

THE AMERICAN PHYSICAL SOCIETY BRIDGE PROGRAM



GRADUATE STUDENT INDUCTION MANUAL

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Summary of Contents

Introduction

This section outlines ways in which the APS Bridge program can support you in implementing and improving your bridge program.

Making Appropriate Matches

Appropriately selecting students for your program is crucial to success. In this section, we provide things to consider in choosing students for your program and also information to share with students to increase the likelihood that an appropriate match is made.

What Students Need to Know Prior to Arrival

We outline information that bridge students should receive prior to arrival in this section. This includes information that should be communicated to students directly and information that should be included in an information packet sent to students.

Developing Induction Activities

Well-developed and successfully implemented induction activities are effective retention tools. In this section, we discuss a variety of induction activities and strategies for developing them.

Academic Assessment and Support

In this section, we discuss ways to assess academic preparation prior to student arrival through interviews and pre-assessments. We also discuss progress monitoring and strategies for supporting students struggling academically.

Integration into the Community

Strategies for integrating students into the graduate community and preventing isolation are covered in this section. This is an effective tool for retention and also allows for early intervention should challenges arise.

Mentoring for Retention

Mentoring is one of the most important retention strategies. In this section, we provide general tips on mentoring, various mentoring models that your program can implement, questions to ask during mentoring meetings, and strategies for engaging in culturally responsive mentoring.

Building, Sustaining, and Reestablishing Trust

In this section, we offer tools for building, sustaining, and reestablishing trust. We also provide examples illustrating the use of these tools.

Preparation to Transition into the PhD.

Tips for preparing students to transition to the PhD are provided in this section. This section will be especially useful to master's institutions and doctoral institutions that do not admit students directly into the PhD.

I. Introduction: What Can the Bridge Program Do for You?

What is your department's objective in implementing a bridge program?

This may seem like a trivial question, but it has a major impact on the resources needed to sustain your program, the characteristics and academic backgrounds of the students you will decide to admit into your program, and the model you will choose in implementing a bridge program. We assume that all departments interested in implementing a bridge program are hoping to broaden participation in graduate physics education and increase diversity within their department, but even more, departments have recognized that the fundamental ideas behind bridge programs benefit all students. Below are some more nuanced objectives for implementing a bridge program and considerations on how to successfully achieve those objectives. The objectives are to identify and recruit ethnic/racial minority students to your graduate program:

- ❖ Who would be admitted and successful in your current program, but would not likely apply.
- ❖ Who would not be admitted through traditional routes, but would be successful in your current program.
- ❖ Who might need additional resources to be successful in your program.

The APS Bridge Program (BP) is equipped to support physics departments that fall into the categories above. Of course, the amount and kinds of support offered depend on which of the objectives above best describe your institution's motivation.

What the APS Bridge Program Can Provide

The APS - BP supports graduate physics programs in their efforts to increase diversity and broaden participation through recruitment support, admissions initiatives, and retention. In addition, APS seeks the broader goal of implementing best practices that benefit all graduate students. It is our contention that these practices do benefit all students, and their implementation is worth considering. Specific areas that APS- BP can support your program's efforts include:

Recruitment:

❖ **Providing Access to APS Bridge Program Applications**

One of the most significant ways in which the bridge program supports departments is access to student applications. Students applying to the bridge program are diverse in terms of academic preparation, research experience, and racial and ethnic origin, but all are eager to enter graduate school in physics. In previous years, bridge sites have found that some applicants would have been accepted into their program if they had only applied through the usual channels. In fact, some of the bridge applicants were immediately accepted into the institution's PhD program, despite entering

through a bridge application. The bridge application process is designed to help programs get a more holistic understanding of student potential as a PhD scientist than some traditional graduate applications, but it is still imperative to do due diligence in making appropriate matches for your program (See [Making Appropriate Matches](#) and [Academic Assessment and Support](#)).

❖ **Helping students find programs they would not find otherwise**

Research on our applicant pool reveals that students are not aware of a number of great departments. If financial constraints limit the number of schools to which they can apply, they will only apply to 1 or 2 schools known to them. The bridge program application eliminates the financial burden of applying to multiple graduate schools. The bridge program website (www.apsbridgeprogram.org) also makes potential students aware of programs they would not have considered otherwise.

Furthermore, as the bridge program continues to grow its network of students, these men and women have served as ambassadors for their institution, and tell potential graduate students about the support they are receiving. APS staff, National Advisory Board Members, and consultants also stay in touch with undergraduate students through a variety of networks, including the National Mentoring Community (www.aps.org/nmc), collaborations with other professional societies (e.g., the National Society of Black Physicists, the National Society of Hispanic Physicists, and the Society of Physics Students), and private/closed groups focused on intersectionality within physics.

Admissions:

❖ **Advocating for use of holistic admissions practices**

Application processes by their very nature can not give a complete picture of an individual, nor can they predict who will become a great scientist. We know from the current success of many bridge students and other physicists, that what someone looks like on paper does not tell the entire story, especially if that individual has overcome a number of obstacles and barriers in their academic journey. With that in mind, the APS BP offers support on understanding and utilizing holistic admissions criteria that minimize biases, and can help an institution create a more diverse class. Some example techniques for reducing bias include a) not requiring the physics GRE, b) conducting short video-interviews with finalists where one probes a student's resiliency and problem solving skills (See [Making Appropriate Matches](#)), and c) looking at the trends of undergraduate GPA rather than the cumulative score and reading carefully to see if life situations contributed to academic performance (e.g., loss of a family member, having to work to support one's self, etc.)

Elucidating examples such as these is a large part of a closely related project supported by APS: the Inclusive Graduate Education Network (IGEN). For more information on IGEN or holistic admissions, please, contact Monica Plisch, plisch@aps.org.

Retention:

❖ Building and maintaining connections to students

Members of the APS bridge program team work to maintain relationships with students in bridge programs. They can also reach out to students that may be at-risk of leaving graduate program. Conferences and meetups organized by the bridge program also provide opportunities for graduate students to connect with peers from other institutions that can serve as part of their support network.

❖ A network committed to increasing diversity in physics graduate education

In the same way that having a support network is beneficial to students, the bridge program provides a support network for faculty. The APS bridge program staff can put you in contact with site leaders who have stated their willingness to help other individuals/institutions navigate challenges in their bridge program. Bridge program site leaders have valuable information regarding mentoring models, assessment tools for placing students in first year courses, and effective recruitment strategies.

In addition to these efforts that are focused on the students, the APS bridge program realizes that departmental climate, faculty buy-in, and institutional support are also related to the success of a bridge program. Thus, the APS can also do the following things to support your bridge program.

- Write letters to your institution's stakeholders in support of your bridge program.
- Visit with stakeholders at your institution during site visits.
- Put you in touch with other bridge program site leaders who can support you in institutional change

II. Making Appropriate Matches

Making appropriate matches is key to having a successful bridge program.

The goal for bridge students is to complete the program, whether that be a master's degree, a PhD, or a research program with preparation for matriculation into a PhD. To increase the likelihood of this happening, programs may want to consider resources they have (or do not have) available to students with various backgrounds and academic preparation. Prior to offering admissions it would be helpful to assess a student's preparation. It is imperative that students understand your institution-type, expectations for completion of the program, and research options available at your institution.

❖ **Consider what resources are available at your institution.**

What resources are available to support bridge students academically, emotionally, financially, and socially? How many faculty are supportive of the idea of a bridge program? Beyond support, how many faculty will be understanding—as an instructor—of students needing extra support due to deficiencies in their academic preparation? How many faculty will be understanding—as a research advisor—if extra time spent on academics results in less time spent in the lab? Can tutoring be offered to students with deficiencies in their academic background? What about instructor-led tutorials or study sessions. Will it be possible for bridge students to take undergraduate courses if needed? What other academic support will be available for bridge students?

Are there multiple people in the department, faculty, staff, or students that can help students with the transition, understanding departmental climate, expectations for graduate students, and expectations for the various research labs? Does your department have a physics graduate student association (See [Mentoring](#))? What other organizations are available to support graduate students outside of your department? What services are available to support students with mental or physical health issues? Are there potential funding sources for ethnical/racial minority students, women, first generation college students, or graduate students with financial hardships? Although the graduate student stipend, may be enough for some individual students to live on, particularly with support from families, this may not be the case for students of low socioeconomic status or students with families to support.

❖ **Are you making good use of pre-matriculation interviews?**

Several reports from bridge sites have indicated that conducting interviews was extremely helpful for assessing student needs and match for the institution. The number of applicants may preclude this from happening for all students, but it is often feasible to conduct virtual interviews with a subset of applicants. These interviews provide an opportunity to better understand student

preparation and motivations, determine if students are a good match for your program, and recruit students to your program.

Testing academic preparation during an interview can be tricky. Thus, we suggest that pre-matriculation interviews not be used in this way. Site leaders have found that asking students to solve problems results in anxiety and students failing to answer questions for which they clearly do know the answer. However, asking students how they go about solving a difficult problem has provided useful information for understanding their ability to solve problems. For students offered admissions, some programs have created assessments for determining placement. If you would like more information regarding these assessments or to speak with someone about these assessments contact the APS Bridge program at bridgeprogram@aps.org. Site leaders have also reported that having non-Bridge faculty participate in the interviews has helped with generating buy-in and support from other faculty members.

❖ **Interview suggestions**

Pre-matriculation interviews should also help students determine whether or not your program is a good fit for them. However, students may not always know the questions to ask. Thus, you want to be prepared to provide them with that information without prompt. Lack of information on the

things listed below has led to some misunderstandings regarding bridge programs. A few topics to discuss are outlined here.

➤ **What does your program offer to potential students?**

Although their goals may be similar, bridge programs vary greatly and students will need help understanding these differences. In fact, students may be under the impression that all bridge programs have the same format and they do not. Thus, it is important to explain the kind of program that you offer in terms of preparation for a PhD program, process for transitioning into your PhD program, and research opportunities offered at your institution. If your program can only admit a single student, from the APS bridge program pool, make sure the student is aware of this (some automatically assume they will be a part of a larger group), and discuss with the student, ways that they can be supported (e.g., by connecting them to students from previous classes, or others outside the department).

If your institution is a master's granting institution, what preparation does your institution offer in terms of helping students to prepare for the PhD (i.e., research experience, GRE preparation, support with PhD applications, etc.). Some students are not aware of the benefits of doing an MS degree prior to matriculating in a PhD program. How can you help them appreciate the advantages and also the implications?

For doctoral granting institutions, what is the process for applying to your institution after successfully completing a bridge experience? Are students enrolled as master's students? As PhD students? As staff members? What markers must they achieve to advance to doctoral candidacy, or to complete their degree? If students are accepted directly into the PhD program, this should be explained explicitly prior to student matriculation.

➤ **Discussing research opportunities available at your institution is extremely important.**

Prior to their matriculation, discuss with students the research areas offered, how many opportunities to work in particular areas are available, and how selective the various research groups are at your institution. Many bridge students are excited about physics because of one or two areas of research that have piqued their interest. Students should receive honest answers about their chances of receiving a degree in their desired area of research. Some students have unrealistic expectations about this, and departments attempt to attract a student with the hopes that they will find another area as rewarding. While this is a reasonable approach, students should have full knowledge that some areas will be more difficult to pursue. Some sites have found it helpful to encourage students to be open to a variety of research areas and then having students start in the summer with doing research to build their awareness and interest in particular research groups.

III. What Students Need to Know Prior to Arrival

The more information that can be provided to students prior to their arrival, the better. However, we have found that there is critical information that students have prior to arrival. We discuss elements of that essential information below.

❖ **Housing Information**

Appropriate housing is probably one of the most important things for students to choose wisely prior to matriculation. Housing issues have been at the root of problems we have seen with a number of bridge students. Thus, it is important to provide specific guidance prior to students making housing decisions. Some bridge sites now require students to receive approval from the program prior to making a decision as a condition for their acceptance.

Housing must be appropriate in terms of distance. It is imperative that students have housing close to campus if your institution does not offer on-campus housing for students. If your institution offers on-campus housing apartments for graduate students, students should be encouraged to take advantage of this. If it is not offered or if it does not fit the student's circumstances, they should be encouraged to find suitable housing near campus. This allows them to easily spend time as needed for study groups, working in the lab, and meeting with professors. Students who have lived far from campus often had difficulty integrating into the physics community because commuting time did not allow them to participate in many activities on campus. This was especially true for students relying on public transportation that included lengthy commutes to get to campus. Current graduate students can be extremely helpful with this task. Depending on their circumstances, they may be able to help by identifying communities in which they, their peers, or their friends may live that supports academic engagement.

Housing must also be affordable. For students living away from home for the first time, finding affordable housing is an important part of their financial management. If student housing is outside of the student's price range, they may find themselves stressed over their finances and some have even taken on a second job to the detriment of their progress toward the PhD. Again, it will be helpful if current graduate students can identify a variety of communities that will provide appropriate housing for incoming students and share this information with students prior to their arrival.

We encourage program leaders to check-in with students prior to their arrival and inquire about their housing arrangements. It is okay to ask students where they have found housing or even to ask students to check-in with you prior to signing a lease or moving into housing. Of course, some students may be bringing families or have other circumstances that require accommodations that are not typical, limiting housing options.

❖ **Managing Finances**

The financial situation for incoming students will vary. For students of limited financial means, it may be useful to offer an advance to cover moving or housing costs. Your institution may be able to use funds from a development account to initially cover this cost and then reimburse the account from the graduate student stipend, spread over several months. Your institution's development and alumni relations offices may also be willing to support raising funds for this case.

We also encourage you to inform students about opportunities to earn extra income on campus in positions that will not require extensive time and will be beneficial to them, such as tutoring undergraduate students. Such tutoring can be beneficial for students who need to review this material. Encourage students to reach out to you in a financial crisis so that you all may discuss options that will not impede academic progress prior to students taking on additional employment or debt load.

❖ **Arrival and preparation for starting classes**

It is important to give students a deadline for arrival. If an induction meeting is scheduled or if they are expected to participate in activities over the summer, it should be made clear to students through direct communication, when they are expected to arrive. Some students may be working prior to matriculation and may decide that it's best to work in a different location until they absolutely have to be on campus to take classes. This should be strongly discouraged. Encourage students to arrive early and become acclimated with the neighborhood and the campus.

It may also be necessary to encourage students to purchase textbooks prior to the start of classes. If there are other things that the students should complete prior to matriculation, such as campus orientations/inductions for incoming graduate students, or programs that your department is offering over the summer, it is best to explicitly state your expectations in this regard.

❖ **Expectations and milestones**

Matriculating into a physics PhD program can be quite intimidating. Giving students an outline of what is expected and milestones that they should expect to reach in the program will go a long way in easing their fears. If students are accepted into a master's program with conditional entry into the PhD, information on the process for acceptance will be especially important. Milestones might include timelines for when they should join a research group, when they will have to take the qualifying exam (if required), or when they are expected to complete critical coursework. This may vary by student, but the idea is to let them know how successful progress in the program should look. Thinking about 5-7 years in a PhD program can be daunting; so the more you can break-up that time to show successful progress in the program the better. If students are required to meet regularly with a mentor during the first semester – which we think is essential – this should be shared with students prior to arrival.

You should be clear that the purpose of these meetings is to ensure their needs are being met and to quickly address any issues that might arise. If such mentoring can not be offered to all students, it is important to communicate that this is not a result of lowered expectations for them, but a commitment by the department to ensure success for all students. If there are other expectations that you have for them during their first year, you may want to include this in information sent to them prior to arrival as well. This is especially important if your department is not engaging in induction activities for students (See [Developing Induction Activities](#)).

❖ Information Packet

Current graduate students may volunteer (or be asked if they have formed a physics graduate student organization) to provide an information packet to be sent to incoming students prior to their arrival. One of the things that graduate students have included was a list of things that they wish they knew during their first year. Bridge students have found this extremely helpful. Advanced graduate students are obviously more in touch with the needs of first year graduate students and often provided beneficial information that faculty did not consider.

IV. Developing Induction Activities For Students

Many bridge program leaders find it beneficial to develop induction activities for bridge students (and in some cases for all incoming students). These activities have been greatly improved by involving current graduate students, particularly students from Physics Graduate Student Associations (See Section: Integration into the Graduate Community). The induction activities should provide an initial introduction to the physics department and university-wide resources that may be beneficial to the students. Although most institutions offer induction/graduate student orientation events, developing induction activities that focus on resources to improve student retention is imperative. During induction activities, bridge program leaders distribute materials to incoming students, previously matriculated graduate students provide advice, present workshops, and offer tours.

❖ **Handouts & Other Materials:**

➤ **Graduate Student Collective Resources**

Some graduate student groups develop materials consisting of “things I wish I would have known prior to my first year” or “how to survive your first year in the graduate physics program.” If your institution has a physics graduate student association or a similar group, encourage them to develop these materials. This is also a channel to provide students with brochures, fliers, and other information on campus resources. Although students may not need or want to look at all of these materials at induction, it may be beneficial to encourage them to keep these materials, so they have these materials available to them if future needs arise.

Implementation of induction activities at bridge sites vary greatly. Some sites bring bridge students in for the entire summer prior to matriculation. Others hold a 1-3 day event prior to the start of the semester. For some, the orientation consisted of a series of workshops/sessions that last throughout the first semester. What is consistent at many sites, is how valuable current graduate students are in planning and implementing induction sessions. In this section, we describe some activities and/or accomplishments of induction activities for bridge students. Some activities described below are obviously more conducive to a semester long seminar than a one- or two-day workshop/event.

❖ **Orientation Presentation Topics:**

➤ **Introduction to research groups**

Some bridge sites arrange for presentations by research groups during a 1-3 day induction prior to the start of the semester. Still other institutions offer monthly seminars during the first semester as part of induction, hosted by graduate students, with topics that cover research groups available, projects they are engaged in, expectations of working in the lab, and climate within that research group. These seminars provide an insider perspective of various labs to help students consider their important choice of research group, and how it will impact their life for many years. In some cases, faculty members were asked to attend and add their perspective as well. As a part of a summer long induction, some bridge sites

allow students to visit with multiple research groups. This gives students a better understanding of research opportunities available at the institutions. Others assign students to research groups during the entire summer based on their identified preference in research area.

➤ **Introduction to campus resources**

Regardless of when it takes place or how it is implemented, students and site leaders agree that having representatives from other offices on campus give presentations to or offer meetups for the bridge students is beneficial. These offices have included a variety of affinity groups such as the Black Graduate Student Association, Latin American Student Organizations, and Q house (or another organization focused on supporting LGBTQ students).

Despite financial aid packages, some bridge students still struggle with money. Having representatives from the financial aid and/or other support offices meet with students is beneficial to some.

From feedback we receive, presentations for counseling services or other offices supporting mental health issues related to, but not limited to depression, homesickness, and anxiety is extremely important. We strongly suggest making students aware of these resources through some medium prior to the start of the semester, and reminding them throughout the first few years to reinforce the availability of such services, and the department's support for students in seeking such aid.

➤ **Discussion/review of departmental expectations**

Orientation is also a good time to introduce students to departmental culture or to explain departmental expectations (e.g., attendance at departmental seminars, advising or mentoring meetings, exam structure, expectations of academic performance in core courses, etc.). Expectations vary from institution to institution, so it is best to clarify and make explicit these policies for students. For example, if there are expectations regarding the amount of time students should or should not spend away during semester breaks, this may be something to note during induction activities and suggest that students discuss with their research or academic advisors in person. Class attendance may have been viewed very differently at a bridge student's undergraduate institution than it is within your department; make this explicit. Many of these topics, and the conversations resulting from them are best held in person (See [Mentoring for Retention](#)). However, some "ground rules" can be laid out in writing at an induction session and students should then be encouraged to follow up with mentors or research advisors to discuss further.

❖ **Organizing New Student Tours:**

➤ **Campus Tours**

If representatives from the campus resources discussed above are not available, it may be beneficial to provide a campus tour pointing out these offices or resources. Although many institutions offer a campus tour to all incoming students as a part of their general orientation, it is especially beneficial for incoming bridge students to also receive a tour from current graduate students in physics. During these tours, students point out particular areas where physics graduate students frequent or particular resources they find beneficial. These tours given as a part of orientation provide an opportunity for students to get to know and build a relationship with more senior physics graduate students. Often other questions arise during these tours and very important conversations can happen between the current graduate students and the incoming students.

➤ **Tours of the local area, outside of campus**

Tours of the local area provide an excellent opportunity for bridge students to learn about their new surroundings and to discuss a number of important topics with graduate students and/or faculty participating in the tours. Students should receive information on housing prior to arrival (See [What Students Need to Know Prior to Arrival](#)), but if not, this is a time to show them where graduate students typically find affordable housing that is close to campus. It is also a good time to give an introduction to local neighborhood cultures.

Bridge students have highlighted student-led trips to local grocery stores as very important to their induction. For some students living away from home for the first time, having to cook/prepare their own meals is not something they thought about in preparation for graduate school. However, they soon found this is an important part of financial budgeting while in graduate school. They report that taking a couple trips to grocery stores with other graduate students in the beginning of their first semester is valuable.

Pointing out local transportation routes is also very important. Some students will be coming to graduate school without personal transportation and will need to take advantage of local mass transit. Providing a tour and an introduction to local routes also helps cut down on the stress of learning these things after the semester has started.

Local tours may also include identifying churches/religious organizations, community organizations, and recreational places (e.g., local bowling alleys, coffee shops, etc.). These kind of activities help bridge students to develop a support network for themselves while in graduate school and to adjust to the local culture. This is particularly important for those living far from home. Just as some graduate students will be living away from their family for the first time and will benefit from an introduction to resources for them (e.g., grocery shopping trips), some graduate students will have a family of their own and it is helpful to point out local things of interest to them (e.g., day-care centers, local K-12 schools, parks, etc.).

V. Academic Assessment and Support

Academic preparation for bridge students may vary widely. Some applicants will have taken the typical undergraduate core courses and excelled. Others, may have completed their undergraduate degrees without ever having an opportunity to take standard undergraduate physics courses such as quantum mechanics or thermodynamics. Furthermore, student self-assessment may not always prove accurate. Thus, it is imperative to assess students' academic preparation. This will allow bridge site leaders to help students in choosing appropriate classes and to determine what resources or support may be needed throughout the academic year. In addition to these things, below we discuss support needed in terms of time management, learning, study, and problem-solving challenges.

❖ **Ways to assess academic preparation prior to student arrival/enrollment in courses.**

➤ **Application Materials.**

Thoroughly review application materials. Applications should include physics courses taken, textbooks used, how many chapters of the textbook were reviewed, and grades earned. This information will give some indication of preparation and has been quite useful for bridge site leaders.

➤ **Entrance Assessment Exams**

Some bridge sites have started administering an entrance assessment exam to determine student preparation. This practice was extended to all incoming graduate students and not just bridge students at a number of institutions. This allowed for comparisons between students admitted through the bridge program and other incoming graduate students, and proved beneficial for placing and supporting all graduate students. *Note: This practice has been effective when assessment was administered to students that were already admitted. Assessing student content knowledge as part of the admissions process has proven problematic.*

➤ **Admissions Interviews**

Interviews during the admissions process have provided useful information in terms of needs for academic support. For example, some bridge sites have asked students how they go about solving a difficult problem, how they prepare for a course prior to lecture, and how they study for courses. This helps site leaders to determine if students will likely need help with these things prior to arrival or during their first year, or if they have a good idea of the level of study inherent in graduate-level work. *Note: When students were asked to solve problems or specific content questions during interviews prior to admissions, they often failed to answer simple questions to which they knew the answer. This resulted in some students being discouraged from continuing the pursuit of graduate education.*

Thus, we **do not** recommend using interviews during the admissions process to assess student content knowledge.

➤ **Connecting to undergraduate Institutions**

Connecting to undergraduate institutions may also be useful in understanding the level of preparation offered at those institutions. Physics faculty at primarily undergraduate minority serving institutions have indicated their willingness to provide encouragement and guidance on how to successfully transition to graduate school (see [Mentoring for Retention](#)). Building relationships with faculty from these institutions and reaching out to them to understand what was offered to students at their institution may be useful. In addition, such a relationship has the potential to build a recruiting pipeline to your program.

The APS bridge program encourages faculty with programs that support underrepresented students to build partnerships with physics faculty from minority serving institutions. Some bridge site leaders have found that students from particular institutions do very well in their programs and have been able to successfully build a relationship with that institution and recruit their students. The APS bridge program also offers an MSI travel award with the goal of creating research collaborations between minority serving institutions and doctoral-granting institutions. For more information on this program, see <http://www.apsbridgeprogram.org/awards/msitravelaward.cfm> or contact the APS Bridge Program at bridgeprogram@aps.org.

❖ **Ways to assess academic performance and support admitted bridge students**

Assessment prior to admissions is useful in making appropriate matches (See [Making Appropriate Matches](#)) and also understanding what resources may be necessary to support students upon matriculation. However, it is imperative that assessment of bridge student academic performance is ongoing, especially within the first two years of the graduate program

➤ **Progress Monitoring**

Ongoing progress monitoring in the first two years is imperative and requires implementation of multiple strategies for monitoring student progress. Meeting regularly (i.e. bi-weekly, if not weekly) in the first semester provides an opportunity for program leaders to find out how students are performing in their courses among many other important things (See [Mentoring for Retention](#)).

It is important to determine if students are keeping up with homework, if they are regularly attending classes, asking questions in class, and if they are participating in study groups. This is especially true for courses in which students take only 1 or 2 examinations. Waiting for the results of the first examination is probably too late to salvage a poor semester; early intervention is key. Some students at bridge program sites had to withdraw from graduate core courses and enroll in the respective undergraduate course. This was only possible because problems were caught early on in the semester.. Because students may not always

be forthcoming about or accurately assess their own progress, open communication between course instructors and program leaders is imperative.

➤ **Academic Support Services**

Some bridge programs have found it helpful to have academic tutors, offering additional course support, available to graduate students. Induction for incoming students has been used to provide some instruction on time management, study methods, and learning strategies. Bear in mind that without intervention, students will likely rely on the strategies they used to be successful in their undergraduate institutions. These strategies may not be sufficient or even conducive to their success in a graduate physics programs. Without discussing this, students and advisors may be completely unaware of these pitfalls. That is why having a session discussing these things during an orientation for incoming students has been especially beneficial.

➤ **Guided Group Workshops**

Some bridge sites have begun offering guided group workshops for undergraduate and graduate core courses. These courses are often taught by a post-doc or faculty member. They are designed to accompany the core courses. Students work together in groups of 2-4 on problems that range from simple and/or qualitative questions designed to strengthen the basic foundations all the way up to calculation-heavy problems that are similar in difficulty to homework or test problems. Structured group work helps break down social barriers that might otherwise have prevented ethnic/racial minority students from finding study partners. Rosa and Mensah (2013) found that African American women, in particular, have difficulty joining study groups in graduate school.

Ohio State University (OSU) has successfully implemented guided group workshops. These sessions proved popular among students and participation included bridge students as well as other students enrolled in the course. Moreover, students who participated in the sessions showed greater improvement in coursework throughout the semester. Faculty at OSU are in the process of modifying existing guided group workshops for dissemination to other institutions with bridge programs. Feel free to contact the APS bridge program at (bridgeprogram@aps.org) if you are interested in more information regarding this or would like to contact other faculty engaged in these kinds of activities.

VI. Integration Into the Community

Integrating bridge students into the graduate student community and the community of the physics department as a whole is an effective retention strategy. This also supports early intervention because it increases the likelihood that someone will be aware of any challenges to a student's progress. Below, we will discuss a few strategies for integrating students into the community.

❖ **Deciding on whether or not to identify graduate students**

We recommend that all students, whether they were admitted through the typical application process, or recruited from the APS pool of bridge students, all be considered as “graduate students.” Bridge sites rarely make this distinction, and it helps the student feel they are a part of the larger community, rather than a “special” subgroup. Advertising and raising awareness of a bridge program in your department, however, is encouraged. Having a bridge program is a testament to an institution's commitment to diversity, inclusion, and student success, as well as, improving the graduate student experience for all.

❖ **Providing space on campus**

Graduate students need a space on campus. There is no way around this. Having a dedicated space where graduate students can gather formally and informally is imperative to building community among all students. This also provides a natural space for study groups and, thus, lowers the barriers for students who might otherwise feel isolated to participate in study groups. To be clear, if you admit students from the APS pool, they should have offices in the same location as all other graduate students. If a common office space is not possible, thought should be given as to how students from various offices can interact, study together, or plan social events. Some institutions also make available a common space (similar to, or identical to that used to provide a space for undergraduate physics students). We have seen this to be helpful in reducing isolation as well. If photographs of graduate students are posted online or elsewhere on campus, then photos of the bridge students should be included with the other graduate students.

❖ **Implementing a physics graduate student association**

We strongly encourage all graduate physics programs to develop some kind of physics graduate student association, if they do not already have one. These kinds of organizations can go a long way in helping to create or strengthen the sense of community among graduate students in your program and often require very few resources to develop and sustain. Students engaged in these associations often feel empowered to better support their peers and advocate for themselves. It also provides some level of autonomy to graduate students in regard to policies and procedures that will impact their path toward the PhD. Members of these associations have been used in various ways on graduate admissions committees and other impactful roles within the department.

As you will note in other areas of this guide, we have encouraged utilizing the support of graduate students in a number of areas including development of induction materials and seminars, creation of information packets to be given to students upon arrival, serving as peer mentors, organizing “insider information” graduate student-only meetings, helping incoming graduate students to identify resources on and off campus, sponsoring professional development gatherings from alumni, and other things. Having a physics graduate student association allows for a more organized way of graduate students to support themselves in these ways.

Having a physics graduate student association can also provide an organized and streamlined system of communication between graduate students and faculty. This kind of communication is appreciated by graduate students and faculty alike. It helps faculty to have a better pulse on the graduate student experience and increases the likelihood that graduate students’ voices are heard within the department.

We strongly advise that physics graduate student associations have multiple officers that rotate roles. For example, the model of having a past chair, chair, vice chair and secretary are encouraged. Without this system or something similar in place, some students serving as champions in the department may take both the energy and the organizational knowledge with them when they leave. To ensure the association is sustainable, it is helpful to have multiple offices and rotating roles.

❖ **Hosting seminars and social events that allow graduate students to get to know one another**

Some bridge programs have found it useful to host a seminar aimed at helping graduate students to get to know one another. One such seminar that turned out to be quite effective focused on sharing of culture. Graduate students were asked to attend and to share some part of their culture in a short presentation and to also bring food representative of their culture. This kind of seminar may help with also encouraging international students to feel a part of the larger graduate student community. This can also help break down barriers that might exist in an ethnically diverse graduate program. In this case, it was graduate students that suggested this idea and likely graduate students at your institution may be able to come up with other ideas for seminars that can help with the integration of all students into the physics community; it may only be a matter of encouraging them to do so.

If you are interested in more ideas for hosting seminars designed to integrate graduate students into the community or you would like more information regarding establishing a physics graduate association, please, reach out to the APS Bridge program at bridgeprogram@aps.org.

❖ **Have first year students (bridge and traditional) take a course together**

Many students (bridge students included) have varied backgrounds; some will be ready for the graduate core and others will not. However, having them take a class together helps with building a sense of community among the group. Examples of such courses include (i.e. Ethics in research seminar, STEM Professional Development course – designed to prepare students with skills they will

need in the future, such as efficient use of the scientific literature, grant writing, communication, ethical responsibilities, etc.).

❖ **When you only have 1-2 bridge students at your institution**

Several factors may influence the number of bridge students that matriculate to your institution (i.e. resources, departmental buy-in, number of bridge applicants, student acceptances, etc.). Having a group of bridge students may allow for increased opportunities for peer mentorship and peer support on academic coursework. Accepting an individual student may result in that student feeling isolated within the community. Thus, accepting individual students may require additional effort to integrate them into the graduate student community. Be aware that some bridge applicants expect that bridge programs accept a group of bridge students. If this is not the case at your institution, be sure to communicate that to students at the time of offering admissions (See [Making an Appropriate Match](#)). Make an effort to connect bridge students across years; so, that incoming students are integrated into the larger graduate student community.

VII. Mentoring for Retention

Mentoring is one of the most effective retention strategies. Effective mentoring can contribute to a student's resilience and desire to work through challenges. Effective mentoring can curtail academic and personal challenges and also allows for early intervention if these kinds of challenges arise. There are a variety of mentoring models that can be employed. The ideal model to be implemented in your program will strongly depend on human resources available at your institution and the preferences of your students. Below we describe a few mentoring models and the roles that various people can play in mentoring students, but first we have a few general tips that are important for mentors.

❖ General Tips

- **Effective mentors are active listeners.** It is important to allow students to express themselves freely. Complete information about a situation along with an understanding of student feelings will put you in a better position to address issues as they arise. Active listeners often repeat back what they have heard to ensure their understanding is correct and to demonstrate they are fully engaged in the conversation.
- **Students should know that you, as their mentor, are dedicated to their success.** This should be evident in your conversations with students when you are commending them for their success and offering them constructive feedback regarding challenges. Feedback is best framed in terms of its connection to the student's success in the program or completion of the PhD.
- **Be cognizant of meeting locations when students are discussing sensitive information.** An informal conversation may start in a setting that allows for others to hear what is being communicated. If the conversation shifts to more sensitive or confidential information, it is best to move the conversation to a more private area.
- **Effective mentors should meet regularly with students.** A good practice is to have regularly bi-weekly (if not weekly) meetings with students in their first semester of the program in a location that allows for private conversations. If these meetings are scheduled it is important to keep these meetings and to also express to the students the importance of keeping these meetings. Both mentor and mentee should also be ready or prepared to engage in conversation during the scheduled meeting times -- try to avoid outside distractions like taking phone calls, texting, talking with other students, etc.
- **Clearly communicating to your mentees the difference between suggestions and mandates is key.** Some mentors are naturally more comfortable making suggestions rather than setting requirements or expectations. Mentors should be aware that suggestions will be taken as suggestions and may not be acted upon. If a student's success requires particular actions, it is imperative to clearly differentiate between what is being suggested and what is being mandated.
- **Effective mentors are also willing to step outside of their comfort zone.** Students may bring up topics with which mentors have no familiarity or concerns that simply fall outside of the mentor's area of expertise. Being open and honest about this and referring the student

to someone else is okay. However, shutting down the conversation in uncomfortable moments should be avoided.

❖ **Mentoring Models**

There are a variety of mentoring models that have been employed to support student retentions. Below we discuss the wrap-around mentoring model—also known as the constellation mentoring model, the multi-layered mentoring model, and the intrusive mentoring approach.

- **Wrap Around or Constellation Mentoring.** The wrap-around mentoring model is one in which multiple people work together in mentoring an individual.

Everyone actively participates in covering multiple areas of the student's life—academic, personal, health, and wellness. This model requires timely communication between all mentors. This can be effective in that everyone works together to make sure the student is covered in all aspects where they may need support or guidance. The responsibility of mentoring the student is often shared among the team of mentors. The team of mentors may be made of the instructors in the courses that students are taking, the director of graduate studies, administrators in the office of graduate studies, graduate faculty, and faculty/staff outside of the department. Faculty at undergraduate institutions have also indicated interest in continuing to encourage students and provide guidance on how to transition from undergraduate to graduate school.

Having a team of mentors with diverse backgrounds and roles at the institution allows for mentors to help in ways that they are best suited and inform other mentors regarding situations for which they may not be well-suited to offer support. However, pitfalls can occur in terms of the student losing trust in the mentor, if student information is shared without transparency. We highly recommend that if you need to share sensitive data with other mentors or individuals, you discuss this with the student prior to sharing information. For example, a mentor might say, *I am not sure the best way to help you with this, but I think so-and-so might know more about this situation and could potentially point you to some resources that could be very helpful. Would you mind if I share this situation (or what you told me) with so-and-so?* If information such as course progress or research progress is routinely shared with a mentoring team, it is best to let all students know that this is a normal part of the team mentoring model. This is particularly important if information is shared with faculty/staff outside of the department that serve as mentors. Mentors must also comply with federal regulations regarding the sharing of grades.

- **Multi-layered Mentoring.** The multi-layered mentoring also relies on multiple people serving as mentors, but in this case each person generally has a specific role.

For example, the mentoring team might consist of a research mentor and advisor, a peer mentor, a staff mentor, and another faculty or staff mentor. The idea behind this approach is that each mentor is focused on specific area(s) of the student's progress. In this case, the

advice given above regarding transparency in sharing information regarding the student's progress is still relevant. Institutions employing this model have found it effective to have at least two faculty mentors, one of which is usually the research advisor.

Students at institutions employing this model have indicated that they often do not feel comfortable talking to their research advisors regarding areas in which they struggle because they want to present themselves in the best possible light to their research advisors. Thus, they appreciated having another faculty member to speak to with whom they could speak more candidly regarding challenges they were facing. Staff mentors have also been instrumental in institutions utilizing this model. Students often are more comfortable sharing challenges with non-faculty staff members because they felt less intimidated. Moreover, staff mentors generally provided support for students prior to and upon arrival that helped them to build trust and relationship early on in the program. Students were often accustomed to going to them with logistical and administrative challenges. In some cases, this allowed extensions to more serious concerns that arose. Staff mentors also helped in transferring trust to other faculty committed to the success of the students.

- **Intrusive Mentoring.** The intrusive mentoring model may be implemented with one or more mentors. The key to this model is that at least one mentor is actively monitoring the student in all respects, academic, personal, holistic, etc. Holistic aspects should take into account many things that might affect the student, including mental health, various social relationships (i.e., family/significant others, peers, and other friends), and physical well-being.

The mentor usually arranges for frequent and regular check-in meetings (potentially weekly or bi-weekly as students start, but tapering off as issues are dealt with and students become more integrated into the department community). These meetings may be one-on-one meetings or group meetings. Some intrusive mentors have regular coffee-walks, cookie meetings, or other frequent, but often short meeting with students to check-in. Intrusive mentors are comfortable asking students about class attendance, homework completion, relationships with other faculty, relationships with peers and family members, adjustment to the local town/city, and overall well-being. Often faculty who employ an intrusive mentoring model are comfortable doing so and known by students as an individual that all students can approach. This is often a result of their own personal/natural mentoring style. In some cases, students are assigned a faculty mentor and each student has one mentor that is responsible for checking-in on all areas and thus employing the intrusive mentoring model as well.

❖ **Leveraging Peer Mentors**

Do not underestimate the effectiveness and importance of peer mentors. In many cases, peer mentors are often the first ones to be aware of challenges, allowing for early intervention. Having potentially navigated some of these challenges themselves, peer mentors have been instrumental in helping students to handle challenging situations. Having bridge students who have successfully completed their first year mentor incoming bridge students has been extremely helpful and

mutually beneficial to both groups of students. To help foster peer mentoring relationships, graduate students may want to pick up incoming students from the airport, provide tours of the campus during induction activities, take students on grocery store runs prior to the semester starting, arrange social gatherings, or develop student-only seminars (See [Integration into the Community](#)).

❖ **How to make effective mentor matches**

Bridge sites have implemented numerous models for this as well. In some places, students are assigned faculty mentors based on their research interest. This is often the case with the multi-layered mentoring model. Some peer mentor arrangements are made based on assumed affinity due to similar geographic, ethnic/racial, gender, or other backgrounds. Reviews regarding this have been mixed. What has been shown to be effective is allowing mentor matches to happen organically. Bridge sites create multiple opportunities for all of the faculty and students to join together during mixers or receptions throughout the first semester (and during the prior summer when possible). Then during the middle or at the end of the first semester mentor assignments are based on relationships that have formed naturally. Even when this model is employed, it is imperative that someone meet with students regularly in the first semester. The weekly or bi-weekly meetings during the first semester have been proven to be critical to student success and early intervention when needed. Thus, even if your program allows for more formal mentoring relationships to develop organically, someone should be responsible for regular check-ins with students in the beginning.

❖ **Making the Most out of Mentoring Meetings**

In the first semester, it is important that mentors meet with students frequently. We suggest weekly or bi-weekly meetings. During these meetings, you want to assess their academic progress, their understanding of departmental expectations, and their well-being.

❖ **Questions that address their academic progress might include:**

- How is homework going?
- What do you think of the pace of the course?
- How do you like the text that you are using?
- Are you following what is going on in the course from the reading?
- Have you joined a study group?
- What grade do you think you will achieve in each course (this should be compared with instructors' perceptions)?
- Are you attending all class meetings?

❖ **Discussions regarding departmental expectations might include:**

- Regular attendance at class. (Keep in mind that success at their undergraduate institution may not have required this and/or missing class may not have been a big deal).
- Attendance at departmental colloquiums or other events
- Departmental norms regarding effective communication (i.e. email response time)

- What milestones are expected of a successful graduate student in the program
- Time spent away from research during winter breaks and summer sessions
- Hours spent on research during the week
- Perception of how the student is progressing

❖ **Questions to ascertain mental and physical well-being may include:**

- How are you interacting with other graduate students?
- Are you interacting with folks from any groups outside of the physics department?
- Are you keeping in touch with folks/significant others back home?
- How do you like (location/town/city)?
- What social activities are you involved with (this can gauge too little or too much)?
- How are you feeling (physical health)?
- Are you happy about your progress (mental health)?

Keep in mind that affective issues impact academic progress. It is important that mentors keep an eye on students' overall well-being as well as academic performance. If departmental rules are not written, they should be verbalized. Be sure students are aware of commonly held expectations regarding attending classes, participating in department seminars, email response time, etc. Practices at their undergraduate institutions may have differed in ways that you might find surprising; it is best to be clear and explicit regarding expectations within your department.

Mentoring meetings should be a time to offer open and honest feedback if students are not meeting expectations. It is important to provide clear explanations on why/how expectations are not being met and to be encouraging regarding steps students can take to meet expectations in the future. It is also important to be explicit regarding their integration into the department and if you notice areas of concern in this regard. These may be difficult, yet important discussions to have if students are to be successful in the department. If students are meeting expectations, state this with explanations as to why as well. Even if students are having difficulties in some areas, it is important for them to also hear what they are doing well. These makes constructive feedback more palatable and also provides positive reinforcement for their successes. Mentoring meetings are important for both validation when students are progressing well and correction when they are not.

❖ **Mentoring is not only for problem solving**

Mentoring should not be limited to supporting students that are at-risk. Mentoring is also important for students who are progressing favorably. Meetings with these students should include commendation and specific feedback on what they are doing well. Additionally, these students should be given direction on how they can continue to grow and progress as scientists. Be careful not to neglect students who are progressing favorably. It may be the case that at-risk students require more time and attention, but this should not be at the expense of those who are currently doing well. Without feedback and regular check-ins, students who are progressing well may lose motivation, unnecessarily worry about their progress, and encounter a "hidden" challenge without needed support.

❖ **Culturally responsive mentoring**

There is a lot of research that exists on the topic of culturally responsive mentoring. In short, the gist is that instructors should be compelled to learn about the cultures and experiences of their students since this impacts their students' learning environment and the ways in which they learn. It is not necessary for the social identities of the mentor to exactly match the social identities of their mentees. Moreover, shared social identities do not guarantee that someone will be an effective mentor for a student. What seems to be important is a demonstrated interest in and understanding of a student's values, concerns, communication styles, and cultural norms.

It is also important to understand the significance of things that might impact your students differently than you. Examples of things that might impact your students include acts of racially-motivated violence, terrorist attacks, and political changes. These can impact your students directly or indirectly both emotionally and physically. The first step to being responsive to these things is being aware. The second step would be letting students know that you are available to listen, if they would like to share their feelings.

This may also be a beneficial learning experience to you as a faculty member. Hearing a student's feelings in regard to these things may provide valuable insights into the experiences of people from different identity groups. One way to encourage this is to make statements either verbally or through signage regarding issues that impact students or that are important to (or impact) you personally. This can also be reinforced by attending campus events focused on social justice issues that you are also interested in as well. These are often sponsored by student affairs and faculty are encouraged to attend. At the very least, you may want to do a check-in with all students after a national event that might impact student's well-being or emotional state.

❖ **Do not be discouraged**

We end this section with these few words of advice: *do not be discouraged*. We have seen instances, when mentoring relationships started off rocky, but have ended well. Mentoring relationships do evolve. There are instances where students have kept important information regarding their progress from their mentors, which was no fault to the mentor. These things happen. It may take time for some students to build trust. People have different levels of comfort and multiple reasons why they may not feel comfortable sharing challenges they are facing. We encourage all programs to implement a mentoring plan because by and large, they are a major tool for aiding in student retention.

VIII. Building, Maintaining, and Reestablishing Trust

There are many opportunities to build trust with students and it is obviously important to do so. We are often asked about best practices for building, maintaining, and reestablishing trust. Of course, people are different and some students will naturally trust their advisors, mentors, and peers. However, this is not the case with everyone. Building trust may take more time for some students. This may be an aspect of their personality or it may have resulted from past experiences. Nonetheless, trust can be built over time. In this section, we mention three situations in which trust can be gained or lost. These three examples are used to illustrate the importance of *transparency, effective communication, and confirmation of your support and commitment to student success.*

- ❖ **When making determinations regarding placement in classes, it is important to be transparent with students and explain assessment and/or decision making.**

Students placed in undergraduate courses rather than the graduate core without explanation have felt that lowered expectations were set for them and trust was lost. Students placed directly in the graduate core courses who thought they would be placed in undergraduate courses felt they were being set up for failure and trust was lost. So, regardless of the situation, it is important to make graduate students aware of the process for determining course placement. This is also an opportunity for building trust. Ensuring students that decisions are being made with their best interest in mind and that you are dedicated to their success helps to build trust. Thus, we encourage communicating this to students when discussing course placement. Let them know that you have high expectations for them and believe that they will be successful in completing their PhD. This should guide decisions made in regard to their course placement and students should be made aware of this.

Difficulty can arise when there is a difference of opinion between the advisor and student on the level of course for which the student is prepared. While we have seen instances where a student felt they could take on the more advanced course, and have been successful, it is common for students to feel they are ready to take on the advanced course, and end up doing poorly. In these cases, having a common way of assessing students and then assigning courses allows students to see the process as being less biased. If students do persist in a course that you think is either too high or too low, having frequent early discussions with the instructor and the student is essential, as this may allow changing to a lower or higher level course without jeopardizing the student's grade and self-esteem.

- ❖ **When mentoring, it is important to be transparent about what information about a student is being shared with whom and when possible obtaining permission prior to sharing sensitive information.**

No one wants to feel as if people are talking about them behind their back. Sharing information regarding performance or progress in courses, mental health issues, and other topics that are sensitive is important to bridge student retention (see [Mentoring for Retention](#)). However, a loss of trust can occur if students find out that information they have disclosed to one person in what they have stated (or even just perceived) to be in confidence is being shared with others. Thus, we recommend that

advisors explain to students what will be shared and the motivation behind their reasons for sharing. Again, you are more likely to gain trust when it is apparent that you are acting in the student's best interest. Thus, if you are sharing information with others to seek more support for the student or to get help in addressing a challenge the student may be facing, communicate this to the student.

❖ **Open and honest communication in both directions is vital to student success.**

A student's relationship with their research advisor is one of the most important relationships during their graduate career. However, building and maintaining this relationship can be difficult if there is a lack of trust by either party, or if there has been a complete loss of trust. Thus, we strongly encourage research advisors to communicate regularly and effectively with students.

It is important for research advisors to clearly articulate expectations for their research students. For example, clear expectations should be set regarding the amount of time to be spent in lab, hours during which students are expected to be present in labs, time away from lab during vacations and semester breaks, and the frequency and nature of check-ins (i.e. emails, face-to-face meetings, participation in research group meetings, etc.). Loss of trust can occur if students feel that they have been unsuccessful at meeting expectations for which they were unprepared or unaware.

Students who struggle academically may find it difficult to balance their coursework and research requirements. Research advisors should ask students about their academic progress and whether or not it is impeding their ability to accomplish what is expected in terms of research if they are not meeting expectations. It may also be necessary for research advisors to reach out to other faculty that interact with the students. This may require extra effort and time from the research advisor. Students should be made aware of these efforts and that the motivation behind them.

It may be necessary for students to spend less time on research during their first or second year to focus more on coursework. Some bridge programs have limited student's research experience to literature reviews, initial data collection, participation in journal clubs or research meetings, or familiarizing themselves with equipment until they have a better handle on their academics. These kinds of decisions require transparency and communication with students. Again, it should be clear to students that these decisions are made with the goal of helping them to successfully complete the PhD. Effective communication goes both ways. Yet, students may be reluctant to tell their research advisors about challenges they are having. This is often because students often do not want to disappoint or lose the respect of their research advisors. To circumvent this, some bridge programs intentionally assign faculty mentors to students that are not their research advisors and then apply the constellation mentoring model (See [Mentoring for Retention](#)).

IX. Transition to the PhD

In this section, we will mention just a few strategies for preparing students to transition to the PhD. This will be especially relevant to master's institutions, but also applies to doctoral institutions that do not admit students directly into the PhD program.

❖ **Preparation for the Physics GRE**

Preparation for the Physics GRE is an obvious part of preparation to the PhD for many programs. Offering a class designed to provide such preparation has been beneficial for a number of reasons. In addition to providing the expected preparation, it also provided an opportunity for bridge students who might not otherwise be in the same courses to study together and build a relationship. At institutions where this was offered to non-bridge masters students, it helped with the integration of the bridge students into the larger graduate student community at the institution. Feedback from institutions that offer such supplemental classes have been that it is best if these classes are made mandatory for bridge students and that they are offered on the weekdays rather than on Saturdays. Other courses that have been offered to bridge students to help in their transition to the PhD have included time management courses and courses focused on strategies for learning new or difficult material.

❖ **Advice on applying to graduate programs**

Some bridge students applied to the APS Bridge Program because they only applied to a small number of schools—in some cases only 1 or 2—and were not accepted at these institutions. The decision to apply to a small number of schools may be a result of financial constraints. What is of more importance is that with applications going to only 1 or 2 programs, they may not have known how to choose appropriate schools to apply. Support in choosing schools wisely will be necessary in helping students transition to a PhD program. For students who will not complete their PhD at your institution, it is also helpful to have discussions with them on the availability of opportunities in particular research areas. Students will likely need some advice/direction in this arena as this is a major part of choosing schools wisely. Even after completing a research project during their bridge experience, some students were allowed to do lab rotations toward the end of their program so that they were introduced to other research fields. The idea is that this will broaden their fields of interest and increase the likelihood they will be able to matriculate into a PhD program that matches their interests.

Some programs have also offered more formalized help on completing graduate applications, which included support in the timing of application material preparation with fall coursework. Having faculty with experience on admissions committees supporting these efforts was found to be especially effective.

❖ **Advice for students who have selected a PhD program**

After students have selected a program, they may need advice on how to choose a research advisor at the new institution. If you have contacts that can serve as research advisors or mentors for these students this may help the student to make a good transition and make appropriate connections. It may also be necessary to discuss with students whether or not the courses they have taken at your institution will count toward degree completion at the next institution or encourage students to connect with the appropriate people at the new institution to address this concern. Students will also benefit from discussions regarding qualifying examinations and how they might prepare for taking this examination at the new institution.