Framing Research to Develop Successful Articulation Models Between Two- and Four-Year Technology Programs

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Introduction:
The purpose of the planning grant was to identify the areas of research required to identify and test models which could be replicated to promote the articulation of students from 2-year technology to 4-year technology programs. It was anticipated that these models would consist of characteristics applicable to diverse academic environments and identify the support needed from industry, government and accrediting bodies to ensure success. The planning grant consisted of five stages: literature search, survey of some ATE projects as well as 2- and 4-year accredited technology programs, phone interviews with selected survey respondents, a one day workshop of faculty and administrators from technology programs, and a “validation” workshop with attendees of the annual ATE conference. These activities would result in research questions that, when investigated, would lead to the development and testing of successful articulation models for technology programs.

Statement of the problem

By the year 2014 it is estimated that over 65,000 new engineering technicians will be needed in the areas of aerospace, civil, electrical/electronic, electro-mechanical, environmental, industrial, and mechanical alone. This does not include the anticipated growth of computing/IT and other technicians where just the need for computer specialists will grow by over 950,000 [44]. The data do not reflect the fluctuation in employment by technical area; it is known that many technical workers are currently unemployed or underemployed, while still others are very anxious about their job security. Not surprisingly these workers believe that the real STEM crisis is not lack of supply but lack of demand. The need for continuing education is critical for STEM workers, so that they can continue to develop their skills and develop new skills while on the job and transition to new positions. With the rapid pace of technological change, these workers will likely need more, not less, on-going education [37].

Significant attention has been paid to the issue of transfer from 2-year to 4-year institutions in recent years. The US Department of Education reports that only about one-half of the community college students who indicate that they are going to transfer to a four-year institution actually complete [5]. A NSF 2001 National Survey of Recent College Graduates [50] found that 44% of science and engineering graduates attended a community college at some time during their college career. Open admissions, proximity to jobs and family, and low tuition and fees make community colleges attractive to a large number of students. Students from all types of colleges and
universities are changing institutions in ever-greater numbers. These students too often find themselves having to repeat coursework because of a lack of coordination and alignment between their previous and current institutions [49].

The focus area for this planning grant was to identify the relevant issues that affect smooth articulation and transfer of students from 2-year to 4-year technical programs and, after exploring similarities and differences between the experience of students in technology programs and academic programs in general, develop research questions that could be pursued in a full proposal which, when answered, could provide models that could be used to promote smooth articulation or transfer of technological students.

**Terminology**

The following terminology was used in this planning grant:

- **Articulation** - The manner of joining or interrelating two or more technological programs
- **Transfer** - To move or pass from one technological program to another
- **Success** - The achievement of one's aim or educational goal
- **Pathways** - A sequence of experiences which form a track through a technological program
- **Technological programs** - Programs that educate students to become technicians for high-technology fields

**Process for information gathering**

Information gathering for the planning grant was conducted in four stages:

1. The first stage was a search of the literature. The objective of the literature search was to identify the characteristics of current articulation agreements and existing barriers and promoters of successful transfer between/among two-year and four-year programs. There were no existing studies found that focused on technology programs.

2. Findings from the literature search were used to develop a survey of selected recipients of ATE awards and ABET accredited 2 and 4 year technology programs to document the alignment of their experience with articulation and/or transfer as compared to what was found in the literature.

3. Based on the survey findings, phone interviews were conducted with volunteer survey respondents with the primary purpose of identifying the promoters and barriers of successful articulation/transfer. The questions were designed to
probe the findings from the survey and to validate the relevance of the literature search findings to technical programs.

4. Once the issues were refined from the literature search, survey results, and phone interviews, they served as the foundation for a planning workshop. The workshop included 18 faculty and other education professionals to review and respond to the initial findings and propose potential research questions that, when answered, could serve as the basis for the development of models for successful articulation/transfer from 2-year technical to 4-year technical programs.

Literature Review

A comprehensive review of literature related to articulation between two-year and four-year institutions was conducted. The purpose of the literature search was to identify the characteristics of articulation agreements and the current understanding of the barriers and promoters of articulation and/or successful transfer between/among two-year and four-year programs. There were no studies found that focused on technology programs. The bibliography is included in this report as Attachment 1.

One comprehensive synopsis of the literature (1993) on articulation and transfer [3] was reviewed. Despite the report being more than 17 years old, many of the patterns identified as forces that promote or hinder articulation and transfer are the same as those found in the more recent literature. These include the role of statewide articulation policies and agreements, transfer guides, common academic calendars, common course numbering, student advising, communication among faculty, transfer student orientation, and feedback to the 2-year institution.

One recent comprehensive research study [24] of the perceived non-financial barriers to baccalaureate access was identified. Improving Access to the Baccalaureate was conducted jointly by the American Association of Community Colleges (AACC) and the American Association of State Colleges and Universities (AASCU) in 2004. The study included a survey to assess attitudes and perceived barriers of successful transfer, and convening a national conference to engage 2-year and 4-year institutions, state systems, and national leaders in analyzing the survey’s findings and contributing their own insights. The study identified five broad categories of barriers:

1. Non-traditional profile of community college students;
2. Differing academic missions and institutional capacity between 2-year and 4-year institutions;
3. Faculty attitudes at sending and receiving institutions;
4. Inadequate advising and student support services; and
5. Current state and system policy decisions.

In 2000 an extensive evaluation of state-level articulation agreements against aspects of good practice was published in Community College Review. The findings indicated that there is room for improvement. Thirty-four of the 43 states studied (79%) reported having state-wide articulation agreements. Seven principles were identified as constituting “good practice” for establishing strong statewide articulation agreements:

1. Parity among institutions. Community college faculty and four-year college faculty are equal partners in the development of curriculum.
2. Parity among students. Both native and transfer students should be treated the same by the receiving institution.
3. Faculty, as content experts, should have primary responsibility for creating articulation agreements.
4. Agreements should accommodate students who do not have associates degrees and include general education course work.
5. Development of agreements should be in specific program majors as well as major courses.
6. Private colleges and universities should be included in state-wide agreements.
7. Data-driven evaluation should be used to determine how articulation is working.

A 2007 study in Southern Regional Education Board (SREB) [8] identified nine keys to successful transfer programs in SREB states:

1. Statewide transfer/articulation committees;
2. Core curriculum that includes freshman and sophomore level general education courses as well as a group of courses that prepare students for study in their major fields;
3. Common course numbering systems that ensures comparable courses at public 2-year and 4-year colleges across the state have common titles, numbers and descriptions;
4. Transfer guides that inform students and advisers about the transferability of courses from one college or university to another and provide details about the degree requirements beyond transfer credit;
5. Guarantees of transfer for students who complete associate of arts or associate of science degrees at 2-year colleges.
6. Transfer counselor networks that coordinate the transfer of credit and advise students as they enter and leave institutions;
7. Appeals procedures available to students who question an institution’s evaluation and application of credits;
8. Monitoring and auditing systems to review state and institutional compliance with policies and the effectiveness of transfer programs; and
9. Faculty members representing all institutions affected by the agreements reach consensus on the credits related to course content and objectives.

Similar elements of state education policy were found in other articles [26, 43, 55, and 57].

Institutional structures, policies and procedures were identified in several articles as factors impeding successful articulation and transfer [9, 10, 30, 39, 41, and 53]. These factors include:

- Differing missions of 2-year and 4-year institutions;
- Curriculum rigidity and changes;
- Articulation agreements not adhered to by deans and/or department heads;
- Little or no financial aid for transfer students;
- Timing of acceptance relative to financial aid and campus housing deadlines;
- Requiring transfer students to take standardized college admissions tests regardless of quality of two-year preparation;
- Completing transfer student transcript analysis after they are already enrolled in first semester;
- Requiring transfer students to register last;
- Little or no on-campus residential opportunities for transfer students;
- No identifiable articulation/transfer officer;
- Lack of advising and student support services for transfer students;
- Limited faculty involvement; and
- Limited data to assess articulation/transfer and to track students through the transition.

Two recent studies [11 and 25] explored the community college – 4-year partnership. Both discuss the challenges of managing such partnerships on a day-to-day basis, especially given the complexity of transfer today (no longer vertical or one-way). Involvement of respected faculty members in transfer program design and implementation was noted as key to success. Attributes of successful articulation agreements were identified as:

- Transferability in which the associate’s degree is transferred as an entire block of credits and give the student junior standing in the 4-year institution.
- Student advising/counseling services at both institutions specified in the agreement.
- Routine communication and review of the articulation agreement

Other articles [6, 16, 19, 24, and 31] highlighted the importance of trust and respect between partnering institutions, common objectives and strategies, continuous dialog
between faculty and administrators at both institutions, dedicated resources to manage articulation/transfer processes, student advising and support services, and collaboration on curriculum development.

The active involvement of faculty in articulation and transfer was noted in numerous articles [11, 16, 18, 19, 24, 25, and 53]. As noted in a 1993 article in Community College Review [18], however, there are few incentives, in both 2-year and 4-year institutions, to encourage faculty to spend time improving the fit of courses and programs across institutions or to work with students to help them make an efficient transition.

A number of articles highlight the role of student advising and counseling [22, 30, 33, 45, and 53]. Inconsistent information is often provided by faculty and staff at sending and receiving institutions and confusion can exist over who is the academic advisor. Further, student support services often lack integration with academic programs at both 2-year and 4-year institutions.

Three studies [14, 52, and 54] involved the longitudinal study of students. The 2008 National Bureau of Economic Research study [14] compared community college entrants to similar students who initially entered a 4-year institution within the Ohio public higher education system; the students were tracked for nine years. It was found that students who initially began at a community college were 14.5% less likely to complete a bachelor’s degree within 9 years. A study of 5000 community college students from the nine campuses of the Los Angeles Community College District [54] found that traditional linear transfer is rare among urban students and that students who become “transfer ready” do so in approximately 9.5 semesters (far more than two years). The third study followed a nationally representative cohort of students from high school into postsecondary education [52] found that the best markers for successful bachelor degree completion were: the highest level of mathematics reached in high school, successful completion of credits in “gateway” courses in the first postsecondary year, number of credits complete within the first year, and continuous enrollment.

Numerous articles cited examples of successful articulation and/or transfer programs. Examples include:

- Programs to draw low-income, first generation students into 2-year programs and onto 4-year programs, including scholarships and internships [1, 19, 34, 42].
- Transfer evaluation [49].
- Academic and non-academic support services [21, 53].
- Articulation agreements [3, 16, 17, 19, 20, 30, 56].
- Curriculum alignment [6].
• Collaboration between 2-year and 4-year institutions [28].
• Institutional policies that promote transfer [39].

While research has been conducted on articulation agreements and various studies have focused on the transfer of students from two-year to four-year institutions, none of the research or studies have focused on technology programs. Two studies [16, 50] examined the role of community colleges as a pathway to engineering careers.

The National Academy of Sciences 2005 study on the community college pathway to engineering careers [16] focused on five themes:
1. Challenges and opportunities for improving articulation and transfer between community colleges and 4-year educational institutions;
2. Recruitment and retention of students at various junctures of the pathway to engineering careers;
3. The curricular content, quality, and standards of 2-year AS programs and of 4-year engineering programs;
4. Opportunities for community colleges to increase diversity in the engineering workforce; and
5. Sources of data on community college and transfer students and the need for more systematic data collection.

Regarding articulation and transfer, the study identified cooperative efforts by the 2-year and 4-year institutions as critical to recruit students into engineering. Communication between the partners was identified as being critical to successful articulation. Successful partners communicate frequently, visit each other’s campuses, meet frequently, and even share facilities. Faculty members in such partnerships collaborate on projects, curriculum development, student recruitment, and other activities. The study identified the lack of financial assistance from institutional, state, and federal sources as a significant barrier to the recruitment and retention of engineering students in community colleges. The study also identified the need for better evaluations of articulation agreements and the transfer process, including definitions of positive outcomes of diversity and assessment of learning outcomes. It notes, however, that many educational institutions do not collect or analyze the data on students that would support such assessments.

Two studies [4, 12] examined access of nurses with an associate degree to a bachelor’s degree at two institutions. One nursing study [4] identified five accessibility factors: cost, proximity, transferability, accommodations, and support services. They note that program cost is more than tuition and fees and must consider exam fees and number of residency credits required for graduation. They also note that on-line courses present a
paradox of accessibility. Students need additional self-direction, support, and technical skills to succeed in an on-line environment.

Survey of Technology Programs

Upon completion of the literature search, two surveys were developed: one for 2-year technology programs, one for 4-year technology programs. To understand the presence of the factors identified in the literature search, questions focused on articulation agreements and types, student transfer success, advising and student support provided, communication and collaboration between partner institutions, roles and administrative support provided by the institution, and communication of transfer information to students. An additional question asked for agreement with statements regarding the role of articulation agreements in promoting student transfer. The surveys ended with open-ended questions on the promoters and barriers of successful articulation and transfer. Copies of the surveys are included as Attachments 2 and 3.

The surveys were sent directly to 200 ABET accredited 2-year and 4-year accredited technology programs and select recipients of ATE awards. A link to the survey was also communicated to technology program leaders through AACC and ASEE.

Twenty-five percent (50) of those directly solicited responded to the survey. This included representatives from 21 two-year and 29 four-year institutions.

The majority of respondents indicated that their department or program has one or more articulation and/or transfer agreements (17 out of 21 two-year institutions; 23 out of 29 four-year institutions). Of these, the majority of the agreements include transfer of technical courses into the program major (94% for two-year institutions; 79% for four-year institutions). The agreements include dual admission (5 two-year; 5 four-year), concurrent enrollment (2 two-year; 5 four-year), and block transfer (11 two-year; 15 four-year). The majority of the agreements are also formal (15 two-year; 24 four-year). Six two-year respondents indicated, however, that their agreements are informal while only one four-year respondent indicate that their agreements are informal. Seven of the 21 two-year respondents indicated that articulation is mandated statewide for general education courses while 14 of the 29 four-year respondents indicated that articulation is mandated statewide for general education courses.

Fifty-three percent of the two-year respondents characterized the success of the articulation/transfer process as very successful while 25% of the four-year respondents characterized the success of the articulation/transfer process as very successful (students transfer with ease without loss of credit or repeating courses). Likewise, 73%
of two-year respondents feel their technology students are well prepared for a four-year program while only 29% of the four-year respondents felt the same.

Eighty-eight percent of representatives of four-year programs indicated that there is a designated person responsible for articulation/transfer agreement while only 53% representatives of two-year programs indicated the same.

Collaborations between two-year and four-year partner technology programs include curriculum development, student recruitment, projects, and mutual campus visits. Twenty-four percent of the two-year respondents and 30% of the four-year respondents, however, indicated they have no collaborations with their partner technology program.

The majority (82%) of two-year respondents indicate they have no formal mentoring program for transfer of technology students while 42% of the four-year respondents indicate they provide academic mentoring to technology transfer students.

Programs to inform two-year technology students about four-year transfer options include: host transfer information sessions, campus tours for transfer students, outreach activities, orientation programs for prospective transfer students, and formal transfer guide documentation.

Sixty-two percent of two-year respondents indicate collaboration between department heads of the two-year and four-year programs while 35% of the four-year respondents indicated such collaboration. Thirty-one percent of two-year respondents and 48% of four-year respondents indicated no support, including stipends or release time for faculty involvement in articulation/transfer, sharing of faculty, or regular communication between partners regarding students of mutual interest.

Due to the limited number of responses, Chi-square comparisons could only be made between 2-year and 4-year responses. Differences between 2-year and 4-year institution responses include:

- Whether agreements between institutions are formal or informal is dependent on whether the institution is 2-year or 4-year. More 2-year institutions have informal agreements than expected.
- How well prepared the survey respondents view technology transfer students is dependent on the type of institution. Respondents from 2-year institutions view transfer students as “well-prepared” more than expected and “poorly prepared” less than expected while respondents from 4-year institutions view transfer students as “well-prepared” less than expected and “poorly prepared” more than expected.
• Consultation is dependent on the type of institution. Respondents from 2-year institutions are consulted by 4-year institutions less than expected and consult with 4-year institutions more than expected; respondents from 4-year institutions consult with 2-year institutions more than expected and are consulted by 2-year institutions less than expected.

• Whether an institution has a designated person responsible for articulation/transfer agreements is dependent on whether a 2-year or 4-year institution. Respondents from 4-year institutions responded they have a designated person responsible for articulation/transfer more than expected.

• The type of mentoring programs provided to students is dependent on the type of institution. 2-year institutions provide less peer mentoring than expected and no mentoring more than expected; 4-year institutions provide more peer mentoring and academic support office mentoring than expected and no mentoring less than expected.

• The type of program offered to inform 2-year technology students about 4-year program transfer options is dependent on whether the institution is 2-year or 4-year. 2-year institutions host more information sessions and less orientations than expected while 4-year institutions host more orientation programs and less information sessions than expected.

Survey responses where there were no differences between 2-year and 4-year institutions included:

• What the articulation/transfer agreement includes (general education, technical courses, other) is independent of the type of institution (2-year versus 4-year).

• The type of agreement (dual admission, concurrent enrollment, block transfer) is independent of the type of institution (2-year versus 4-year).

• How survey respondents characterize the success of the articulation/transfer process for technology programs is independent on the whether the respondent is from a 2-year or 4-year institution.

• Whether an institution has advising specifically for transfer students is independent of the type of institution (2-year or 4-year).

• The type of academic support programs offered to students planning to/are transferring to 4-year technology programs is independent of the type of institution.

• The level of agreement with the statement “articulation/transfer agreements are generally effective” is independent of the type of institution (2-year versus 4-year). Both 2-year and 4-year respondents agree that articulation/transfer agreements are generally effective.
Phone Interviews

Survey participants were asked if they would be willing to participate in a phone interview to share details of their articulation/transfer experiences. Nineteen survey participants responded positively and were available for a scheduled phone interview during the month of July, 2009.

The phone interview questions were designed to elicit detailed information about the programs involved, number and type of agreements, extent of the relationship between partner institutions, how success is measured, barriers at their institution, strategies that promote articulation and transfer, and the amount of control the individual interviewed has over articulation/transfer at their institution. The phone interview ended with an open-ended question on what one thing they would change to ensure successful transfer of students.

Responses to the interview questions agreed with the findings from the literature search and survey regarding articulation agreements, articulation partner relationship and communication, role of faculty, student characteristics, and curriculum alignment.

Sixteen of the nineteen interviewees have formal or informal articulation agreements with regional institutions. Most of the partner institutions are within an hour drive and within the same state. One four-year program interviewee is located on a two-year campus. Another has “regional centers” close to clusters of two-year institutions at which it holds classes. One two-year technology program interviewed hosts upper division classes delivered by their four-year partner through synchronous broadcast.

Interviewees from both types of institutions agreed that the relationship and communication between partner institutions is key to the success of articulation/transfer. Fifteen of the nineteen have frequent (at least annual) meetings between department heads, faculty, counselors, and/or admissions coordinators. One two-year interviewee stated: “Dialog between faculty and administration at both institutions is key. We must recognize differences and come together to work through them.” A four-year interviewee stated: “We work hard for the two-year programs to be successful. We provide an in-service once a year, visit each other’s campuses two times a year and sit down department by department to analyze ways to ensure maximum transfer.”

Interviewees with active articulation/transfer efforts, often defined a successful transfer process as one that is “seamless” – students transfer from the two-year institution to the four-year institution with little loss of credit and are able to complete the four-year degree within a reasonable period of time.
Eleven interviewees mentioned the importance of faculty in the articulation and/or transfer process. This included faculty involvement in the development of articulation agreements between partner institutions, communication and collaboration between faculty at two-year and four-year programs, review of transfer transcripts, and advising of transfer students.

Eight interviewees mentioned the role of curriculum alignment and consistent student preparation as important for ensuring a smooth transfer between two-year and four-year programs. Misalignment or poor preparation primarily focused on mathematics. One two-year interviewee described how his institution is addressing this with a heavy investment in basic skills, including writing and math tutorial centers. Others described how their course approval system includes consideration of the transferability of the course to a four-year program. Two two-year interviewees, however, talked about the challenges of aligning their curriculum with multiple four-year partners. Two also mentioned the lack of curriculum enforcement at the two-year institution: students have too many choices of the courses they can take to obtain an associate’s degree, yet many will not count towards transfer at a four-year institution.

Five mentioned the importance of advising, primarily advising of two-year students in preparation for transfer to the four-year program. Six mentioned the importance of transfer information and its accessibility in communicating to students the requirements for transfer.

A number of interviewees mentioned student characteristics as barriers to student transfer from two-year technology programs to four-year technology programs. Characteristics mentioned included:
- Poor math preparation in high school
- Family and work commitments preventing from attending full-time
- Lack of financial support
- Geographically bound
- No / limited role models
- Skills focused

Two topics came out in the interviews that were not found in the literature and only briefly mentioned in the survey open-ended question: understanding of technology fields and careers, and role of ABET accreditation.

Eight interviewees mentioned that technology fields and careers are not well understood, especially the benefits of continuing education for a four-year degree. It
was reported that students, parents, high school counselors, and even college/university counselors don’t often understand the fields or careers and the professions do little to communicate the career opportunities within the fields. The other challenge two-year technology programs face was identified as the balance between meeting the skill needs of local employers with meeting the needs of four-year transfer requirements.

Two two-year program interviewees indicated that they are ABET accredited and that this is viewed positively by their four-year partners. One four-year partner is not ABET accredited but views the fact that the two-year program is accredited as an assurance of quality of the program.

Positive and Negative Forces

Based on the results of the literature review, surveys and interviews, positive and negative forces which promote/inhibit successful transfer were identified and used as the basis of the planning workshop. The forces are:

Positive Forces

Communication Between Institutions
- Frequent communication between partner institutions including administration, department heads, program faculty, counselors, registrar, admissions.
- Beyond course by course evaluation.
- Relationship.
- Collaboration on curriculum, recruiting, advising, marketing.

Agreements
- Well-defined with clear guidelines as to what is accepted and what is not.
- Simple agreements.
- Includes block transfer, 2+2, dual enrollment.
- Include measurable objectives for both institutions.
- Agreements for specific majors, not just general education.
- Focus on student learning and outcomes versus course by course transfer.

Transfer Information
- Information on transfer available through multiple sources (transfer guides, web, transfer center, etc) and easily accessible by students throughout their career.
- Consistent information.

Student Advising / Support & Transfer Preparation
• Dedicated, targeted advising for transfer students at both institutions.
• Faculty advisors.
• Counseling beyond academics.
• Orientation program for transfer students.
• Host transfer information sessions.
• Host campus visits.

Faculty Involvement
• Faculty involved in articulation agreement development and maintenance.
• Faculty serve as advisors for transfer students.
• Faculty collaborate on projects, curriculum, and other activities between institutions.
• Faculty involved in statewide articulation committees, disciplinary groups.

Academic Rigor
• Integrity of 2-year program.
• Rigorous fundamentals at 2-year program.
• Strict adherence to curriculum at 2-year institution.
• 2-year investment in basic communication and math skills.

Curriculum Alignment
• Transfer friendly 4-year curriculum.
• 2-year curriculum designed to transfer to 4-year.
• Close collaboration and communication of curriculum between partner institutions.
• Common course numbering across partnering institutions.
• Common academic calendar between partnering institutions.

Student Characteristics
• Transfer students tend to be mature and motivated to continue education.

Institutional Policies
• Transfer viewed by institution administration as part of a larger educational pathway.
• Institutions define academic achievement and transfer as priority.

Finances
• Keep tuition and other fees low.
• Designate scholarship and financial aid for transfer students.
• State incentives promoting successful transfer.

Geography
• Proximity of 4-year institution to 2-year institution.
• Regional 4-year centers close to 2-year institution.
• Agreements that allow 2-year students to earn 4-year degree locally.
Accreditation
- ABET accreditation of 2-year program viewed positively by 4-year programs.

Environment
- State education requirements and support for transfer.

Negative Forces

Communication Between Institutions
- Lack of communication.
- Lack of relationship.
- Inconsistent information from different sources.
- No format agreement; dependent on individual faculty or administrators.

Finances
- Lack of financial aid and scholarships for transfer students.
- Cost of 4-year institutions.
- State funding policies.
- 2-year funding to support faculty development and adequate infrastructure.

Student Characteristics
- 2-year student profile often different from traditional 4-year student: older, work/family commitments, minority, limited finances, no/limited role models).
- 2-year students tend to attend part-time due to financial, work or family needs.
- Academic preparation – high school preparation lacking (especially in math and science).
- Math and English requirement to transfer exceed the abilities/interest of many students interested in technology.
- Lack of planning beyond current semester.
- 2-year students often place bound.
- 2-year students intimidated by 4-year climate.

Faculty Characteristics
- 4-year perceptions/ attitudes of 2-year programs and faculty.
- 2-year perceptions/attitudes of 4-year programs and faculty.
- No/few incentives for faculty to work across institutions.

Student Advising
- Inadequate or non-existent advising and counseling.
- No coordination between 2-year and 4-year advisors/counselors.
- Lack of awareness at 4-year institutions of advising needs of transfer students; misconception they do not need as much help as freshman.
- Lack of integration between student support services and academics.
- Lack of defined contact person at 2-year and/or 4-year.

Institutional Policies
- Different missions and priorities between 2-year and 4-year institutions.
- 4-year require transfer students to take standardized college-admissions tests regardless of quality of academic performance at 2-year.
- Timing – 4-year complete transcript analysis after student enrolled; student admitted after housing deadline; transfer students lowest priority for registration.
- Capacity at 2-year institution: faculty, courses, lab/classroom space to offer all lower division courses required by multiple technology programs.
- Lack of dedicated resources, administration, and time to support articulation agreements and transfer.

Curriculum
- Ambiguous standards.
- 2-year curriculum more basic/vocational than academic.
- Rigor in math and science lacking.
- Lack of common course numbering.
- Course disparity between 2-year and 4-year programs.
- Focus on course title and credits versus learning outcomes.
- Students have too many options (primarily general ed courses).
- Difficulty in maintaining a highly marketable 2-year program while aligning with 4-year transfer requirements.
- Variability in requirements of different 4-year programs even in the same discipline.

Environment
- Weak or non-existent state-level articulation coordination.
- Articulation is multi-directional – no longer linear and vertical.

Technology Field
- Misunderstood.
- Not viewed as a positive career path.

Planning Workshop:

The planning workshop was the culminating activity for the planning grant (a list of the attendees and agenda is Attachment 5). The people who were invited were selected because it was believed that they had the experience and perspective to inform the national problem of smooth transfer into technology programs from multiple pathways.
The activities revolved around a systems approach to the issues and the use of common definitions. The purpose of the workshop was posted on a large banner in the front of the room to help to keep attendees focused on the big picture and not their individual situations: “What research questions, when answered, will provide new insights into developing successful transfer models for technological programs?” There was also an agreement to use the following term definitions:

- **Articulation**: The manner of joining or interrelating two or more technological programs
- **Transfer**: To move or pass from one technological program to another
- **Success**: The achievement of one’s aim or educational goal
- **Pathways**: A sequence of experiences which form a track through a technological program
- **Technological programs**: Programs that educate students to become technicians for high-technology fields

Attendees were divided into three groups for the day’s activities. The first part of the day was used to define the technological education system. The model used was the SIPOC model (Modified from: *Improving Performance: How to Manage the White Space on the Organization Chart*, Geary A. Rummler & Alan P. Brache). The focus was on identifying the “suppliers, inputs, processes, outputs, and customers.” Each table was assigned to identify these elements with the caveat that, for this part of the process, they were NOT to define steps within the educational process or environmental factors outside the system. They were also asked to focus on technology education. The task was divided by table with each table working on secondary education, 2-year institutions, or 4-year institutions. After completing this task, the results were shared and any additions made. The groups then were asked to identify the alignments they could between the three educational units and also to identify the environmental factors that have an influence on the system.

Environmental issues were in the areas of **regulatory** – laws, policies, procedures; **economy** – general economic climate, sources of funding; **technology** – new innovations, new applications; and, **society** – patterns of thinking, concerns, expectations, perceptions.
After the system had been defined, results from the first three phases of the project were shared. The high level findings were presented as the following:

**Positive Forces:**
- Communication Between Institutions
- Transfer Information
- Student Advising / Support
- Student Transfer Preparation
- Faculty Involvement
- Agreements
- Academic Rigor
- Curriculum Alignment
- Student Characteristics
- Collaboration Between Institutions

**Negative Forces:**
- Finances
- Institutional Policies
- Geography
- Accreditation
- Environment

A complete list of the forces is provided earlier in this report. Using a force-field analysis process, the attendees were asked to identify what they believed were the most significant forces that impact the successful transfer of students and to indicate where they were found on the systems map. The positive and negative forces were listed on flip chart paper and, using a nominal group process, the workshop participants prioritized the forces in terms of those which had the most significant impact on the transfer process. The prioritized list was used as a basis for focusing their proposed questions to be used to focus research and is listed here:
<table>
<thead>
<tr>
<th>Positive Forces</th>
<th>Votes</th>
<th>Negative forces:</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal transfer agreements &amp; plans</td>
<td>12</td>
<td>Transfer Aid</td>
<td>12</td>
</tr>
<tr>
<td>Curriculum alignment</td>
<td>10</td>
<td>Communications</td>
<td>11</td>
</tr>
<tr>
<td>Communication between institutions</td>
<td>10</td>
<td>Student Academic &amp; Non-Academic on</td>
<td>11</td>
</tr>
<tr>
<td>Transfer information</td>
<td>10</td>
<td>Institution Admin</td>
<td>9</td>
</tr>
<tr>
<td>Quality of advisors</td>
<td>8</td>
<td>Transfer Process</td>
<td>6</td>
</tr>
<tr>
<td>Faculty involvement</td>
<td>7</td>
<td>Interception to Apply Transfer Credit</td>
<td>5</td>
</tr>
<tr>
<td>Student transfer preparation</td>
<td>7</td>
<td>Limits &amp; Restrictions on Financial Aid</td>
<td>4</td>
</tr>
<tr>
<td>Financing</td>
<td>5</td>
<td>Higher Ed Governance</td>
<td>4</td>
</tr>
<tr>
<td>Collaboration</td>
<td>2</td>
<td>General Transfer Student Behaviors</td>
<td>3</td>
</tr>
<tr>
<td>Geography</td>
<td>2</td>
<td>Institutional Support</td>
<td>3</td>
</tr>
<tr>
<td>Environment</td>
<td>1</td>
<td>Environment</td>
<td>2</td>
</tr>
<tr>
<td>Accreditation</td>
<td>1</td>
<td>Funding - Cost to Students to Attend</td>
<td>2</td>
</tr>
<tr>
<td>Institutional Policy</td>
<td></td>
<td>Student Demographics</td>
<td>1</td>
</tr>
<tr>
<td>Academic Rigor</td>
<td></td>
<td>Faculty Characteristics</td>
<td>1</td>
</tr>
</tbody>
</table>

The final task for the group was to take all the input and develop topics for research that they believed, when explored, would provide new insights into developing successful transfer models for technological programs. The result of this process was to generate the following research topics which have been categorized in terms of focus and target audience.
<table>
<thead>
<tr>
<th>Focus of Research</th>
<th>Students</th>
<th>Faculty</th>
<th>Institutional process</th>
<th>Intra-institutional processes</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do individual schools use to evaluate transfer transcripts? Who evaluates, what is the timeline, is there a cap on the number of credits transfer? (Evaluation Transfer Credit)</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>How is the transfer process managed? What are the number, roles, level, titles and what are the mechanics of how to they interact? (Transfer process)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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</tr>
<tr>
<td>What are the best practices for faculty involvement in the transfer process? Why are they best practices? What are the drivers? (Faculty Involvement)</td>
<td>X</td>
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<tr>
<td>What are the best practices, extent of best practices and what are drivers for curriculum alignment? (Curriculum Alignment)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What are some characteristics of an effective ET Transfer Advisor – factors that hinder or help quality of advising? (Quality of Advising)</td>
<td>X</td>
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<tr>
<td>Are extended engineering technology bridge programs more effective than short-term program? What are the best practices associated with extended bridge program? What is focus: social, environmental and content preparation. (Transfer preparation)</td>
<td></td>
<td></td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>What are causal agents behind the difficulty with developing ET transfer programs? (Transfer preparation)</td>
<td></td>
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<td>X</td>
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</tr>
<tr>
<td>How do you measure the success rate of the transfer process? (Transfer process)</td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>What does the agreement look like? Is it dictated by the state? What are the best practices in developing? (Formal Transfer Agreements)</td>
<td></td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>Does the use of an outcomes based model for articulation as contrasted by a course by course model create a more effective communication among articulation partners, and improve transfer articulation agreement as measured by…. (Communication)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Focus of Research</td>
<td>Students</td>
<td>Faculty</td>
<td>Institutional process</td>
<td>Intra-institutional processes</td>
<td>Other</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>What form does transfer information take (website, pamphlets, etc)? What is the best way to get information out? (Transfer Information)</td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>What barriers (points of resistance) are presented by institutional administration to transfer / articulation? (Institution administration)</td>
<td></td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>How to institutionalize the transfer articulation process to withstand changes in educational administration? (Institutional administration)</td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>To what degree does the availability of BS Technology programs increase the number of students and/or employees in the pipeline? Is there an economic development rationale? Are employers going to value the interdisciplinary programs?</td>
<td></td>
<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>What are the factors that actually influence a state's decision to add a technology program?</td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>What are the non-academic barriers to student success?</td>
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</tr>
<tr>
<td>What is the disparity between faculty expectations and student competencies (Student academic and non-academic prep)</td>
<td>X</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>What are the tools that are emerging for the identification of student career interest or identification of the need for early academic intervention? (Student academic and non-academic preparation)</td>
<td></td>
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<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**ATE Conference**

On October 9, 2009, Dr. Susan Schall presented the preliminary findings of the planning grant at a session at the ATE PI Conference held in Washington, DC.
Plans to submit a full proposal:

On September 9, 2009, Dr. Michael Milligan, ABET Executive Director, and Gloria Rogers went to NSF to meet with Drs. Gerhard Salinger and Eileen Lewis, Program Officers for the ATE program, to discuss preliminary findings and to get some guidance on the NSF areas of interest related to research related to transfer from two- to four-year projects. A preliminary report was sent to the program officers in advance to provide background for the discussion. After a brief review, it was indicated that the ATE Program was not interested in two- to four-year transfer proposals. They indicated that there might be some other programs who might have some interest but the primary focus of the ATE program was technician training and workforce development. Because transfer/articulation was the focus of the planning grant, it was determined that there was no advantage in preparing a full proposal at this time. However, there will be an effort to publish the preliminary findings to provide the community with a technology-based summary of the issues around transfer/articulation.
Attachment 1  
Planning Grant to Frame Research Questions to Develop Successful Articulation Models Between 2-yr and 4-yr Technology Programs

Literature Review


16. Enhancing the Community College Pathway to Engineering Careers, National Academy of Sciences, 2005


24. Improving Access to the Baccalaureate, AACC and AASCU, 2004


27. Improving Transfer and Articulation Policies, Barbara Tobolowsky, ERIC Digest ED416934 1998-03-11

28. In the Shadow of Baccalaureate Institutions, Jan Ignash, ERIC Digest, ED348129, 1992-09-00


46. “Studying Transfer of Credit, Take 2”, Inside Higher Ed, 8/25/2008


49. “The ‘Other’ Transfer of Credit Problem”, Inside Higher Ed, 2/19/2008


