In the last 15 years, the question of mathematics remediation was extensively studied at the Richard J. Daley College and the result of this research was the development of a new teaching methodology, the Keystone method.

The Keystone method was initially pilot-tested at Richard J. Daley College during 1993–1995 academic years (Sagher & Siadat, 1997; Sagher, Siadat, & Hagedorn, 2000, 2001). The ensuing project was further expanded in 1998 and 1999, funded through a grant from Gabriella and Paul Rosenbaum Foundation (Siadat, Musial, & Sagher, 2000, 2001). The Keystone method has been extensively researched and has won numerous state and national awards (NCIA, 1999; ICCB, 2001).

In the 1998–2000, 2001–2003, and also 2004–2006 studies, the results of the experimental and control groups were compared at the common final exams and clearly showed that the Keystone method of instruction produced superior outcomes in mathematics without sacrificing the classroom retention rates (Siadat, Musial, & Sagher, 2008; Peterson & Siadat, 2009). An interesting and important concomitant of the results was that students in experimental classes improved in their reading comprehension scores compared to those in the control groups. The latter effect is attributed to the students' improved concentration skills.

The present study investigates the impact of computer-learning technology on traditional instructional milieu as well as the integration of technology with an innovative method (Keystone) on student learning in elementary and intermediate algebra classes at the college. The study shows that use of technology alone has insignificant effect on learning, whereas incorporating modern technology into a dynamic teaching methodology can produce significant positive impact on student learning.

## Research Background

The Keystone method was developed by Sagher and Siadat (1997) in an attempt to address difficulties in teaching and learning of developmental mathematics in colleges and universities. The Keystone method and its constituent elements are grounded on research in the efficacy of different educational models, cognitive science of learning, and educational psychology. The frequent testing and the insistence on the fast performance and fluency are important ingredients in precision teaching, a method of working with exceptional children. The insistence on satisfactory performance on each unit is connected with mastery learning, and the group work is related to cooperative learning. In the Keystone methodology, all tests and quizzes are frequent, time-restricted, cumulative, and based on homework.

Frequent testing of the subject is an important assessment tool that provides valuable information to the teacher and the student about the learning process. It also effects other educational benefits such as long-term retention and consolidation of knowledge and improvement of memory (Karpicke, Butler, & Roediger III, 2009; Nungester & Duchastel, 1982; Pyc & Rawson, 2010; Roediger III & Karpicke, 2006; Spitzer, 1939). Timed tests teach students to work with full concentration, leading to an improvement of their attention span. Timed tests also train students to improve on their automaticity of basic skills as well as factual and procedural knowledge. Automaticity in these skills frees up space in working (short-term) memory, facilitating the attainment of problem-solving skills (Willingham, 2009). Timed tests are not mere assessment tools; the period of work in high arousal state such as in a timed test, affects long-term memory (Kleinsmith & Kaplan, 1963, 1964). Following the seminal work of Kleinsmith and Kaplan, researchers have found a biological mechanism for improved long-term memory associated with emotional arousal (Cahill, Prins, Weber, & McGaugh, 1994; Cahill, Babinski, Markowitsch, & McGaugh, 1995). Recently, cognitive scientists have also determined that stress within the context of a learning experience, as in timed tests, induces focused attention and improves memory of relevant information (Joëls, Pu, Wiegert, Oitzl, & Krugers, 2006).

Cumulative testing motivates students to review and practice the older topics at all times and deepens their knowledge of the subject matter, which results in higher levels of learning (Dempster, 1992) and attainment of the mastery of the subject. Moreover, cumulative practice of basic skills contributes to an improvement of students' problem-solving skills (Mayfield & Chase, 2002). The fact that all quizzes and tests are homework-based motivates students to do their homework, which reinforces learning. Homework contributes to mathematics achievement of students and is essential for their success (Foyle & Lyman, 1989; Sasser, 1981).

Finally, research has shown that cooperative group work promotes development of cognitive and interpersonal skills (Felder & Brent, 2007), which contribute to improved learning. Group work also enhances social and academic interaction among students (Slavin, 1995) and fosters student engagement in classroom.

## Keystone Method in Practice

The Keystone method is based on well-researched educational practices. It incorporates proven teaching techniques such as short lecture, classroom discussion, cooperative learning, and peer tutoring, along with frequent quizzes with immediate feedback. The most essential and innovative feature of the method is that all these good practices are organized in a learning-effective instructional cycle. The Keystone instructional cycle (Fig. 1) shows the interactive sequence of these components. All the components are carefully planned and designed in order to optimize student learning. The most salient components of this cycle are the frequent quizzes and cooperative learning. All quizzes are timed-restricted, cumulative, and based on homework. The iteration among practice quiz, study plan, and in-class quiz forms the central part of the frequent quizzing component and helps students to focus on solving problems and to apply common procedures and concepts to specific questions.

When there is a significant divergence in student performance, as evidenced by high standard deviation on the tests, the instructor moves from the lecture mode to cooperative learning and peer tutoring. For our present study in beginning and intermediate algebra classes, the typical standard deviation of a test is at the level of 20 on the scale of 100, which shows significant divergence in performance. In this setting, groups of four students from each quartile of the class standings assemble to discuss mathematics, solve problems, and learn from each other. Our model of cooperative group work incorporates individual accountability where each group member is accountable for the entire work assigned to the group. Only upon satisfactory performance of each member, the entire group can earn points. If one of the group members has not done sufficient preparation, he or she will be helped by other group members since there is an incentive for all to succeed as a group. The role of the instructor is not to punish a group for insufficient explanations of one of its members, but to help elucidate and articulate the concepts in order for the group to achieve common understanding of the problem.

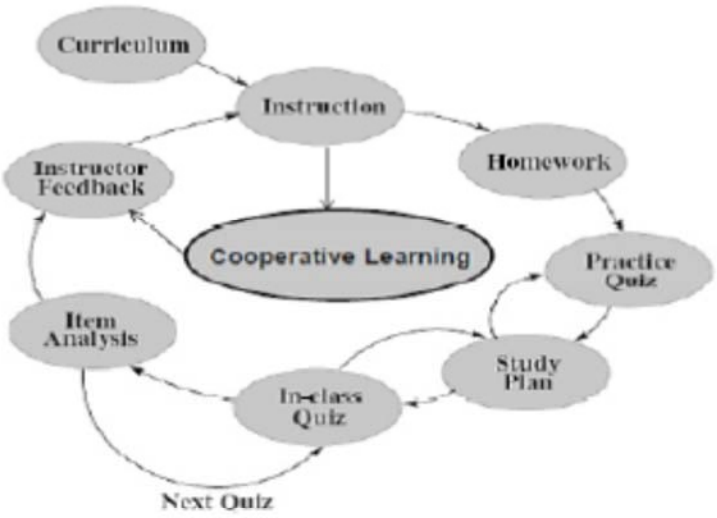


**Figure 1.** Keystone Instructional Cycle

In the Keystone approach troublesome questions on tests and quizzes are repeated until mastery of the topics is attained. Attainment of mastery aside from improvement of knowledge of students has a motivating by-product. It encourages students to work hard in order to achieve even higher gains. Evidence of recurring achievements improves students' self-confidence in doing mathematics and also enhances their self-esteem.

Finally, in the Keystone assessment system, grading of all tests and quizzes is determined on an absolute scale, rather than on a curve, requiring all students to acquire a certain level of proficiency to earn their grades, irrespective of other students' standings in the class. The fact that a student's own performance determines his/her own measure of success, and not its relation to other students' performance, mitigates classroom anxiety and produces bonding and camaraderie among students. Thus, cooperation and striving for excellence are promoted among all students without anyone's fear of being evaluated at the detriment of others. Moreover, the sense of being a member of a learning community, rather than being adversaries, promotes collegiality and social interaction and improves class participation and attendance.

In short, the Keystone method not only aims to improve student performance towards excellence in mathematics but also trains students to improve their universal skills such as concentration. Improvement of universal skills in students inculcates better work and study habits, which can transfer to other disciplines.

## The Role of Computer-Learning Technology

Research literature shows that technology alone cannot educate and "the mere presence of technology in a classroom is no guarantee that students will learn more" (Willingham, 2010). As Albano and Ferrari (2008) rightly observe, "Research in mathematics education has widely shown the complexity of teaching and learning processes, and thus the inadequacy of one-dimensional models, including the belief that simple addition of some technology to standard teaching practices could provide considerable improvements of the outcomes." One large study on the use of technology conducted on first-year general calculus students at a major research university showed that for students who do homework on a computer software program, WeBWorK, there was a slight, but nonsignificant improvement, in final exam scores compared to the control group (Hirsch & Weibel, 2003; Lewis & Tucker, 2009; Weibel & Hirsch 2002). In developmental courses, particularly in developmental mathematics classes, technology must be used very judiciously and only as a supplement to the classroom instruction. An interesting research study from the National Study of Developmental Education (Boylan, Bonham, Claxton, & Bliss, 1992) actually identified an inverse relationship between the amount of technology used and pass rates in developmental classes in both colleges and universities. "In essence, where computer technology was used as the only means of instruction, developmental students performed poorly." (Boylan, 2002).

Our experience shows that only through incorporating technology into a dynamic teaching model, we can improve the learning process for all students. Our current study will confirm that Keystone methodology is well suited for integration with computer-learning technology and their combination bears a synergistic effect.

In fall 2006, a computer program, MyMathLab, was used for the first time at Daley College to simplify quiz preparation, administration, and automatic item analysis. This computerization made it possible to provide an immediate feedback of the results of the quizzes to the students and to the instructor and opened a possibility for interactive teaching, where teaching techniques are adjusted according to the assessment results. This interactive design fit perfectly with the Keystone philosophy. It also allowed for effective coordination of multiple-section classes by one Keystone-trained instructor. In particular, the coordinator was able to prepare Keystone quizzes in the coordinator's class, which are automatically distributed to all other classes. This technique significantly simplified implementation of Keystone quiz methodology in multiple-session settings and made the method more practical. Computer technology also allowed for students to do a large number of algorithmically generated homework problems with an online assistance option that acted as an electronic tutor. At all times, grading and item analysis were provided automatically by computer software, freeing the instructor to work on more creative aspects of teaching and learning. Moreover, the instructor was able to not only monitor students' progress on homework and tests at all times, but to also monitor the amount of actual time students spend on different assignments. This aspect of time management served as an important diagnostic tool and helped the instructor to better assess the nature of students' difficulties on quizzes, tests, and homework.

## Research Method

In order to investigate the effect of the integration of Keystone methodology and computer learning technology on student learning, we performed an experimental/control study. The study was conducted in elementary and intermediate algebra classes at a community college in Chicago. From fall 2006 through spring 2009, more than 17 adjunct and full-time faculty members (35% full time, 65% adjunct) were trained in the management of the MyMathLab computer system through group workshops and individual training sessions. All students in experimental and control classes (except three control sections that did not incorporate technological support) used MyMathLab software for homework assignments during this period. Additionally, students in experimental classes were given daily quizzes with immediate feedback through item analysis, were able to take the post quizzes to attain mastery of the topics, and engaged in cooperative group work to improve their problem-solving skills (see the Keystone Instructional Cycle, Fig. 1). Instructors in the control classes were free to choose their own teaching and assessment techniques. Midterm and final exams were administered using MyMathLab software in all sections of beginning and intermediate algebra classes for six semesters, serving approximately 800 students each semester.

In this study, we used two different instruments for measuring student-learning outcomes: a national standard exit test, COMPASS, and the departmentally constructed common midterm and final exams. The cut-off score on the COMPASS test required for all elementary algebra students to advance to the next higher class, intermediate algebra, was 29.0.

(a) Student Learning Outcomes on COMPASS: A random sample of $N = 182$ students in elementary algebra classes was used in spring 2006, before MyMathLab was introduced as a technological medium to the department. At the end of this semester, these students took the COMPASS exit test in order to determine their competency to advance to the next higher class. In fall 2006 and spring 2007, MyMathLab technology was used in the department as a vehicle for students to do their homework on the computer, which provided them with immediate feedback on their answers and an opportunity to use online tutoring. Our sample consisted of $N = 311$ students in elementary algebra classes in fall 2006, and $N = 262$ students in elementary algebra classes in spring 2007. At the end of the semester, these students also took the COMPASS exit test in order to determine their competency to move to the higher math class. Furthermore, to test the effects of technology integrated with methodology, we used a sample of $N = 378$ elementary algebra students taught under the Keystone method with support of MyMathLab technology in fall 2007, and another sample of $N = 252$ elementary algebra students in spring 2008. Again, at the end of the respective semesters, these students took the COMPASS exit test.

(b) Student Learning Outcomes on Departmental Exams: For the experimental group, the study sample consisted of six classes comprising $N = 205$ students in elementary algebra for fall 2008 and spring 2009 semesters and also six classes comprising $N = 221$ students in intermediate algebra during the same period. There were two control groups, one that incorporated technology with instructional activities and the other that did not utilize technology in its coursework. The first control group, which used technology, consisted of eleven classes comprising $N = 333$ students in elementary algebra for both semesters and also eleven classes comprising $N = 354$ students in intermediate algebra for both semesters. The second control group, which did not utilize technology, consisted of three classes comprising $N = 101$ students in elementary algebra classes in fall 2008 and fall 2009 semesters. The assignment of all classes was random, i.e., students took their classes to meet their specific time and

work schedule requirements and not because of a peculiarity of teaching techniques. The teachers in experimental classes administered daily quizzes that were time-restricted, cumulative, and based on homework assignments.

Following each quiz, an automatic item analysis of quiz scores was generated and immediate feedback on class performance on each problem, as well as time spent on each question was provided to all students in class. The instructor then briefly reviewed the low-scoring problems, answered questions, and addressed students' difficulties. In order to encourage students to engage in the review/practice process and achieve mastery, students were allowed to take the postquizzes following each in-class administered quiz. Postquizzes were essentially a different version of the in-class quizzes and allowed students to earn additional points if they attained perfect scores. But in order to attain perfect scores, students had to perform a study plan, review the topics, and learn from their mistakes.

At each class session, following instruction and classroom discussion, cooperative group work and peer tutoring of students was conducted. The groups comprised four students from each quartile of the class standings, which engaged in discussion of problems provided by the instructor. The instructor then moved about the class and checked the work of each group by asking a randomly chosen member of the group to thoroughly explain the work done within his/her group. Only upon satisfactory explanation of the work done within the group, the entire group earned credit. For control classes, in the first control group (using technology) the instructors taught their classes in traditional ways, mostly by lecture, and assigned homework problems on computer that provided feedback and online tutoring and answered students' questions. They did not necessarily employ interactive teaching or frequent quizzing with immediate feedback. Also they did not conduct cooperative group work in a structured way, as was done in experimental groups. In the second control group (no technology), the instructors taught their classes in traditional ways, mostly by lecture, assigned homework problems on paper and administered their own periodic tests.

## Results

(a) Student Learning Outcomes on COMPASS: In this section, we will discuss the impact of technology on traditional and innovative teaching as measured by gains in student learning outcomes. Table 1 and Fig. 2 display the comparative COMPASS test exit scores for elementary algebra students for five semesters, from spring 2006 through spring 2008, academic years. As is seen from the table and the graph, in spring 2006, the last semester before MyMathLab computer software was implemented at the department, the elementary algebra students' COMPASS exit test scores had an average of 30.0. In fall 2006, and spring 2007, when MyMathLab technology was implemented, the elementary algebra students' COMPASS exit test scores had averages of 29.24 and 29.21, respectively. Thus, the exit test scores of students in two consecutive semesters showed a very slight, but statistically insignificant decline, upon the introduction of technology. These results demonstrate that a mere introduction of modern technology on traditional teaching does not improve student-learning outcomes. Also, the fact that the cut-off COMPASS test score determining eligibility to advance to the next higher class, intermediate algebra, remained at 29.0 in all semesters, indicates that students taught under traditional methods attained very similar but, minimal, competency to advance to intermediate algebra, in both pretechnology and posttechnology periods. Table 1 and Fig. 2 also exhibit the COMPASS test scores of elementary algebra students who were taught under the Keystone method with the use of MyMathLab technology. As is clearly seen, students' average test scores were 31.53 and 32.89, in fall 2007 and spring 2008, respectively. These scores are highly significant, exceeding 3-sigma standard error, indicating that the Keystone methodology with the utilization of MyMathLab technology produces student outcomes that far exceed those attained solely under traditional teaching with or without the use of technology.

| Semesters | Spring 2006 | Fall 2006 | Spring 2007 | Fall 2007 | Spring 2008 |
|---|---|---|---|---|---|
| Compass Test Scores | 30.0 | 29.24 | 29.21 | 31.53 | 32.89 |
| Sample size | N = 182 | N = 311 | N = 262 | N = 378 | N =2 52 |
| Use of Methodology (Keystone) | No | No | No | Yes | Yes |
| Use of Technology (MyMathLab) | No | Yes | Yes | Yes | Yes |

Table 1. COMPASS Test Results for Elementary Algebra Students

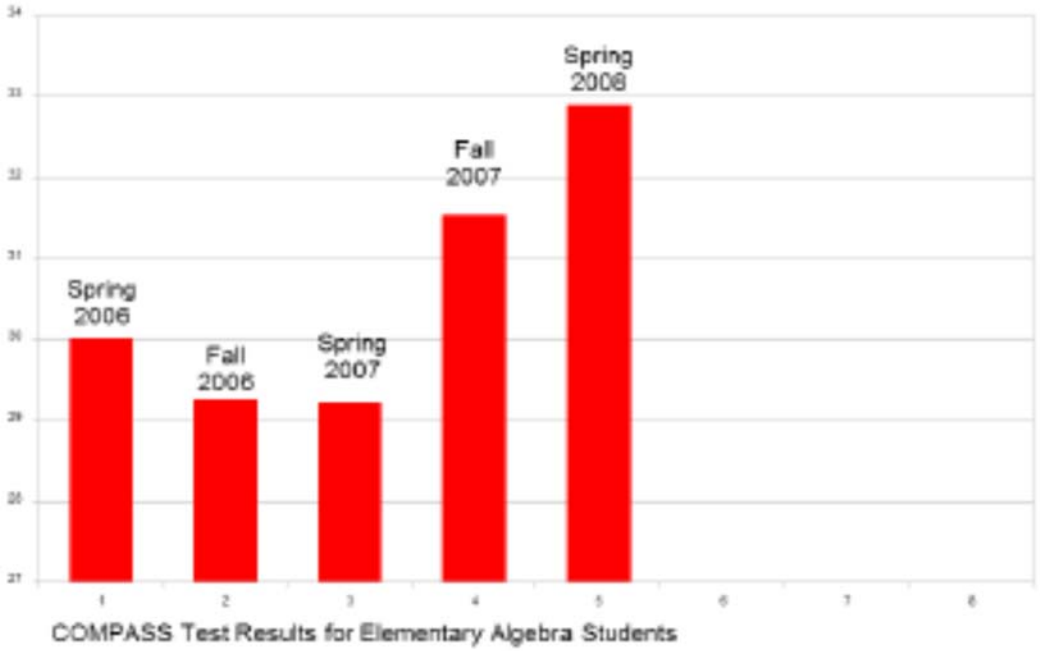


**Figure 2.** Spring 2006–Spring 2008 Elementary Algebra COMPASS Test Scores

The preceding results confirm that technology produces positive and significant impact on learning only when it is used in conjunction with and in support of innovative teaching methodology.

(b) Student Learning Outcomes on Departmental Exams: Student performance is measured on the departmentally constructed pretests, midterm, and final exams during fall 2008 and spring 2009 semesters.

Table 2 presents descriptive statistics on student performance in elementary algebra for both experimental and control classes for fall 2008 and spring 2009 semesters. The weighted average pretest scores for experimental and control classes were 49.5 and 51.1, respectively, indicating that the classes were similar in prerequisite knowledge. The midterm weighted average scores for experimental and control groups were 61.4 and 55.3, respectively, showing the better performance of experimental over the control groups in spite of the fact that the experimental groups started off with lower pretest scores compared to the controls. The final weighted average scores for experimental and control groups were 73.7 and 61.1, respectively, clearly showing the significant improvement (exceeding the 5-sigma standard deviation, which has a $p$-value $<10^{-6}$, for one-tailed Gaussian distribution) of experimental groups over the controls at the end of the semesters (see Fig. 3). The retention rates for experimental and control groups were 65% and 66%, respectively, which are also statistically equivalent.

| Elementary Algebra | Pretest Score | Midterm Exam Score | Final Exam Score | Retention Rate |
|---|---|---|---|---|
| Experimental Classes N = 205 | 49.5 | 61.4 | 73.7 | 65% |
| Control Classes N = 333 | 51.1 | 55.3 | 61.1 | 66% |

**Table 2.** Impact of Methodology on Elementary Algebra as Measured on Departmental Exams (Fall 2008–Spring 2009)

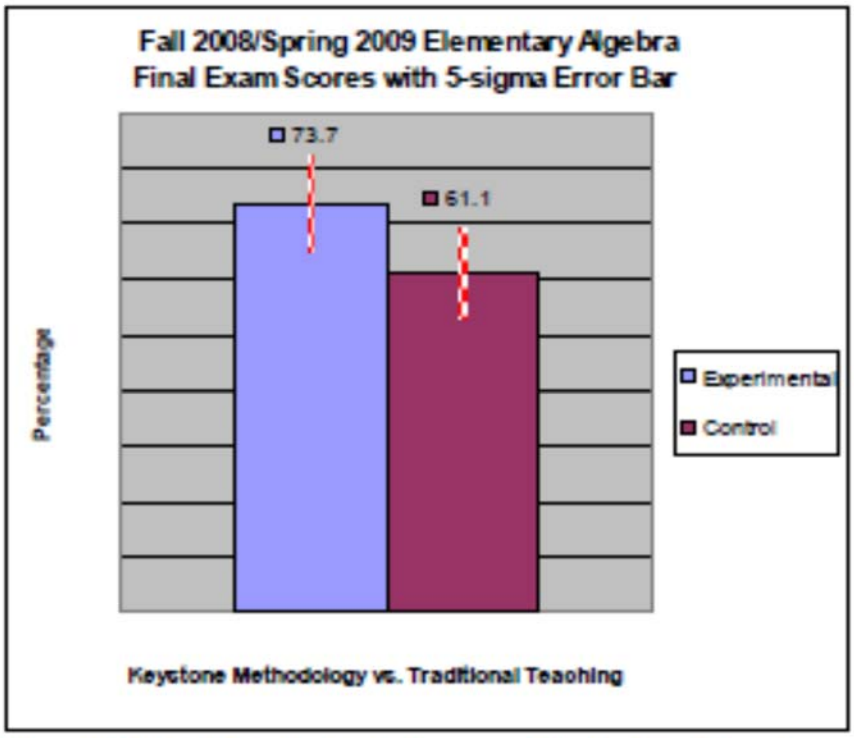


Figure 3. Fall 2008/Spring 2009 Elementary Algebra Final Exam Scores

Table 3 displays descriptive statistics on student performance in intermediate algebra for both experimental and control classes for fall 2008 and spring 2009 semesters. The weighted average pretest scores for experimental and control classes were 75.0 and 76.0, respectively, indicating that the classes were similar in student prerequisite knowledge. The midterm weighted average scores for experimental and control groups were 52.4 and 57.4, respectively, showing the slightly better performance of controls over the experimental groups nearly halfway into the semester. The final weighted average scores for experimental and control groups were 74.2 and 57.9, respectively, clearly showing the highly significant improvement (exceeding the 5-sigma standard deviation, which has a $p$-value $<10^{-6}$, for one-tailed Gaussian distribution) of experimental groups over the controls at the end of the semesters (see Fig. 4). The retention rates for experimental and control groups were 77% and 69%, respectively, showing that experimental groups achieved higher gains with improved classroom retention.

| Intermediate Algebra | Pretest Score* | Midterm Exam Score | Final Exam Score | Retention Rate |
|---|---|---|---|---|
| Experimental Classes N = 221 | 75.0 | 52.4 | 74.2 | 77% |
| Control Classes N = 354 | 76.0 | 57.4 | 57.9 | 69% |

Table 3. Impact of Methodology on Intermediate Algebra as Measured on Departmental Exams (Fall 2008–Spring 2009)

*Pretest scores represent the average final exam scores of students in their elementary algebra classes

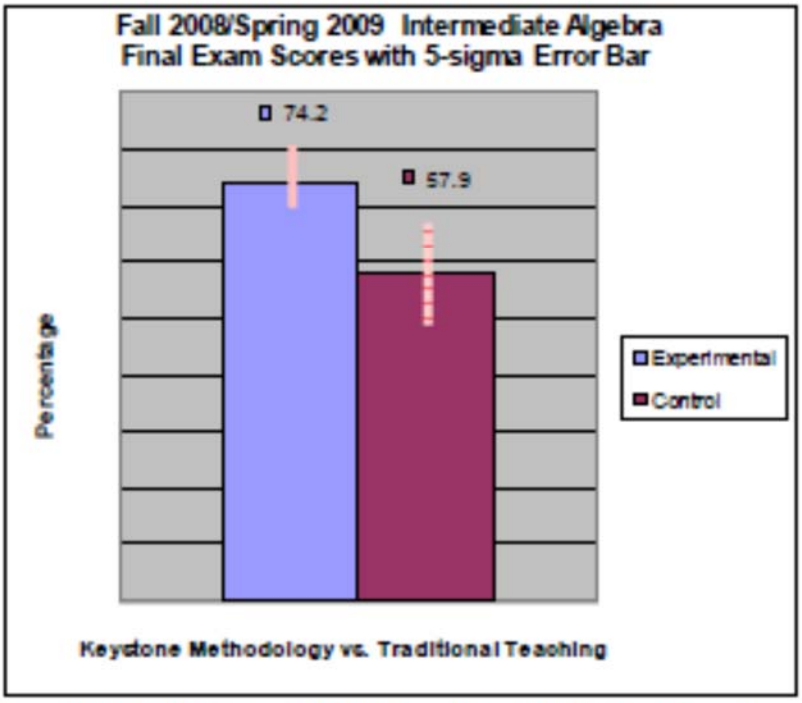


Figure 4. Fall 2008/Spring 2009 Intermediate Algebra Final Exam Scores

Finally, Table 4 and Fig. 5 exhibit the performance outcomes of elementary algebra students taught under traditional approaches, without the use of technology, in fall 2008 and fall 2009 semesters, as well as the performance of elementary algebra students taught under traditional approaches incorporating technology, in fall 2008 and fall 2009 semesters. The student outcomes were measured on departmentally constructed midterm and final exams. As is seen the weighted average pretest, midterm and final exam scores in these classes for the first group (traditional and no technology) were 54.4%, 55.8%, and 59.5%, respectively, with the weighted average retention rate of 77%. For the second group (traditional with technology) the weighted average pretest, midterm, and final exam scores were 47.7%, 57.8%, and 61%, respectively, with the weighted average retention rate (final to initial enrollments) of 83%. The average final exam scores for both groups were very similar and, in fact, statistically equivalent (a 0.41-sigma standard deviation, which has a $p$-value = 0.341, for one-tailed Gaussian distribution). The slightly higher gains of the technology group over its no-technology counterpart could be attributed to the added computer skills acquired by the former over the latter, since the exams were all administered online in a computer lab. This could have confounded the gains in favor of the technology group. These results indicate that incorporating technology with traditional approaches does not contribute to a significant improvement of student learning outcomes in elementary algebra classes.

| Elementary Algebra | Pretest Score Average | Midterm Exam Average | Final Exam Average | Retention Rate |
|---|---|---|---|---|
| Traditional without Technology N = 101 | 54.4% | 55.8% | 59.5% | 77% |
| Traditional with Technology N = 103 | 47.7% | 57.8% | 61.0% | 83% |

Table 4. Impact of Technology on Elementary Algebra as Measured on Departmental Exams (Fall 2008–Fall 2009)

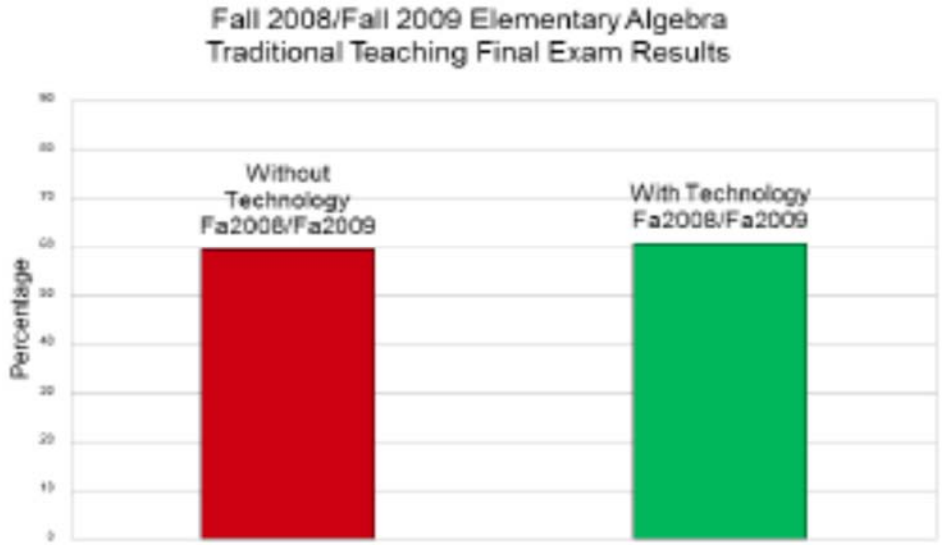


Figure 5. Fall 2008/Fall 2009 Results without and with Technology

In Table 5, below, we present a concise summary of the research study for 2006-2009.

| Type of Study | | Methodology (Keystone) | | Technology (MyMathLab) | |
|---|---|---|---|---|---|
| Definitions of Groups & Sample Information | | Keystone Experimental Group | Keystone Control Group (No Keystone) | Technology Experimental Group | Technology Control Group (No Technology) |
| COMPASS Data of Elementary Algebra | Semester | Fall 2007 | Fall 2006 | Fall 2006 | Spring 2006 |
| | Sample Size | 378 | 311 | 311 | 182 |
| | Test Scores | 31.53 | 29.24 | 29.24 | 30.0 |
| | Semester | Spring 2008 | Spring 2007 | Spring 2007 | |
| | Sample Size | 252 | 262 | 262 | |
| | Test Scores | 32.89 | 29.21 | 29.21 | |
| | Total Size | 630 | 573 | 573 | 182 |
| Final Exam Data of Elementary Algebra | Semester | Fall 2008 | Fall 2008 | Fall 2008 | Fall 2008 |
| | Sample Size | 133 | 119 | 0 | 36 |
| | Semester | Spring 2009 | Spring 2009 | Fall 2009 | Fall 2009 |
| | Sample Size | 72 | 214 | 103 | 65 |
| | Total Size | 205 | 333 | 103 | 101 |
| | Test Scores | 73.7 | 61.1 | 61.0 | 59.5 |
| Final Exam Data of Intermediate Algebra | Semester | Fall 2008 | Fall 2008 | | |
| | Sample Size | 112 | 178 | | |
| | Semester | Spring 2009 | Spring 2009 | | |
| | Sample Size | 109 | 176 | | |
| | Total Size | 221 | 354 | | |
| | Test Scores | 74.2 | 57.9 | | |

Table 5. Summary of Findings for Experimental and Control Groups for the Period of Study

The findings in Table 5 demonstrate that students achieve higher performance outcomes in elementary and intermediate algebra when taught under our synergistic system of methodology and technology compared to those taught under traditional methods with or without the incorporation of technology.

## Discussion

The question of modern technology in today's higher education is not one of access, since personal computers, the Internet, and advanced software have been widely available on the educational scene for several decades now. The important question lies in the proper use of technology: How can technology be used to help improve teaching and learning? The authors of this article strongly believe that to be effective, modern technology needs to be integrated into innovative instructional practices. Our study shows that only the synergistic approach that incorporates modern technology with the Keystone methodology can produce significant outcomes in student learning in developmental math classes at the college level. Using two different instruments of measurement: a common departmental exams and a COMPASS test, we have seen that application of technology on traditional teaching does not produce significant outcomes in learning. In contrast, employing the innovative Keystone methodology with state-of-the-art MyMathLab technology produces significant learning outcomes in developmental math classes.

The Keystone model preserves the integrity of classroom instruction while incorporating computer technology as a tool in support of teaching and the teacher. It is not labor-intensive since it frees the teachers from devoting inordinate amounts of time grading homework, constructing multiple versions of quizzes and tests, and tracking student progress. Instead, it allows the instructor to better focus and engage in more creative and productive aspects of teaching and learning.

This study needs to be further expanded to encompass larger samples of students and other colleges with significant enrollments in developmental math classes. Moreover, there needs to be additional studies designed to track cohorts of students in several continuous semesters in order to investigate the retention of students' knowledge in experimental and control classes over time.

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## The *Math*AMATYC *Educator* is looking for "LUCKY LARRY"!

Who is "Lucky Larry" (or Lucky Lucy?) These are examples of student work where the student got the correct answer, but used an incorrect technique or process! If you encounter these while you are grading student work, please take a moment and send them off to editor, Pete Wildman, at petewildman@comcast.net or Production Manager, George Alexander, at galexander@matcmadison.edu. Many of our readers use these as learning tools in their classrooms. Furthermore, they can just be fun and interesting!