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Best Practices in Creating and Running Research Experience Programs

Abstract

Research experience projects for undergraduates, teachers, community colleges, and K-12 students have increased in recent years. The properly designed and executed projects have the potential to not only expose the participants to the advanced research environment and provide engagement opportunities in exciting scientific activities, but also their positive impacts enhance the project faculty and graduate assistant career developments.

This paper describes various planning and management aspects of different research experience programs that target a wide spectrum of audiences from K-12 to undergraduate students. The experiences are described by utilizing the three research experience project director perspectives, including the authors of the paper. The discussions identify best practices in the design of research experience programs and effective engagement approaches for the participants, graduate assistants, faculty members, and administrators for superior program achievements.

Introduction

Research experience programs have recently become a popular approach to introduce various segments of the population to the research world. Students focusing on scientific research careers are highly important to maintain US global competitiveness and national interests. It is widely believed that hands-on research opportunities encourage undergraduate students for STEM disciplines, with up to 30% ‘increased a lot’ ratings\(^1\). Undergraduate students extensively indicate personal and intellectual developments\(^2\) as well as recognition by mentors\(^3\) and postgraduate education in the sciences\(^4\) after the research programs. Also, research has been conducted to analyze the components of undergraduate research programs for effective research sites and improved educational experiences\(^5\).

The most popular and well established research opportunities are the Research Experience for Undergraduates (REU) and Research Experience for Teachers (RET) programs, with a number of sites across the United States and collaborative international sites\(^6\). REUs and RETs offer several forms including the individual support for undergraduate students or teachers through external or internal funding of a faculty member. Under this model, one or more individuals participate in a faculty member’s research and are funded either directly by the research or through supplemental funding obtained through a funding agency such as the National Science Foundation (NSF). Another model, the focus of the current research, is the establishment of a research experience site targeting a certain segment of the population. There are also research programs for prospective students in K-14 levels, including a week-long hands-on high school research experience camp\(^7\) with desired program outputs and a two-week community college research experience program with retention and recruitment goals\(^8\).

A research experience site can be sponsored by an external or internal entity and includes three major components, as shown in Figure 1.
The research theme for a site dictates the research project selection process and is a very important aspect for the research site. The thematic basis for the program can be a discipline specific or multidisciplinary in nature. The research projects could be loosely connected within broad themes such as science and engineering that allows almost all of the research conducted within a college or a university, or could be included in a more defined research theme such as metal casting research that connects all participants’ research around a well defined goal. The advantage of the latter is the ability of the participants to see and experience connections among different research projects to achieve a common goal.

A project director leads and manages the research site. The director is responsible for the following activities:

- Conceptualizing and writing the project proposal to a funding agency, with clear presentation of the theme of the research site and associated components,
- Engaging all project Principal Investigators and faculty members during the proposal stage to ensure buy-in and commitment with the project, if funded, for the project duration and including departmental and other appropriate administrators in the discussions to promote support and possible future resources for the project,
- Establishing and maintaining two-way communications among the management team, the faculty mentors, graduate assistants, project participants, and affected administrators at the appropriate points in the proposal and project timelines,
- Designing and administering the logistic and financial frameworks for healthy research activity executions,
- Securing the resources needed to manage and support the activities of the participants such as supplies, space, lodging, and travel at a time when the budgets for the research sites are becoming increasingly tighter,
- Recruiting and engaging the faculty mentors, graduate assistants, and support staff members to manage various program activities under the same conditions that allow very limited financial support,
- Designing and managing the recruitment plan for the prospective program participants,
- Evaluating the program execution and objective achievement,
- Administering follow up activities, and
- Disseminating the results and preparing annual and final reports.
The faculty mentors and graduate assistants are also among the most important elements for establishing an effective research experience site since they work closely with the participants to conduct research on the projects. It is important to recruit and engage faculty mentors and graduate/undergraduate student assistants to ensure that a critical balance is struck between providing a true research experience for the participants who has ownership of the small research project and the mentor and graduate assistant interests in achieving their own research objectives. In other words, while the participant significant research experience is the focus of the project, instead of being a mere data collector, there needs to be academic merit and associated value for the mentor and graduate assistants to accommodate the participants in laboratories.

**Advantages to Research Experience Participants**

Participation in research experience programs that are designed properly can have tremendous advantages. The key is the proper design of activities that provide as much ownership of the research to the participant as possible. Major advantages are described below:

**Personal Growth:** Participants will enhance their interpersonal skills and time as well as project management.

- **Team skills:** Participants generally work in teams consisting of peers or graduate student assistants under the supervision of the faculty mentor. The close engagement and supervision allow the participants to develop a sense of worth and learn evaluating the effects of orders, criticism or suggestions in their own research, rather than just accepting the orders.

- **Time management:** Properly designed programs require one or more deliverables. Participants will generally have to balance time and resources in order to achieve the project-related deliverables. The time management is an essential skill needed for all of the models.

- **Project planning:** In models that ensure ownership of the research projects with the participants, scheduling the lab and other resources needed for research, ordering project-related supplies, and rescheduling and modifying project milestones dynamically throughout the semester need to be learned and handled effectively by the participants. No longer will it be someone else’s responsibility to get things ready, it is the participant’s responsibility to make sure the research components take place as scheduled using the proper channels and resources.

**Technical Growth:** Learning possible and effective usage of new technology or refinement of existing technological knowledge is the most obvious of the benefits. Participation in a research project generally involves learning new as well as advanced technical skills related to the field of study. The research experience will also entail oral communication and writing skills that are necessary for disseminating the research results.
Creativity: The participant creativity in a properly designed research experience model is usually more challenging than what is found in traditional tasks due to the following aspects:

- Open ended expectations: Participants are not given a definite task. The project students define their tasks and often are motivated and urged to go beyond the basic threshold.
- Troubleshooting problems: When problems related to research project occur while resources are available to help them overcome these problems, the project participants need to utilize these resources, technical or personnel, to solve the underlying problems.
- Finding alternative solutions due to short time frame: As the constraint of the short time frame and the problems arising along the way challenge the original research plans, the participants learn to find alternative solutions to cope with the challenges.

Challenges of a Research Experience Sites

Based on the experience of the author in governing REU and RET sites and personal involvement and interviews with the project directors of a community college research experience program and a high school research camp director, major challenges are tabulated in Table 1 for an easy overview and possible adoption in other academic institutions and are discussed below.

Challenges for the Principal Investigators (PIs)

The site PIs need to balance many conflicting and challenging objectives, as discussed below.

Theme & Projects Selection: In preparing a proposal for a research site, the potential project director faces the challenge of needing to present a research theme that is timely and has a large base of research support within the host institution. This condition is necessary to guarantee active and popular research project availability for the participants to engage over the project period. The number of disciplines involved is determined by the availability and buy-in of the faculty who have committed to the project. Having more topics is not necessarily the best choice due to associated logistics and participant background considerations.

Large research schools do not usually have a problem in placing participants in actively funded research. This problem is more pronounced in smaller schools where teaching is a major component of the faculty activity and funded research is limited. For such smaller schools, interdisciplinary themes may be more appropriate to achieve such a critical mass of research base to support the site. An example of such an interdisciplinary theme is found in manufacturing that is a field in which boundaries between disciplines disappear and opportunities for multidisciplinary research become feasible. The current research projects and faculty mentors participating in the program represented different disciplines in the Texas A&M University-Kingsville (TAMUK), College of Engineering.

The Research Experience for Teachers in Manufacturing for Competitiveness in the United States (RETainUS), funded by the NSF, was established at University of Tennessee and later moved to TAMUK. The project aimed at retaining and advancing the manufacturing base in the U.S. through improvements in the teachers’ understanding of manufacturing and relations to the existing math and science curriculum. The following research projects were covered including:
Table 1: Best Practices for Research Experience Sites

<table>
<thead>
<tr>
<th>Project Director Challenges</th>
<th>Mentors Challenges</th>
<th>Participants Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theme and Projects Selection</strong></td>
<td><strong>Communication Gap</strong></td>
<td><strong>Fear Factor</strong></td>
</tr>
<tr>
<td>Select a theme that has sufficient research depth within the institution</td>
<td>Mentor the project mentors prior to the program on project expectations and on handling difficult situations</td>
<td>Explain the expectations clearly and share success stories of previous programs</td>
</tr>
<tr>
<td>A multidisciplinary theme should have a focus to enhance collaborations</td>
<td>Use available participants from previous years to help in the program</td>
<td><strong>Technical Preparation</strong></td>
</tr>
<tr>
<td>A very broad theme can be challenging to manage</td>
<td></td>
<td>Select projects appropriate to the participant technical knowledge levels and resources available</td>
</tr>
<tr>
<td><strong>Guaranteeing Mentors' Buy-in</strong></td>
<td><strong>Dissemination</strong></td>
<td><strong>Technical Preparation</strong></td>
</tr>
<tr>
<td>Highlight previous years' successes</td>
<td>Emphasize importance to all participants repeatedly</td>
<td>Select projects appropriate to the participant technical knowledge levels and resources available</td>
</tr>
<tr>
<td>Coordinate with mentors on research project outreach requirements</td>
<td>Educate the participants on project reporting by sample examples</td>
<td>Provide support to overcome the knowledge barrier</td>
</tr>
<tr>
<td>Flexibility in project selections, with support from mentor interests</td>
<td>Work with mentors to publish project results and credit the funding agency</td>
<td><strong>Peer Interactions</strong></td>
</tr>
<tr>
<td>Involve mentors as much as possible in the selection of participants</td>
<td>Tie in to mentors own outreach activities for their research projects</td>
<td>Explain possible handling approaches for interdependent projects and remedies for lagging teams</td>
</tr>
<tr>
<td>Financial support for mentors and graduate students</td>
<td>Share successes with program managers - Your success is their success</td>
<td>Allocate administration time and attention fairly among the participants</td>
</tr>
<tr>
<td>Give credit to mentors in all press releases and project activities</td>
<td></td>
<td><strong>Engaging Administration</strong></td>
</tr>
<tr>
<td><strong>Project Management</strong></td>
<td></td>
<td>Involve in internal evaluation committees for the project</td>
</tr>
<tr>
<td>Large scale projects need extensive initial planning and preparation</td>
<td></td>
<td>Invite to important program events to share successes</td>
</tr>
<tr>
<td>Select trustworthy staff members and explain the importance and demands of the project</td>
<td></td>
<td>Illustrate the project execution that assists the institutional mission</td>
</tr>
<tr>
<td>Start all activities such as recruiting participants early</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
a) Advancing the state of the art in conventional manufacturing processes such as metal-casting,
b) New trends in manufacturing such as rapid prototyping,
c) Emerging technologies such as nano-materials and manufacturing of special coating materials, and
d) Enabling technologies serving manufacturing processes in general such as intelligent optimization.

Although the multidisciplinary nature of the theme of manufacturing worked well for the RET experience, a too broad theme or having no theme at all may pose a challenge for the project director. One of the elements of success of a research site is establishing a professional connection and effective communications between the project director and the various mentors. Such relationships allow the director to maintain the mentors engaged and ensure buy-in from the mentors. As noted in the Appendices A.1 and A.2, the project director of a research summer camp for high school (HS) students suggests that limiting the research mentors to engineering (discipline of the director), as opposed to science and engineering, may make the summer camp more manageable.

**Guaranteeing the Mentors’ Buy-In:** Out of several models to design a potential research experience opportunity, the easiest of these models is to take the participant and plug him/her into a functioning research group. The participant is assigned to a mentor from the research group (graduate or undergraduate student) who supervises the participant during the research period. This model has the danger of the participant turning into a high cost data collector who just follows the orders of the direct mentor. Other models such as the model used by the author, Student as Principal Investigator (SPI), aim to place the control of the research in the hands of the participant to a large extent. It is important, however, for the mentors to have a vested interest in the participants’ research projects. Moreover, mentors usually have their doubts regarding participants’ abilities to identify a research question and come up with a research plan during the first week of the summer. This anxiety is usually relieved during the first week as the participants are guided to identify a problem that falls within the scope of research interest of the mentor and with agreement on a time schedule and milestones. *The project director’s challenge is to effectively balance independence of the participants’ research and the vested interest of the mentors.*

One of the best methods for engaging the mentors and reducing their skepticism regarding the participants’ abilities to contribute is to involve mentors in the early stages of the process of participant selection. The mentors, hence, assist screening the applicants and select those prospective participants with highest potential to contribute to the research activities.

**Project Management:** Successful research experience programs require continuous involvement and support for the participants and mentors at various stages of the program. The project director needs to provide advice to the participants in tandem with the faculty mentors on managing and updating research plans, accessing on- and off-campus resources, documenting and presenting results, and interacting with staff and personnel on the campus. A balance between directing the project and facilitating participants’ learning needs to be maintained by the project director and the PIs if they are not the same.
Based on the model of the research experience, the project participants can be empowered to make decisions regarding their research directions. This process sometimes conflicts with the mentor and graduate assistant expectations. Most of the time, these conflicts are handled directly by the mentors. However, certain situations require informal mediation by the project PIs. During possible mediations, it is always useful to remember that the need for mentor’s buy in with participants’ ownership and ability to grow as researchers provide a balanced arrangement.

One of the main aspects of long term research sites such as a RET is the need to establish the expectation in writing at the onset of the program. Teachers, in general, are comfortable with long-term planning and do not accept any perceived changes in the requirements easily. For example, it is best to lay out the expected project deliverables, the time for financial compensation and associated responsibilities, and the nature and timeline of follow-up activities after the active research experience. It is advisable to make most of the critical project deliverables due while the participants are still on campus. For teachers, it is very difficult to compete for attention with their students and their training requirements during the academic year. For undergraduate students who are not on campus, the situation is very similar. In a similar fashion, information needed for annual reports should be collected from participants while on campus. Information required from the participants after leaving the campus should be requested early. PIs need to be prepared to have to request this information repeatedly as well.

**Dissemination:** the complete impact of a research experience program can truly be reflected by paying close attention to dissemination. Scholarly dissemination for the research experience sites is different than other research programs. The participants are not generally aware of the need for the dissemination and, in general, have not previously participated in such activities. The importance of the dissemination to the success of the program needs to be emphasized time and again during the program duration. It should also, if possible, be incentivized or integrated as one of the requirements of the program, i.e., a post-project deliverable. There are many successful examples of teachers participating in RET programs, publishing and presenting in national academic conferences\(^\text{10, 11, 12}\).

Another challenge is to properly and effectively follow-up with the project participants after the program completion to get a report about satisfactory dissemination activities that they may have participated in. For example, teachers presenting to other teachers within a training session in the district was not reported back to the program director even though it is an important dissemination activity. Regular communication with and reminders to the participants can be an effective tool to gather useful information for project dissemination deliverables.

Dissemination of the technical information that resulted from the program is usually the responsibility of the mentor and performed seamlessly. However, the problem is to make sure that this activity is reported back to the project director. Another issue is the proper referencing of the supporting grant as applicable.

**Recruiting Faculty Mentors and Graduate Students:** The challenge in recruiting mentors to participate in a research experience site is greatly simplified with the proper research theme. As discussed earlier, the proper theme will provide access to active research projects on the campus.
allowing for successful insertion of the project participants. Programs offering some financial support for the mentors are easier to recruit for. However, most of the REU and RET programs do not allow financial incentive for the mentors. Partial support for graduate assistants over the project duration has been one reasonable incentive to use during the mentor recruitment. RET and K-12 programs are attractive to mentors whose research funding requires an outreach component.

Recruitment also depends on the proper explanation of the potential benefits of the program to mentors’ own research, alignment with the outreach components of their research funding, and the effects of the project on their academic status. Some of the benefits for mentors are provided in Table 2.

<table>
<thead>
<tr>
<th>Research Contributions</th>
<th>Research participants can take on tasks that can help the main research thrust of the mentor or allow him/her to explore other aspects of the research that would otherwise not be addressed. Documenting and sharing success stories such as research publications and invention disclosures that resulted from previous years with contributions of previous participants can be an effective tool in highlighting the potential research impact.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service &amp; Outreach</td>
<td>Research Experience programs can be documented, high impact outreach and service activities for participating mentors.</td>
</tr>
<tr>
<td>Collaborations</td>
<td>Interactions among various mentors involved in the same project site focused on a common theme can result in future collaborations among mentors.</td>
</tr>
<tr>
<td>Exploring Mentoring Strategies</td>
<td>Research experience programs also offer the mentors the chance to explore new mentoring strategies or styles. If the style is successful, it can be generalized to a form of active learning.</td>
</tr>
</tbody>
</table>

**Engaging Administration:** The engagement of the host university administration is a very important aspect that is often neglected. Getting the needed resources for the success of the programs especially under the current budget crunch and reduction in the available funding for similar programs make this engagement very important, with perceived potential benefits. The administration needs to recognize the value and merit of these research programs on the school image and reputation, and the nature of project alignments with the mission of the school. The administration personnel are in need of being updated on a regular basis on the project status and associated successful achievements. For example, the research programs have proven an important recruitment tool in the case of community college students. RET programs are truly outstanding methodologies in making the teachers ambassadors for engineering. These teachers have been successful in using their research experiences for recruiting their students into engineering.

**Recruiting Participants:** A recommendation for successful programs states that the participant recruitment process starts several months prior to the start of the research program. Mass emails to various regional institutional bodies may produce higher number of applications. However, contacts with key individuals such as curriculum supervisors, school counselors, community
college advisors, and faculty members in community colleges will yield the best results. It is also important to ask previous participants to advertise for the proposed program and recommend it to colleagues and peers.

**Challenges for the Faculty Mentors and Graduate Students**
The mentors and graduate students are an essential part of any research experience program. Their roles vary according to the model used from actively leading the program and controlling all aspects of it to acting as facilitators in the SPI model.

**Communication Gap:** As one of the project directors interviewed noted, some mentors treat high school student participants in a summer camp as if they are graduate students. Proper training of and guidance for the mentors especially those who have not dealt with teachers, community college students, or K-12 students is essential. It may also be helpful to use some of previous years’ participants to assist in the program as this practice will alleviate some of the anxiety of the new participants.

Research experience models that aim to empower the participants as the main researchers can be especially challenging to mentors. Some mentors revert to the assistant model giving detailed instructions to the participants and asking the participant to follow these instructions. Other mentors take an approach in which too many options are presented to the participants. This practice, in turn, may overwhelm the participants given the limited amount of time available in the project duration to investigate all the options. In addition, some other mentors take a complete hands-off approach in which the participants do not have a facilitator to help guide them as they make decisions regarding modifications in the research plan. This implementation approach can give the participants the feeling that their research is not important to the mentor. Thus, although mentors have to accept the participants’ independence, they still need to present their interests for the research being conducted.

**Challenges for the Participants**
The research experience site also presents challenges for the prospective participants.

**Fear Factor:** Participants in research experience programs are usually anxious about the experience that awaits them over the project duration and whether they will be able to meet the project expectations of the mentors and the program directors. Models that challenge the participants such as SPI can greatly amplify these fears, if the corresponding anxiety is not handled properly. The anxiety is due to the fact that they are in charge of the design and direction of their research project. Proper design and implementation of the first week activities in which the participants observe their peers going through the same experience have usually resulted in the reduction of anxiety. Most participants over the past two project periods have been able to come up with a satisfactory research plan that is acceptable to their mentors and program PIs. The necessary changes in the research plan take place in a more natural way as a result of consultation with the mentors.
**Lack of Technical Preparation:** Another challenge to the participant is to find that he/she is unprepared to take the responsibility of the research question due to being technically unprepared. However, identifying this problem early on can improve the outcome. Some of the problem identification can be done during the recruitment phase and while matching participants with mentors. Participants have generally shown that a combination of the right attitude and hard work can overcome potential and legitimate hurdles. An illustrative example is that one of our participants worked on a system identification problem of a dynamical system even though he had not had any formal courses in control systems. The participant started by focusing on learning the relevant aspects of modeling of linear systems and the MATLAB Identification Toolbox over the first few weeks. The participant learning curve was impressive with data collection and analysis of a real problem.

**Peer Interactions:** To many participants especially for those in REU programs, another challenge that may arise is when their planning skills are challenged for the first time. Some find themselves responsible for running a research project that may be interdependent on one or more of the participants. This interdependence sometimes raises interesting situations in which participants learn that their success is not only reliant on their own efforts but on others’ efforts as well. Another interesting situation can arise from competition for the attention and praise of a common mentor. This situation can also be one of the challenges for the mentors in balancing their attention to each of the new researchers looking for proof of their success. This environment is similar to sibling rivalry and needs to be handled with tact.

**Conclusions**

This paper provides valuable perspectives on designing successful research experience sites and associated benefits of these sites to the participants. Based on the personal experience of the authors in directing REU and RET sites and interviews with two other research experience site project directors, potential challenges that may arise were also addressed. The challenges discussed include those that face all project directors, mentors, graduate students, and participants in such programs. Insights into effectively addressing possible challenges have been discussed. It has been observed that the research experience sites are very instrumental to connect participants with advanced research, to disseminate scientific developments into classrooms effectively, and to enhance future STEM applicant pipeline. Carefully integrating the research theme and site, project personnel and participants in a balanced manner and with clear project execution and objectives is likely to yield best educational and sustained outcomes. The work presented here is currently in progress and is the basis for a more comprehensive analysis of the challenges that face those involved in such programs.

**Bibliography**

The Appendices include sample responses from the project directors on research experience sites.

Appendix A.1

A.1 Research Experience for High School Students:

Synopsis

This program is designed as a series of summer camps for students. It has been conducted at Texas A&M University-Kingsville, a minority serving institution for several years. The series is composed of three independent summer camps. Each of the camps is one week long. All target high school students.

Questions & Answers

1. Designing the research program as you have learned through your experience (period, range of projects, presentations, etc)?
“For high school (HS) students, one-week seemed to be fine since the students were eager to find the end results. Research program should include popular subjects and advanced laboratories. The prospective participants should be able to choose their own research topic (a challenge for the organizers). HS officials can be part of the recruitment and admission plans to truly identify students with highest potentials. Presentations are very motivational and instrumental provided that the students are trained about the supporting documentation and presentation specifications, requirements, principles, etc. While poster presentation is easily handled by most HS students, oral presentation and Q&A sessions for judges can really motivate the students for better presentation and subject comprehension. Universities such as TAMUK can consider past camp experiences during scholarship assignments for effective research program candidate selection.”

2. Recruiting and selecting the mentors? Engaging the mentors?

“Any research faculty member can easily serve as a mentor provided that they are fully aware of HS students. Mentors sometime seem to treat HS students as if they are MSc students. Mentors can also maintain past camp participation records with (at least) acceptable HS student ratings. A mentor orientation session focusing on educational expectations of the program can really remove a lot of potential problems. Also, there could be a minimum number of hours for mentors to satisfy the program objectives and associated pay, etc. The HS student/team performance can also be a bonus factor for engaging and productive mentors.”

3. Recruiting and selecting students for the program?

“HS officials can be part of the evaluation team. The program organizers can start very early such that HS research projects/competitions can be sponsored by the program and potentially promising students can be identified. Also, the same HS events can serve as a precursor for the advanced research camp. GPA is important during the student selection but the research potential and interest of the candidate should somehow get into the big picture.”

4. Selecting projects for the program?

“Popular projects such as robotics, computers, and bridge building for the HS students are very effective. The potential student or a student team from the same school can develop a research proposal and the program administrators can match the research subject as much as possible with the available faculty, labs, etc.

Hands-on nature of the projects is also an important factor to successfully engage students. Projects with heavy computer programming do not seem to affect students extensively (except pure computer science projects such as animation development, etc.)

5. Utilizing graduate students to help with the program?

“Graduate students (GS) are very instrumental for more efficient program experience provided that the GS understands the HS student mindset. Any GS should already have learned the American culture and social situations to reach out their project HS students. Stipend should not be the only factor for a GS to take part in the program. Perhaps, the GSs associated with the
program competition winner HS teams can be offered some sort of recognition by the program/school or considerable support for academic events such as partial support for a conference, textbook(s) of their choices, etc. A short but intensive orientation session about pedagogical issues for GSs can improve the overall success of the program.”

6. Engaging administration on campus?

“Starting with the president, all high profile administrators should engage with program students. Engagements may be short but should convey the message in terms of speech content, gestures, personal interactions, etc.

Campus offices should support the event as if the event is their own. This process seems to be little hard for many events, possibly due to lack of incentives for potential people. If someone sits in an office or goes crazy for a short-noticed presentation, the evaluation by the administration (or a supervisor) should rightly reflect the varying amount of efforts.

The program administrators may not have all the supporting personnel for many different offices on the campus or required paperwork for the program. There could be a one-stop shop (such as Javelina Student Success Center) for campus-wide programs.”

7. Sustaining the program beyond funding?

“Industry connections should produce some sponsorship. Departmental and college advisory boards can facilitate attempts to reach out into corporate ladders. Sometimes, if the program does not know any insider, it is extremely difficult to contact the right person and receive some support. Corporate sponsorship for senior design projects can be attached to the program period.

Private foundations can also assist to sustain the program provided that timely applications (sometimes 1-2 year prior to the program) are submitted.

University community should also be rewarded for their time & effort donations to programs in some attractive way. Faculty with research funding may be expected to provide slot(s) for summer research programs and the administrative evaluation may reflect the faculty kind-in donation for the program.

Undergraduate students can enhance the service component of their educational experience and student clubs can sponsor some portion of the activities in terms of personnel, etc.”
Appendix A.2

A.2 Research Experience for Community College Students:

Synopsis

Another type of research experience programs is a short term research programs intended to give a quick introduction to research to community college students as a way of attracting the students to 4-year study in Engineering and Science. The particular program surveyed was offered at the period between spring and summer during the month of May and is termed May-mester. The program was funded as part of a broader NSF program. Students spent two weeks working closely with a science or engineering faculty supported by a graduate student. The community college student was expected to do a simple research project and make a poster presentation at the end of the two weeks.

The survey questions were presented to the current project director who was not part of the original proposal team, but joined the program in the 3rd year.

Questions & Answers

1. Designing the research program as you have learned through your experience (period, range of projects, presentations, etc)?

“As the research program is designed it should be focused on the main audience is going to benefit.”

“The period of 2 weeks for the May-mester program is short and probably one month as a minimum would allow a better completion of the projects.

Research projects should be narrowed to specific fields, e.g. Engineering only. Trying to include other STEM fields is quite challenging.

The poster presentation was the best way to showcase the research and students enjoyed this format.”

2. Recruiting and selecting the mentors? Engaging the mentors?

“It was usually very challenging mainly because the May-mester occurred during the intersection between Spring and Summer. Invite faculty with established research projects. Most of times, tenure-track faculty were especially eager to participate. The idea of potentially publishing the research outcomes from the project is particularly appealing to faculty. Offer graduate student support, research and supplies and a reasonable stipend.”

3. Recruiting and selecting students for the program?

“Start early (at least 6 months in advance). Having a contact person at the community colleges, particularly STEM counselors is key to recruit students for the program. Avoid having minors
working together with more senior students (This model did not work well). If having minors from dual enrollment programs put them in the same research team.”

4. Selecting projects for the program?
“The projects came directly from the faculty mentors. The team program has to select faculty from specific fields.”

5. Utilizing graduate students to help with the program?
“Very important! In fact, graduate students are the ones that spent most of the time (if not all) with the student participants. Graduate students (and I should add undergraduate students as well) are the best ambassadors to recruit potential new students to the College.”

6. Engaging administration on campus?
“Definitely a must. Administration should be aware of the benefits of the program to the university. Have Administration in the internal evaluation of the program.”

7. Sustaining the program beyond funding?
“Crucial. One of the main expectations from the sponsoring agency and probably the most challenging. Need to have good internal and external evaluation /assessment to strongly justify the institutionalization of the program within the university.”