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NJCSTM_2018-2019_Deans_Report

Abstract

NJCSTM 2018-2019 Deans Report

Keywords

NJCSTM, 2018-2019, Deans Report

2018-2019 College-level Annual Assessment Results and Recommendations Report

This report serves to provide a summary of results and recommendations for the College-at-large.

Data from each individual program is to be addressed:

College: New Jersey Center for Science, Technology & Mathematics

Dean: Keith A. Bostian

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Section 1: Summary of the State of the College

This report provides a college level assessment of the academic programs for the New Jersey Center for Science, Technology and Mathematics for the 2018-2019 academic year. The state of the Center remains very strong. Enrollment is up significantly, with the exception of the STEM Ed programs, and many curriculum enhancements have been implemented across the board, including the 120-credit mandate, at both the undergraduate and graduate level.

Student Learning Outcome assessment data indicates that students are performing as expected, and above average in several areas. We had noticed a dip in last year's assessment data with regard to quantitative literacy in the 2017 (BS) graduating cohort, and have seen the following cohort return to norms performing at standard in that area. One question we had last year was whether the RFI program was having an impact on literacy and communication skills. We looked at assessment of quantitative literacy across two courses taken exclusively by either non-RFI students (STME 3610) or RFI students (STME 3903). While both groups performed at or above standard, the RFI students outperformed the non-RFI students, despite being assessed a full 3 semesters earlier in their academic development. We do not know if this is causal or a selection effect at this time. Academic performance across the board continues to be a strength of the program and in line with other measures of student retention and success.

Major new initiatives planned for the upcoming academic year, include:

- Complete the launch of the MS Genetic Counseling Program
- Develop new programs in Human Genetics/Genomics
- Determine feasibility of establishing a new program in Emerging/Disruptive Technologies
- Secure scholarship funding source(s) for 5th year professional degree program students
- Through effort of a newly formed STEM Ed Task Force, revitalize the curriculum and recruitment strategies for the STEM Ed programs and build enrollment
- Increase outside funding for NJCSTM research programs
- Expand and enhance outside academic collaborations with NJIT, Hackensack Meridian Medical School, Wenzhou University and Wenzhou Kean University

Recruitment efforts will continue, with a focus on the Science Education and MS Biotechnology Programs, and development of new recruitment strategies, including broader regional and national marketing and recruitment.

A. Enrollment and Graduation Rate Analysis

Analyze and discuss the current year's program data as compared to the previous five years of collected data for each program with respect to:

- **Program Enrollment**

Overall enrollment for NJCSTM has been increasing over the past five years, particularly in the Biomedicine, Molecular Biology/Biotechnology and Computational Science & Engineering programs. We have exceeded our enrollment goal for the class of 2019-20 with a total of 70 students (66 FTF and 4 transfers), an over 2-fold increase from 2013. The Computational Science & Engineering and Biomedicine programs have grown significantly over the past 3 years and Math Education remains steady and consistent with last year's numbers.

The Biology and Chemistry Education programs continue to struggle with low enrollment numbers, with the Math Education program comprising the majority of Education students remaining at approximately 67% of Education majors since 2014. Combined, the three Education programs meet minimum enrollment numbers at the undergraduate level, however, at the graduate level the courses divide for Math and Chemistry/Biology, causing low course enrollment issues in several graduate level Science Education courses. The department is aware that promoting and advancing the STEM Educators program is needed, and is a priority for the 2019-2020 year. As such, a STEM Education task force was recently created to rebuild the Education program with respect to curriculum enhancements that position the program more competitively, create new marketing material, and develop and pursue new outreach and recruiting strategies. Some examples of this already underway are a Seeds of Change initiative and a China Sister School Program that are engaging and developing relationships with New Jersey academic administrators and teachers.

Table 1. NJCSTM Undergraduate Program Enrollment*

	2019	2018	2017	2016	2015	2014	2013	2012	2011
Bio Ed	4	2	3	1	4	2	3	3	2
Chem Ed	1	1	4	1	2	2	2	4	2
Math Ed	12	9	9	13	10	6	5	4	10
Mol Biol/Biotech	12	13	13	18	15	7	9	8	2
Comp Science	19	18	11	9	7	6	2	2	1
Biomed	19	12	5	6	3	1	2	1	7
Biomed DRX	-	-	-	-	-	2	1	3	0
Engineering	3	3	0	0	1	0	5	1	0
Total	70	58	45	48	42	26	29	26	24

**Transfer students are counted in incoming class numbers for the year they matriculate into the STEM program, although their graduating cohort year may be different depending on their class standing at the point of transfer.*

+ Anticipated cohort number for FA19 (as of 9/1/19).

Despite the discontinuation of the Drexel agreement, enrollment in the Biomedicine program has tripled since 2016. Conversations are underway with Hackensack Meridian Health (HMH) regarding a 4+4 BS/MD articulation agreement that would further increase enrollment in our programs. While relationships have been developed at the executive leadership level at HMH, and the research arm of the medical school (HMH CDI), we have not yet been able to engage with the academic leadership to discuss such a program. Pursuing this with them will be a high priority for the Center in the 2019-2020 year.

Engineering Science does continue to struggle with low numbers; although the program has attracted more students in recent cohorts. The articulation agreement with NJIT is in the process of being updated to address issues with registration, advisement and tuition, along with refining the engineering tracks offered to more closely align with the STEM programs offered by NJCSTM. It is expected that these changes will further increase enrollment in the program.

Because the NJCSTM offers 5-year BS/MS/MA programs, undergraduate enrollment numbers have a direct impact on graduate program enrollment (See **Table 2**).

Table 2. MA & MS (5th Year) NJCSTM Program Enrollment

	2019 (2015 cohort)	2018 (2014 cohort)	2017 (2013 cohort)	2016 (2012 cohort)	2015 (2011 cohort)	2014 (2010 cohort)	2013 (2009 cohort)
MA Bio Ed	1	2	2	2	1	2	1
MA Chem Ed	3	0	1	2	1	5	2
MA Math Ed	3	5	6	3	10	8	9
MS Biotech	5	6	8	8	2	2	6
MS Comp Math	1	7	2	1	0	1	0
Total	13	20	19	16	14	18	18

As the most recent cohorts of undergraduate students (2012-present) matriculate into the MS/MA programs, enrollment numbers will continue to increase in the Biotechnology program. There was a drop in graduates from the Computational Math program this year; however, this will start to increase again as the latest cohorts move through the program. Enrollment in the Biology and Chemistry Education programs will continue to struggle.

Enrollment in the MS Biotechnology program was on the rise but has now plateaued (See **Table 3**). The stand-alone program is very synergistic with the 5-year BS/MS Molecular Biology program. Students in their 5th year take required and elective courses with the stand-alone Master's students, and combined, these numbers have enabled the courses to continue to run with healthy enrollment numbers (See combined enrollment numbers in **Table 4**). As enrollment in recent cohorts of the undergraduate Molecular Biology program continues to increase, overall numbers in the MS Biotechnology courses will also continue to rise.

A new curriculum was implemented in 2018 to align coursework with current employment needs with tracks in Advanced Biotechnology & Drug Discovery, Analytical Chemistry, Bioinformatics, and Life Sciences Business Management. Several new courses were developed but have not yet achieved full capacity with current enrollment numbers. Revised course scheduling and management practices may help address this problem in the near term. Course demand and scheduling will become easier with time, as students select specific tracks from among the four tracks offered, based on individual track requirements. In addition, some of the older courses are currently offered in both Fall and Spring. Eliminating this redundancy by offering these courses once a year, in either the Fall or Spring would help increase enrollment in the newer courses. Lastly, the older courses are scheduled during prime time hours, offering some of the newer courses at earlier times may also improve enrollment. Until a greater number of students matriculate into the program, this will continue to be a problem. The addition of students from Wenzhou University and Wenzhou-Kean University in the coming years will help rectify this problem in the longer term.

We need a better marketing strategy to highlight the new curriculum and more effort must be put into recruitment for the stand-alone program. A marketing and recruitment strategy and partnership with the graduate admissions group, focused on candidates in the mid to late 20's age group from undergraduate institutions and the biopharmaceutical, healthcare and chemical sectors should be a priority.

Table 3. MS Biotechnology Program Enrollment (2-year stand-alone).

	2019	2018	2017	2016	2015	2014	2013	2012
MS Biotechnology*	22**	24	30	22	16	25	27	30

*numbers obtained from IR report

**includes 16 continuing students (based on internal records) plus 6 new FA19 admits as of 9/1/19

Table 4. MS Sci/Tech Biotech Option & MS Biotechnology Combined Program Enrollment.

	2019	2018	2017	2016	2015	2014	2013	2012
MS Biotechnology	22	24	30	22	16	25	27	30
MS Biotech (5 th Year)	5	2	8	8	2	2	6	2
Total	27	26	38	30	18	27	33	32

- **Graduation Rates (4-year and 6-year graduation rates)**

The graduation rate from the STEM program between 2014-2018 is **72.1%**. When you include the most recent graduating class, this drops to 66%. The 2015 cohort struggled with retention and there are a number of students who were unable to graduate on time (within 4 years). Retention for the 2020 graduating class is currently 75% so we anticipate a higher graduation rate next year.

Table 5. NJCSTM Undergraduate Program Graduation Rates (First-time full-time freshmen)

	Class of 2019 (2015 Cohort)	Class of 2018 (2014 Cohort)	Class of 2017 (2013 Cohort)	Class of 2016 (2012 Cohort)	Class of 2015 (2011 Cohort)	Class of 2014 (2010 Cohort)
STEM Overall Graduation Rate		81.8%	68.0%	73.1%	78.3%	63.6%
STEM 4-Year Graduation Rate	40.0%	65.3%	65.5%	69.2%	79.2%	60.6%
Overall Kean Graduation Rate (includes students who transferred to another major at Kean and graduated)	43.3%	95.5%	72.0%	80.8%	87.0%	72.7%

The overall graduation rate between 2014-2018 rises to **80.6%** when you include students who entered the STEM program, but graduated from other majors at Kean (the average number of years for degree completion for students who transferred out from STEM is 5.3).

The graduation rate for the Master's (5th) year of all STEM programs is **91%** since 2013 (See **Table 6**). Nearly all students who matriculated into the 5th year completed their degree within one year. Those students who do not complete their MS degree in 1 year often decide to take a year/semester off, or move directly into a PhD program.

Table 6. MA/MS 5th Year Program Graduation Rates.

	Class of 2019 (2018 Matric Yr*) (2014 UG Cohort)	Class of 2018 (2017 Matric Yr*) (2013 UG Cohort)	Class of 2017 (2016 Matric Yr*) (2012 UG Cohort)	Class of 2016 (2015 Matric Yr*) (2011 UG Cohort)	Class of 2015 (2014 Matric Yr*) (2010 UG Cohort)	Class of 2014 (2013 Matric Yr*) (2009 UG Cohort)	Class of 2013 (2012 Matric Yr*) (2008 UG Cohort)
MA Bio Ed	100%	100%	100%	100%	100%	100%	-
MA Chem Ed	-	100%	100%	100%	80%	50%	100%
MA Math Ed	80%	83.3%	100%	90%	100%	88.9%	100%
MS Biotech	83%	75%	100%	100%	100%	100%	100%
MS Comp Math	86%	50%	100%	-	100%	-	-
Total		83.3%	87.5%	92.9%	94.4%	88.9%	100%

**Graduation rates are calculated based on the year of matriculation into the program; the UG cohort year may vary for some students (i.e., transfers and those who did not graduate from their UG program in 4 years).*

Table 7 below includes the number of degrees conferred from the stand-alone 2-year MS Biotechnology program during the last 6 years. We anticipate these numbers to increase as enrollment grows.

Table 7. MS Biotechnology Degrees Conferred (2-year stand-alone).

	2018	2017	2016	2015	2014	2013	2012
MS Biotechnology*	9	10	4	19	13	13	14

**numbers obtained from IR report*

B. Program Student Learning Outcome Assessment Data and Recommendations

For each individual program, summarize the current year’s program assessment (from annual reports and program reviews) including:

- **Student Learning Outcomes Data**
- **Recommendations Based on Findings**

Overall NJCSTM Student Learning Outcome Assessment Data

The interdisciplinary nature of NJCSTM requires most courses to be points of assessment across all programs. To increase the number of responses and decrease redundancy, assessment data has been summarized across program options. **Table 8** summarizes the SLOs and direct measures used across all programs.

We continue to work to unify NJ assessment across our programs, allowing us to better gather data aligned with university and GE SLOs, particularly as our BS/MS options share much of the introductory coursework and the students go through the program as a cohort. Additionally, we have significant overlap in coursework and content between the Biomedicine, Molecular Biology, and Biotechnology cohorts. We have rewritten our SLOs into four core objectives, with options within programs to be able to specify either; additional details for a given SLO or additional SLOs beyond the core assessment goals.

Table 8. SLOs & Direct Measures across NJCSTM Programs.

Direct Measure	Academic Program	SLO Addressed	
STME 4610 Paper & Presentation	All BS Students	Holistic knowledge - Quantitative Literacy	SLO2,2.3
STME 3610 & 3903 Poster Presentation	All BS Students	Holistic knowledge - Quantitative Literacy Communication-Oral	SLO2,2.3 SLO4
GE 2024 Review Paper	All BS students BS Molecular Biology	Critical Thinking Communication-Oral Ethics (SLO5)	SLO2,2.3 SLO4 SLO5
STME 2199 (formerly 1603 Lab practical)	All BS Option Computational Mathematics	Critical Thinking Scientific Programming	SLO3 SLO1.1
STME 5615 Paper	Biotechnology	Content knowledge Skills Holistic knowledge - Quantitative Literacy Connections Communication	SLO1 SLO1.1 SLO2 SLO2.5 SLO4
ID 5800 Thesis	Computational Mathematics	Applied Math Knowledge Scientific Programming Modeling Optimization Data Mining & Visualization Holistic knowledge - Quantitative Literacy Critical Thinking Communication	SLO1 SLO1.1 SLO1.2 SLO1.3 SLO1.4 SLO2 SLO3 SLO4
Master's Thesis	Molecular Biology Biotechnology	Content Knowledge Content Knowledge Skills Communication	SLO1 SLO1 SLO1.1 SLO4
EMSE 5564 Student Teaching Evaluation	Instruction & Curriculum	Pedagogical Knowledge Content Knowledge & Leadership	SLO1.1 SLO1.2
STME 5031 Project	Instruction & Curriculum	Pedagogical Knowledge Content Knowledge & Leadership	SLO1.1 SLO1.2
EMSE 3220/3230 Mini TWS, Sample Lesson Plan	Instruction & Curriculum	Standards Pedagogical Knowledge	SLO1.1 SLO1.2

STME 4610 Paper & Presentation

SLOs: KU Quantitative Literacy Rubric for 10-15 minute oral presentation

Target: Department target is that students score a 3 or higher (based on a 4 point scale) on each measure in the rubric.

Discussion of Findings: This is the third year specifically using the Quantitative Literacy rubric and substantial improvements have been made in all categories since implementation in 2017.

STME 4610 Paper & Presentation			
Category/Criterion	Mean 2017	Mean 2018	Mean 2019
Interpretation	2.99	3.42	3.65
Representation	2.96	3.48	3.48
Calculation	3.15	3.5	3.57
Application/Analysis	3.02	3.4	3.63
Assumptions	3.00	3.5	3.57
Communication	2.85	3.25	3.55

Suggestions made by previous instructors were implemented and the course was revised to focus on these key areas. In particular, a great deal of time was spent on presenting quantitative data to a mixed audience. These sessions encouraged the students to provide more background information without sacrificing time for results. Another technique used was to have each student come up with three questions for each talk in order to better prepare the speakers.

The trends are encouraging; however, there is definite room for improvement. We will continue to stress quantitative aspects in STEM research projects and have students utilize appropriate statistical tools and generally become more comfortable with the methodology.

STME 3610 & 3903 Poster Presentation

SLOs: KU Quantitative literacy rubric was used to evaluate poster presentations in STME 3610 (junior year seminar course) and STME 3903 (Advanced RFI).

Target: Department target is that student performs satisfactorily (2.8 on a 4-point scale) on each measure in the rubric.

Discussion of Findings: Both groups of students meet the standard expected at the junior level in quantitative understanding. However, the students in 3903 meet it at a higher level, and in most cases do so as sophomores instead of as juniors. Whether this is due to a higher level of student choosing to complete the RFI sequence or the RFI sequence better preparing our students is yet to be determined.

SLO 2.3 Category/Criterion	Mean 2019 STME 3610	Mean 2019 STME 3903
Interpretation	3.22	3.4
Representation	3.10	3.69
Calculation	3.0	3.31
Application/Analysis	3.09	3.4
Assumptions	3.0	3.4
Communication	3.08	3.21

GE 2024 Review Paper

SLOs: KU Oral Communication Rubric for Oral Presentation. KU Written Communication Rubric for Final Paper. KU Critical Thinking Rubric for Review Paper, Oral Presentation & Class Participation.

Target: Department target is that students score a 2.4 on 4 point scale (3 on a 5 point scale) or higher on each measure in the rubric.

10-15 page Review Paper				
SLO 4: Communication - Writing	2018 Mean	2018 St Dev	2019 Mean	2019 St Dev
Genre/Audience	4.52	0.40	4.05	1.17
Focus	4.44	0.45	3.95	1.09
Development	4.58	0.48	3.73	1.12
Organization	4.48	0.67	4.00	1.11
Grammar/Mechanics	4.67	0.35	3.91	1.06
Revision	4.63	0.49	3.32	1.36

15-minute Oral Presentation				
SLO 4: Communication - Oral	2018 Mean	2018 St Dev	2019 Mean	2019 St Dev
Analysis of Topic	4.60	0.29	4.54	0.39
Supporting Material	4.56	0.31	4.29	0.35
Organization	4.59	0.31	4.44	0.30
Style	4.52	0.34	4.43	0.40
Engagement	4.40	0.38	4.09	0.40
Body Movement	4.52	0.38	4.31	0.44
Voice Quality	4.33	0.46	4.27	0.57
Fluency	4.32	0.37	4.17	0.43
Outline	4.57	0.29	4.36	0.45
Overall Impact	4.44	0.32	4.39	0.35

Review Paper, Oral Presentation and Class Participation		
SLO 2: Critical Thinking	Mean	St Dev
Explanation of Issues	2.14	0.71
Evidence	2.23	0.53
Influence & Contradictions	1.73	0.55
Student's Position	1.59	0.67
Connections & Synthesis	1.36	0.49
Conclusions and Outcomes	1.55	0.51

Discussion of Findings: Throughout the semester, students were oriented towards the KU Communication Literacies expectations and it was expected that performance should have increased steadily and culminated in high scores. Although scores remained high in all areas, they did not increase from the previous year. Continued coaching on expectations should continue in future semesters. In regards to Critical Thinking, this was the first semester in which the rubric was applied so there is no data from previous semesters to compare. As both the instructor and students had no prior knowledge of the KU GE Critical Thinking expectations, scores may be low by comparison to the general student population. All critical thinking scores from SP19 fell between Benchmark and early Milestone levels (1.36-2.23). These scores may be interpreted in light of the fact that the majority (20 of 22) of students were in the first year of their undergraduate experience. It is expected that their critical thinking skills will improve as they move through their curriculum.

STME 2199 (formerly 1603) Lab practical

SLOs: Scored with custom rubric. The STME 2199 Lab Practical has tasks designed to assess skills in running and interpreting code, modifying an existing code to solve a similar problem, plotting functions in MATLAB, using built-in MATLAB functions, debugging code, and writing a new script to solve a novel problem. The intent was to design tasks that could be used to address only a single skill. For this reason, some of the tasks were simple.

STME 2199 Lab Practical	
SLO	Results
BS/MS Science & Tech. (all options)	Interpreting Graphs = 3.17
SLO 3	Modifying Code = 3.92
Critical Thinking	Plotting/Visualization = 3.40
BS/MS Science & Tech., Comp. Science & Eng.	PreBuilt Tools = 3.58
SLO 1.1	Debugging = 0
Scientific Programming	New Code = 3.08

Target: Students should score 2.8/4 on a 4-point scale.

Discussion of Findings: The lab practical had computational problems directly related to the math content of the lecture. This year’s practical reflected an emphasis on plotting and interpretation of graphs, as well as numerical integration and tools for solving differential equations. By far the biggest deficiency in this lab practical was in the debugging skill. This is a crucial critical thinking skill, but was probably not assessed properly this year. In the past, debugging problems had both syntax errors and logical errors. Since these are two different types of errors, the instructor decided this year to put in a script that had only a few errors (capitalization of variable name). Unfortunately, the program ran fine, but resulted in an incorrect answer. Since the code produced a result (albeit an incorrect one), all of the students were satisfied, and indicated that no modifications were needed. For next year, we will ask the question at the end of each solution: “does it look right? Why or why not?” For next year’s practical, two different debugging problems will be included. One that expressly gives errors (that is, the code will not successfully run to the end), and a second which runs but gives wrong answers. Students will be told at the outset what the correct answer is, and to find the source of the problem. The second biggest problem was in interpreting graphs. A single question was asked (“at what time does $y = 4$?”) and many students misread the question as “what is $y(4)$ ”. If both questions had been asked we expect that most students would have answered correctly. Next year multiple questions about the plot will be included.

STME 5615 Chemical Instrumentation, Paper

SLOs: Paper scored for communication using GE writing rubric, and for applied and holistic knowledge using a custom rubric.

Target: Students should score 3.9/5 on a 5-point scale.

Discussion of Findings: Students scoring at acceptable level on all measures, no action recommended at this time.

STME 5615 Chemical Instrumentation	
SLO	Results
Biotech SLO 1 applied knowledge	4.2/5 (average, no of students = 10)
Biotech SLO 2 holistic knowledge	4.3/5 (average, no of students = 10)
Biotech SLO 4 communication	4.3/5 (average, no of students = 10)

ID 5800 Thesis

SLOs: Scored with custom rubric. Student prepared a written thesis, which was reviewed by the thesis committee consisting of the computational science and engineering faculty in the NJCSTM.

Target: Students should score 4/5 on a 5-point scale (3.2/4 for a 4-point scale). The scores for 2019 were pro-rated for a 4-point scale.

ID 5800 Thesis		
Objective	2018 Mean	2019 Mean
Student expresses comprehensive knowledge of mathematics & computer science concepts	5	3.75
Student shows ability to apply computational mathematics to a distinct content area	3	3.625
Student shows ability to think critically	5	3.375
Student shows ability to express mathematical & scientific content verbally	4	3.25
Student shows ability to express mathematical and scientific content in writing	4	3.75
Student should be able to properly implement an algorithm	5	3.5
Student should be able to choose an appropriate algorithm to solve a problem	5	3.375
Student should be able to determine the optimum of many solutions to a problem	N/A	N/A
Student should be able to visualize & express massive datasets	5	3.25

Discussion of Findings: Students (n=6) were all at level, however scores were brought down substantially by one of the students included in this analysis. Efforts will need to be made in future thesis projects to ensure that students begin projects that have a clear pathway to completion in the shortened timescale of the program and an enhanced approval process will be put in place for thesis projects in future years.

Master’s Thesis, MS Biotech Program

SLOs: Scored with custom rubric. All students currently enrolled in the MS Biotechnology Program must complete a total of 6 credits of independent research under the supervision of a STEM faculty member or an approved mentor. This culminates in a written thesis and an oral presentation as required for the degree. We assess the student’s thesis and presentation using rubrics for each.

Target: Students should score a 4 or higher (based on a 5 point scale) on each measure in the rubric.

Master’s Thesis, MS Biotech Program			
	Oral	2018 Mean	2019 Mean
Content	Analysis of Topic	4.6	4.77
	Supporting Material	4.6	
	Organization	4.6	
	Style	4.6	
Delivery	Engagement	4.5	4.83
	Body Movement	4.6	
	Voice Quality	4.5	

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	Fluency	4.6	
Preparation	Outline	4.8	4.83
Impact	Overall Impact	4.75	4.91

Discussion of Findings: The Thesis defense is the culmination of the student’s career as a graduate student at Kean NJCSTM. Typically, it summarizes the results from two semesters of independent research at the graduate level, however more recently it is a body of work that reflects up to 5 years of mentored authentic research experience in the lab of a faculty member (RFI participation etc.). Reflecting these aspects of the MS Biotechnology Program, the overall quality of the oral defense of our most recent graduates has been very high (4.91 out of 5). The students are generally very well prepared to present and defend their work in front of a committee of NJCSTM faculty and have a reasonably high degree of knowledge and technical skill in their specialized field of study.

EMSE 5564 Student Teaching Evaluation

SLOs: Teaching evaluation data collected based on reports from student teacher supervisors and cooperating teachers, and maintained by Teaching Performance Center.

Target: Students should score 3.2/4 on a 4-point scale. (pro-rated for non 4-point scales)

Mean scores overall: Data not yet available from COE

Distribution of Scores: Data not yet available from COE

Discussion of Findings: Data not yet available from COE

STME 5031 Project

SLOs: Semester project in course used to evaluate students applied knowledge in field, graded with a custom rubric by instructor.

Target: Students should score 3.2/4 on a 4-point scale. (pro-rated for non 4-point scales)

Mean Scores Overall: 91/100

Discussion of Findings: Students were at target. No action needed.

EMSE 3220/3230 (Mini TWS, Sample Lesson Plan)

SLOs: Students applied knowledge measured using a custom rubric applied to course projects related to the EdTPA (replacement to Teacher Work Sample) as well as sample lesson plans.

Target: Students should score 2.8/4 on a 4-point scale (pro-rated for non 4-point scales).

Mean Scores Overall: EMSE 3220 (edTPA – Planning, Instruction & Assessment Tasks): 90/100

EMSE 3230 (Unit Plan Components): 91/100

Discussion of Findings: Students were at target. No action needed.

Research First Initiative Assessment Data

The Research First Initiative (RFI) was launched as a pilot program during the 2015-2016 academic year, and completed its first full cycle in 2016-2017 (See **Table 9** below for enrollment data). Assessment data for the RFI is reflected in the STME 3610/3903 Data (presented above).

Table 9. RFI Streams Enrollment

	1st Roll-Out		2016-2017			2017-2018			2018-2019		
	SP16	S1 16	FA16	SP17	S1 17	FA17 (3903)	SP18 (2903)	S1 18	FA18 (3903)	SP19 (2903)	S1 19
Cancer Mechanisms (Coniglio)	2903: 9	-	3903: 8	2903: 7	2903: 6	3	8	-	5	10	-
Microbiomes (Hayes)	2903: 5	-	3903: 4	2903: 6	-	2	4	-	5	4	-
CCR1 Antagonists (Merritt/S-Huby)	2903: 5	3903: 6	2903: 4	2903: 6	2903: 5	6	6	2903: 6	11	6	2903: 5
					3903: 6			3903: 2			
Waves (Farnum)	2903: 7	-	3903: 3	2903: 10	-	7	4	-	4	-	-
Drug Metabolites (Ramanathan)	2903: 3	3903: 5	2903: 4	2903: 6	-	5	6	-	8	6	-
				3903: 4							
3D Scientific Visualization (Joiner)	-	-	2903: 5	2903: 2	-	0	6	-	8	8	-
				3903: 5							
STEM Education (Baldwin)	-	-	-	2903: 6	-	6	11	-	10	8	-
Fruit Fly Genetics (Manheim)	-	-	-	-	-	-	3	-	-	-	-
Total RFI Participants	29	11	28	46	17	29	48	8	51	42	5
Average RFI Stream Size	5.8	5.5	4.6	5.7	5.6	4.8	6	4	7.3	7	5

The RFI is proving quite popular among students with enrollment across streams increasing each year. Nearly 200 students from NJCSTM and CNAHS have participated in the RFI, since the program was initiated in 2016, and 123 students have completed the program as of SP19. As incoming class sizes rise we anticipate even greater involvement in the RFI. We hope to add several new RFI streams in 2020 as new faculty from NJCSTM establish their laboratories and a faculty from the College of Natural & Applied Health Sciences express interest in participating in the program.

Table 10. Total number of students enrolled in RFI courses and percent completing RFI Program course sequence by year since inception.

RFI Enrollment	2016	2017	2018	2019	Total
STME 2903	42	54	54	47	197
STME 3903	26	44	53	36	159
% Completing RFI	62%	82%	98%	77%*	82%*

* partial enrollment data as of 8/19/19

Program Assessment Recommendations:

Closing the Loop

Students continue to perform at or above the expected standard in their ability to communicate quantitative information. Our current assessment goal is to better determine the impact of the RFI

program on our students' success. We saw in the 2017 (BS) graduating cohort a dip in ability to express and communicate both quantitative and written information, and a return to norm in following years. A hypothesis was formed that the newly instituted RFI program might help to strengthen these areas, as students are required to write and present more often and earlier in their academic career. We assessed this year quantitative literacy between RFI and non-RFI students. In comparing performance of RFI and non-RFI students, while both are meeting expectations the RFI students are doing so at a higher level, and in most cases do so as sophomores instead of as juniors. This outcome could be due to a higher level of student choosing to complete the RFI sequence or the RFI sequence is better preparing our students. We are continuing to assess this finding to determine whether this is a causal, selective, or placebo effect.

One challenge in assessment is the need for streamlined access to assessment data that crosses programs and colleges, particularly assessment data related to the EdTPA. We will continue to work with the College of Ed to improve this assessment process and use EdTPA data to improve our teacher track programs.

Additionally, as the percentage of low-income students increases in our incoming student cohort, we are seeing anecdotal evidence of known high-risk factors that pose serious threats to their success in pursuing a STEM education. For the first time we have observed that a number of these students do not possess modern laptop computers, preventing them from fully participating in class exercises and hampering their ability to complete assignments. In addition, some students are working one or more non-stem jobs while attending school to support themselves or their families. The inability to afford the necessary resources and the work status of these low income students have been identified by the NSF and the Presidential Task Force on Promoting STEM Education Among Underserved Populations as major barriers to retention and ultimately to the success of this vulnerable student population in pursuing a career in STEM. The full impact of these observations on this student cohort is unknown at this time. We will monitor the cohort carefully over the coming year and seek to identify the educational and financial resources, including additional scholarship and work-study funding that will allow these students to succeed at NJCSTM.

Specific action items related to the recommendations detailed in the individual assessments above include:

1. Continue to track assessment data between RFI and non-RFI students to determine the impact of the program on student success.
2. Reinforce to students how to quantify information and appropriately communicate data.
3. NJCSTM administration will evaluate our current Assessment standards and practices to ensure alignment with core STEM competencies, and COE requirements as well as NJDOE and external accreditors.
4. Develop a plan among faculty to increase writing emphasis and standardize writing assessment throughout the student plan of study.
5. Meet with College of Education to discuss how to best optimize the process of obtaining assessment and accreditation data from professional and pre-professional field.
6. Collect data on graduate level written thesis for the MS Biotechnology program (oral thesis data has been collected).
7. Refine and standardize independent research and thesis requirements. [ongoing]
8. Hold a faculty workshop to standardize course assessment reports in the program, ensuring better uniformity of data submitted by faculty in future assessment reports.

Section 2: General Academic Planning

Using the information analyzed, discuss the following:

- **What Do I Open?**

MS Genetic Counseling

A proposal to establish a Genetic Counseling Master's Degree was approved by the President of the University on August 2, 2017. This program will be an accredited 2-year (65 credit hour) professional training program. An experienced Genetic Counselor was hired as a consultant in January 2018. She designed the curriculum, drafted the 27 course outlines, and identified clinical rotation sites that meet the standards for accreditation. The curriculum and course outlines were approved in April 2018 by NJCSTM's Faculty Curriculum Committee. The consultant drafted the program proposal document and presented such to the University Curriculum Committee in June 2018. It received unanimous approval. The program proposal was presented to and approved by the Kean University Board of Trustees in September 2018. The consultant drafted the New Jersey Presidents' Council Academic Issues Committee (NJPC AIC) documents. The Program Announcement was submitted for the required 30-day review in September 2018. Positive results of the 30-day review were received and the mandatory site visit by an additional genetic counseling consultant was conducted in October. The AIC documents were then submitted in November. The Kean consultant was hired as full-time Program Director (PD) on November 5, 2019. Approval of the program was granted by the NJPC on December 10, 2018. The PD completed and submitted the Accreditation Council for Genetic Counseling (ACGC) Candidacy Application on December 19, 2018.

ACGC Candidacy status was granted on March 28, 2019. The PD identified candidates for the Medical Director position. A contract for the Medical Director (0.05 FTE) began in April 2019. The PD, Associate Dean, faculty members and staff conducted a search for the NJCSTM Assistant Professor of Human Genetics and Genomics. The top candidate was secured in April 2019 and started in September 2019. This faculty member will serve various programs in NJCSTM. He will act as an instructor and Research Coordinator (0.25 FTE) for the Genetic Counseling Graduate Program. The PD created a program web site and Student Handbook, visited potential clinical rotation sites, and worked with the Office of University Counsel to complete affiliation agreements with these new clinical rotation sites. The Dean, Associate Dean and PD met with Hackensack Meridian Health administrators regarding establishing an affiliation for the program. The PD completed and submitted the ACGC New Program Accreditation Application on May 15, 2019. First response from ACGC to be received in Fall 2019. The PD completed an application for a U.S. Department of Education grant for the Developing Hispanic-Serving Institutions Program; the application was submitted on July 11, 2019. The PD met with University Relations in July 2019 regarding marketing the program via hard copy materials, the web site and social media platforms. After an initial meeting with Graduate Admissions in April 2019, the PD has maintained communication with this office to confirm readiness for acceptance of applications to the new program once accreditation is achieved.

New Human Genetics/Genomics Program

Commencing FA19, we will explore the possibility of creating a new degree program focused on human genomics and conduct a due diligence analysis to establish a business case for said program. The analysis will include aspects of clinical genomics, pharmacogenomics, and genomic medicine. This

program would further expand NJCSTM's current educational footprint in biotechnology and genetic counseling into clinical and translational science.

Mentors in STEM Research Program (MSRP)

Last year a concept for increasing research mentorship for STEM students was conceived, the Mentors in STEM Research, providing an approach to meet the increased demand for student research opportunities within the program. The hiring of two new faculty last year, one filling a vacancy, has partially addressed this need. However, our capacity to support student research is still stretched thin, and with the dramatic increase in enrollment over the past 2-3 years, additional faculty mentors are required. The MSRP program will utilize qualified adjuncts, with research experience and expertise, willing to commit to the program, to serve as adjunct mentors, supporting research streams for the RFI and for independent research, alone or in collaboration with full-time faculty. The MSRP concept has been vetted internally and with prospective mentors, and will be implemented during the 2019-2020 year. The Associate Dean for Research will form a committee to provide oversight and to establish the terms of the program. Adjuncts will be hired and compensated through the normal university procedure.

BS/MS Program in Business and Science

We will continue our due diligence to determine the feasibility of establishing a joint BS/MS Program in Business and Science with the School of Business and Public Management at Kean over the next year. Whether to pursue this effort will be determined in part by the level of interest we observe in the Life Sciences Business Management Track offered in our Biotechnology MS program. As an alternative, NJCSTM will explore establishing a BS/MS degree program in Emerging/Disruptive Technologies to complement its strengths in engineering and computational sciences.

MA STEM Education

The concept for a Master's program in STEM Education has been discussed within the STEM faculty over the past few years, along with thoughts on establishing a NJ teacher certification in STEM. Further research into academic models for such a program, the market demand, as well as a competitive assessment of similar programs offered across the state should be carried out in order to determine whether such a program would be viable. This will be taken up and fully considered by the STEM Ed Task Force, along with other curriculum development opportunities.

- **What Do I Close?**

BS Science & Technology/Engineering Option

In 2016/2017, we recommended that the NJIT (engineering) linkage program be revisited or cancelled, as the program was not serving our students or leading to increased STEM Program enrollment, despite having the largest number of applications of any NJCSTM program. Enrollment in the NJIT program has increased to a meaningful level for the second time in a row this past year, since inception. In February 2019, we met with NJIT's Provost and staff to discuss revision and renewal of the linkage agreement. Both parties acknowledged deficiencies in the current agreement and a strong desire to continue the joint program to the mutual benefits of both universities. A revised draft agreement was prepared to address operational matters pertaining to billing, tuition & fees, registration, advisement and student transitioning. The revised draft is currently under review at NJIT. The program is ongoing, pending execution of the final agreement. In addition, a potential collaboration with Stevens Institute for Technology will continue to be explored. A decision on the path forward will be made pending the outcome of discussions with NJIT and Stevens.

- **What Needs to be Supported With:**

- **More Faculty**

MS Genetic Counseling Program Administrator/Faculty Support

As detailed at the beginning of Section 2, development of a program in Genetic Counseling is underway and progressing on schedule. Once New Program Accreditation status is achieved in Fall 2019, a full-time Assistant Program Director (APD) needs to be hired. This position should be filled by January 2020. A main role of this position is to ensure proper medical and ethical oversight of the clinical rotations to maintain accreditation. Following achievement of New Program Accreditation status, there is a substantial amount of work, including the recruitment, interviewing and admitting of students (January – April 2020); finalization of affiliation agreements with new clinical rotation sites; creation of teaching materials for courses; training of adjunct faculty; holding Advisory Board meetings; and training of clinical rotation supervisors, that will need to be performed by the Program Director and Assistant Program Director.

STEM Core Curriculum Support

A Lecturer in mathematics and computational science is required to support the department in teaching core coursework in mathematics, programming and statistics that is required for all NJCSTM students. Enrollment has more than doubled since 2014 and a greater number of adjuncts have been required to teach undergraduate core courses in these areas. It has been historically difficult to find high quality adjuncts with a Mathematics background and experience in teaching to cover our core courses during daytime hours. It is also especially important that all required lecture and lab courses, particularly those taken by Freshmen and Sophomores during their two-year sequence of core courses, are taught by seasoned faculty members who are consistently available throughout the week. Coordination between lecture and lab content and consistency across all sections of the same course is much easier to implement between full-time faculty members than ad-hoc adjuncts. Having a lecturer available to cover these sections will provide a much better learning experience for STEM students in their first few semesters and enable us to maintain our high retention rate and student success, while also reducing the need to recruit and hire new adjuncts each semester. Additionally, a permanent lecturer position will enable us to better streamline faculty assignments, freeing up senior faculty (who are always in overload) to oversee independent research projects and teach upper-level courses.

- **Other Resources?**

Program Space for MS Genetic Counseling Program. Program space is a requirement of accreditation. The program suite should include private offices for the Program Director, Assistant Program Director, and Medical Director, reception area, conference room, student room and library, and storage room. Program space should be ready by January 2020 to accommodate the need for administrator offices and host the applicant interviews.

Research Support. As enrollment continues to increase for the Center, and as the instruction-intensive research stream courses continue to be rolled-out over the next few years, an additional research assistant hired as an academic specialist or graduate assistant will be required in order to support research activities and growing capacity. In 2018-2019, we had two academic specialists and a graduate assistant supporting 7 research streams, as well as teaching (including lab preparation), and independent research activities, which is unsustainable. As more and more students engage in research, additional staffing will be required to ensure proper student oversight, adequate preparation for lab courses, and research program support. With the University's stated commitment to provide all

students with internship opportunities there is even more urgency to expand research support and coordination. It is estimated that we will need to provide approximately 70 - 100 individual students with research opportunities, through the RFI, Independent Research and Internships each year, depending on enrollment. The number of external internships available to our students is currently limiting. The creation of the MSRP will help alleviate this problem, by providing highly experienced research mentors to work with the increasing number of students on independent research projects. We will also take steps to increase the number of external internship opportunities leveraging our relationships with the R&D Council of NJ, ILSE and others to obtain commitments from corporate sponsors to accept NJCSTM interns on yearly basis.

In addition to staff resources, financial support for the RFI, Independent Research and the MSRP is also required. Actual expenses for educational supplies for the Center were approximately \$42,000 in FY 2019. Additionally, we spent \$64,000 on equipment repairs, \$10,000 on replacement/new equipment, \$7,000 for computer equipment and \$10,000 for computer services and software (including the ChemOffice site license). With the addition of two new full-time tenure-track faculty member, two additional research streams will be offered in Spring 2020 (bringing the total number of RFI streams to 9). If we are able to begin the MSRP, additional funding will be needed to initiate the research that will follow. To continue with this successful work and support upcoming research, an extra allocation of \$8,000 will be needed for additional consumables and laboratory supplies. An academic specialist is required to support the RFI program.

Finally, as 5th year WU and WKU STEM students begin to reach Kean Union in 4 years; more laboratory space will be required for their graduate thesis research.

Recruitment Support. Outreach efforts to high schools, non-profit organizations, industry and corporations throughout the local region and nationally will continue to improve relations increase visibility of NJCSTM programs and the state of the art STEM facility/instrumentation. University recruiters will continue to promote STEM and identify qualified high school students for the NJCSTM programs. We will continue to target underrepresented student populations and local high schools with these specific demographics. A continued effort to distinguish between NJCSTM and CNAHS degree programs is essential; the effort put forth this year by NJCSTM and Admission's Recruiters has made a great impact on our enrollment numbers. The incoming class for Fall 2019 is our biggest and most diverse class to date.

As mentioned in the enrollment analysis section of this report, there is a need to increase enrollment in the STEM Education programs, and as a first step, a STEM Ed Task force has been formed to drive this effort. A complete market assessment of regional program offerings and potential grant/scholarship programs is required in order to develop a strategy and communication plan for differentiation and competitiveness of the program. For the above efforts, there is a need for funds to support an academic specialist with appropriate expertise (\$5,000). In addition to market research on science education programs at the undergraduate level, an analysis of the market demand for a Master's program in STEM Education is also required. An academic specialist will be needed to conduct a competitive assessment of similar programs offered across the state in order to determine whether such a program would be viable (\$2,500).

Retention Support. Ongoing retention initiatives will continue to be enhanced by both staff and faculty. Individual counseling and advising is key to ensuring that our students are aware of the resources available to them. The tutoring POD, Peers On Demand walk in tutoring will increase from 4 to 5 tutors for the academic year 2019/20. Students will continue to meet with faculty as well as the Coordinator

of Student Services and Retention throughout the academic year to maintain student engagement and connectivity to NJCSTM. The faculty member teaching the Research Methods course will enhance student engagement and group activities by utilizing assessment tools/resources during the first semester for freshmen. This course sets into motion and solidifies retaining students and sets them up for success beyond their first semester. Most assessment resources are free of charge with the exception of California Critical Thinking Skills Test (CCTST). The cost for this assessment tool will be approximately \$1,200.00 to be administered to our 66 freshmen students.

Scholarship Support: Since the inception of the STEM program, students in the 5-year BS/MS Research Track programs (Biotechnology & Computational Science) have been provided 50% tuition support. This support has been continued for the 2019-2020 incoming class, for the 2023-2024 academic year. Going forward with subsequent classes we need to secure funding for this tuition support. Several strategies are being pursued, including grants, assigned GA assistantships, philanthropic funding and establishment of an endowment. This will be a key initiative in 2019-2020, with a goal to show meaningful momentum in securing funds for the 2024-25 5th year class.

• What Actions Will be taken to Strengthen the Programs and the College-at-Large?

CAEP Accreditation

In March 2019, we were notified that our 3 STEM Education programs received National Recognition from the National Science Teachers Association. The reports identified areas for follow-up and action items, that need to be prioritized and proactively addressed beginning in the coming academic year.

Research First Initiative

The RFI has become a mainstay of NJCSTM's research-based curriculum, attracting students to our majors and encouraging current students to engage in research early in their academic careers, promoting retention and success both academically and in the workplace upon graduation (see data presented in [Section 1B](#)). We continue to collaborate with CNAHS to encourage student participation and expand research streams to include motivated faculty from across the university. With the help of Dr. Brian Teasdale, Associate Dean, CNAHS, a series of information sessions and discussions took place in FA18 to enlist additional CNAHS faculty in the RFI. Because of these efforts, CNAHS has begun to establish RFI research streams of its own. We are currently working with a faculty member from the Math department to establish an RFI research stream within NJCSTM.

Two new faculty have joined NJCSTM this past year, Dr. Matthew Niepielko and Dr. Robert Pyatt, bringing additional scientific expertise to our research community. Dr. Niepielko is setting up his laboratory and hopes to launch a new RFI stream in SP20. Dr. Pyatt has just come on board and will participate in the RFI, once his research program and teaching assignments are established.

In June 2019, the second cohort of students who participated in the RFI graduated. Upon graduating, RFI students received a designation of either "Distinction in Research" or "Honors Distinction in Research" on their official transcript, depending on their course of study. The majority of RFI students were awarded the "Honors Distinction in Research", indicating that they continued to conduct one or more semesters of independent research with their faculty mentor, beyond the basic RFI sequence.

Curriculum Updates

NJCSTM revised all undergraduate programs to meet the 120-credit mandate and updated all outlines for courses that have not been updated within the last 3 years. Pathways to graduation were updated as well to reflect changes in course offerings.

In 2019-2020, the curriculum for the Master's years of all 5-year programs will be updated to incorporate changes in course content and tracks, as well as the new edTPA requirements for all education programs.

NJCSTM Advisory Board

The NJCSTM Advisory Board was reconstituted in 2016 and has proved to be incredibly useful as we seek guidance and feedback on our programs and future directions. In 2018-19, ad hoc meetings with select members of the Advisory Board took place to discuss new initiatives. Kim Case, Esq. and Leonard Bielory, M.D. have been particularly instrumental in advancing our STEM Ed initiative and pollen research program, respectively. A more active board is helping us to increase NJCSTM's visibility, secure partners in research and community collaborations, and act as an advocate for NJCSTM in the business and academic community. We have two openings on the Board and are currently interviewing candidates. The next full advisory board meeting is being planned for FA19. Resources will be required for the cost of two board meetings in 2019/2020, estimated to be \$1,250.

Group Summer Scholars Research Program

The GSSRP ran for the fifth time in 2019, with seven research streams this year, an increase of one over last year, supporting 57 high school students. This year the program received the largest number of applicants to date (173 and accepted the largest class ever, due in large part to increased visibility of the program online. An annual assessment report for the 2019 program was conducted and is being prepared. Feedback collected over the course of the 6-week program via discussions with students, parents, faculty and staff, provided the following insights:

1. The majority of applicants are learning about the GSSRP through on line searches, despite our extensive outreach efforts to high school counselors and administrators. In view of this, we should review our recruiting strategy for the GSSRP and consider further increasing our online visibility and establishing a robust social media presence to advertise the program directly to our target audiences.
2. Students and parents continue to provide excellent feedback regarding the unique focus and content of the GSSRP research experience. These unique features of the GSSRP should be emphasized in our advertising of the program to students and prospective sponsors.
3. The GSSRP is proving to be an excellent recruiting mechanism for NJCSTM. Six of the GSSRP participants from 2019 (10%) have either applied for admissions to NJCSTM this Fall or expressed interest in applying during upcoming admissions cycles. Since the program started in 2015, 9 students that completed the GSSRP have enrolled in the STEM program.

In 2019, we again achieved our stated goal to increase enrollment overall, and maintain the proportion of students from underrepresented groups and underserved communities. This year, 22 of the 57 students accepted into the GSSRP program received full need-based scholarships, approximately 40% of the participants. NJCSTM was awarded eight Project Seed grants, totaling \$22,000, from the American Chemical Society; \$6,000 was contributed by anonymous donors to the Kean Foundation specifically for the GSSRP and \$10,000 from University funds. Overall, \$37,500 in scholarships were awarded to GSSRP participants to support diversity and inclusiveness in STEM. In addition, GeneWiz, IBM and the Elizabeth Township Municipal Authority generously provided in-kind contributions to support student field trips to their facilities.

Continued resources are required for program advertising support to reach prospective applicants, as well as assistance of the Kean University Foundation in identifying potential sponsors to help fund the

program. Kean contributed \$10,000 to the 2019 program, \$58,700 was obtained in revenue from program fees and \$32,000 from grants and donations – the total approximate cost to run the program in 2019 was \$134,630. The ultimate goal is for the GSSRP to becoming self-sustaining, but in order to do so outside sponsorship and grant money must be secured.

Efforts to secure sponsors will continue to be a high priority for the 2020 program. We will renew attempts to obtain the assistance of the Kean Foundation in identifying potential sponsors.

Kean University Pollen Counting Station Project

In January 2018, with the help of Leonard Bielory, M.D., NJCSTM established a regional pollen counting station on campus. The Kean University Pollen Counting station is in its second year of operations and continues to collect, record and broadcast tree, grass, and weed pollen and mold counts on a routine basis during pollen season via a free mobile phone app, the AccuPollen™ Allergy Tracker. NJCSTM's students are conducting independent research projects to analyze and visualize data from the station. Expansion of the user base over time will increase Kean's visibility across the region and provide increased opportunities for student and faculty research. Our facilities manager, Nan Perigo, who is trained in microbiology and environmental sciences, currently oversees the daily operation of the station with the assistance of student volunteers and a graduate assistant. Nan, in conjunction with Dr. Bielory, recently submitted a grant to the National Geographic Society to expand the Pollen Counting Network to high schools throughout NJ, with Kean as the base of the network. Additional training is required in order to certify our personnel as pollen identification specialists by the National Allergy Bureau. This formal training and certification will provide standardized, research-quality data for student and faculty researchers in various fields.

Collaboration with Wenzhou University and Wenzhou Kean University

The 5-year BS/MS Biotechnology Program collaboration with Wenzhou University will be launched in FA19, and a similar program will be developed for Wenzhou Kean University. Chinese students will pursue their undergraduate degree in China, taking certain courses at Wenzhou Kean University, and they will complete their Master's degree at Kean USA. As part of this agreement, faculty research collaborations between the two universities will be formed.

Soller's College Collaboration

Discussions were initiated with Soller's College (Edison, NJ) in 2018 to expand the course offerings in our Biotech Program to include Clinical Trials Management and Drug Safety and Pharmacovigilance. The joint program would prepare students in our 2-year MS or 5-year BS/MS Biotechnology programs for careers in drug development in the pharma and biotech sectors. Under the proposed agreement, faculty from Soller's would teach courses at NJCSTM or Soller's College, using actual clinical trials management software and case studies in patient enrollment, clinical trials management and drug safety/pharmacovigilance reporting. Detailed course outlines and curriculum guide sheets were developed for approval and a draft articulation agreement prepared. The draft agreement was reviewed by the VPAA and placed on indefinite hold, pending approval of Soller's application for Middle States accreditation. We are currently pursuing a new internal Human Genomics Program as an alternative solution to expand our program offerings in the biopharma and healthcare space.

Recommendations

In addition to the actions listed above, we recommend that the University expend more effort and resources to highlight the significant accomplishments of the RFI, GSSRP and Pollen Station to increase

the University's visibility and reputation. Leveraging the impact of these programs on promoting diversity in STEM and career opportunity for under-represented students would significantly aid our admissions and recruiting efforts and contribute to the reputation of Kean as a whole. A consistent messaging and marketing campaign coordinated through University Relations and Admissions should be instituted. This campaign, consisting of print and social media advertising to defined target audiences at the high school, graduate and professional levels is needed to insure steady recruitment into our undergraduate and graduate programs.

Section 3: College Resource Needs

A. Faculty and Staff Resource Needs

Discuss faculty and staff resource needs **using supporting data and a rationale** connected to Section 2 (General Academic Planning) and individual program data.

Finally, provide an itemized list of faculty needs (with reference to the data and rationale).

- Assistant Program Director for MS Genetic Counseling Program (See Section 2 pg. 16 for rationale). **[Required for new program]**
- Lecturer, Math and Computational Science. (See Section 2 pg. 17).

B. General Resource Needs

Discuss general resource needs using supporting data and a rationale connected to Section 2 (General Academic Planning) and individual program data with respect to the following:

- **Office Supplies, Travel**
 - Travel for MS Genetic Counseling Program Director to attend professional conferences annually—mandatory to maintain accreditation status of the program (See Section 2 pg. 14-15).
 - Funds for NJCSTM Advisory Board meetings. (See Section 2 pg. 19).
- **Technology (e.g. administrative software, faculty computers, etc.)**
 - Four of our staff require new computers this year. Our newest faculty member, Dr. Robert Pyatt, will require a high performance laptop. In addition, we need to replace three other staff and faculty computers (Tocci, Hayes, Root) (4 computers at \$1,400 each).
 - One laptop computer for the MS Genetic Counseling Assistant Program Director. One desktop computer for the program to be used by students. AV equipment for the MS Genetic Counseling conference room including speaker phone, projection screen with laptop connection, and lectern. (See Section 2 pg. 17).
- **Office Equipment**
 - One printer/scanner/fax machine for MS Genetic Counseling Program and phones for offices in new space. (See Section 2 pg. 17).
- **Facilities (Office space, etc.)**
 - For the Genetic Counseling MS Program, we will need to identify and renovate space. Program space is a requirement of accreditation. The program suite should include private offices for the PD, APD, and Medical Director, reception area, conference room, student room and library, and

storage room. Private space allows for discussion of confidential patient information and case studies. Program space should be ready by January 2020 to accommodate the need for administrator offices and host the applicant interviews. Furniture for the program suite may be required inclusive of desks, tables, chairs, and filing/storage cabinets. Cost TBD by Tracie Feldman, estimated at \$100,000. (See Section 2 pg. 17).

- **Furniture, etc.**
- **Memberships, Accreditation Fees, etc.**

C. Pedagogical/Curricular Needs

Discuss pedagogical/curricular resource needs using supporting data and a rationale connected to Section 2 (General Academic Planning) and individual program data with respect to the following:

In order to support the Research First Initiative and uphold the state-of-the-art educational opportunities offered by the NJCSTM academic programs, the following items are required for research and curricular activities (See Section 2, pg. 17-19):

- **Software (instructional)**
 - MatLab software for our math and computational sciences labs (10 site licenses); recurring each year at \$1,430. This software is actively used by both our math and computational sciences classes and streams.
 - Our biotechnology research streams would benefit from access to a software program called SnapGene, which would allow them to analyze, visualize, plan, and document molecular biology procedures. This type of software is common in industry and would give our students a boost in preparation for their careers. Annual subscription for 3 licenses is \$645, 6 licenses (two for each of three streams), is \$995.
- **Instructional Technology (instructional software, LCD projectors, printers, etc.)**
 - NJCSTM currently lacks a synchronous-distance learning classroom. The ability to compete for students in modern day higher education programs, particularly at the graduate level demands access to state of the art distance learning technology. Jill Fisher, Director of the new Genetic Counseling Graduate Program in collaboration with OSRP have submitted a grant to the USDOE to enhance Kean's educational capacity under our mission as a Hispanic Serving Institution. The grant includes, among other things, a proposal to create a combined distance-learning classroom and computer laboratory (DLC/CL). The distance learning capabilities will allow for synchronous learning by students, through live on-line video lectures, seminars and demonstrations when off-campus at clinical rotations and internships anywhere in the world, enhancing personal education and professional networking. The DLC/CL will house 20 modern desktop computers providing hands-on experiences for coursework such as in bioinformatics and molecular genetics. The DLC/CL will provide the GCGP with multiple opportunities to enhance teaching and student experiences. Use of the DLC/CL will also extend to other STEM programs in NJCSTM allowing for support of undergraduate and non-GCGP graduate students again providing innovative teaching opportunities and possible expansion of course offerings at NJCSTM. Twenty desktop computers would need to be purchased. \$40,000 of USDOE funds has been requested.
 - *Distance Learning Classroom/Computer Laboratory – non-computer items.* Flat screen SMART television monitors, cameras and a Learning Management System subscription would also need

to be purchased for the DLC/CL. \$110,000 of USDOE funds has been requested for all equipment and installation. \$5,000 per year for 4 years has been requested for a service contract for a total of \$130,000 of USDOE funds.

- **Instructional Equipment (microscopes, etc.)**

- Our LC-MS (Liquid Chromatograph-Mass Spectrometer) is limping along and needs to be replaced, as parts are becoming scarce and difficult to find (this model has not been manufactured for many years). A current quote for repairing a part of the system that cannot currently be used is \$25,000 to replace the part and bring the complete system back online for now. A newer model refurbished unit to do the minimum required LC-MS analysis costs \$65,000, but would be sub-optimal for truly research-grade analyses. Research-level work could be done with a unit that does better analyses, but the cost of these units is high, with a minimum of \$433,000. We plan to apply for grant funding for this research-grade instrument, but need to have at least a refurbished unit or repair the malfunctioning part to maintain basic analyses for our research students until such funding can be obtained. [Critical]
- Our fifth floor ice machine broke down in March and needs to be replaced. A replacement will cost approximately \$8500. [Critical]
- With the establishment of the MSRP, funds for small equipment and specialized materials will be needed to help each Mentor establish a research program here at NJCSTM. Four to five mentors will take a minimum of approximately \$5,000 each to set up laboratories. [Critical]
- Chemistry has been working with two very old stir-plate systems that need to be replaced (they are currently over 10 years old and are used almost daily during the academic year). The systems allow for precisely controlled heating and monitoring of material during chemical reactions. One magnetic hot plate stirrer, complete with thermocouple and support structure, is \$1,925, for a total of \$3,850 for two of these important devices. [Critical]
- Biotechnology has lost two small centrifuges that could run in the refrigerator for biotechnology research and classes. We need at least one small centrifuge for refrigerated work in Biotechnology (\$1700).
- Our laboratory pumps are aging and several need replacement. A second hi-vacuum pump used for organic chemicals is now failing (we had replaced another unit); replacement for this unit is approximately \$1200. The low-pressure pumps we use for tissue culture media removal are aging as well; we need an additional 2 replacements (we replaced one last year) at approx. \$600 each. Total for pumps needed is \$2,400.
- In order to improve the performance of the medicinal compounds that Dr. James Merritt's research students (RFI and Independent Research) produce, each compound is tested using a CCR1 binding assay provided through ThermoFisher Life Technologies. By having each compound tested, additional syntheses have been more directed and effective. These assays now cost \$180 per compound, and Dr. Merritt tests 18 new compounds each semester, for a total of 36 compounds and \$6,480 for the academic year (not including summer research).
- Analytical Chemistry is in need of a new heated ultrasonic bath. This sonicator allows for improved extraction of materials from samples (e.g. plant materials from Costa Rica and other sources), which would provide more of the chemicals to be analyzed as well as cleaner extracts. By improving extraction, fewer plant materials would have to be imported, reducing costs and time. This would also provide for better training of students on more modern equipment and techniques than the mortar-and-pestle extraction methods currently employed. The cost of a

new Heated Ultrasonic Bath is approximately \$1,370.

- **Professional Services (Practice exams for licensure preparation, etc.)**

- Consider patent search system (Thomson Innovation; PatBase, etc.) for patent analysis (prior art and freedom to operate).
- Our new Pollen Counting Station requires a trained operator to properly train students to count and identify pollen grains. Proper training will allow for better identification and use of data in research. Training sessions are available during the winter or spring. Registration fees for a researcher for a week-long intensive training will be approximately \$760. Flight costs will vary based on location of training, estimated at \$450. Costs for housing and meals during the week would be approx. \$775, for a total of approximately \$1,985. Part of this could be travel money, but the additional fee for training is significant. (See Section 2, pg. 21).

- **Library Resources (Databases, etc.)**

- We have had very positive response to our use of a university-wide site license for ChemOffice, which includes access to ChemDraw and to electronic lab notebook software (Signals). This has become an important educational tool for all chemistry courses in NJCSTM and CNAHS, and Signals is being piloted and used in a number of lab courses and research streams broadly across scientific disciplines, and the license should be continued for classes and research university-wide. A yearly site license costs \$7,530. [Critical]
- EndNote (bibliographic database system) site license subscription is needed (\$5,500/year).
- NJCSTM is a leader on campus in utilizing Open Educational Resources (OER) throughout its curriculum. A significant number of courses taught within the center exclusively employ OER materials. Greater access to scientific journals under OER agreements with publishers through the NTLC is needed and would greatly enhance teaching of current topics and lower costs.

- **Facilities (Classrooms, labs, etc.)**

- The lab in STEM 3-22 needs to be refurbished with proper lab benches with cabinets and counter space to increase working area and to improve safe use of the space by the numerous research students accommodated there. Cost TBD by Tracie Feldman, estimated at \$15,000-18,000. (See Section 2, pg. 17-19). [Critical]

Section 4: Budget Request Line Items

College (Program)	Description of Resource Request	Page # Reference (For Rationale)	Quantity Requested (Where relevant)	Unit Cost (Where relevant)	Total Cost (To nearest dollar)	Strategic Plan Goal (2013-2020)
Example: COE (B.S. Athl. Training)	Example: BOC Practice Exams for CAATE Licensure Exam Preparation (25 students, 4 exams each)	Example: pg. 2	Example: 100	Example: 25.50	Example: 2,550	Example: 1.1.4.2
NJCSTM	<u>Overall</u> : Funding for 2 NJCSTM and 1 Genetic Counseling Graduate Program Advisory Board meetings	Pg. 14, 19	3	\$625	\$1,875	1, 5, 7
NJCSTM	<u>Recruitment</u> : STEM Branding and marketing collateral, advertising	Pg. 18	-	-	\$10,000	1, 2
NJCSTM	<u>Recruitment</u> : SAT/GRE prospective student lists for recruitment efforts	Pg. 18	-	-	\$5,000	2
NJCSTM	<u>Recruitment</u> : Market research on Science Education scholarship programs as well as a Master's program in STEM Education (academic specialist)	Pg. 16, 18	-	-	\$7,500	1, 2
NJCSTM	<u>Retention</u> : California Critical Thinking Skills Test	Pg. 18	-	-	\$200	1, 2
NJCSTM	<u>Faculty</u> : Lecturer in Mathematics [critical]	Pg. 17, 22	1 position	-	-	1, 2, 3
NJCSTM	<u>Facility</u> : Refurbish STEM 3-22 to improve work space in research lab for use by research students and faculty, including new faculty, in RFI and MSRP [critical]	Pg. 15, 17, 19, 25	-	\$15,000	\$15,000	1, 2, 3, 8
NJCSTM	<u>Research</u> : Additional lab consumables budget to support active and new RFI streams and increasing numbers of independent research students and mentors [critical]	Pg. 17-18	-	\$8,000	\$8,000	1, 2, 3, 9
NJCSTM	<u>Research</u> : Small equipment for establishing new research streams and MSRP mentors (pipetors, mixers, baths, etc.) [critical]	Pg. 23-24	4-5	\$5,000	\$20,000-\$25,000	1, 2, 3, 5, 9
NJCSTM	<u>Research</u> : Academic specialist to support research labs and RFI research streams [critical]	Pg. 17-18	2	\$3,500	\$7,000	1, 2, 3, 9
NJCSTM	<u>Research</u> : Assays to test medicinal compounds	Pg. 24	18 x 2 = 36	\$180	\$6,480	1, 3, 9

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College (Program)	Description of Resource Request	Page # Reference (For Rationale)	Quantity Requested (Where relevant)	Unit Cost (Where relevant)	Total Cost (To nearest dollar)	Strategic Plan Goal (2013-2020)
NJSCTM	<u>Research</u> : Formal training and certification for Pollen Station counter	Pg. 20, 24	-	-	\$1,985	1, 2, 9
NJCSTM	<u>Equipment</u> : Replacement for ice machine that broke down in March 2019 [critical]	Pg. 24	1	\$8,500	\$8,500	1, 2, 3, 9
NJCSTM	<u>Equipment</u> : Replacement LC-MS for old unit. \$25,000 immediate repair, \$65,000 for refurbished with 18 month service contract, or \$433,000 for new [critical]	Pg. 23	1	\$25,000, \$65,000 - \$433,000	\$25,000, \$65,000 - \$433,000	1, 9
NJCSTM	<u>Equipment</u> : New stir-plate system for chemistry lab [critical]	Pg. 24	2	\$1,925	\$3,850	1, 2, 3, 9
NJCSTM	<u>Equipment</u> : Small centrifuge for refrigerated work in Biotechnology	Pg. 24	1	\$1,700	\$1,700	
NJCSTM	<u>Equipment</u> : Replacement pumps. One for organic chemistry and two for biotechnology	Pg. 24	3	Org=\$1,200 Biotech=\$600	\$2,400	
NJCSTM	<u>Equipment</u> : Ultrasonic bath for analytical chemistry	Pg. 24	1		\$1,370	
NJCSTM	<u>Technology</u> : Synchronous-distance learning classroom	Pg. 23	Grant submitted to USDOE			1, 2, 3, 6, 9
Library	<u>IT/DB/Software</u> : ChemDraw and electronic notebook software site license [critical]	Pg. 18	Site license	\$7,530	\$7,530	9
NJCSTM	<u>IT/DB/Software</u> : New computers for faculty & staff members	Pg. 22	4	\$1,400	\$5,600	
NJCSTM	<u>IT/DB/Software</u> : MatLab software for math/computational science labs	Pg. 23	10 licenses	\$143	\$1,430	
NJCSTM	<u>IT/DB/Software</u> : SnapGene site licenses	Pg. 23	3-6	\$695-995	\$995	
Library	<u>IT/DB/Software</u> : Patent searching service (Thomson Reuters)	Pg. 24	-	-	TBD	
Library	<u>IT/DB/Software</u> : EndNote site license subscription	Pg. 25	-	-	\$5,400	
NJCSTM (MS Genetic Counseling)	<u>Faculty</u> [Required for new program]: Assistant Program Director [critical]	Pg. 16	1 full-time position	-	-	

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College (Program)	Description of Resource Request	Page # Reference (For Rationale)	Quantity Requested (Where relevant)	Unit Cost (Where relevant)	Total Cost (To nearest dollar)	Strategic Plan Goal (2013-2020)
NJCSTM (MS Genetic Counseling)	<u>Facilities</u> : identify and renovate space for Genetic Counseling Graduate Program. May require desks, tables, chairs, etc. [critical]	Pg. 22	-	TBD	TBD	1, 2, 3, 6, 8, 9
NJCSTM (MS Genetic Counseling)	<u>Office Equipment</u> : One printer/scanner/fax machine for the program. Phones for each office (3)		-	TBD	TBD	
NJCSTM (MS Genetic Counseling)	<u>Technology</u> : One laptop computer for the Assistant Program Director		1	\$1,400	\$1,400	
NJCSTM (MS Genetic Counseling)	<u>Technology</u> : One desktop computer for the program to be used by students		1	\$1,700	\$1,700	
NJCSTM (MS Genetic Counseling)	<u>Technology</u> : A/V equipment for the conference room including speaker phone, projection screen with laptop connection, and lectern		-	TBD	TBD	
NJCSTM (MS Genetic Counseling)	<u>Travel</u> : To maintain accreditation status of program, Program Director must attend professional conferences annually		2 conferences	\$2,000	\$4,000	1, 5, 10