Resource Allocation Proposal (RAP) | 2016-17

Proposal Title: Nuclear Magnetic Resonance Spectrometer

Originator and Position: Rosaleen Gibbons, Assistant Professor of Chemistry, Dept. Chair of Physical Sciences

Area Dean: Carlos Tovares

Campus: San Jacinto

Area Vice President: Rudolph Besikof

Budget Account Code: Click here to enter text.

*Total Amount Requested: $110,000

*Please complete all applicable portions of “Section VI - Projected Expense File” now to determine the “Total Amount Requested” above.

Please check:

| One-Time Funding: ☒ | On-Going Funding: ☐ | Safety: ☐ |

1.) For what are you asking?  2.) Why is the request timely and important?  3.) Where was the need identified? Please answer these three questions in 250 words or less. See instructions for further explanation.

Chemistry is requesting one-time funds to purchase a Nuclear Magnetic Resonance (NMR) Spectrometer for use in the laboratory to enhance student analyses of synthesized compounds in general and organic chemistry. This sophisticated piece of equipment is needed as part of an ongoing effort to development of an active-learning environment for students taking chemistry courses at MSJC by facilitating increased opportunities for laboratory research, collaborative learning, data collection, and interactive assessment of results to focus on student-centered learning and improve success in STEM. This request is timely and important because chemistry faculty are currently engaging students with experiential learning activities in which students are required - within curriculum guidelines - to demonstrate operational and analytical skills with NMR. MSJC chemistry students are currently struggling with these skills because the lab does not have adequate equipment, in spite of the fact that many other community colleges in the local area do. The need for currency of educational technology in chemistry is defined on page 17 and page 26 of the 2015-2016 Chemistry Annual Program Assessment.

Section I – Program Review and Learning Outcomes - 20 points possible
1.) Identify support from your 2014-15 Comprehensive Program Review (CPR) or 2015 – 16 Annual Program Assessment (APA) for this request (8 points). Link to Program Review

This RAP request for an NMR is supported by Chemistry’s 2015-16 APA in which success rates are reported to have dropped below the program average rate by as much as 16% over the last measured academic year (FA14-SP15). We attributed declining success rates to a number of factors including technology limitations on page 17 of the APA, which states, “Teaching a new generation of community college students who have been engaged in active learning during elementary, middle, and high school academics requires updated equipment and facilities.” “Increasing the sophistication of science laboratory equipment will give students transfer advantages because MSJC students can include hands-on experience with state of the art equipment such as Nuclear Magnetic Resonance (NMR)...on their academic resumes.” On page 25-26 of the 2015-16 Chemistry APA, more sophisticated laboratory equipment is identified as one of the three greatest needs, “The greatest need is...updated laboratory technology, instrumentation, equipment and supplies to support an active-learning environment and evidence-based pedagogy; it is impossible to teach scientific literacy in STEM without currency of experimental laboratory equipment, supplies, and instrumentation.” Based on these determinants, Chemistry is submitting a RAP for an NMR spectrometer. This sophisticated piece of equipment will afford students the opportunity to build operational and analytical skills with NMR, which are inherently defined in the course curriculum and assessed with CLOs. By supporting these needs, the administration will help Chemistry empower students, ultimately leading to better success and retention rates.

2.) How will this request help improve student learning in the course and/or program (12 points)? Link to Learning Outcomes

ILOs
Scientific Awareness: The student will possess an awareness of the physical and biological principles related to science. – The equipment being requested above supports the investigation of physical principles through analysis of magnetic interactions, which are analyzed using computational software.

Social Awareness: The student will demonstrate societal awareness. – This equipment will allow students to form collaborations and benefit from interactive inquiry and teamwork, while exploring concepts and engaging one another with intellectual challenges. Interdisciplinary STEM collaborations are also possible.

Responsibility: The student will display personal and civic responsibility. – This equipment will connect student data to current research objectives and associated data published in current literature, emphasizing interactions between MSJC chemistry students and the greater scientific community.

Chemistry PLOs
Demonstrate a fundamental knowledge and understanding of the Periodic Table of Elements and the nature and properties of elements. – The equipment chemistry is requesting will put current projects with related data and results at the student’s fingertips, so they can evaluate how, where, and when the nuclei of carbon and hydrogen atoms exhibit resonating properties with an external magnetic field.

Demonstrate a knowledge and understanding of the fundamental principles governing matter and energy and their transformations via chemical reactions. – NMR resonance in a magnetic field results
when spin-splitting energy levels occur. This equipment will allow students hands-on experience to solidify this very complex system of transformations during chemical synthesis reactions.

Chemistry CLOs

**Chem 101 and 102 CLOs** identify molecular geometry and equilibrium ratios as important student outcomes, and this equipment will allow real-time opportunities to assess these CLOs.

**Chem 112 CLOs** identify spectral analysis as a method to analyze chemical functional groups and molecular size. The equipment we are requesting would make it possible for students to create NMR spectra and evaluate functional groups and structural organization of Carbon-Hydrogen backbones for molecules that they synthesized, which will be used to assess active learning.

**Chem 113 CLOs** require students to conduct syntheses reactions, and this equipment will allow students to analyze and verify their products. Used in conjunction with other instrumentation in the lab, this equipment will allow students to evaluate synthesis products throughout a sequence of mechanistic steps to assess learning outcomes with practical application.

---

**Section II – Alignment with Institutional Priorities via the Strategic Plan - 25 points possible**

1.) How is your request aligned to the strategic goals below? Check all (typically 2 – 6 goals total) that apply. Click [here](#) for the 2016-17 Prioritization Allocation Rubric (PAR) for points-weighting during scoring.

2014-17 Strategic Plan Goals

| ☒ 1. Reduce time to completion of student educational goals and increase degree, transfer and certificate completion. |
| ☒ 2. Drive institutional decision-making using internal and external data to inform planning and prioritize resources. |
| ☒ 3. Refine staffing plan and process |
| ☒ 4. Improve fiscal responsibility that is sustainable for the long term |
| ☑ 5. Identify sustainability strategies to improve efficiencies in processes district-wide |
| ☑ 6. Expand and improve student involvement in campus life |
| ☒ 7. Promote quality of institution through enhanced communication within the community (internal/external) |
| ☒ 8. Enhance the overall campus life experience |
| ☒ 9. In an effort to serve students build bridges between instructional services, student services and administrative services |
| ☒ 10. Increase the College’s visibility, value and recognition in the service area |

2.) Please describe the connections between the goals you checked and your proposal (200 words maximum):
By fostering innovation and promoting the scholarship of teaching and learning, this instrumentation will provide greater access to collaborative research opportunities with universities, improving success and transfer (Goal 1). This equipment will accentuate data-driven institutional decision-making by impacting how department learning outcomes are taught and assessed (Goal 2); not to mention, contribute to the facilitation of Learning Outcomes by providing tools to improve teaching and learning at the program and institutional levels (Goal 3). This RAP is fiscally sound because it encourages a paperless campus by adoption of computational instrumentation (Goal 4). Funding this RAP also enhances communication within the community since students will have opportunities for collaborative research projects that impact the area (Goal 7). This equipment will also enhance the overall campus life experience by meeting the goal of providing facilities that enhance student engagement and awareness of services and activities using other technologies (Goal 8). This sophisticated instrumentation will “build bridges between instructional services” by “increasing professional development” and collaboration (Goal 9). The College’s visibility, reputation, and recognition will improve in the local community as a site that is valued for innovative teaching practices and sound investments in educational technology for STEM (Goal 10).

**Section III – Alignment with Institutional Plans - 15 points possible**

Explain how your proposal is supported by the following plans: 2009-16 Educational Master Plan (4 points), Distance Education Plan (4 points), Technology Plan (4 points) and/or Facilities Master Plan (3 points). [Link to Plans](#)

Pages 294 and 295 of the Educational Master Plan define the need to keep up with the growing demands of laboratory-based courses. Funding of this RAP will further that goal. We seek to acquire high quality, sophisticated instrumentation with associated computer software for student use in our program that will meet the technology requirements of the College community as reflected by both the Educational Master plan, and the Technology Plan. The use of technology is supported by the Technology Plan, which describes the mission of the Information Technology Department as providing “an institutional computing environment that manages and maintains accurate, reliable, and efficient technology services for the success of the College community” (page 2). The administrative unit outcomes listed on the same page emphasize the need to support “a technology infrastructure that is conducive to student learning...” These statements also support the Distance Education Plan in which currency in computational equipment is a necessary characteristic of DE and student success. Students at SJC will be able to collaborate with students at four-year institutions and universities, sharing and discussing data and results of common projects. The Facilities Master Plan goals include creating “campuses that strongly support student learning and contribute to a high standard of student life” as well as creating “campuses and facilities that promote increased student-faculty interaction and interdisciplinary and collaborative learning.” In line with the Facilities Master Plan, this equipment strongly supports student learning and promotes increased student-faculty interactions and
interdisciplinary collaborations in STEM as faculty will facilitate student learning by encouraging instructor-student interactions through authentic research investigations and data analysis.

Section IV – Goals and Measurable Outcomes – 30 points possible

1.) Describe your goal(s) for this project (10 points). How will this improve student learning or enhance institutional services? For a review of goals, see pp. 18 – 20 of a presentation via this link.

Goal 1 – Create a more equitable learning environment at MSJC for chemistry students to access and utilize sophisticated real-world computational technology. Goal 2 – Encourage student success by providing students with an active-learning environment in which they can access and evaluate real-world, real-time phenomena from the perspective of course-based knowledge; Goal 3 – Facilitate experiences in which MSJC students can collaborate with one another and with transfer institutions by sharing knowledge and ideas; Goal 4 – Assess student interest throughout the process in real-time to determine whether active participatory learning is happening to encourage student retention; Goal 5 – involve full-time and part-time faculty in regular communication regarding implementation of experiential learning methodologies in chemistry courses.

2.) What are the measurable outcomes for this RAP (10 points)? That is, how will progress toward meeting your goal(s) be identified and/or measured? Click here for learning outcome reference materials.

Measurable outcome for Goal 1 – Purchase Nuclear Magnetic Resonance Spectrometer for chemistry students at SJC. This equipment will complement mass spectrometry instrumentation in the lab to provide students with increased hands-on laboratory experiences. Measurable outcome for Goal 2 – Analyze institutional data of the chemistry success rates and compare these data to previous semesters. Measurable outcome for Goal 3 – Analyze institutional data of the chemistry department transfer rates and compare these data to previous academic years. Measurable outcome for Goal 4 – Analyze institutional data of the chemistry retention rates and compare these data to previous semesters. Measurable outcome for Goal 5 – Collaboratively design, develop and distribute new laboratory (and potentially honors) activities that incorporate use of the new instrumentation to full-time and part-time chemistry faculty.

3.) Explain how your outcomes are tied to your CLOs/PLOs/AUOs/SLOs (10 points).

Measurable outcome for Goal 1 (purchasing the NMR) corresponds to ILOs for scientific awareness, social awareness, and responsibility, in addition to PLOs that site fundamental knowledge and understanding of the nature and properties of elements since the equipment requested in this RAP supports the investigation of physical principles through analysis of magnetic interactions, which are analyzed using computational software. Furthermore, this equipment will allow students to form
collaborations and benefit from interactive inquiry and teamwork, while exploring concepts and engaging one another with intellectual challenges. Not to mention, student experiments will be comparable to current research objectives in the greater scientific community. **Measurable outcome for Goal 2** (analysis of chemistry success rates) corresponds to PLOs that emphasize the **ability of students to demonstrate application of scientific inquiry to problem solving and fundamental knowledge of principles governing matter and energy and their transformations via chemical reactions** in addition to CLOs because measuring student success correlates directly to the breadth and depth of knowledge that can be demonstrated. Our CLOs for CHEM101, 102, 112, and 113 are designed to assess demonstrated application of chemistry concepts, and Goal 2 provides an active learning environment in which students may apply course-based knowledge to real-world science. **Measurable outcome for Goal 3** (analysis of transfer rates) corresponds to ILOs, chemistry PLOs, and chemistry CLOs because transfer students have engaged across disciplines at our institution and have developed skills and abilities associated with various levels of academic **responsibility** and **scientific literacy**. Facilitation of collaborative experiences using advanced technology will support a bridge for MSJC transfer students to four-year institutions and universities. **Measurable outcome for Goal 4** corresponds to ILOs for **scientific awareness**, **social awareness**, and **responsibility**, as well as the chemistry PLOs that emphasize the **ability of students to demonstrate application of scientific inquiry to problem solving** and course-related CLOs for CHEM101, 102, 112, and 113. Student retention correlates to both cognitive and non-cognitive skill sets, including perseverance and a sense of community and personal support. **Measurable outcome for Goal 5** relates to all aspects in which student-faculty-staff-administrative aspects of professional development affects learning outcomes.

**Section V – Implementation Plan – 10 points possible**

What are the steps that you will take or need to be taken to implement this proposal?

1.) Who is in charge of implementing the project (2 points)? Rosaleen Gibbons

2.) What are the projected start and end dates (2 points)? Fall 2016 – Spring 2017 to measure initial outcomes, then ongoing each academic year.

3.) What other departments will need to assist to assist with the acquisition/implementation of the project (2 points)?

Purchasing, Facilities

4.) When will the outcomes be measured (2 points)? Throughout and at the conclusion of each semester

5.) How will you measure the desired outcomes (2 points)? Surveys, reports, assessments, exams, and CLOs
### Section VI - Projected Expense Profile

For the object codes and titles below, please indicate the monetary amounts requested.

**Object Code 4XXX**
- **Supplies and Materials**: Please indicate the monetary amounts requested.
- **Supplies and Materials**: Please indicate the monetary amounts requested.
- **Supplies and Materials**: Please indicate the monetary amounts requested.

**Object Code 5XXX**
- **Services**: Please indicate the monetary amounts requested.
- **Services**: Please indicate the monetary amounts requested.
- **Services**: Please indicate the monetary amounts requested.

**Object Code 6XXX**
- **New Equipment/Building or Site Improvements**: NMR Spectrometer. Amount requested: $110,000
- **New Equipment/Building or Site Improvements**: Please indicate the monetary amounts requested.
- **New Equipment/Building or Site Improvements**: Please indicate the monetary amounts requested.

(S2) Subtotal from Non-Personnel Requests: Please indicate the monetary amounts requested.

Total Proposed Budget (sum subtotals (S1) and (S2) above): $110,000

### 3. Secondary Effects (if this proposal is approved)

If a Classified/Administrative Personnel Prioritization Request is being submitted in tandem with this RAP, what additional space, if any, is needed to accommodate this position: Please indicate the monetary amounts requested.

For equipment and technology requests, will additional space be needed to accommodate the requested equipment? If so, where is the proposed location? No

Will requested equipment require maintenance agreements or support personnel? If so, what the projected costs? No

Please list future year anticipated needs and estimated financial needs. NOTE: This section refers to any anticipated funding not addressed by this RAP but required in the future. *This will not be automatically funded.* A new RAP must be completed in the future.
<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Anticipated need</th>
<th>Estimated amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiscal Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiscal Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiscal Year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>