# Maximizing Our Impact in the World of Student Transfer: A Handbook for Chemistry Faculty

**Preliminary Edition**

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**Based on a workshop on student transfer held by ChemEd Bridges**

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# Preface

Building connections between the chemistry faculties of community colleges and baccalaureate-granting institutions is key to advancing the quality and reach of postsecondary chemistry education. *ChemEd Bridges,* a community college chemistry faculty development project funded by the National Science Foundation, aims to expand faculty engagement in scholarly activity, undergraduate research, and curriculum innovation, encouraging the sharing of resources and strategies and the development of partnerships among those of us in the chemistry community.

Over the past four years, ChemEd Bridges has increased the involvement of community college faculty in national and regional activities of the American Chemical Society (ACS) and has worked to strengthen relations between the chemistry faculties at community colleges and baccalaureate-granting institutions. The inspiration for this handbook was a workshop on student transfer, co-sponsored by several ACS committees, that ChemEd Bridges held in Chicago in October 2011 (see Appendix A).

Opportunities and strategies for increasing the roles that chemistry faculty play in enhancing student transfer were the focus of the workshop. The majority of workshop participants were chemistry faculty, with an approximately equal representation from community colleges and baccalaureate-granting institutions. Stakeholders from student support services, administration, and ACS were also represented.

The objectives of this handbook mirror those of the workshop, namely to help the chemistry community:

- gain an understanding of the student transfer landscape;
- acquire insights into the challenges and opportunities for increasing faculty participation in activities and establishing partnerships that enhance student transfer; and
- share effective practices and lessons learned.

This knowledge will position us, whether acting individually or collectively, to respond to an increasingly complex student transfer landscape in ways that will be most effective.

Our workshop discussions were constructive, candid, and courageous — in the words of participants — and covered a number of challenging topics. They led to recommendations for chemistry faculty that reflect the perspectives of the range of institutions and stakeholders involved in student transfer, and also the range of ways in which we may be involved.

This handbook shares the insights from the workshop discussions, including two fundamental aspects at the core of successful efforts to enhance student transfer: building and maintaining an atmosphere of trust and respect and a shared vision. These aspects, along with strategies for developing the level of communication, collaboration, and partnerships needed to significantly improve student success in the transfer process, are introduced in Chapter 1 and revisited throughout the handbook.

This handbook also shares the framework for the workshop discussions. Participants indicated that these guided discussions resulted in the mutual respect, honest communication, and development of trust needed when addressing student transfer issues, while generating a fuller understanding of the other stakeholders' needs and requirements. Plans to hold similar discussions can be informed by the series of guiding questions in "Moving

from Opportunity to Action" in Chapter 3, as well as the workshop overview in Appendix A and the glossary in Appendix B.

This handbook is primarily addressed to the community of chemistry faculty at both transferring and receiving institutions. It may also be a useful resource for academic administrators and other stakeholders, given the roles they play in encouraging involvement, facilitating collaborations, and rewarding individuals for their role in improving the transfer process.

Designed to be a resource in a variety of situations, this handbook serves as an introduction to the world of student transfer and as a resource for those of us already involved in collaborative initiatives. The chapters can be read in any order according to your interests. The first three chapters are general, covering the key points from the workshop, providing more background about student transfer, and exploring faculty roles. Each of the next four chapters focuses on a different area in which we could initiate or expand efforts in our departments, across several science departments, or with colleagues at other institutions, both transferring and receiving. The final chapter explores how we can increase our efforts, advocate for resources, and learn from each other — positioning ourselves to have the maximum impact, now and over the long term.

Although chemistry faculty are the audience for the handbook, students are at the heart of the suggested strategies and activities. Whether they plan to transfer, are in the midst of the process, or have already transitioned, we want to do all that we can to ensure that chemistry students are making progress, moving forward, and getting closer to completing a baccalaureate degree.

Although individual efforts to assist transfer students often make a meaningful difference, chemistry faculty who are part of inter- and intra-institutional partnerships can have a substantial and sustained impact. The strategies and activities presented here will help build successful partnerships among individuals, departments and offices, and institutions, regardless of size or focus. As many workshop participants noted, student success is an effective place to start and an ongoing focal point for conversations that can build bridges and promote buy-in. Student success can be an effective driver of communications among those in different roles, coming from different institutions with different perspectives and timelines. Additional lessons from partnerships shared at the workshop can be found throughout the handbook.

The vision for this handbook is that it will be a resource that engages the chemistry community in an ongoing exploration of options, establishes partnerships, and maximizes the opportunities we have to help guide our students through the educational process — before, during, and after transfer — and into successful careers.

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Chapter 1

# The Need for Action: Identifying Opportunities and Developing Strategies

As faculty, we play critical roles in the lives of transfer students. Each of us has probably interacted with individual transfer students — those who anticipate transferring, are in the process of transferring, or who have already transferred — and learned about their needs.

Perhaps you have been approached by chemistry colleagues at institutions from or to which students will transfer, and have become more familiar with the realities and resources for students navigating the transfer landscape. Registrars at transferring and receiving institutions may have requested your assistance regarding articulation, or the transfer of credits, of chemistry courses.

As academic administrations develop plans to meet institutional missions and respond to directives from governing and legislative bodies, transfer students will be among those impacted by the opportunities for improving chemistry education. Changes in higher education and student transfer are increasing expectations for all of us to be more involved and have a greater impact.

**DEFINITIONS**

- **Transfer students** – students who anticipate transferring, are in the process of transferring, or who have already transferred
- **Student transfer** – process by which students are transferred among institutions
- **Articulation** – process by which credits are transferred among institutions
- **Receiving institutions** – institutions to which students transfer
- **Transferring institutions** – institutions from which students transfer

## Considering the Impact of Involvement

Academic institutions are being asked to make student transfer a more effective and efficient process. To be successful, faculty need to be involved, working with their students and those who provide academic, career, financial, and social support.

The world of student transfer involves a multitude of factors influencing student success, a wide range of stakeholders, and many opportunities. Chemistry faculty impact student transfer in two key ways:

- Interactions with transfer students throughout their educational progression
- Involvement with various programs and people associated with student transfer and articulation

The benefits of these efforts extend beyond the transfer students and are seen at multiple levels.

***Students*** – Transfer and non-transfer students alike benefit from introductions to the central concepts, key contributions, and opportunities in the field of chemistry – and also from support that helps them determine and achieve their goals. Strategies to improve the effectiveness of student transfer can enhance the overall quality of education. Interactions among students with different backgrounds and experiences can broaden their horizons.

***Faculty –*** Benefits to faculty go beyond the personal satisfaction and enriching relationships resulting from interactions with transfer students and other colleagues supporting them. Our students can become more invested in their learning, increasing their level of interest and success in our courses. They can assist with special projects and conduct undergraduate research. Activities to support transfer students can satisfy the broader impacts criteria for grant proposals and broaden participation in chemistry.

***Departmental –*** Involvement in efforts to support student transfer can enhance the reputation of a department, internally and among partner institutions. Persistence and course completion rates will increase. Students can become more involved in the activities of the department. Efforts to support transfer students who help diversify and prepare the scientific workforce can help garner more resources.

***Institutional –*** Our participation in efforts to enhance student transfer can maximize the investment of resources, increase enrollments, and improve student outcomes. The relationships and partnerships that we build with colleagues at other institutions can increase the reach and visability of our own institutions.

***Regional –*** Collective efforts to improve the effectiveness of student transfer can increase the size and level of preparation of state and regional scientific workforces, which supports the development of their economies.

***National*** – Increasing the number of transfer students interested in science who persist and complete their degrees can help the U.S. fill the predicted need for approximately 1 million more college graduates in science, technology, engineering, and mathematics (STEM) over the next decade.[1] Such efforts will support economic development and innovation across the nation.

Faculty involvement in the world of student transfer is likely to increase in response to a collection of efforts and recommendations (see sidebar, Calls for Faculty Involvement in Student Transfer, below) focused on strategic and systemic actions to:

- Connect students intending to transfer to a program of study or pre-major, and
- Integrate students who have transferred into the receiving institutions.

As educational institutions and systems establish transfer practices and policies — a process that is complex and takes time — we have the opportunity to inform discussions, improve decisions, and support implementations. As faculty, we also have opportunities to act within our courses and departments, across our campuses and regions, and at a national level.

[1] Executive Office of the President, President's Council of Advisors on Science and Technology. *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*; Washington, DC, February 2012.

## Calls for Faculty Involvement in Student Transfer

The world of student transfer is influenced by economic, social, and political factors. State systems and educational organizations have turned to education research and reviewed existing practices and policies, looking for effective ways to support the growing numbers and needs of transfer students. The following reports are among those noting the importance of faculty interactions with students and faculty engagement in the development and implementation of programs and resources.

***Sense of Direction: The Importance of Helping Community College Students Select and Enter a Program of Study*** (Institute for Higher Education Leadership & Policy, C. Moore and N. Shulock, August 2011)

> *"Require students to declare a major program of study after a certain amount of time or accumulation of credits, and assign students faculty advisors in their declared major programs."*

***Improving Student Transfer from Community Colleges to Four-Year Institutions – The Perspective of Leaders from Baccalaureate-Granting Institutions*** (College Board, July 2011)

> *"If an institution's aim is to admit transfer students who are prepared for their chosen major, faculty must be involved from the beginning — not simply to create an admissions policy (though that is essential), but as participants who are actively engaged in the admission process — reading applications, assessing student preparation and consulting with admissions staff."*

***Get with the Program: Accelerating Community College Students' Entry into and Completion of Programs of Study*** (Community College Research Center, D. Jenkins, April 2011)

> *"Colleges need to implement a 'best process' approach in which faculty, staff, and administrators from across the college work together to review programs, processes, and services at each stage of students' experience with the college and rethink and better align their practices to accelerate entry into and completion of programs of study."*

***Implementing Statewide Transfer & Articulation Reform: An Analysis of Transfer Associate Degrees in Four States*** (Center for the Study of Community Colleges, C. B. Kisker, R. L. Wagoner, A. M. Cohen, April 2011)

> *"Facilitating disciplinary conversations among two- and four-year faculty and implementing processes for periodic review of transfer curricula and courses are critical in moving participants past their own institutional or disciplinary silos and creating efficient, student-centered transfer systems."*

***Reforming Transfer and Articulation in California: Four Statewide Solutions for Creating a More Successful and Seamless Transfer Path to the Baccalaureate*** (Center for the Study of Community Colleges, C. B. Kisker, R. L. Wagoner, A. M. Cohen, April 2010)

> *"Implement discipline-based, inter-segmental faculty commissions that can work to balance greater standardization of lower-division, transferrable courses with respect for faculty and institutional autonomy and curricular quality."*

***The Progress of Education Reform*** (Education Commission of the States, October 2009)

> *"Institutions should ask faculty to be engaged in the transfer mission by providing a rigorous curriculum that adequately prepares its students… and make it a priority to effectively transition transfer students."*

## Opening Access to Chemistry

Institutions offering chemistry courses have established systems of prerequisites that, at first glance, appear to make the transfer process straightforward once chemistry students have decided on their educational goals and declared their course of study. The reality for most students who plan to transfer between institutions is very different.

After selecting academic institutions and programs of study, students face a complex series of decisions. As Judith Scott-Clayton notes, "They must choose how many courses to take and when to take them, based on course descriptions that may provide only partial information about course content and difficulty, and program descriptions that provide little guidance about which course should be taken when. On top of this, students may have to make tradeoffs depending on the vagaries of class schedules and work schedules. Logistically, just obtaining all of the information needed to make wise choices can be difficult. Information about course content and prerequisites is often located in one place, while course schedules are in another place, and the requirements for specific degree programs are spelled out in yet another location."[2] Transfer students, especially those who are the first in their families to pursue higher education, may find it overwhelming and not seek out the faculty, staff, and other students who can help them navigate through the options.

*"Logistically, just obtaining all of the information needed to make wise choices can be difficult [for transfer students]."*

— Judith Scott-Clayton

There are also the realities of course selection and alignment. If students do not have appropriate guidance, the courses they take may not be the needed prerequisites for future courses. The appropriate courses may not be available. If the courses already taken have objectives, depth of coverage, and laboratory experiences that are not equivalent to those at the receiving institution, the course credits will not articulate.

When students transfer from a collegiate environment that they know to one that is unfamiliar, they are likely to experience a phenomena called "transfer shock." The effect, exemplified by a drop in GPA, can be magnified when students transfer between or among very different or multiple institutions.

Under the best of circumstances, chemistry students are guided through the higher education landscape and the transfer process. They possess and demonstrate the academic skills and knowledge to succeed in their course of study. They also have opportunities to fully participate in academic life and the motivation and financial means to do so. But almost anything that impacts our students' lives can diminish their academic success.

[2] Scott-Clayton, J. *The Shapeless River: Does a Lack of Structure Inhibit Students' Progress at Community Colleges?* Working Paper No. 25, Assessment of Evidence Series; Community College Research Center, Columbia University, New York, NY, January 2011, p. 5.

Consideration of factors within the following categories[3,4] will help us maximize student access to and success in higher education:

***Academic preparation*** – a wide range of factors are involved in preparing students for postsecondary education in general and in specific programs of study, including:

- Understanding of the expectations of higher education
- Appropriate levels of skills and knowledge
- Recognition of the importance of academic support

***Level of participation*** – for curricular and extracurricular activities to have the desired impacts, they must be scheduled and conducted in a way that fosters:

- Understanding of the benefits of participation
- Appropriateness for students with different backgrounds (such as age, culture, and family responsibilities)
- High levels of student engagement and interaction with faculty

***Motivation*** – an environment that inspires students to pursue higher education and enourages them to persist and complete programs of study will provide:

- Knowledge of career options
- Role models
- Mentoring

***Financial means*** – strategies for providing students with sufficient funds to support and maintain full-time status, before and after transfer include:

- Assistance with financial aid applications
- Scholarship and grant programs
- On-campus employement

Chemistry faculty need to interact with students interested in science, providing the insights and encouragement they need to succeed in the world of higher education — both before and after they transfer. When providing student support (e.g., transportation, childcare, employment, family issues) we need to acknowledge the varied challenges and issues diverse students face. Recognizing that student failure is often a symptom will help us and our colleagues treat the fundamental causes.

[3] Tara Milano, Executive Director of the National College Access Network, referred to similar categories as the "four A's" of success: academic preparation, aspiration, availability, and affordability. Pathways to College Network, the Institute for Higher Education Policy, and the Social Science Research Council. *Questions that Matter: Connecting Research, Policy, and Practice to Improve College Access and Success.* Pathways to College Network, Boston, MA, 2006, p. 4.

[4] The University of Texas at El Paso is addressing four components of access: aspirational, academic, financial, and participatory. Ekal, D. E.; Hurley, S. R.; Padilla, R. Validation Theory and Student Success: The UTEP Way. *Enrollment Management Journal: Student Access, Finance, and Success in Higher Education* 2011, *5(2)*, pp. 138-147.

## Navigating an Evolving Student Transfer Landscape

Although the contexts, people, and specific goals of various efforts will vary, the ultimate goal is to help students transfer and complete programs of study. Improving success rates for transfer students requires input and participation from faculty, staff, and administrators in diverse institutions, departments, and roles. Students and these other stakeholders must be involved in a series of thoughtful and candid dialogues that build understanding and frame a plan of action.

Two fundamental aspects are at the core of successful efforts to enhance student transfer:

- an atmosphere of trust and respect; and
- a shared vision.

Both take time to develop. Given the complexity of and constant changes in the student transfer landscape, the conversations may be difficult — with questions to answer, misunderstandings to correct, and disagreements to address — but they need to be sustained.

If the dialogue and resulting activities are focused on areas of common interest and shared benefits, those involved will see the value of participating. In many cases, student transfer efforts grow out of related areas of opportunity that span academic institutions, such as professional development and undergraduate research.

**BRIDGING THE CULTURE GAP**

*"At the University of Arizona, which pays special attention to recruiting students from two-year tribal colleges, they work with both the students and the family to ease the transition. Many of our students are first in their family to attend college. This carries prestige within their families, but also a great deal of responsibility. Often times there are greater expectations on them — they feel an obligation to go home when there is a crisis or to help the family financially. Sometimes, it can be overwhelming."*

— Karen Francis-Begay, Special Advisor to the President on Native American Affairs

For more information, refer to the College Board report, *Improving Student Transfer from Community Colleges to Four-Year Institutions – The Perspective of Leaders from Baccalaureate-Granting Institutions*, July 2011.

Regardless of the focus of the effort — whether a one-on-one mentoring relationship or a system-wide articulation agreement — it is important to define the goals, roles, and responsibilities for those involved. As faculty, we should have a sense of what is expected, assume realistic roles, and know how our contributions align with those of others.

Given the multiple factors influencing student transfer, the range of student needs and goals, and the variety of institutions involved, there is no single road map for navigating the landscape. We must be part of a process of developing relationships and programs that enhance student transfer. As Figure I illustrates, the steps associated with this process — Information, Communication, Collaboration, and Integration — can form a self-sustaining cycle. Regardless of the areas of opportunity and the scope and level of conversations, we can follow these steps and use a series of cross-cutting strategies (see sidebar, Strategies for Maximizing Our Impact, below.)

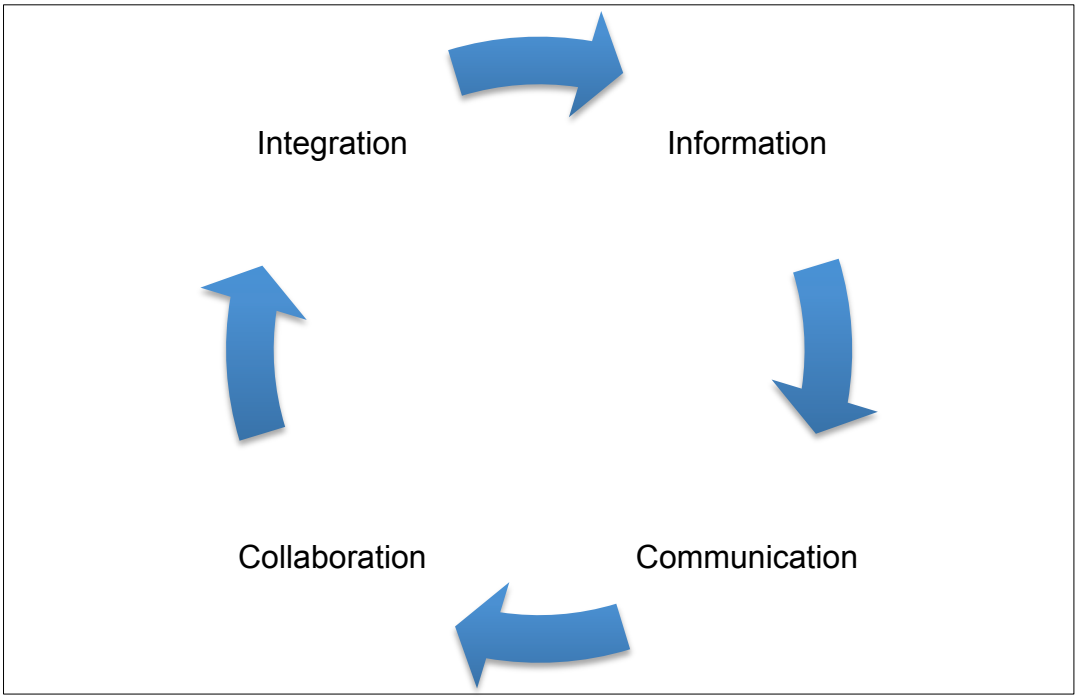


**Figure I.** Cycle of Continuous Development

**STRATEGIES FOR MAXIMIZING OUR IMPACT**

***Information***

- Learn from the literature of student transfer studies and the experiences of others.
- Gather data and feedback that can be used to improve the student transfer experience.

***Communication***

- Encourage, facilitate, and sustain opportunities for communication among faculty, staff, and students at transferring and receiving institutions on topics of common interest.
- Use conversations about transfer student success to develop a shared understanding of challenges and opportunities, along with mutual trust and respect.
- Be aware of the different backgrounds, circumstances, and aspirations of the students, staff, and faculty involved in student transfer and ensure that their perspectives are represented.

***Collaboration***

- Maintain a focus on the overarching aspects of the student transfer experience and shared goals, referring to them when working on the details.
- Recognize commonalities and differences among transferring, receiving, and other partnering institutions.
- Create, facilitate, and sustain effective partnerships among faculty, staff, and students at transferring, receiving, and other partnering institutions.

***Integration***

- Discuss transfer student success at all levels (i.e., disciplinary, departmental, institutional, regional).
- Incorporate activities that support transfer students into the ongoing operational and planning processes for programs, departments, institutions, and regions.
- Include support of student success in reward structures for faculty at transferring and receiving institutions.

## Identifying Areas of Opportunity

Given limited resources, it is important to be strategic when determining where to invest faculty efforts. Many of the areas of opportunity we can pursue are aligned with broader educational goals and efforts:

- Enhancing communications
- Enhancing career counseling
- Enhancing academic advising
- Enhancing academic support
- Increasing financial support
- Developing a sense of belonging to a community of learners
- Providing peer support
- Mentoring
- Aligning learning outcomes
- Partnering with K-12 institutions
- Developing articulation and other policies

Chemistry faculty must avoid thinking that others are taking care of issues and problems in these areas. Faculty can make meaningful contributions to increase student success — as individuals and as a group — before, during, and after transfer. The nature of these contributions will vary based on your students and the institutions involved (Chapter 2) and the roles that you and your colleagues are best positioned to play (Chapter 3). In some areas, we can only stay informed and provide input on activities. In other areas, we can be more proactive. Areas of particular interest to chemistry faculty include enhancing academic support (Chapter 4), developing a sense of belonging to a community of learners (Chapter 5), mentoring (Chapter 6), and aligning learning outcomes (Chapter 7). Coordinating efforts and leveraging resources (Chapter 8) will benefit all of these and other areas.

Both individual and department commitments — many in conjunction with partners across and beyond the institution — are needed to successfully pursue opportunities. As areas of opportunity and potential commitments are identified, engaging with others will help establish an atmosphere of trust and respect and a shared vision — the two fundamental aspects of successful student transfer efforts.

Chapter 2

# The Student Transfer Landscape: Knowing the Pathways and Stakeholders

Your academic institution is one of over 4,600 U.S. institutions[5] serving over 21 million undergraduate students.[6] Approximately one-third of these students will enroll in courses at more than one institution,[7] and many more will do so concurrently.[8] As society becomes more mobile, economic pressures increase, and other factors contribute to a population of students who regularly attend more than one academic institution, it is more important than ever to understand how different institutions are structured and serve their student populations.

As a faculty member, you may find guiding students who are interested in science through the complex landscape of student transfer to be a daunting prospect. Yet we are at the very heart of this landscape. To the students, we are the collective face of the discipline of chemistry, of our institutions, and of higher education. To the institutions that students are transferring among, we are the indicators of their preparedness, assessing and conveying their academic accomplishments, while monitoring their progress. We are also the students' voices, advocating for their needs.

Knowing more about transfer students enrolled in chemistry courses, the institutions in which they plan to enroll or have already attended, and how they intersect will help us play these key roles. This knowledge will also enable us do so strategically, in a way that is commensurate with our responsibilities and resources, and that is beneficial to us and our departments (see Chapter 3).

A strategic way to learn more about the world of student transfer is by engaging students and colleagues at our own institutions. The insights and connections we make will position us to make the most of resources on our own campuses. Reaching out and learning more about the cultures, resources, and opportunities at other transferring and receiving institutions can develop relationships that will help us and our colleagues improve the student transfer process and prepare more students for careers in science. Leveraging the resources and activities of other stakeholders to enhance student transfer will allow us all to contribute to local, regional, and national initiatives that increase access to and success in higher education.

## Getting to Know the Students

Effectively and successfully guiding science students through the world of higher education requires knowing where they are coming from and where they want to go. It is also important to understand their postsecondary experiences — actual and potential — and how we, as faculty, can maximize the impact of those experiences.

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[5] Carnegie Classification Page, http://classifications.carnegiefoundation.org/. (This source, as well all other Web-based references throughout this document, were accessed in September 2012.)

[6] National Center for Education Statistics. *Digest of Education Statistics: 2011,* NCES 2012-001; US Department of Education: Washington, DC, May 2012, Table 199.

[7] A longitudinal study of students who began postsecondary education in the U.S. in fall 2006 considered consecutive enrollments. National Student Clearinghouse Research Center and the Project on Academic Success, *Transfer & Mobility: A National View of Pre-Degree Student Movement in Postsecondary Institutions*, February 2012, p. 7.

[8] A longitudinal study of students who were in 8th grade in 1988, which considered consecutive and concurrent enrollments, found that 60% of undergraduate students attended more than one institution. Clifford Adelman, *The Toolbox Revisited: Paths to Degree Completion From High School Through College;* US Department of Education: Washington, DC, 2006, p. xvi.

Research has shown that a range of background characteristics can influence students' experiences and progress in higher education:[9]

- Age
- Race/ethnicity
- First-generation status
- Socio-economic status
- Parental education
- Parental income
- High school achievement/ preparation
- English language learners
- Placement test scores
- Other variables

Awareness of these characteristics can inform our efforts to enhance the success of transfer students. It can also focus activities that we may undertake with our communities and K-12 partners.

### Student Goals

In many cases, students entering the world of higher education are not familiar with their career options and their goals are very vague. The goals that students often identify include:

- Baccalaureate degree
- Employment
- Graduate degree

Our chemistry classes include students for whom chemistry is just a general education requirement as well as students who need to master chemistry knowledge and skills for their careers.

A survey of students who attended community college during the course of earning bachelor's and master's degrees in science, engineering, and health (SEH) in 2006-2007 provides valuable insights into their motivations and factors influencing their transfer pathways (see Table 1). The high percentage of those wanting to earn credits for bachelor's degrees reflects the fact that those surveyed were students who transferred and earned degrees. Although the number of students in the physical and related sciences is small, chemistry courses are required in the majority of the fields of study included in Table 1. Among the 17,000 bachelor's and master's graduates who earned their degrees in physical/related sciences, 35% indicated that either leisure or personal interests was among the reasons for attending community colleges. Nearly 30% indicated that they wanted to earn college credit while in high school.[10]

[9] Laanan, F. S. *The State of STEM.* Opening plenary session at Creating Pathways for STEM Transfer Student Success. Asheville, NC, September 12-14, 2011.

[10] Mooney, G. M., Foley, D. J. *Community Colleges: Playing an Important Role in the Education of Science, Engineering, and Health Graduates,* NSF 11-317, National Science Foundation, Arlington, VA, July 2011, p. 4.

**Table 1.** Reasons for attending community college among recent recipients of SEH bachelor's and master's degrees, by field of major: Academic years 2006–07.

| | All recipients | Biological/ life sciences | Computer/ mathematical sciences | Physical/ related sciences | Social/ related sciences | Engineering | Health |
|---|---|---|---|---|---|---|---|
| Attended community college (number) | 722,000 | 95,000 | 72,000 | 17,000 | 270,000 | 71,000 | 197,000 |
| Earn credits for bachelor's degree | 74.5% | 73.8% | 71.1% | 69.2% | 74.7% | 75.8% | 75.7% |
| Financial reasons (e.g., cost of 4-year school) | 44.0 | 36.9 | 46.1 | 37.0 | 42.7 | 42.5 | 49.5 |
| Gain skills or knowledge in academic or occupational field | 42.3 | 38.5 | 48.7 | 34.8 | 41.0 | 37.9 | 45.9 |
| Prepare for college/increase chance of acceptance to 4-year college or university | 41.6 | 37.9 | 42.4 | 39.2 | 43.7 | 38.4 | 41.5 |
| Complete associate's degree | 28.7 | 18.3 | 33.1 | 15.3 | 28.8 | 15.8 | 37.7 |
| Leisure or personal interests | 28.0 | 27.8 | 33.3 | 35.0 | 32.4 | 27.1 | 19.7 |
| Facilitate change in academic or occupational field | 26.6 | 21.1 | 24.9 | 17.8 | 26.0 | 16.7 | 35.0 |
| Earn college credits while in high school | 25.3 | 34.3 | 23.9 | 29.8 | 27.0 | 28.2 | 17.6 |
| Increase opportunities for promotion, advancement, or higher salary | 21.4 | 15.1 | 25.7 | 13.0 | 21.7 | 15.0 | 25.4 |

Notes: Numbers are rounded to nearest 1,000. Percentages sum to more than 100% because of multiple responses. Each academic year runs from 1 July of one year to 30 June of the next year. For example, the 2008 NSRCG sample included those graduating between 1 July 2005 and 30 June 2007, representing 2 academic years: AY 2006 and 2007.

Source: National Science Foundation/National Center for Science and Engineering Statistics, National Survey of Recent College Graduates: 2008.

If students do not express interests in any academic area when they enroll, it is difficult to give them guidance and help them connect with the institution, a specific discipline, and the faculty and other students in that discipline. A lack of direction, motivation, and support network makes it difficult for students at any institution to make sound choices and persevere through challenges in their studies. Recognizing this, many institutions are increasing efforts to provide academic and career guidance. (See sidebar, Calls for Faculty Involvement in Student Transfer, in Chapter 1.)

Students who have already been in the workforce, many of whom enroll in community colleges, tend to have the intrinsic motivation, maturity, and basic skill sets needed to successfully complete their course of study. Even so, academic and career guidance is important for these students as well. If they form the connections that provide academic and financial support, they will be much more likely to rise above challenges and complete their degree.

*A lack of direction, motivation, and support network makes it difficult for students at any institution to make sound choices and persevere through challenges in their studies.*

Whether embarking on a well-defined path or a process of exploration, the postsecondary experience must be structured. The students' roles in and ownership of their education must be made explicit. We can make a "considerable change in the language that we use in describing what happens to students from a negative rhetoric that assumes passivity to one that respects students as active players, seeking and discovering paths to their educational goals."[11]

[11] Adelman, p. xxvi.

We should take advantage of opportunities to convey interim goals, as well as the consequences of not achieving them: [12]

- Retention in higher education
- Retention in STEM/SEH programs/majors
- GPA needed to advance
- Mastery of knowledge and skills
- Sense of self-confidence and self-efficacy

Successful students are building knowledge in the subject matter, skills, and an evidence-based belief in their own competencies as they complete the initial years of coursework in their major. Efforts to maximize the use of academic time and resources, and increase academic performance at the initial stages of collegiate study (see Chapter 4) can set the stage for future academic success.

### Academic Experiences

The exact keys to successful transfer for students vary with with their backgrounds, goals, and the experiences they have in the academic environments through which they navigate. Research has indicated that a collection of experiences influence the process.

As faculty, we can look for opportunities to improve and expand:

- Experiences with faculty
- Learning communities
- Bridge programs
- Partnerships among community colleges and baccalaureate-granting institutions

These experiences interact with the major factors that determine student success:

- Academic preparation
- Level of participation
- Motivation
- Financial means

In regards to academic preparation, the experiences that students have in the following areas will influence their trajectory:

- Developmental courses
- General education courses
- Academic advising/counseling
- Selection of and introduction to an academic major/program of study
- Development of learning and study skills
- Courses within a major/program of study

In regards to level of participation, we can find ways to increase and improve the following:

- Hours spent on campus
- General perceptions of institution (e.g., accessibility of faculty, friendly “transfer culture”)
- Adjustment process (e.g., social and academic, transfer shock, transition issues)
- College satisfaction

[12] Laanan.

In regards to motivation, the nature of the experiences listed above and how they are perceived are critical.

In regards to financial means, we can help introduce and encourage pursuit of resources, programs, and employment opportunities.

Students' backgrounds influence their perceptions and understanding of the world of higher education. Asking transfer students, individually and collectively, about their experiences, helping them understand expectations, and actively encouraging them to use resources to meet their needs are effective ways to help them overcome barriers before, during, and after transfer.

It is not enough to merely provide opportunities. Faculty must also inform and empower students. Clifford Adelman's analysis of a longitudinal cohort study, *A Toolbox Revisited: Paths to Degree Completion from High School through College,* indicates that the decisions that the students themselves make regarding their academic paths also play a central role. "While these choices do not take place in a social and psychological vacuum," noted Adelman, "this is a story about the intersection of student choice with the structures of opportunity offered by institutions whose first order of business is the distribution of knowledge."[13]

*"While [students'] choices do not take place in a social and psychological vacuum, this is a story about the intersection of student choice with the structures of opportunity offered by institutions whose first order of business is the distribution of knowledge."*

— Clifford Adelman

## Student Transfer Pathways

Due to a number of economic, social, and political factors, the higher education landscape and the world of student transfer is becoming more complicated. Students are pursuing various pathways to degrees (see the sidebar, Types of Transfer, below). Forward transfer, as its name implies, describes the path from a community college to a baccalaureate-granting institution. This type of transfer is the path that most directly moves students toward baccalaureate degrees. A significant number of students, however, are following other transfer pathways.

[13] Adelman, p. xxiv.

**TYPES OF TRANSFER**

**Forward transfer –** transfer from a community college to a baccalaureate-granting institution

- without earning an associate degree
- after earning an associate degree

**Lateral transfer –** transfer among institutions offering similar types of degrees, with or without eventual return to the original institution

- from one community college to another
- from one baccalaureate-granting institution to another

**Reverse transfer –** transfer from a baccalaureate-granting institution to a community college, with or without eventual return to the baccalaureate-granting institution

**Serial transfer –** a series of movements among institutions

Adapted from *Transfer & Mobility: A National View of Pre-Degree Student Movement in Postsecondary Institutions*, a Signature Report from the National Student Clearinghouse Research Center and the Project on Academic Success, Indiana University, February 2012.

The transferring institutions are not always community colleges. Likewise, the receiving institutions are not always baccalaureate-granting institutions. The percentage of students who transferred at least once between 2006 and 2011 was the same (32.6%) from both community colleges and baccalaureate-granting institutions, with over 433,800 students starting at community colleges and nearly 914,500 starting at baccalaureate-granting institutions.[14] Of those students who transferred:

- 37% transferred in their second year
- 22% transferred as late as their fourth or fifth years
- 25% transferred more than once
- 27% transferred across state lines
- 43% transferred into a public community college

These numbers include neither those students who earned a certificate or associate's degree before transferring, nor those who are concurrently enrolled.

The destinations of students who transfer also vary.[15] Of those originating at public community colleges in 2006, 41.2% transferred to public baccalaureate-granting institutions and 37.6% to other public community colleges. Public community colleges were the top destination for students transferring from all other categories of institutions.

[14] National Student Clearinghouse Research Center, p. 18-19.

[15] Ibid., p. 22-23.

Given the high levels of student mobility and the ever-evolving student transfer landscape, faculty, staff, and administrators at institutions that enroll transfer students need to develop practices and protocols that can accommodate a range of students and situations, now and in the future. "Today's students are demanding more: they seek special programs to prepare for admission to four-year institutions, support for transitions from two-year to four-year institutions, and help to progress to graduate school. To adapt the traditional system to the needs of today, colleges and universities must seek new strategies and innovative solutions."[16] During their interactions with transfer students, faculty may be among the first to identify shifting patterns that require new approaches and additional partners.

**THE MANY PEOPLE ALONG STUDENT TRANSFER PATHWAYS**

Preparing and guiding students along the transfer pathways involves a community of people, some of whom the students may never meet … but all of whom can have a tremendous impact.

- Academic leaders
- Policy makers
- Faculty
- Registrars
- Academic advisors and counselors
- Support service staff
- Admissions staff
- Financial aid staff
- Orientation staff
- Other students

## Understanding Perspectives across the Student Transfer Bridge

The expansion of the traditional Carnegie classifications highlights the many differences among the over 4,600 U.S. institutions of higher education, and how hard it is to put them into well-defined categories.[17] When determining how to help students navigate this landscape and what we might do to better inform and encourage their decisions, it is important to consider a range of aspects about the institutions involved — particularly those that shape the institutions' cultures and students' experiences — and to do so without falling into stereotypes or biases.

### Institutional Mission

Each institution of higher education is looking for a way to distinguish itself and attract students, faculty, and resources. The baccalaureate-granting institutions range from new institutions just opening their doors (or websites) to long-established institutions such as Harvard University, founded in 1636.[18] From the time that Joliet Junior College was founded in 1901, community colleges have grown to fill an important role in higher education. They provide open access across a wide range of subjects with an emphasis on teaching and lifelong learning,[19] as well as a gateway to postsecondary education for many minority, low income, and first-generation students.

Accredited, degree-granting colleges and universities are classified as public or private, non-profit or for-profit. The U.S. Department of Education estimates that close to 70% of all undergraduate students attend public institutions (see the sidebar, Behind the Scenes at Public Institutions, below). These institutions, which include the majority of community colleges and many baccalaureate-granting colleges and universities, have missions

[16] Coleman, A. L.; Lipper, K. E.; Keith, J. L.; Chubin, D. E.; Taylor, T. E., *The Smart Grid for Institutions of Higher Education and the Students They Serve: Developing and Using Collaborative Agreements to Bring More Students into STEM*, American Association for the Advancement of Science: Washington, DC, 2012, p. 19.

[17] Carnegie Classification page, http://classifications.carnegiefoundation.org/.

[18] About Harvard Page. http://www.harvard.edu/about-harvard.

[19] George B. Vaughan, *The Community College Story*, 3rd ed.; American Association of Community Colleges: Washington, DC, 2006.

focused on benefiting the communities and states in which they are located. Community colleges often have workforce development programs, such as those in chemistry-based technology. Universities may have hospitals or research and technology centers that serve as economic drivers. Among the public institutions are those created by the Morrill Land-Grant Act of 1862 and the historically Black colleges and universities established by a second Morrill Act in 1890, in states where Blacks were being excluded from land-grant institutions. In the intervening years, many other public institutions have become minority-serving, attracting students from an increasingly diverse U.S. population.

Although levels of research and community-oriented activities vary among academic institutions, providing quality education is a common theme. The Carnegie Foundation for the Advancement of Teaching describes undergraduate education as "an essential component of what most colleges and universities do… Indeed, even at institutions with strong commitments to graduate education and the production of new knowledge through research and scholarship, the undergraduate program usually accounts for the majority of student enrollment."[20]

In response to the research on learning, many institutions are adopting student-centered approaches and high-impact educational practices that foster engagement. The extent to which this is occurring depends on many factors, including institutional leadership and resources.

**BEHIND THE SCENES**
**AT PUBLIC INSTITUTIONS**

Given their systems of governance and sources of support, activities at public institutions are influenced by the political and economic climates of the communities and states in which they are located.

- **Governance** — Systems vary across the states. There may be state boards, councils, commissions, and offices of higher education that play various roles. State legislatures also exert influence, including passing legislation regarding articulation.
- **Funding** — Public universities rely on two primary sources of income: state subsidies and student tuition and fees. Recent reductions in state appropriations have resulted in increased tuition and fees across many state institutions.
- **Accountability** — With increasing calls for accountability, efforts to track and monitor student progress are expanding. The challenge is finding the resources needed — both for assessment and for responding to the needs uncovered.

## Degrees Offered

The wide range of missions for community colleges is reflected in the range of certifications and degrees offered — and the number of students who do not pursue either. The associate degrees offered are approximately 60 semester credit hours in length. Those community college students who are preparing to transfer will be expected to take courses that parallel those offered during the first two years at receiving institutions — in some cases earning an associate degree in the process, but in many cases not.

If an associate degree is earned, it is unlikely to be one in chemistry. Most community colleges do not have disciplinary majors or degrees to pursue, making it challenging for students to be introduced to career options and role models. Recent reports have called for community colleges to facilitate the process of identifying

[20] Carnegie Undergraduate Instructional Program Classification Page. http://classifications.carnegiefoundation.org/descriptions/ugrad_program.php.

programs of study.[21, 22, 23] If done prior to enrollment, students could receive guidance and be placed in appropriate courses starting in the first semester. In addition to improving retention, this process could provide opportunities to broaden the horizons of those interested in STEM, and engage their imagination about science and the contributions they could make.

Students pursuing bachelor's degrees have a range of baccalaureate-granting institutions to which to transfer. Some students select their institution based on the program (e.g., pre-professional). They may also make their selection based on location, particularity proximity to one's home and transferring institution. Another common factor is cost, with most transfer students enrolling in public baccalaureate-granting institutions, which have lower tuitions than private institutions.

### Student Demographics

The culture of an institution is shaped by its student body. As noted earlier, there is much variation across higher education institutions, even within the categories in Table 2.

Having an understanding of differences and similarities can facilitate the process of aligning efforts to enhance the success of transfer students. Differences in socio-economic status, ages, and racial and ethnic cultures — and the opportunities they provide for broadening participation in science — should be considered, while recognizing that serving undergraduate students is a primary role of higher educational institutions.

**ENCOURAGING PURSUIT OF PRE-MAJORS AND ASSOCIATE DEGREES**

Transitions from the community colleges to baccalaureate-granting institutions in North Carolina are being facilitated by the state's Comprehensive Articulation Agreement, which includes a guaranteed admission to one of the sixteen public universities and junior status to students graduating with associate degrees, and pre-majors, which serve as guides to course selection.

For more information, visit http://www.nccommunitycolleges.edu/Programs/comprehensive_a_a.htm.

**A CASE OF UNINTENDED CONSEQUENCES**

The terms 'two-year' and 'four-year' are often used to describe community colleges and baccalaureate-granting institutions, respectively. When student circumstances — such as part-time status, the need for remedial courses, and changing career goals — prevent them from completing courses of study within those timeframes, they (and their families and friends) may assume that they are not on track and decide to leave higher education.

[21] Moore, C., Shulock, N. *Sense of Direction: The Importance of Helping Community College Students Select and Enter a Program of Study;* Institute for Higher Education Leadership & Policy: California State University, Sacramento, August 2011.

[22] Jenkins, D. *Get with the Program: Accelerating Community College Students' Entry into and Completion of Programs of Study*; Community College Research Center, Columbia University, New York, NY, April 2011.

[23] Scott-Clayton, J. *The Shapeless River: Does a Lack of Structure Inhibit Students' Progress at Community Colleges?* Working Paper No. 25, Assessment of Evidence Series; Community College Research Center, Columbia University, New York, NY, January 2011.

**Table 2.** Tuition and Enrollment at Higher Education Institutions for 2010-2011 Academic Year

| | **Community colleges** | **Baccalaureate-granting institutions** |
|---|---|---|
| Tuition and fees for full-time undergraduate students (excluding room and board)[a] | $2,439 (public); $12,669 (private, not-for-profit) | $7,136 (public, in-state); $26,523 (private, not-for-profit) |
| Fall enrollment (both full- and part-time)[b] | 7.68M | 13.34M; (10.40M undergraduates) |
| Enrollment as a percentage of all 18-24 year-old high school completers in the U.S.[c] | 15.2% | 33.1% |
| Ethnicity[d] | | |
| White | 56.3% | 63.0% |
| Hispanics | 18.0% | 10.2% |
| Black | 15.6% | 13.8% |
| Asian | 5.7% | 5.9% |
| Pacific Islander | 0.4% | 0.3% |
| Native American/ Alaskan Native | 1.1% | 0.8% |
| 2 or more | 1.6% | 1.5% |

Source: National Center for Education Statistics (NCES) Digest of Education Statistics: 2011.a) Table 349; b) Tables 199 and 309; c) Table 213; d) Table 328.

The success of institutions is determined by their ability to provide resources that lead to student success. "To reach and meet the needs of today's diverse population of students, institutions must be innovative in their approach. Collaborative relationships between institutions can help them be just that."[24] Connections between departments and units within institutions are also important.[25]

## Interacting with Other Stakeholders

Stakeholders across the education continuum and in the workforce have an interest and a role to play in preparing seamless transfer pathways. Taking the time and effort to solicit their input will provide us with a sense of ideas, resources, and level of involvement they can contribute.

### Postsecondary Preparation

Since level of secondary preparation is a significant factor affecting both access to and success in higher education, high schools have a role to play in addressing a major challenge. Increasing numbers of high schools around the country are offering their students the chance to earn college credit through dual credit or dual enrollment programs in conjunction with their local community college and/or university. The Texas Association of Community Colleges reports that Texas alone has over 100,000 high school students earning dual

[24] Coleman, et al., p. 16.

[25] Ibid., p. 9.

credit in over 2,000 class sections serving approximately 900 independent school districts and 1,200 high schools across the state.[26]

### Workforce Preparation

Input from industry and workforce development organizations can help shape the goals and outcomes of programs in higher education. Many interactions among educators and employers occur at the local and regional levels. Among the national initiatives is the STEM Higher Education and Workforce Project, launched by the Business Higher Education Forum.[27] Approaches range from having advisory boards to cooperative ventures, such as Bachelor of Applied Arts and Science degrees that combine college level credits, eligible work experience, and work related training.

Although not traditionally involved in higher education, the U.S. military is another institution that now has significant influence. The American Council for Education, for example, is funded by the Department of Defense to evaluate and determine issues of academic credit for military school, correspondence courses, and occupations. Each branch of service has its own programs and resources, such as www.goarmyed.com, to help eligible soldiers with issues of tuition assistance and managing their educational portfolio.

These and other opportunities illustrate how we can better serve students, especially those who are not 18 year-old freshmen completing a degree in four consecutive years at a single institution. At the same time, our efforts can benefit our institutions and partnering organizations.

## Fulfilling a National Imperative

The role that higher education plays in innovation and economic development, particularly in STEM, is increasingly highlighted. In addition to the calls for action in numerous reports (see sidebar, Calls for Faculty Involvement in Student Transfer, in Chapter 1), President Obama has also expressed support for increasing the number of American students completing degree programs by promoting a commitment to having the highest proportion of students graduating from college in the world by 2020.[28] In the report *Engage to Excel*, the President's Council of Advisors in Science and Technology presented a series of recommendations to fill a gap in the STEM workforce by retaining the students who come to higher education with an interest in STEM.[29] These recommendations focus on strategies which we have a role in implementing.

These efforts will leverage others across the country. Major educational funding agencies such as the Lumina Foundation have established national goals for college completion. Lumina's Big Goal for 2025 is to increase the percentage of Americans with degrees and credentials to 60 percent by 2025.[30]

The visibility of these initiatives, combined with the collective dialogue and resulting collaborations, can inform and empower our efforts. The challenges associated with student transfer are many, but the need to improve the process and the payoff for doing so are great. "It is clear that higher education institutions must continue to

[26] Dual Credit Texas Page. http://www.dualcredittexas.org/index.php

[27] Business-Higher Education Forum. STEM Higher Education and Workforce Project. http://bhef.com/solutions/stem/hewp.asp.

[28] The White House Higher Education Page. http://www.whitehouse.gov/issues/education/higher-education.

[29] Executive Office of the President, President's Council of Advisors on Science and Technology. *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*; Washington, DC, February 2012.

[30] Lumina Foundation Goal 2025 page. http://www.luminafoundation.org/goal_2025.html.

pursue new strategic and systemic ways of thinking and adopt multiple strategic efforts. By finding new ways to improve America's education system and help more students earn the credentials required for the 21st Century, the United States can assert its place as 'the world's engine of scientific discovery and technological innovation.' To be successful, institutions of higher education must attract and meet the needs of students who are increasingly diverse, mobile, and reliant on transition pathways between schools."[31]

[31] Coleman, et al., p. 8.

Chapter 3

# The Faculty Roles: Framing Responsibilities and Focusing Efforts

Understanding the range of pathways and stakeholders involved in student transfer, as described in Chapter 2, provides a foundation on which to base our efforts. Faculty who are committed to helping chemistry students navigate the student transfer landscape, minimizing barriers, and improving the process will find a number of strategic opportunities. Once we've recognized the variety of steps that we can take as chemistry faculty to enhance the process for students transferring into and out of our institutions, the next step is to consider how to maximize our investment of time and resources.

## Playing Meaningful and Connected Roles

Whether we are looking to do something within our courses, develop comprehensive plans with partnering institutions, or something in between, it is critical to consider factors that influence student transfer and to connect our efforts with those of others. Efforts to enhance student transfer, like those to improve teaching and conduct research, should be informed by the literature, data, and experiences of others. Although new insights can certainly be gained by reinventing the wheel, our time and resources are better spent building on the insights and efforts of others.

Research on student transfer has identified a series of factors at both transferring and receiving institutions that should be considered when working with students who are transferring (see Academic Experiences in Chapter 2). As faculty, we can readily identify and address many of these factors — beginning with the students' experience with faculty. Some of these factors are academic in nature, while others focus on the motivations, finances, and level of participation of students — but all of them play roles in providing access to higher education.

In addition, consider the roles that our students, other faculty, staff, administrators, and partners play before, during, and after transfer. Chapter 2 of this document includes additional insights into the various individuals and factors that affect the success of student transfers. Naturally, given the many players involved, it makes sense to align our efforts with those of others; our activities must make sense in the context of our departments and institutions.

## Expanding Our Sphere of Influence

At first glance, many factors that influence student transfer seem outside of the control of chemistry faculty. By being aware of them, however, we can recognize and take advantage of opportunities to respond to these factors. For example, knowing that parental education and first-generation status are factors that can influence transfer may prompt us to suggest that parents of transfer students be involved in outreach, recruitment, and transfer activities.

Some actions can address more than one of the factors influencing transfer. Finding ways to employ more students within our departments and/or research groups, for example, can help students who struggle to balance employment with academic responsibilities, while developing their connection to faculty and the chemistry community.

Engaging others in our departments, across campus, and at partnering institutions in addressing various factors can leverage and increase the success of efforts being made in chemistry classrooms, laboratories, and programs. It also gives us and our students a network of colleagues to call upon for advice and assistance.

## Staying Current with the Changing Student Transfer Landscape

With sustained calls for accountability and ongoing economic, political, and social changes, student transfer is likely to be the focus of many studies and policy debates. Tapping into our local networks and national organizations will help us be aware of aspects that can influence our transfer students and efforts to support them.

Policy changes may occur at many levels. At the national level, the federal government is focused on ensuring access to higher education. Accrediting agencies impact practices at regional levels. Some states have instituted state-wide policies and developed corresponding guides for students. Other institutions have cooperative agreements with either a consortium or series of institutions, often focusing on general education.

On a more local level, academic leaders may introduce new policies for their systems or campuses. Administrators and registrars on your campus can serve as sources of information and advocates as policies are developed and updated. In states such as Arizona and California, where disciplinary faculty meet regularly, chemistry faculty have the chance to consider changes and their impacts.

Research on higher education will continue to provide insights on the efficacy and efficiency of student transfer. The following organizations offer a variety of resources, including overviews of the scholarly work being done on a range of topics:

### Student success

- Association for the Study of Higher Education
- Association of American Colleges and Universities
- Lumina Foundation
- MetLife Foundation
- U.S. Department of Education

### Transfer

- Association of American Colleges and Universities
- National Articulation and Transfer Network

### Transfer in science, technology, engineering, and mathematics

- Pathway to a STEM degree

### Community colleges

- American Association of Community Colleges
- League for Innovation in the Community College
- Community College Research Center
- Center for the Study of Community Colleges
- Center of Community College Research
- Community College Survey of Student Engagement

Contacts on our campuses and at partnering institutions can also provide expertise. Conversations with colleagues in higher education departments, teaching and learning centers, and student support services can help us learn what is being published as well as how it relates to our students, departments, and partners.

Student transfer studies and the data on which they are based make a compelling case. Of course, the most compelling numbers are those provided by institutional research offices on our campuses and at our partnering institutions. State education offices may also have information that could be disaggregated and inform efforts.[32]

## Identifying Areas of Opportunity

There are many ways we can make a positive difference on the success of students transferring to and from our institutions, including those listed in Chapter 1. (For the reader's convenience, we've relisted these opportunities in the sidebar, Identifying Areas of Opportunity, below; several are also covered in more detail in Chapters 4 through 7.) Determining which initial steps to take can be difficult, given all the factors involved in student transfer. We should pick those that make sense for us, our students, our institutions, and our partners. If colleagues on your campus or at partnering institutions have determined strategic areas that fit the context of the institutions and students involved, the energy and resources already being invested can make it easier for you and your department to undertake related efforts. Don't overlook initiatives that may be focused on tangential goals — undergraduate research, diversity and inclusion, or workforce development — they may not even allude to student transfer, but could play a key role in addressing factors involved in student transfer and build key connections needed to address these factors.

**IDENTIFYING AREAS OF OPPORTUNITY**

Given limited resources, it is important to be strategic when determining where to invest our efforts. Many areas of opportunity we can pursue align with broader educational goals and efforts, including:

- Enhancing communications
- Enhancing career counseling
- Enhancing academic advising
- Enhancing academic support
- Increasing financial support
- Developing a sense of belonging to a community of learners
- Providing peer support
- Mentoring
- Aligning learning outcomes
- Partnering with K-12 institutions
- Developing articulation and other policies

## Mapping Out Plans

There are no pre-defined road maps for enhancing student transfer. If there were, they would not reflect the landscapes in which we find ourselves. Those who are already involved recommend focusing on information, communication, collaboration, and integration (see sidebar, Strategies for Maximizing Our Impact, in Chapter 1).

Engaging others will also position us and our colleagues to identify strategic actions that will have the maximum impact. In most cases, the resources available for enhancing student transfers will be limited, and strategic

[32] Education Commission of the States. *The Progress of Education Reform;* Denver, CO, October 2009; Vol. 10, No. 5.

choices will need to be made. In all cases, the plans will need to be adapted to fit the needs of students, as well as the contexts of departments and institutions.

A series of discussions regarding the role of faculty, partnerships, and other stakeholders can help frame plans. Open-ended questions (see the sidebar, Moving from Opportunity to Action, below) can be used to guide such discussions and structure conversations to tap into the collective knowledge and expertise of colleagues with different perspectives and experiences.

**MOVING FROM OPPORTUNITY TO ACTION**

The following questions, used in a series of discussions with colleagues, can help outline aspects to be included in action plans.

1. Define areas of opportunity
2. Consider the role of faculty
   a. What roles should chemistry faculty play in regards to this area of opportunity?
   b. Are there specific roles that chemistry faculty at transferring institutions should play? What about chemistry faculty at receiving institutions?
   c. What examples can you share where faculty have played these roles?
   d. What practices will help chemistry faculty pursue this area of opportunity? What would hinder them?
   e. What strategies will help put these practices in place?
3. Discuss partnership options
   a. What partnerships, both within and outside their institutions, should chemistry faculty establish to pursue this area of opportunity? What examples can you share of such partnerships?
   b. What practices will help chemistry faculty establish and sustain partnerships in this area of opportunity? What would hinder them?
   c. What strategies will help put these practices in place?
4. Identify other stakeholders
   a. What other stakeholders can help pursue this area of opportunity, and what roles should they play?
   b. What examples can you share of such partnerships?

## Being at the Heart of the Student Transfer Landscape

Since we interact with students and serve as a face of higher education, we are positioned to influence others and play leadership roles in efforts to enhance student transfer. In such roles, there are some additional strategies for maximizing our impact beyond those presented in Chapter 1.

**Information**

- Embrace overlapping and multiple perspectives. When possible, involve colleagues who can wear multiple hats — faculty who teach at partner institutions, staff who serve on multiple committees, and administrators who have colleagues at campuses across town. The range of insights will result in rich discussions and more robust plans.

**Communication**

- Stay student-centered. Colleagues may come up with many reasons not to create new policies or programs that promote transfer. When student success is at the heart of the conversation, many of those obstacles can be overcome.

**Collaboration**

- Build support across all levels. Support must exist from the chief executive and academic officers as well as deans, chairs, faculty, and staff. It can spread from bottom to top, top to bottom, or meet in the middle — whatever is most appropriate for your institutions and partners.
- Generate wide-ranging support. Efforts to plan and implement an initiative are much more likely to be successful and sustained if key players are engaged. Depending on the scope, you may be including other faculty in your department, faculty in other departments, and colleagues from other institutions. Some may be involved sooner and others may come on board at later stages.
- Create some early wins. Having some tangible outcomes at the initial stages of a project can help build enthusiasm for additional efforts.

**Integration**

- Plan for the long term. Sustainable solutions for these complex issues are not determined or implemented quickly, and must be built into multiple cycles of planning.

Insights from others who have been part of collaborative endeavors are presented in Appendix C and additional thoughts on ways to move forward are in Chapter 8.

**BUILDING YOUR LEADERSHIP SKILLS**

There are many opportunities for chemists to play leadership roles. To help prepare us and make us more effective, the American Chemical Society has developed a series of leadership courses. They include:

- Engaging Colleagues in Dialogue
- Communicating across Boundaries
- Leading without Authority
- Fostering Innovation
- Leading Change

For more information on these courses, see www.acs.org/leaderdevelopment.

## Sustaining Momentum

Given the time needed for mapping out and implementing plans of action, it is essential to demonstrate progress and keep efforts moving forward. Initial efforts and individual contributions should be celebrated.

The transfer landscape continues to evolve. Regardless of whether our efforts are focused on one course or are part of an initiative spanning across institutions, the strategies for navigating an evolving landscape — information, communication, collaboration, and integration — should be constantly applied. As new people become involved, it is critical to revisit the vision and ensure that the atmosphere of trust and respect is maintained. As we extend efforts to have a greater impact, we should keep everyone focused on student success.

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Chapter 4

# Opportunities for Action: Enhancing Academic Support for Transfer Students

As chemistry faculty, we become concerned when students struggle with, yet fail to master the learning outcomes for chemistry courses. The frustration can be particularly intense if we are incorporating high-impact educational practices into our classrooms, directing students to academic support services, or taking other measures to increase student success. If those students are planning to transfer or have recently done so, their limited mastery of knowledge and skills will significantly diminish their chances of persisting and graduating.

We have an opportunity to enhance the level of academic support in ways that will help transfer students successfully complete chemistry prerequisites and transfer programs. Chemistry students who are not academically prepared and do not take advantage of academic support can get caught in a cycle of perpetual motion — dropping or failing chemistry courses, simply to enroll again the next semester. Efforts are needed both prior to and after transfer to increase the level and use of resources that can help students master learning outcomes and successfully complete chemistry courses.

**DEFINITIONS**

**High-impact educational practices** – approaches to teaching and learning that increase rates of persistence and engagement for students from many backgrounds. Examples include:

- First-year seminars and experiences
- Common intellectual experiences (often thematic, with curricular and co-curricular options)
- Learning communities
- Writing-intensive courses
- Collaborative assignments and projects
- Undergraduate research
- Diversity/global learning
- Service learning, community-based learning
- Internships
- Capstone courses and projects

Source: George D. Kuh, *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter*; Association of American Colleges and Universities: Washington DC, 2008.

**Persistence** – desire and action of a student to stay within the system of higher education from beginning through degree completion

Source: Lamont D. Simmons, *Student Retention and Persistence in Higher Education: An Overview of College Student Retention and Persistence*; Yahoo! Voices, August 18, 2010.

## Focusing on Academic Performance and Progress

Institutions are under increasing pressure regarding student outcomes. Thus, it is not surprising when low enrollments or low completion rates in chemistry garner attention. Given the importance of early academic successes to completion of a program of study,[33] efforts focused on the first-year chemistry courses have the potential to have a significant impact — on transfer students as well as those who do not transfer. A recent

[33] Adelman, p. xxii.

report to President Obama highlighted the need to improve the effectiveness of introductory science and math courses.[34]

What you do to improve the student transfer process will depend on your institution, your partners, your students, and the resources available. The multifaceted nature of student transfer (see Chapter 2) should be kept in mind, but the central focus must be academic performance. We must help students who enter and transition among academic institutions to be successful as soon as possible. Consequently, we will be most successful when students' participation is encouraged, their needs anticipated, and their circumstances taken into consideration.

**MODELS**

**"Fast Tracking" General Chemistry Students**

Adequately preparing students while minimizing time to degree is a challenge. Looking for a way to balance those needs, Hinds Community College began offering an 8-week "Fast Track Principles of Chemistry" course, followed by an 8-week "Fast Track General Chemistry I" — a sequence modeled after a similar one in biology. This option keeps chemistry students enrolled and on track for successful transfer.

**Partnering for Student Success**

Discussions about student pathways, academic preparation, and programmatic goals have resulted in joint programming at the University of Texas at El Paso and its partner institutions. "Early College High School" campuses are giving high school students the opportunity to earn associate degrees from local community colleges while earning their high school diplomas. A summer workshop taught by undergraduate students is helping increase the level of preparation for and performance in general chemistry.

For more information, visit http://txechs.com/ and http://academics.utep.edu/Default.aspx?tabid=70105.

## Coordinating the Many Ways of Providing Academic Support

Strategies for improving academic performance vary widely, reflecting a large range of institutions and students across the country. Support services can be directed at study skills, math and reading skills, written and oral communication skills, and chemistry knowledge. Some approaches provide support only to chemistry students from a particular course; others include students from different chemistry courses; and still others include science students from more than one discipline. Some approaches are adopted from nationwide or statewide educational programs that disseminate their models, while others are locally developed.

Most chemistry faculty members encourage students to use academic support services like tutoring and study groups. But many are not aware of the extent and variety of services offered on campus or which methods are most effective at increasing persistence and student performance. Common support activities include:

- Study groups
- Study centers
- Tutoring
- Peer instruction
- Supplemental instruction

Informal activities, such as those of ACS student chapters and other campus organizations, can provide academic support as well as giving students a sense of belonging (see Chapter 5).

[34] Executive Office of the President, President's Council of Advisors on Science and Technology. p. 1.

Academic advisors, who play a signficant role in mapping out the academic paths of students, can also increase their impact by learning more about academic programs and then encouraging students to specify those of interest and use the academic support they offer. At many institutions, students who have not selected a major or program of study are usually advised by professional staff. This is particularly common at community colleges, which do not offer disciplinary majors or associate degrees and have many students who do not identify a potential area of study when they enroll. By interacting with advising staff, we can convey the academic opportunities and expectations of both transferring and receiving institutions and share insights about how transfer students are supported.

## Integrating Academic Support into the Curriculum

A number of educational strategies have been shown to improve student performance, particularly for transfer students. Research on how students learn continues to expand and can be applied in chemistry courses. Colleagues in education departments, teaching and learning centers, and the STEM education community can help us determine which methods and activities are likely to improve the quality of our transfer students' education. They can also help us encourage expansion of existing academic support programs and introduction of new ones within our departments, across our campuses, and at partner institutions.

Use of scientific-based teaching,[35] evaluation of the effectiveness of the pedagogical practices used in science courses,[36] and responding to the growing body of disciplinary-based education research[37] will benefit us and our students, colleagues, and departments. It could also help transform the reputation of chemistry courses.

**MODEL**
**Integrating Support Services**

The California Mathematics, Engineering & Science Achievement (MESA) program provides a resource-rich home base for a community of budding science scholars, built around a theme of cooperation and mutual help. Campus centers offer a space to do homework, work with peer tutors, tutor and mentor others, meet with MESA counselors, attend field trips, participate in leadership retreats, and engage in other activities that enhance student success. The California MESA program has been a model for the development of similar programs in other states.

For more information, visit http://mesa.ucop.edu/.

## Maximizing Our Impact

Academic success is critical for student persistence and graduation. Faculty at both transferring and receiving institutions can undertake a series of activities within and outside of the curriculum to enhance the academic success of transfer students

[35] Handelsman, J.; Miller, S.; Pfund, C. *Scientific Teaching;* W. H. Freeman and Company: New York, 2007.

[36] Eberlein, T.; Kampmeier, J.; Minderhout, V.; Moog, R. S.; Platt, T.; Varma-Nelson, P.; White, H. B. "Pedagogies of Engagement in Science: A Comparison of PBL, POGIL, AND PLTL"; *Biochemistry and Molecular Biology Education,* 2008, *36 (4),* pp. 262–273.

[37] National Research Council, *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering.* Singer, S. R.; Nielsen, N. R.; Schweingruber, H. A. Eds.; Committee on the Status, Contributions, and Future Directions of Discipline-Based Education Research. Board on Science Education, Division of Behavioral and Social Sciences and Education. The National Academies Press: Washington, DC, 2012.

(see the sidebar, Activities that Enhance Academic Support for Transfer Students, below). Carrying out these and other activities in the context of the strategies described in Chapter 1 (see sidebar, Strategies for Maximizing Our Impact) will feed the process of continuous development

**ACTIVITIES THAT ENHANCE ACADEMIC SUPPORT FOR TRANSFER STUDENTS**

| | |
|---|---|
| Activity A.1 | Build awareness and encourage use of academic support services at both transferring and receiving institutions. |
| Activity A.2 | Use existing and disaggregated data from both transferring and receiving institutions to examine the success of students who have and have not transferred. |
| Activity A.3 | Take advantage of opportunities to interact with staff providing — and colleagues advocating for — academic support services at both transferring and receiving institutions. |
| Activity A.4 | Have candid conversations, based on reliable data and the literature, about the success of students who have and have not transferred. |
| Activity A.5 | Foster the formation of formal learning communities and informal communities of learning. |
| Activity A.6 | Align content and learning objectives. |
| Activity A.7 | Increase the attention and resources devoted to providing academic support for transfer students. |
| Activity A.8 | Incorporate pedagogical practices based on learning theory into courses taken by transfer students. |
| Activity A.9 | Implement a mix of traditional and non-traditional teaching and assessment practices. |
| Activity A.10 | Examine assessment policies and practices and identify different ways of assessing student learning. |

shown in Figure 1. Students who experience academic successes are more likely to develop a sense of belonging (Chapter 5) and develop mentoring relationships (Chapter 6).

## Information

Know what is available at both transferring and receiving institutions, as well as which colleagues are interested in expanding the use of those resources. Since students often consider academic support as services for those who are not performing well, rather than resources that savvy students use, any information that we share about academic strategies and resources at transferring and receiving institutions should be accompanied by encouragement to use them (Activity A.1). Students often need to be taught that seeking out available resources is an important element for success. Provide explicit explanations, such as why the information is important to your students, how it relates to them, and the outcomes of various choices. Consider developing incentives to encourage use of support services. Doing so for the entire class avoids anyone from feeling singled out, but should be followed up with personal invitations to take advantage of the bonus points, free lunch, or whatever other incentive you offer.

Becoming familiar with the literature on student learning can help us provide relevant information to students and encourage them to use resources. It will also inform the development of academic support resources and services, as well as effective pedagogical practices to use in courses, where they can reach the most students most easily.

Use data to inform decisions of where to invest efforts. You and your chemistry colleagues can consider data collected by the department. Student retention and the use of academic support services are tracked at most institutions. Faculty at receiving institutions should disaggregate and compare data for students who have and have not transferred (Activity A.2).

Obtaining and interpreting data provides opportunities to interact with staff providing academic support services, as well as those colleagues interested in expanding their use (Activity A.3). Learning more about each other's efforts and concerns sets the stage for potential coordination of efforts.

## Communication

Ongoing interactions with staff who provide academic support services (Activity A.3) can lead to greater understanding of the challenges in and opportunities for meeting transfer student needs. The resulting relationships and insights will facilitate candid conversations, based on data and literature, about student success and ways to increase it (Activity A.4). These conversations start making the case for obtaining more resources and incorporating effective approaches in the classroom.

**INVOLVING STAKEHOLDERS IN ENHANCING ACADEMIC SUPPORT FOR TRANSFER STUDENTS**

The list of stakeholders will vary depending on the scope of efforts and the institutions involved, but is likely to include the following:

- Chemistry faculty
- Chemistry students
- Student organizations
- Academic administrators
- Orientation staff
- Academic advisors
- Support services staff
- Teaching and learning centers
- Institutional assessment staff
- Employers and graduate programs

## Collaboration

Working with others is the best way to leverage our efforts to provide academic support for students before and after they transfer. Collaborating with others in your department starts a process that can expand to include other partners as needs and opportunities arise. Regardless of the level and scope of your activities — you may be incorporating "Writing across the Curriculum" requirements into a general chemistry course or inviting students who have transferred to serve as tutors — your impact can be amplified by coordinating efforts within departments, across campuses, and among institutions. If you and your colleagues are providing opportunities for students to be part of learning communities, either formal or informal (Activity A.5), you will also be fostering a sense of belonging to a community of learners (see Chapter 5).

**MOVING FROM OPPORTUNITY TO ACTION**

The series of discussion questions in Chapter 3 can be used as a framework for conversations focused on providing academic support for transfer students.

By learning more about what is already in place and what is being planned, we can take a larger role in implementing and improving academic programs and activities. Collaboration between faculty and academic advisors can ensure that non-chemists are familiar with both course content and the structure of the discipline. Faculty need to add their voices to these efforts, as well as consider what others have to say. If communications are respectful and information is used formatively, staff in other units and faculty at other institutions are likely to welcome your involvement and want to align their efforts. Aligning content and learning objectives within your department and among transferring and receiving institutions (Activity A.6) will involve similar discussions — and require them to be sustained (see Chapter 7).

## Integration

We need to ensure that academic support, both in and outside of the classroom, is available on a sustained basis for the long term. The attention and resources devoted to providing academic support for transfer students may be leveraged and increased (Activity A.7) by weaving individual activities into an integrated series and increasing their collective visibility.

Invest knowledge, resources, and efforts into enhancing the curriculum, where changes will reach the most students and be most likely to be sustained. Using pedagogical practices based on learning theory (Activity A.8) and a mix of traditional and non-traditional teaching and assessment practices (Activity A.9) will benefit transfer and non-transfer students. Offer development opportunities for faculty and staff, as well as for students serving as teaching assistants, peer leaders, or peer mentors.

Examine assessment policies and practices and identify different ways of assessing student learning (Activity A.10). As those interacting with students, we need to be explicit with administration, highlighting how changes will be beneficial to the institution, its accreditation and reputation, as well as to the full range of students it serves.

**RESOURCES ON ACADEMIC SUPPORT**

- Bunce, D. M.; Muzzi, C. M. *Survival Handbook for the New Chemistry Instructor;* Pearson Education, Inc.: Upper Saddle River, NJ, 2004.
- Center for the Study of College Student Retention. www.cscsr.org
- Eberlein, T.; Kampmeier, J.; Minderhout, V.; Moog, R. S.; Platt, T.; Varma-Nelson, P.; White, H. B. Pedagogies of Engagement in Science: A Comparison of PBL, POGIL, AND PLTL; *Biochemistry and Molecular Biology Education,* 2008, *36 (4),* 262–273.
- The International Center for Supplemental Instruction. http://www.umkc.edu/asm/si/index.shtml
- Kuh, G. D. *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter*; Association of American Colleges and Universities: Washington DC, 2008.
- National Academic Advising Association (NACADA). http://www.nacada.ksu.edu/AboutNACADA/index.htm
- NACADA Advising Transfer Students Commission. http://www.nacada.ksu.edu/Commissions/C19/index.htm
- National Resource Center for The First-Year Experience and Students in Transition. http://www.sc.edu/fye/
- National Resource Center for The First-Year Experience and Students in Transition, *Transfer Students in Higher Education: Building Foundations for Policies, Programs, and Services that Foster Student Success.* Poisel, M. A.; Joseph, S., Eds.: University of South Carolina: Columbia, 2011.
- Pathway to a Science, Technology, Engineering, Math (STEM) Degree. http://www.pathway2stemdegree.org/
- Pienta, N.J.; Cooper, M. M.; Greenbowe, T. J. *Chemists' Guide to Effective Teaching*; Pearson Education, Inc.: Upper Saddle River, NJ, 2004.
- Pienta, N.J.; Cooper, M. M.; Greenbowe, T. J. *Chemists' Guide to Effective Teaching,* Vol II.; Pearson Education, Inc.: Upper Saddle River, NJ, 2009.

Chapter 5

# Opportunities for Action: Developing a Sense of Belonging to a Community of Learners

When students ask how you became a chemist, your response might highlight a transformational moment — such as being invited to be a chemistry tutor or teaching assistant, or an inspirational person, such as a general chemistry professor. It may involve a series of unfolding events — such as being encouraged to take science courses, getting the quantitative analysis unknown completely correct, conducting undergraduate research, and presenting your results at a conference.

Regardless of the process, you became interested in the discipline, formed connections with the chemistry community, and envisioned ways that you could become part of it. Your experiences along the way, some of which may have been particularly challenging, reinforced and shaped your interest, connections, and vision.

**DEFINITION**

**Sense of belonging** – the experience of personal involvement in a system or environment so that people feel themselves to be an integral part of it.

Students who develop a sense of belonging to an academic institution and a community of learners go through similar processes. The experiences of transfer students at both the transferring and receiving institutions will influence their success. Transfer students are much more likely to persist and graduate if they:

- identify reasons for pursuing higher education;
- envision how they can be part of the academic culture;
- have and take opportunities that facilitate their academic and professional development; and
- make progress towards their degree.

As faculty, we can inspire and guide students by sharing our stories, helping them develop their connections to the academic and professional world, and giving them opportunities to frame their self identity. Taking a personal interest in a student can be a critical part of connecting to an institution. Supplying a physical home, a disciplinary home, and an emotional, social home can give students the sense of belonging to a group with a particular identity: a group that will study a certain discipline, become alumni of a certain college, and be part of a network of professionals. Those connections are often the sources of information that allow students to make informed decisions about their educational and professional pathways.

The roles that we as faculty play in connecting transfer students to the academic community and a program of study are as varied as the students and the pathways they pursue. Efforts to reach out to individual students can make a tremendous difference in their lives. Classroom and laboratory activities can be used to reach more students. Coordinated activities at the department and campus levels can be further leveraged via interactions with students, staff, and faculty from other institutions.

## Building Student Connections to the Academic Community

A wide range of activities can be used to welcome and integrate students into campus life. Which activities transfer students experience and the extent of their support network on campus will be determined by the culture and resources of the institutions in which they enroll and their level of participation.

Activities occurring at the start of the semester, such as orientation, advising sessions, and bridge programs, help develop initial connections to the campus community. These bonds can be strengthened by formal activities, such as curricular learning communities, or informal activities, such as student organizations.

Forming connections with students who commute requires making the most of the time they are on campus. Student study and learning centers can develop strong peer communities.

## Building Student Connections to a Program of Study and Disciplinary Community

Focusing on our students' learning can have a tremendous impact on their sense of belonging: there is nothing like academic success to foster a connection to the discipline. It develops confidence and a sense of self-efficacy that can propel students further. Strategies to increase the impact of interactions with faculty and other chemistry students can also strengthen the sense of belonging.

**DEFINITION**

**Curricular learning communities** – classes that are linked or clustered during an academic term, often around an interdisciplinary theme, and enroll a common cohort of students. A variety of approaches are used to build these learning communities, with all intended to restructure the students' time, credit, and learning experiences to build community among students, between students and their teachers, and among faculty members and disciplines.

Source: http://www.evergreen.edu/washcenter/lcfaq.htm

**MODELS**

**Developing a Sense of Belonging to the Receiving Institution**

At the University of San Diego, a transfer student organization has been established. Students transferring to the institution are introduced to the university with a transfer student orientation, and welcomed to the start of the academic year with a transfer student convocation.

For more information, visit http://www.sandiego.edu/orientation/transfers/

**Developing a Sense of Belonging to the Chemistry Community**

ACS student chapters, which can be chartered at community colleges as well as baccalaureate-granting institutions, provide a network and professional development activities.

For more information, visit www.acs.org/undergrad.

## Maximizing Our Impact

We have a range of opportunities, large and small, to help transfer students form connections with academic and disciplinary communities. Faculty at both transferring and receiving institutions can undertake a series of activities individually and collaboratively (see the sidebar, Activities that Help Transfer Students Develop a Sense of Belonging to a Community of Learners). Carrying out these and other activities in the context of the strategies described in Chapter 1 (see sidebar, Strategies for Maximizing Our Impact) will fuel the process of continuous development of activities shown in Figure 1. Developing a sense of belonging will enhance efforts to provide academic support (see Chapter 4) and set the stage for effective mentoring (see Chapter 6).

**ACTIVITIES THAT HELP TRANSFER STUDENTS DEVELOP A SENSE OF BELONGING TO A COMMUNITY OF LEARNERS**

| | |
|---|---|
| Activity B.1 | Develop personal relationships with transfer students, learning about their needs and sharing experiences. |
| Activity B.2 | Introduce transfer students to the profession and discipline of chemistry, starting with first-year courses. |
| Activity B.3 | Encourage every transfer student to identify a potential area of study/major as soon as possible and convey that to the transferring and receiving institutions. |
| Activity B.4 | Find tangible ways to create and demonstrate a sense of belonging. |
| Activity B.5 | Include transfer students in formal and informal communities of learning. |
| Activity B.6 | Teach chemistry in the context of real-world situations that are relevant to transfer students. |

### Information

Learning more about the transfer landscape will help faculty identify ways in which they can help introduce students to the institution and the department and facilitate connections among the transfer students and the rest of the academic community. Recommendations from reports and conclusions of educational and social science research indicate the many ways to facilitate the development of cohorts and increase student engagement, thereby improving student persistence.

When considering the range of high-impact practices and strategies for orienting students to campus life, such as learning communities and undergraduate research,[38] we should take the following into account:

- Input from those familiar with our institution's transfer process and transfer student experiences
- Input from those familiar with our partner institutions' transfer processes and transfer student experiences
- Institutional contexts (past and present)
- Data from admissions and advising
- Institutional assessment data (including student engagement survey data, if available)

[38] G. D. Kuh. *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter*; Association of American Colleges and Universities: Washington DC, 2008, p. 10.

This information will facilitate the adoption and adaptation of strategies in ways that will be more effective and more likely to be sustained.

**INVOLVING STAKEHOLDERS IN DEVELOPING A SENSE OF BELONGING FOR TRANSFER STUDENTS**

The list of stakeholders will vary depending on the scope of efforts and the institutions involved, but is likely to include the following:

- Chemistry faculty
- Chemistry students
- Student organizations
- Academic administrators
- Admissions staff
- Orientation staff
- Student housing staff
- Academic advising staff
- Support services staff
- Counselors
- Institutional assessment staff
- Career services staff
- Employers and graduate programs
- Professional and disciplinary societies

## Communication

There is no better way to convey our interest in and contribute to the success of transfer students than getting to know them on a personal level, learning about their needs and sharing experiences (Activity B.1). This could be done individually or collectively, on an ad hoc basis, or programmatically, depending on the number of students and resources available. Look for opportunities to connect students with others in the chemistry community.

Given the extremely brief window of time in which students decide whether to remain enrolled, efforts to connect transfer students to chemistry should start as soon as possible (Activity B.2). In some cases, it will be advantageous to involve chemistry faculty and students (current and past) in student orientation, advising sessions, and bridge programs — perhaps incorporating chemistry-oriented activities to catch people's attention. The start of the semester, as busy as it is, may be the perfect time to include activities aligned with student interests and invite representatives from different sectors of the workforce to participate.

Recommendations to encourage every transfer student to identify a potential area of study/major as soon as possible (Activity B.3) could have a significant impact on the students. The students' transferring and receiving institutions will be able to more readily enroll them in appropriate courses and connect them with faculty. Strong faculty connections with admissions and advising will facilitate the process.

Tangible ways to create and demonstrate a sense of belonging (Activity B.4) include the following:

- Create displays, such as a 'wall of success' with pictures of students accepted for transfer.
- Involve students in science or chemistry clubs and encourage collaborations between clubs at transferring and receiving institutions.
- Hold science colloquia for students at community colleges with presentations from students and faculty at local universities or students who have previously transferred.
- Fill teaching assistant positions with transfer students.

Additional approaches are likely to be identified during conversations with transfer students.

## Collaboration

Efforts to develop a sense of belonging will involve partnering with others within your department, across your institution, and at partner institutions.

Include transfer students in formal learning communities and informal communities of learning (Activity B.5). In a variety of institutional settings and in a number of forms, learning communities have been shown to increase student retention and academic achievement, increase student involvement and motivation, improve students' time to degree completion, and enhance student intellectual development.[39] By coordinating and aligning activities that help students develop a sense of belonging in a community of learners, we connect them with a support network that increases their confidence, self-efficacy, and engagement with the course content; these impacts, in turn, improve performance and persistence.

## Integration

Establish and conduct activities that develop a sense of belonging in ways that can be supported and sustained over the long term. Unless these activities are integrated into the regular context of department activities and into the budget, they will be subject to personnel and economic changes.

One strategy is to incorporate activities that develop a sense of belonging into courses. Teaching chemistry in the context of real-world situations that are relevant to transfer students (Activity B.6) will require learning more about the experiences and interests of those students. This is particularly important for students transferring in, since they will not have had the same academic experiences as the students who enrolled as freshmen at the receiving institution. Discovery and research-based laboratory activities can serve as a particularly effective introduction to science, as well as involve team-building activities that lead to a sense of belonging to a community of learners. Likewise, undergraduate research experiences, whether on campus or at partnering institutions, connect students with other researchers and help them learn that they are successful because of, rather than in spite of, the failures that often occur when conducting experiments.[40]

**PERSPECTIVES ACROSS THE STUDENT TRANSFER BRIDGE: FACULTY INTERACTIONS WITH TRANSFER STUDENTS**

Faculty at both community colleges and baccalaureate-granting institutions can enhance the student transfer process by finding opportunities to increase interactions with students who plan to transfer.

Interactions between community college students and faculty occur primarily in the classroom and laboratory. Professional staff generally provide academic advising. Since most community colleges do not offer disciplinary majors and students often wait to identify a program of study, they may be advised to pursue general education requirements before taking any chemistry courses — precluding their interactions with chemistry faculty that could help them develop a sense of belonging.

Interactions between students and faculty at baccalaureate-granting institutions will vary. If they are in classes with large enrollments, students are likely to have limited interactions with faculty. Students who have yet to declare a major may not have been advised by chemistry faculty members. Even when students planning to transfer have

**MOVING FROM OPPORTUNITY TO ACTION**

The series of discussion questions in Chapter 3 can be used as a framework for conversations focused on developing a sense of belonging to a community of learners.

[39] Washington Center for Improving the Quality of Undergraduate Education, Learning Communities National Resource Center Page. http://www.evergreen.edu/washcenter/lcfaq.htm

[40] Higgins, T. B.; Brown, K. L.; Gillmore, J. G.; Johnson, J. B.; Peaslee, G. F.; Stanford, D. J. Successful Student Transitions from the Community College to the Four-Year College Facilitated by Undergraduate Research. *Council on Undergraduate Research Quarterly* 2011, *31 (3)*, pp. 16-22.

**RESOURCES FOR DEVELOPING A SENSE OF BELONGING TO A COMMUNITY OF LEARNERS**

- Community College Survey of Student Engagement. http://www.ccsse.org/.
- Council on Undergraduate Research. http://www.cur.org/.
- Evergreen State College, Washington Center for Improving the Quality of Undergraduate Education, Learning Communities National Resource Center. http://www.evergreen.edu/washcenter/lcfaq.htm.
- Kuh, G. *High-Impact Educational Practices: What They Are, Who has Access to Them, and Why They Matter*; Association of American Colleges and Universities: Washington, DC, 2008.
- National Survey of Student Engagement. http://www.nsse.iub.edu/.

Chapter 6

# Opportunities for Action: Mentoring Transfer Students

Mentors have a tremendous influence on our career trajectories. Consider those who helped you articulate your professional and personal goals at various stages of your career, and how they helped you achieve your goals. As an undergraduate, your academic advisor may have played that role. As a graduate student, your research or thesis advisor may have helped you with career development, areas of study, or life in general. As a new faculty member, you may have been mentored by a more experienced colleague in your department. As new faculty members are hired, you may mentor them in turn.

Similarly, students who transfer also need mentors who will help them determine and pursue their professional and personal goals. The range of people who fill this role will reflect the students' experiences, goals, and circumstances. They likely include members of their family or community, a spouse or former employer, or other students. They may include educators from academic institutions that the students attended previously. Ideally, they also include contacts at the institutions to which the students plan to transfer and at potential places of employment.

**DEFINITION**
**Mentor** – trusted counselor or guide

Since students taking chemistry may not understand the value of having chemistry faculty as mentors, we need to convey the importance of making connections, obtaining information, and seeking advice on options before making academic and career decisions. Transfer students will benefit from insights about preparing for and succeeding after transferring, as well as introductions to other faculty and students who could also serve in mentor roles. Recent and former transfer students can serve as near-peer mentors. Once you know more about students' needs and career goals, additional mentors outside of your institution can also be identified.

## Making Mentoring Explicit

Establishing effective relationships between mentors and transfer students requires commitments from both individuals. Mentoring programs often have specific and formal agreements that clarify expectations. These include helping students to:

- articulate their professional and personal goals;
- develop self-efficacy;
- develop the commitment and the discipline to achieve these goals;
- clearly understand the expectations of the institution;
- develop their communication, presentation, and team skills; and
- take advantage of all available resources.

As we mentor transfer students, whether on a formal or informal basis, it is important to assume the role of counselor and guide, as opposed to the source of answers. The reasons for this approach should be made explicit, minimizing the frustration of students struggling with decisions. It will also make current and recent transfer students more effective mentors.

Mentors of transfer students can play a key role in developing a sense of belonging to the institution and the chemistry community (see Chapter 5). In addition to explaining how the system works, mentors help transfer

students understand their academic and career options, highlight the responsibilities the students have in regard to their academic and professional development, and provide direct or indirect introductions to the people the students need to know.

Mentoring relationships take time to develop. Dr. Zaida Morales-Martinez, a consultant for the ACS Scholars Program, outlined five stages:[41]

- **Apprehension.** This occurs on the part of both participants in the relationship.
- **Testing.** A phase in which the protégé tests the relationship to learn where the boundaries are and feel secure in the mentor's commitment to that relationship.
- **Developing trust in the relationship.** The key for the mentor is to let the protégés know that their goals and dreams are important and valuable. This is a holistic approach that signals you find value in them as people.
- **Setting goals for the relationship.** These goals must be realistic and concrete. Be specific in what you think each student can achieve.
- **Predictability in the relationship.** This is a time when the mentor can give constructive criticism and the protégé's feelings are more accessible.

**PERSPECTIVES FROM ACROSS THE STUDENT TRANSFER BRIDGE – APPROACHES TO MENTORING**

Mentoring is a long-established tradition in most baccalaureate colleges and is part of their culture. These institutions often have specific programs that encourage and help faculty become better mentors. Their mentoring programs include a specific and formal agreement between the two individuals that helps clarify expectations. The challenge for receiving institutions is to provide properly prepared mentors for incoming transfer students. These mentors must understand how the situation of transfer students differs from those of students who started at their institution.

Faculty mentoring is not as prevalent in the community college culture. It is generally informal and occurs with the better students in the class and those who show a real interest in chemistry.

It is also important to acknowledge that mentoring relationships have end points, and to be explicit about the reasons (e.g., not enough time, change in interests, not being able to provide appropriate assistance or advice, etc.).

The American Association for the Advancement of Science (AAAS) recommends that STEM departments provide training for mentors, as well as the students they are mentoring. Training can convey more insights and strategies regarding mentoring, along with information about resources available to transfer students. Faculty and students involved in mentoring programs can take formal courses or tap into various resources to help them maximize their relationships. Providing online mentoring resources for faculty and students, for example, was one solution recommended by AAAS.[42]

[41] American Chemical Society. *The ACS Committee on Professional Training and the ACS Committee on Minority Affairs Workshop on Increasing Participation of Hispanic Undergraduate Students in Chemistry*, November 14-18, 2008, American Chemical Society, Washington, DC.

[42] American Association for the Advancement of Science. *Recommendations for Fostering STEM Mentoring that Builds Knowledge about Careers and Workforce Skills*; Washington, DC, 2005. http://ehrweb.aaas.org/sciMentoring/.

## Engaging Others in Mentoring

Recruiting other faculty and students to serve as mentors can help balance the commitments associated with being a mentor, allow students to have multiple mentors, and support mentoring as a departmental or institutional priority. Another AAAS recommendation focused on the development of departmental mentoring plans to provide students with career information and opportunities to develop workforce skills.[43]

As the ACS Project SEED Student, Mentor, and Coordinator Handbook indicates, faculty are often motivated by the natural human desire to share knowledge and experience. Some other reasons include:

- **Achieve satisfaction**. For some mentors, having a student succeed, and eventually become a friend and colleague, is their greatest joy.
- **Attract good students**. The best mentors are most likely to be able to recruit — and keep — students of high caliber who can help produce better research, papers, and grant proposals.
- **Stay on top of your field**. There is no better way to keep sharp professionally than to coach junior colleagues.
- **Develop your professional network**. In making contacts for students, you strengthen your own contacts and make new ones.
- **Extend your contribution**. The results of good mentoring live after you, as former students continue to contribute even after you have retired.

Some of the best mentors of students are other students. Peer or near-peer mentors can help transfer students develop a connection and adapt faster to a new academic environment, thus minimizing the impact of transfer shock. Those students selected to serve as mentors may or may not be transfer students themselves. However, they should have demonstrated specific academic or professional successes and have a knowledge of academic resources and expectations that can be shared. Most peer and near-peer mentors are picked for their sensibility, confidence, social skills, and reliability. All will benefit from training on mentoring techniques and expectations.

**MODEL**
**Peer Mentoring Programs in Community Colleges**

The mentor program at Hostos Community College in New York is supported by their campus' Center for Teaching and Learning and the Office of Academic Advisement. It promotes essential mentorship goals and principles, and urges its mentors to:

- Work with mentees to establish a network of support;
- Foster a relationship with their mentee that guides the student on the "journey towards self-reliance, successful graduation, and transfer to a four-year institution or job placement"
- Challenge their mentees to confront and overcome personal, academic, and professional challenges; and
- Strive to help mentees establish a stronger sense of self-esteem and confidence as they continue their pursuit for enhanced knowledge and higher education.

The mentor program at Scottsdale Community College in Arizona was established in conjunction with their campus Women's Leadership Group. Mentors help students become more focused on their potential future job/career by guiding them through the academic process with professional and structured support.

Source: Grace Chen, "The Value of Mentoring Programs in Community College," Community College Review, December 9, 2008. http://www.communitycollegereview.com/articles/64

[43] Ibid.

## Maximizing Our Impact

Mentors play critical roles in the lives of transfer students. Faculty at both transferring and receiving institutions can undertake a series of activities to support mentors and mentoring programs (see the sidebar, Activities that Enhance Mentoring for Transfer Students, below.) Carrying out these and other activities in the context of the strategies described in Chapter 1 (see sidebar, Strategies for Maximizing Our Impact) will feed the process of continuous development shown in Fig. 1.

**Activities that Enhance Mentoring for Transfer Students**

| | |
|---|---|
| Activity C.1 | Meet transfer students where they are, helping them see the value of mentoring and developing strategies to engage those who are reluctant to be mentored. |
| Activity C.2 | Provide mentoring that corresponds to the different backgrounds, circumstances, and aspirations of transfer students. |
| Activity C.3 | Be approachable, be yourself, and tell about who you are. |
| Activity C.4 | Identify individuals, centers, and offices that can provide early assistance (and intervention if necessary). |
| Activity C.5 | Provide opportunities for transfer students to interact and establish relationships with faculty at transferring and receiving institutions. |
| Activity C.6 | Build inter- and intra-institutional relationships/partnerships to respond to the various needs of transfer students. |
| Activity C.7 | Provide mentoring early and throughout the transfer process. |
| Activity C.8 | Provide mechanisms for peer and near-peer mentoring of transfer students. |
| Activity C.9 | Train peer leaders, teaching assistants, and lab support staff in the art and techniques of mentoring, as well as the student transfer landscape. |

### Information

Mentoring students who plan to transfer or have already done so requires having effective strategies for engaging and developing relationships with them (Activity C.1). In order to provide appropriate information and insights (Activity C.2), mentors need to have a basic understanding of the student transfer landscape (see Chapter 2), as well as the backgrounds, circumstances, and plans of the students. Invest the time to become familiar with policies and resources, and more importantly, get to know the colleagues who understand the policies and provide the resources the student may need. Colleagues who have mentored transfer students can be an invaluable source of advice. If mentoring is to be incorporated into other programs, those already involved will have important perpectives. Literature on the benefits of mentoring and effective strategies can help build the case for involvement and resources, as well as inform the development and implementation of mentoring activities.

**INVOLVING STAKEHOLDERS IN MENTORING TRANSFER STUDENTS**

The list of stakeholders will vary depending on the scope of efforts and the institutions involved, but is likely to include:

- Chemistry faculty
- Chemistry students
- Employers and graduate programs
- Academic administrators
- Academic advising staff
- Support services staff
- Financial aid staff
- Counselors
- Career services staff
- Professional and disciplinary societies

## Communication

The most effective mentoring relationships are based on trust. Being approachable, being yourself, and sharing your own background and experiences while being mindful of appropriate boundaries (Activity C.3), are all strategies for helping students see you as a "real" person, not just a professor, and beginning to establish that trust.

We need to convince students of the need for professional relationships and "advice from the inside" of the institution (Activity C.1). Tap into the power of stories and share the experiences of other transfer students. Those same students may have additional suggestions and could even help convey the message. In addition to tailoring your mentoring conversations to the various backgrounds, circumstances, and aspirations of transfer students (Activity C.2), be sure to make the reasons for your questions and advice explicit. Convey your understanding of the transfer and receiving institutions, and help the students anticipate and plan for what they may experience, particularly in regard to transfer shock.

Being proactive and connecting students to a support network can help students make informed choices. Identify individuals, centers, and offices that you or your students can call on at both transferring and receiving institutions (Activity C.4). In some cases, these colleagues may alert you to needs for mentoring or call on you for advice. Mechanisms should be in place for providing early assistance when academic, financial, and personal needs arise.

**MODELS**

**Mentoring Undergraduate Researchers**

Undergraduate research experiences can provide opportunities to mentor students planning to transfer and recent transfer students. Sustained research partnerships between community colleges and baccalaureate-granting institutions allow faculty at each institution to become more familiar with the other institution. The same is true for other undergraduate research students, many of whom can serve as members of a near-peer network.

For more information, see *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*; Boyd, M. K.; Wesemann, J. L. Eds.; Council on Undergraduate Research: Washington, DC, 2009.

The ACCESS program at University of California, Santa Cruz (UCSC) involves students from Cabrillo College and four other local community colleges in a six-week summer residential research program. Participants who transferred to UCSC are included among the speakers for a lecture series on the community college campuses.

For more information, visit http://www.chem.ucsc.edu/projects/access/.

STEM-ENGINES, a collaborative of 10 Chicago-area community colleges and four midwestern baccalaureate-granting institutions, has provided community colleges students with research opportunities at their home campuses during the academic year, as well as at the baccalaureate-granting institutions during the summer. Various informal and formal social and professional development activities help the students see themselves as scientists.

For more information, visit http://www.stemenginesurc.com/.

## Collaboration

Effectively mentoring transfer students takes coordination across campus and institutions. When identifying the people and places you can call (Activity C.4), explore ways to better anticipate and respond to needs that arise. As you develop relationships with faculty at transferring and receiving institutions, provide opportunities for transfer students to interact with them as well (Activity C.5).

As inter- and intra-institutional relationships/partnerships develop, be sure that they are informed by the literature and data, and respond to the needs of students transferring into and out of your institution (Activity C.6). The partnerships should also be sufficiently flexible to meet students where they are in the transfer process (Activity C.1) and be tailored to their backgrounds, circumstances, and aspirations (Activity C.2). Assigning co-advisors — one at the transferring and one at the receiving institution — can provide important advice from both sides.

**MODEL**

**Mentoring in Student Transfer Programs**

Economically disadvantaged students in the Carolina Student Transfer Excellence Program (C-STEP) at Durham Technical Community College have the opportunity to be admitted to University of North Carolina-Chapel Hill if they maintain a 3.0 GPA and complete an associate's degree in two years. Mentored by faculty, these students have outperformed students with higher GPAs who are not in the mentoring program.

For more information, visit http://www.nccommunitycolleges.edu/Programs/comprehensive_a_a.htm.

**MOVING FROM OPPORTUNITY TO ACTION**

The series of discussion questions in Chapter 3 can be used as a framework for conversations focused on mentoring transfer students.

## Integration

Providing mentoring early and throughout the transfer process (Activity C.7) will help students make more informed choices. It also conveys that seeking advice is an important part of professional development and not an indicator of deficiencies. Mentoring can also be included as a requirement for advising and scholarship programs. Peer and near-peer mentoring of transfer students (Activity C.8) may involve students at the same institution who have transferred or are about to, as well as students at the receiving institution. Since the relationship is more of a peer-to-peer situation, the student may be more open to the mentor's suggestions.

Training peer leaders, teaching assistants, and lab support staff in the art and techniques of mentoring, as well as the student transfer landscape (Activity C.9) will help maximize the impact of their interactions with transfer students. It can also make them more sensitive to the transfer experience and less likely to embrace stereotypes and biases that can hinder transfer students.

**RESOURCES ON MENTORING**

- *Advisor, Teacher, Role Model, Friend; On Being a Mentor to Students in Science and Engineering*, National Academy Press, Washington, DC, 1997.
- *ACS Project SEED Student, Mentor, and Coordinator Handbook*, 11/2011. http://portal.acs.org/portal/fileFetch/C/CTP_005070/pdf/CTP_005070.pdf.
- E-Mentoring for Diversity in Engineering and Science. http://www.mentornet.net/.
- *Entering Mentoring.* Howard Hughes Medical Institute. http://www.hhmi.org/catalog/main?action=product&itemId=272.
- *Getting the Most out of Your Mentoring Relationships: A Handbook for Women in STEM.* Donna J. Dean, Springer, 2009.
- *The Handbook of Mentoring at Work: Theory, Research and Practice.* Ragins & Kram, Eds. Sage Publications, Thousand Oaks, CA 2007.
- Mentoring in Medicine & Science. http://www.mimscience.org/.
- "Mentoring," *Committee on Professional Training Newsletter*, Summer 2001.
- Science Mentoring Research website http://ehrweb.aaas.org/sciMentoring/resources.php.

Chapter 7

# Opportunities for Action: Aligning Learning Outcomes among Transferring and Receiving Institutions

Changes in the expectations of accrediting agencies have resulted in the identification of learning outcomes by higher education institutions across the U.S. Those of us who have developed and assessed learning outcomes for students in chemistry courses know that it takes time and effort. The investment not only helps our departments fulfill accreditation requirements and foster continuous improvements — it also positions our institutions to be more effective before, during, and after transfer.

**DEFINITION**

**Learning outcomes** – Statements of what a learner is expected to know, understand, and/or be able to demonstrate after completion of a process of learning as well as the specific intellectual and practical skills gained and demonstrated by the successful completion of a unit, course, or program.

## Determining Course Equivalencies

Although a range of factors influence the success of transfer students (see previous chapters), articulation — the transfer of credits earned at one institution to another institution — is one that receives much attention. Articulation policies and protocols vary across the states and institutions,[44] but all involve the determination of how many credits to award for a course taken elsewhere. Numerous guides exist to help students determine whether courses will articulate when they transfer among institutions. Online examples include:

- University System of Maryland Articulation System: http://artweb.usmd.edu/
- AZ Transfer: htpp://aztransfer.com
- NJ Transfer: http://njtransfer.org

Students transferring among institutions that are not part of a system with such guides or specific articulation agreements will need to have their courses evaluated for transferability.

The comparability of courses can be more readily demonstrated when each has a set of learning outcomes. These outcomes, which build on course goals and objectives, indicate whether students who successfully complete the course understand the concepts and possess the skills that will be expected at the next level and can do so at an appropriate level of rigor and ability. Ensuring that students have the necessary understanding and skills will increase their success when they transfer.

## Focusing on Student Learning and Development

Research on how people learn has introduced new approaches and terminology into the education landscape. A shift from teaching courses and coverage of content to learning and mastery of concepts and competencies is underway (see the sidebar, Calls for Competencies, below).

[44] Smith, M. *Transfer and Articulation Policies;* Education Commission of the States: Denver, CO, December 2010.

Focusing on competencies and learning outcomes can be very beneficial to transfer students, helping them clearly see what is expected and how they are progressing academically (see Chapter 4). Discussions about learning goals and efforts to sustain them lead to a greater understanding of the context of an institution and its mission, goals, and students. The process of aligning learning goals across transferring and receiving institutions extends that understanding, which faculty and staff can use to advise and mentor transfer students (see Chapter 6).

## Maximizing Our Impact

Aligning learning outcomes across chemistry courses and curricula is an ambitious undertaking. Faculty at both transferring and receiving institutions can undertake a series of activities to develop and update learning outcomes within and among their institutions (see sidebar, Activities that Foster the Alignment of Learning Outcomes, below.) Carrying out these and other activities in the context of the strategies described in Chapter 1 (see sidebar, Strategies for Maximizing Our Impact) will fuel the process of continuous development shown in Figure 1.

**CALLS FOR COMPETENCIES**

"Strategies such as 'tuning' protocols… take articulation to a new level by better outlining the competencies that students must possess to be successful in various academic disciplines." — *The Progress of Education Reform,* Vol 10 (5), October 2009.

"By focusing on scientific competencies rather than courses, undergraduate institutions will have more freedom to develop novel courses to achieve the desired competencies without increasing the total number of instructional hours in the sciences in the face of continuing increases in medically relevant scientific knowledge… a competency [is defined] as the knowledge, skill, or attitude that enables an individual to learn and perform in medical practice and to meet or exceed the standards of the profession." — *Scientific Foundations for Future Physicians*, Association of American Medical Colleges and Howard Hughes Medical Institute, 2009.

**MODELS**
**Aligning Learning Outcomes in the Chemistry Community**

In response to Arizona legislation requiring course-to-course alignment between lower division courses, chemistry faculty from across the state began meeting together. They now hold regular discussions that include learning outcomes. Meanwhile, in Ohio, learning outcomes were used for the development of disciplinary Transfer Assurance Guides.

For more information, visit "Paving the Pathways for Tomorrow's Chemistry Students, Part 2," *Committee on Professional Training Newsletter*, Fall 2006, pp. 3-5.

**ACTIVITIES THAT FOSTER THE ALIGNMENT OF LEARNING OUTCOMES**

| | |
|---|---|
| Activity D.1 | Convey the need to align the learning outcomes of chemistry courses. |
| Activity D.2 | Share data both among and within institutions to identify specific gaps in conceptual understanding and abilities. |
| Activity D.3 | Remain knowledgeable and open to change regarding content and skills needed for transfer into chemistry-related career areas including professional schools, industry, and academia. |
| Activity D.4 | Refer to learning outcomes from other institutions when developing and updating learning outcomes. |
| Activity D.5 | Tie assessment of students, courses, and programs explicitly to learning outcomes. |
| Activity D.6 | Develop policies that go beyond current articulation and encourage learning outcome alignment. |

## Information

For our involvement to be most effective, we must see the value of investing time and effort in aligning the learning outcomes of chemistry courses across curricula and across institutions (Activity D.1). Insights from other faculty, literature, and data will help us understand the reasons for and envision the benefits of aligning learning outcomes.

Stories about how others have established, aligned, and measured learning outcomes at course and program levels, both in chemistry and other related disciplines, can highlight the benefits, model strategies, and transferable lessons involved. If possible, it can be particularly effective to engage colleagues who normally teach upper level chemistry courses in lower level courses, and vice versa. Joint faculty development and faculty exchanges among transferring and receiving institutions can help foster understanding of the different institutional cultures, student bodies, and resources.

Tapping into the literature and resources on learning outcomes — and colleagues with expertise in this area — can be beneficial on multiple levels. Likewise, insights into others' experiences, reports, and resources can provide inspiration and strategies to adapt and adopt.

**PERSPECTIVES FROM ACROSS THE STUDENT TRANSFER BRIDGE – SHARED VISIONS OF EXCELLENCE**

To facilitate communication and coordination among chemistry departments, the document *ACS Guidelines for Chemistry at Two-Year College Programs* has been aligned with the *ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs*.

For more information, visit http://www.acs.org/2Yguidelines.

When gathering data to inform the development and assessment of learning outcomes, focus on what is most needed to inspire action and generate resources. Share data both among and within institutions to identify specific gaps in students' conceptual understanding and abilities (Activity D.2). Emphasizing key concepts and skills can help us avoid getting bogged down in a comprehensive investigation of all the aspects that could be assessed. We need to remember that students, their acquisition of knowledge and skills, and their preparation for subsequent courses and careers are at the core of such efforts.

## Communication

Conversations about the expectations of courses in the chemistry curricula in both transferring and receiving institutions can make the case and identify specific topics for more involved discussions about learning outcomes and the preparation of transfer students. Initial conversations regarding tangible student needs, such as hands-on use of instrumentation, will set the stage for further discussions and collaborations.

**INVOLVING STAKEHOLDERS IN ALIGNING LEARNING OUTCOMES**

The list of stakeholders will vary depending on the scope of efforts and the institutions involved, but is likely to include:

- Chemistry faculty
- Chemistry students
- Employers and graduate programs
- Teaching and learning centers
- Academic administrators

Exploring and shaping professional development opportunities for students — such as career events, internships, and undergraduate research opportunities — will help faculty from both transferring and receiving institutions remain knowledgeable and open to change regarding content needed for transfer into chemistry-related career areas, including professional schools, industry, and academia (Activity D.3). Engaging staff as well as potential partners will both inform and set the stage for coordination of efforts and the pooling of resources.

## Collaboration

As conversations about learning outcomes broaden and turn to alignment and assessment, requiring more resources and commitment, the focus on details will increase. If discussions stall or become adversarial, we should acknowledge the different contributions and perspectives that the partnering institutions provide, and then return the focus to the students and topics of common interest. Getting faculty to agree on the important knowledge and skills that students need to demonstrate is easier than deciding what content can be eliminated from the program of study.

**MOVING FROM OPPORTUNITY TO ACTION**

The series of discussion questions in Chapter 3 can be used as a framework for conversations focused on aligning learning outcomes

Refer to learning outcomes from other institutions when developing and updating learning outcomes (Activity D.4). This will foster understanding of the commonalities and differences among transferring and receiving institutions, setting the stage for alignment of learning outcomes and partnerships that help transfer students achieve them.

## Integration

Alignment of learning outcomes is an ongoing process that has benefits beyond accreditation. If integrated into the regular activities of departments and institutions in a meaningful way, it will be much easier to sustain efforts. Create incentives for the development, pursuit, and assessment of learning outcomes. Tie assessment of students, courses, and programs explicitly to learning outcomes (Activity D.5). Use the assessment to address questions of interest and inform department and collaborative efforts. Since resources are limited, it is important to link efforts to those occurring across campus and across the country.

The success of transfer students depends on more than the transfer of course credits. Policies that go beyond current articulation and encourage learning outcome alignment (Activity D.6) can prompt the sustained attention

needed as faculty develop and refine courses and programs. Responsibility for revisiting the alignment of learning outcomes needs to be assigned to a person or group in each department or institution involved.

**RESOURCES FOR ALIGNING LEARNING OUTCOMES**

- Millett, C. M.; Payne, D. G.; Dwyer, C. A.; Stickler, L. M.; Alexiou, J. J. *A Culture of Evidence: An Evidence-Centered Approach to Accountability for Student Learning Outcomes.* Educational Testing Service, 2008.
- Ambrose, S.A.; Bridges, M.W.; DiPietro, M.; Lovett, M.C.; Norman, M.K. *How Learning Works: Seven Research-Based Principles for Smart Teaching.* Jossey-Bass, 2010.

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Chapter 8

# The Community Response: Coordinating Efforts and Leveraging Resources

The world of student transfer is becoming larger and more complex. The increasing number of transfer students and expanding range of educational pathways are resulting in more calls for seamless student transfer. To have a significant and lasting impact on the transfer process and students, chemistry faculty need resources and support. Efforts to improve the effectiveness and efficiency of the transfer process will need to be coordinated and responsive to the continuously changing landscape.

Developing a collection of ongoing activities that enhance student transfer takes time, planning, and persistence. Regardless of which areas of opportunity we pursue, focusing on information, communication, collaboration, and integration (see Chapter 1) will help set strategic directions and make key connections. The process of identifying the priorities of our departments, institutions, and partnering organizations — and where those priorities overlap — is critical. It will help determine the resources available, the contributions people are willing to make, and appropriate goals and next steps. In some cases, priorities and activities will be specifically focused on student transfer. In all cases, the connections among student transfer and broader educational, service, and research missions should be made explicit. This will help generate the wide-ranging support needed for sustaining and maximizing the impact of our efforts.

## Advocating for Resources

It can be difficult to predict when political and economic winds will blow in directions that are favorable for higher education in general and student transfer in particular. Requests for resources are more likely to be met, even when budgets are tight, when activities are aligned with strategic priorities and supported by a network of advocates.

Many people are involved in preparing students for transfer and ensuring they are successful during and afterwards. As earlier chapters indicate, these stakeholders come from across one's campus and from a range of partnering institutions and organizations. Their level of involvement and contributions will depend on their responsibilities and how closely their priorities are aligned with activities that enhance student transfer. Helping them understand the importance of student transfer and the synergies among activities can enhance their roles and range of influence as advocates.

Since students and their interactions with faculty are at the heart of student transfer, their voices should be part of discussions where strategic directions are considered and resources are allocated. We need to find ways that faculty and students can participate directly or officially. Making other stakeholders aware of our questions and suggestions increases the likelihood of them being considered.

We can also help others understand our transfer students' needs and the strategies for addressing them. This involves being as specific as we can, while using a level of detail and context appropriate for the other stakeholders and their level of commitment and involvement. We should highlight explicit connections to the activities and priorities of the stakeholders as we interact with them. Other faculty and support staff who are already invested in improving student transfer will appreciate background information and details about what is being proposed and the potential roles they could play. Administrators and potential partners are likely to prefer more focused requests and briefer reports. It is always strategic to specify how fulfilling those requests can tie

into existing plans and goals. Examples of related successful activities should be shared as well. It is an iterative process, so we should be prepared to return to discussions and reframe requests after the stakeholders have revisited them. Partnerships are unique relationships that require a collaborative mindset (see Appendix C).

Categorizing requests into short- and long-term timeframes can facilitate both planning and implementation. If others hesitate to proceed with short-term activities, we must remind them of the need for action. Indicate that we are building on the experiences and insights of others, experimenting with the range of approaches that can be taken, and adapting them to the local context. Documenting and showcasing the impact of and lessons learned from short-term activities will generate momentum and help make the case for additional resources from both internal and external sources.

## Connecting with the Chemistry Community

Our efforts, whether specifically focused on improving student transfer or tied to more general pedagogical, advising, and mentoring strategies, will be implemented within the chemistry context. The chemistry community — locally, regionally, and nationally — can be an invaluable resource and network of support.

As chemistry colleagues, we can be sources of inspiration, as well as of ideas, models, and templates. "Although addressing the range of issues associated with student transfer involves a multitude of details and programs, those making progress have all relied on a simple strategy: associating with colleagues from other institutions. Such interactions occur in a variety of venues — respondents cited disciplinary student transfer groups, disciplinary education associations, and ACS local section activities — that allow discussion of the issues in a collegial environment."[45] Insights and experiences of chemistry faculty and students will help improve our efforts, allowing us to build on work already done and target activities to our local contexts.

Connecting transfer students with the chemistry community is an effective way of providing role models, sharing career options, and developing support networks. We can tap into many existing activities, inviting chemists to come to campus for various events and looking for opportunities to take students to local, regional, and national meetings.

Interactions with chemistry faculty at other institutions can lead to increased understanding of the different environments and approaches used to foster student success. If synergistic opportunities are identified, collaborative efforts can result. Visiting other institutions — whether for a day or a sabbatical — can lay the foundation for ongoing activities. Meeting with other chemistry faculty on a regular basis, for either professional development or specific projects, establishes lines of communication and fosters the sharing of information.

Professional development opportunities can be used to cultivate the expertise needed to make student transfer activities more successful. Attend symposia and workshops on student transfer, as well as curriculum development, pedagogy, advising, mentoring, and learning outcomes. Encourage faculty from your department and partnering institutions to join you, and share the highlights afterwards.

[45] Paving the Pathways for Tomorrow's Chemistry Students, Part 2, *Committee on Professional Training Newsletter*, Fall 2006, p 3-5.

Treating the development of student transfer activities as a scholarly activity will benefit all of us and our students. Reports on scientific teaching[46] and the scholarship of teaching and learning[47] note the importance of the following:

- Informing efforts based on the literature
- Assessing impact
- Sharing/discussing
- Contributing to the literature

Although chemists will have the insights and experiences most directly aligned with our efforts, those from other disciplines will be useful as well. Our colleagues in other areas will also benefit from our reports to enhance the success of transfer students.

Implementing a mechanism for regular review and updates will help student transfer activities remain relevant and be sustained. Such efforts can fulfill the self-assessment called for in the *ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs*[48] and the *ACS Guidelines for Chemistry in Two-Year College Programs.*[49]

Developing, implementing, and sustaining student transfer activities requires that those involved — even those who do not have official leadership roles — have leadership skills. In addition to taking advantage of the opportunities to practice and hone our skills, we can pursue formal training from our institutions, ACS, and other organizations.

## Planning for the Long Term

Even though the specific details may not be in place, we should clearly link our current efforts to long-term plans to enhance the success of transfer students. In some cases, we may be expected to do this at the start, before any resources are invested. In other cases, we may be able to initiate efforts while framing plans to be shared after demonstrating initial outcomes and the need to do more. Having documentation and assessments in place will set the stage for ongoing efforts and contributions to the literature on student transfer.

It is important to recognize the need for a coordinated approach addressing the range of needs for students planning to, in the process of, and having completed transfer. Our efforts, especially the initial ones, may only focus on a few of the factors influencing student success, but the importance of those efforts and relation to other efforts should be highlighted.

Establishing activities and programs that will be sustained requires engaging a range of people with diverse perspectives, skills, and connections. We must be prepared for the process of change, providing compelling reasons for changing the status quo, setting a shared vision, coordinating implementation plans, and providing

[46] Handelsman, J.; Miller, S.; Pfund, C. *Scientific Teaching;* W. H. Freeman and Company: New York, 2007.

[47] McKinney, K. "The Scholarship of Teaching and Learning: Past Lessons, Current Challenges, and Future Visions." *To Improve the Academy,* 2004, *22*, p. 3-19.

[48] American Chemical Society. *Undergraduate Professional Education in Chemistry: ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs;* Washington, DC, Spring 2008.

[49] American Chemical Society. *ACS Guidelines for Chemistry in Two-Year College Programs;* Washington, DC, Spring 2009.

resources and incentives.[50] Our commitment to activities and programs should be maintained over the initial steps of establishing and experimenting, through a period of standardization and expansion, until they are optimized, and the process of experimenting and improving them resumes.[51]

Throughout the process, trust of and respect for all the others involved should be maintained. The vision will need to be revisited and redefined as activities and programs expand, responding to the changing student transfer landscape and stakeholder needs and priorities.

## Acting Now

Faculty are being called to action (see Chapter 1). Our responses to the increasing numbers and needs of transfer students may be individual or collaborative. They may fall into a specific area of opportunity or address a collection of factors that can influence the success of our students. All have the potential to create an impact and results that we can sustain and maximize by working together within the chemistry community and across our campuses and institutions.

[50] *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*; Boyd, M. K.; Wesemann, J. L. Eds.; Council on Undergraduate Research: Washington, DC, 2009, p. 354.

[51] For examples of resources to develop capabilities for these types of collaborative efforts, see the ACS Leadership Development System site at http://www.acs.org/leaderdevelopment.

# Appendices

# Appendix A: ChemEd Bridges Student Transfer Workshop
## October 27-29, 2011, Chicago, IL

## Objectives

- Gain understanding of student transfer landscape
- Gain understanding of challenges and opportunities for increasing faculty participation and establishing partnerships
- Share effective practices and lessons-learned
- Identify strategies for addressing areas of opportunity
- Make recommendations for moving forward

## Key Discussions and Breakout Sessions

**Background & Overview of Student Transfer Landscape**

- What perspectives we bring
- What we know about student transfer
- Areas of opportunity/action for the chemistry community
- Insights from the student transfer literature
- Insights from our experiences

**Areas for Opportunity/Action**

- An initial look at recommendations for the chemistry community
- A closer look at areas of opportunity/action
- Faculty roles in areas of opportunity/action (breakout groups)
- What makes partnerships work
- Partnerships in areas of opportunity/action (breakout groups)
- Other stakeholder roles in areas of opportunity/action (breakout groups)
- How change happens
- A closer look at recommendations for the chemistry community

**Next Steps**

- Review student transfer framework and areas of opportunity
- Review recommendations for the chemistry community
- Review areas of opportunity/action and associated recommendations (breakout groups)

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# Appendix B: Glossary

**Articulation** – the movement of students' academic credits from one point to another; including admission, exclusion, readmission, advising, counseling, planning, and course/credit evaluation.

**Associate degree** – degree awarded by two-year colleges after completing two years of study, typically 60 credit hours; includes Associate of Arts (A.A.), Associate of Science (A.S.), Associate of Applied Arts (A.A.A.), and Associate of Applied Science (A.A.S.).

**Baccalaureate-granting institution** – any institution that awards a bachelor's degree.

**Community college** – any institution regionally accredited to award an associate degree as its highest degree.

**Curricular learning communities** – classes that are linked or clustered during an academic term, often around an interdisciplinary theme, and enroll a common cohort of students. A variety of approaches are used to build these learning communities, with all intended to restructure the students' time, credit, and learning experiences to build community among students, between students and their teachers, and among faculty members and disciplines.

**Forward transfer** – also called vertical transfer, refers to transfer from a community college to a bachelor's granting institution, either:

- without earning an Associate's degree
- after earning an Associate's degree

**High-impact educational practices** – teaching and learning practices that increase rates of persistence and engagement for students from many backgrounds. Examples include:

- First-year seminars and experiences
- Common intellectual experiences (often thematic, with curricular and co-curricular options)
- Learning communities
- Writing-intensive courses
- Collaborative assignments and projects
- Undergraduate research
- Diversity/global learning
- Service learning, community-based learning
- Internships
- Capstone courses and projects

**Lateral transfer** – transfer among similar levels of institutions, with or without eventual return to the original institution, including:

- from one community college to another
- from one bachelor's granting institution to another

**Learning outcomes** – statements of what a learner is expected to know, understand, and/or be able to demonstrate after completion of a process of learning as well as the specific intellectual and practical skills gained and demonstrated by the successful completion of a unit, course, or program.

**Mentor** – trusted counselor or guide.

**Non-Traditional Student** – a student attending college as an adult and not directly from high school.

**Persistence** – desire and action of a student to stay within the system of higher education from beginning through degree completion.

**Private institutions** – institutions that are solely funded through donations and tuition, therefore do not need to abide by state and federal guidelines except to obtain/maintain accreditation.

**Public institutions** – institutions that are state and federally funded, and therefore need to abide by state and federal guidelines.

**Receiving institutions** – institutions to which students transfer.

**Reverse transfer** – transfer from a bachelor's granting institution to a community college, with or without eventual return to the four-year institution.

**Sense of belonging** – the experience of personal involvement in a system or environment so that people feel themselves to be an integral part of it.

**Serial transfer** – a series of movements among institutions.

**Student transfer** – process by which students are transferred among institutions.

**Transfer shock** – the tendency of transfer students to experience a dip in their GPA the first or second semester at the new school.

**Transfer students** – students who anticipate transferring, are in the process of transferring, or who have already transferred.

**Transferring institutions** – institutions from which students transfer.

# Appendix C: Seven Ways to Jeopardize Partnerships*

1. Have disparate visions and unarticulated goals
2. Keep your financial, capital, and human resources to yourself
3. Hold tightly to existing values and beliefs
4. Watch out for your own interests and disrespect those of others
5. Disregard the differences among stakeholders
6. Ignore initiatives at regional and state levels
7. Avoid investing in the following activities
    a. Learning outcomes – it takes time/resources to develop, maintain, and update them
    b. Instructional materials – it takes time/resources to align, customize, and maintain them
    c. Faculty development – it takes time/resources develop programs, incentives, and networks
    d. Monitoring trends – it takes time/resources to analyze, discuss, and respond to them
    e. Public relations and outreach – it takes time/resources to get others to understand the importance of what you are doing

***Bonus tip:***

Believe that you have all the solutions and that other partners have nothing to offer you.

* Adapted from: *Foundations for the Future: Lessons Learned from Building Industry/Education Alliances in the Chemical Process Industries,* Washington, DC: American Chemical Society, 2000.

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