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A New Approach to Integrating a Plus-Two Bachelor's Degree in Technology with a Two-Year Associate's Program

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A New Approach to Integrating a Plus-Two Bachelor's Degree in Technology with a Two-Year Associate's Program

By Mr. John H. Mott, Dr. Henry R. Lehrer

ABSTRACT

Divestiture of the first two years of lower-division courses in a four-year aviation technology program and articulation of courses with a similar two-year Associate's program can provide the four-year institution with the means to conserve limited resources. While little evidence exists that articulation agreements between two- and four-year aviation programs have been achieved previously, it is clear that a well-designed plan for curriculum integration is the key to making this successful. By rewriting both curricula to ensure that the first two-year program meets entrance expectations for the completion program and the completion program has more liberal requirements for matriculation, a curricular synergy between the programs can be developed. The authors will discuss a recent implementation of this process at two collocated Midwestern aviation programs. Initial data indicate that the removal of barriers to transfer students has played a role in increasing the percentage of students matriculating from the lower-division program to the upper-division program.

NEED FOR CURRICULAR INTEGRATION

Economic realities are causing some educational institutions to reevaluate their provision of all four years of a traditional Bachelor's degree program in Technology. In locations where such programs are in close collaboration with two-year partner institutions, it makes sense to facilitate a much higher level of curriculum integration between programs than has previously occurred. As Menacker (1974) notes, "community colleges are now important partners with senior institutions, and mutual respect, cooperation, and planning between these two groups are a necessary condition for an adequately functioning system of higher education." Higher education commissions in many states have developed master plans that attempt to create pathways through those states' institutions of higher education utilizing functionally cohesive pieces provided by the various disparate two- and four-year institutions. Removal of the barriers that students transferring between the institutions must face is an important part of this process, as are the concomitant concepts of articulation on both formal and informal levels, and of curricular integra-

tion. It is this last element that is the prime focus of the current research.

BARRIERS ENCOUNTERED BY TRANSFER STUDENTS

A number of educational researchers have examined the barriers to retention that students face as they progress from two-year to four-year institutions. Several studies present evidence that indicates that students moving from two-year community colleges to pursue baccalaureate degrees at four-year colleges may face reductions in degree completion probabilities as high as 19% (Anderson, 1984; Nunley & Breneman, 1988; Velez, 1985) compared with students who bypass community colleges and who matriculate directly in four-year institutions. Recent studies by Alfonso (2006) and by Sandy, Gonzalez, and Hilmer (2005) agreed with these results, and the latter study attributes the cause to lower quality of individual students as opposed to lower quality of the two-year institutions themselves. Velez & Javalgi (1987) and Wang (2009) indicate that some of the factors that are correlated with baccalaureate degree completion probabilities for transfer students from two-year colleges include gender, socioeconomic status, high school curriculum, educational expectations, community college GPA, engagement, and math remediation.

Lee, Mackie-Lewis, & Marks (1993), on the other hand, took issue with the findings of the earlier studies. Their study compared a random sample of 422 transfer students with a sample of 1,899 four-year college students from the same high school class year and found that completion rates were virtually equivalent at 69%. More recent studies by Christie and Hutcheson (2003) and Doyle (2009) similarly, indicate a lower disparity between the two groups. The Christie and Hutcheson study places the estimate of completion probability reduction for the transfer students at 10%; that study removed the effects of "experimenters," or those students who earn fewer than 12 equivalent semester hours of college credit throughout their college careers, as those students tend to be more numerous in two-year colleges. Christie and Hutcheson (2003) followed 1982 high school graduates for ten years of postsecondary study, and noted as a limitation of their research the fact that it was temporally

removed from current students by a generation or so. Robinson (2004) describes a method by which student pathways through a degree course may be identified and tracked, which may lead to improvement in the accuracy of future longitudinal studies.

Christie and Hutcheson (2003) underscore that:

When compared to other variables, the net influence of institutional type is far from the most important criterion in determining baccalaureate degree attainment. According to standardized estimates, the most influential independent variables that enter the model significantly are first-year college GPA, socioeconomic status, on-campus employment, high school GPA, and then institutional type, followed closely by cognitive test scores, institutional control, and high school activities (Christie & Hutcheson, 2003, p. 14).

Whitaker and Pascarella (1994) suggest that if two-year college students are at some modest disadvantage in terms of their baccalaureate degree completion likelihood upon transfer to four-year institutions, these disadvantages are not immutable. In fact, “those two-year college students who successfully negotiate such structural obstacles as transfer to a four-year college and who stay apace of their four-year college counterparts in degree completion appear to compete on generally equal terms with the latter for the most desirable and best-paying jobs (Whitaker & Pascarella, 1994).” It is therefore clear that one key to improving the baccalaureate degree completion likelihood associated with transfer students from two-year colleges is the removal of barriers to the transfer process itself.

According to the National Center for Public Policy in Higher Education (2011), “community colleges are more crucial than ever, but...transfer policies that enable students to move from two-year colleges to baccalaureate-granting institutions are not keeping pace with current needs. In addition, a study by Roksa indicates that:

the larger the proportion of students attending community colleges in a state, the higher the probability of bachelor's degree attainment at public four-year institutions. This appears to be a product of student sorting: the presence of community colleges facilitates sorting of students into higher education in a way that is associated with higher degree completion at public four-year institutions (Roksa, 2009, p. 1).

OPPORTUNITY FOR PROGRAMMATIC CHANGE

The Indianapolis Aviation Technology Center is a facility created and funded by the State of Indiana located at the Indianapolis International Airport.

The mission of the Center is to provide educational programs designed to improve the quality of the workforce in aviation-related industries. Such industries, concentrated in the Indianapolis area, have a significant economic impact on every community within the state.

The Aviation Technology Center is shared by a satellite baccalaureate program in Aviation Operations Technology delivered by the Purdue University Department of Aviation Technology, and by two-year Aviation Flight and Aviation Maintenance programs delivered by Vincennes University. This is a long-standing partnership, as it has been in existence since 1993, and certainly provides a suitable platform meeting the criteria suggested above. The partnership consists of a two-year institution in close proximity with a four-year institution in which the transfer of students from the two-year to the four-year program could be facilitated in such a way as to improve the degree completion likelihood for students desiring to obtain baccalaureates, and to reduce the burden on the four-year program to continue to deliver lower-level courses.

Because of the realization of the potential for synergy between the two programs, the Aviation Technology Department successfully made recent efforts to strengthen its relationship with its partner institution, Vincennes University. As a result, students who would have formerly entered the Purdue program in Indianapolis were encouraged to complete their first two years of undergraduate study at the Vincennes Indianapolis campus, where they could pursue Aviation Maintenance, Professional Flight, or General Studies options. Upon completion of an Associate's degree, these students could apply for admission into the Purdue Aviation Technology program, where they can finish the two years remaining toward their Bachelor's degree with a major in Aviation Operations Technology.

The Purdue Aviation Operations Technology major (AOT) is a plus-two management-focused degree program designed specifically to serve as a convenient opportunity for degree completion for students and working professionals who have not attained their desired educational goals. The program is intended to provide leadership education at the baccalaureate level to students with technical backgrounds in aviation.

Graduates in Aviation Operations Technology are responsible for the management of many different types of financial, capital, human, and information resources in the aerospace industry. They manage engineers and technologists who design, test, and build new aircraft and components. They may be responsible for managing the support of production aircraft, an area that includes product support, modification, and accident investigation. They may also serve as managers at airlines, airports, or

general aviation operations around the world.

Over the past several years, the AOT degree became very unwieldy and difficult to deliver. The previous organization of the AOT degree had several focus areas such as aircraft operations, logistics and supply chain management, air traffic control, and advanced manufacturing operations. Many of the original courses that made up the several specialization options were no longer offered due to resource constraints; it thus became difficult for AOT students to complete the coursework. The upper level courses were highly technical as well as too narrowly focused to attract students with lower division aviation academic majors such as flight and maintenance who instead wished to become mid-level managers in various aeronautical enterprises. As a result, in order for a student to complete the AOT degree program, numerous course substitutions, including independent or directed studies, had to be offered; the quality of course delivery has suffered as a result. Also, completing the program became extremely cumbersome and very frustrating for students, faculty, and the administration. Yet an awareness of the large existing demand for reputable and convenient degree completion programs from former students and working professionals who have not attained the level of education they desire dictated that the program be modified to improve deliverability and educational quality.

CURRICULAR DEVELOPMENT

Given the new framework of a plus-two degree completion program, it remained to modify the program's curriculum to achieve the two previously-identified goals, that of deliverability and of educational quality. The total number of credit hours for the new curriculum was set at 60, in keeping with an effort by the Indiana Commission on Higher Education to reduce the maximum number of hours in baccalaureate programs within the state to 120 hours.

From a perspective of efficiency, as well as the recognition that knowledge of certain core subjects is essential for all program graduates, a primary core curriculum was developed. This core curriculum was designed to be delivered on a rotating basis; that is, all of the core courses are delivered once over the course of an academic year. From a perspective of flexibility, it was desired that a twelve credit hour block be made available as a specialization block. Any number of possible specializations would be available to the student through this block, depending on deliverability of electives and possible courses available through other departments at the program's host institution, IUPUI. Potential specializations that were identified were airline management, airport management, and Purdue's air traffic control program, offered through the FAA's Collegiate Training Initiative. These

specializations were considered appropriate initial offerings, as they followed the specializations available through the four-year aviation management curriculum delivered on Purdue's main campus.

Delivery of the program was expanded past simply that of traditional classes; many of the courses were developed for hybrid delivery, allowing a handful of classroom meetings during the semester, coupled with weekly interaction utilizing the Blackboard LMS involving recorded lectures, discussion board participation, homework assignments, and online assessments. Increasing delivery options allows greater participation of and more flexible options for the nontraditional students who comprise a large portion of the students at the Aviation Technology Center.

COURSEWORK

The coursework required in the degree may be divided into the following five sections:

1. Foundational Courses
2. College of Technology Technical Core Courses
3. Aviation Technology Core Courses
4. AOT Core Courses
5. AOT Specialization

Foundational Courses

The AOT foundational courses are the building blocks of a well-rounded plan of study, and are generally taken at other institutions and transferred into the program. These include eight semester hours of mathematics through technical calculus, six hours of English composition, eight hours of laboratory science selectives, and three hours each of psychology, speech, technical communications, political science, economics, accounting and business statistics. In addition, 22 hours of related credit (a series of related lower-division courses that allows the student to focus in a specific area of interest) are required. Finally, 12 hours (four courses) that are equivalent to courses in the Aviation Technology Department Core are included in the foundational course block.

College of Technology Technical Core Courses

The College of Technology Technical Core consists of three courses: TECH 12000 (Technology and the Individual), TECH 32000 (Technology and the Organization), and TECH 33000 (Technology and the Global Society). These courses, which emphasize the global role of technology in all aspects of aviation and transportation, are offered college-wide

Aviation Technology Core Courses

These are offered as department-wide courses and teach concepts that are fundamental to the nature of the aviation technology degree. Two of

the management-focused core courses (AT 10200, Aviation Business; and AT 20300, Aviation Operations) are specifically offered as part of the AOT program, with the expectation that the remaining four core courses as required by the department will be transferred into the program.

AOT Core Courses

These courses serve as the heart of the AOT program, are required by all AOT students, and are intended to help the student develop additional expertise in the understanding and management of aviation as a complex, interrelated transportation system. The capstone course, AT 49700, is designed to provide the culminating experience required by accrediting organizations based on the material covered in the previous six AOT core courses.

AOT Specialization

The AOT specialization of 12 hours provides a great deal of flexibility for students, in consultation with a faculty academic advisor, to develop a unique set of courses to complete the program. Plans of study could include advanced academic work in the student’s associate degree major area, allow for structured study in a new area of interest, or provide virtually any type of educational focus that will result in the student becoming a more well-rounded and marketable graduate. Students who focus in air traffic control and desire the CTI (Collegiate Training Initiative) endorsement must take two air traffic courses to constitute a portion of this 12 hour block.

Typical thematic areas of concentration in the AOT specialization block include:

- Technology, leadership, and innovation
- Environmental policy
- Law and society
- Management
- Earth and environmental science
- Public policy
- Homeland Security
- Data analysis and informatics
- Logistics

INFORMAL ARTICULATION AND INTEGRATION OF PROGRAMS

Articulation between the Vincennes and Purdue programs was approached primarily on an informal basis, with the expectation of a formalization of that process to occur at some indeterminate point in the future. According to Menacker (1974, p. 203), “the informal process keeps the other program going. Through informal articulation, information moves in both directions and many problems are settled personally, before they reach the proportions of major articulation issues.” Along these lines, a transfer matrix was constructed through a collaborative effort between the directors of the two programs.

FIGURE 1. PROGRAM TRANSFER MATRIX FOR INFORMAL ARTICULATION PROCESS.

General Studies Track			ATC	Dist	IN	Trans	Math	Math	English	COM	PSY	Lab	AT	AT	AT	Related	Add.	Free	
						159	221	Comp	114	120	Sci	290	247	258	Cr	AT Cr	Elect.		
SEMESTER 1																			
AMNT	100	2	INTRODUCTION TO AVIATION	X									X						X
PSYC	142	3	GENERAL PSYCHOLOGY		X	X					X								
MGMT	250	3	INTRO TO MANAGEMENT		X												X		
MATH	102	3	COLLEGE ALGEBRA	X	X	X	X												
ENGL	101	3	COMPOSITION I	X	X	X			X										
SPCH	143	3	INTRO TO SPEECH	X	X	X				X									
17																			
SEMESTER 2																			
AMNT	103	3	BASIC AIRCRAFT SCIENCE	X									X						X
MGMT	256	3	HUMAN RESOURCE MGMT		X												X		
MATH	104	3	TRIGONOMETRY	X	X	X	X												
ENGL	102	3	COMPOSITION II	X	X	X			X										
AFLT	190	4	AIRCRAFT SYS AND PROP	X										X					X
16																			
SEMESTER 3																			
HIST	125	3	HISTORY OF AMERICAN TECH	X													X		
MGMT	257	3	SUPERVISION		X												X		
MGMT	275	3	INTRO TO BUSINESS FINANCE		X												X		
PHIL	212	3	INTRODUCTION TO ETHICS		X	X											X		
PFWL	100	2	FITNESS AND WELLNESS	X	X														X
MATH	115	3	SURVEY OF CALCULUS I		X			X											
17																			
SEMESTER 4																			
AFLT	258	3	AIR TRANSPORTATION	X											X				
AFLT	285	3	ATC PROCEDURES/ WEATHER	X								X							
MGMT	284	3	OPERATIONS MANAGEMENT		X												X		
PHYT	101	4	PHYSICS FOR TECHNICIANS	X							X								
ECON	201	3	MICROECONOMICS		X	X											X		
16																			
Total																			
66																			
66 TOTAL HOURS																			

The matrix shows the relationship of the courses provided in each of the Vincennes associate degree programs to the foundational courses which students matriculating in the Purdue baccalaureate program were expected to have completed. A gap analysis, identifying lower-division courses that needed to be delivered by the two-year institution, was conducted. The two-year institution subsequently followed its curricular process to add the courses identified by the analysis as missing.

Three additional efforts to further reduce barriers for students transferring from the two-year to the four-year institution were initiated. A joint marketing effort, which included joint promotional materials representing both schools and which clearly presented the pathways and courses for lower division students desiring baccalaureate degrees, was begun. In addition, existing individual social media sites for each institution were merged into single sites (see, for example, <http://www.facebook.com/IndyATC>, <http://www.youtube.com/IndyATC>, and @IndyATC on Twitter), providing further cohesion in recruitment and retention efforts. Finally, a student chapter of a professional organization, the American Association of Airport Executives, was chartered, and chapter bylaws were designed to provide for joint membership between the two institutions.

RESULTS AND CONCLUSIONS

The net result of this collaborative effort was a much smoother flow from the three Vincennes programs to the single Purdue program, and the implicit articulation that was a product of the effort worked well from its inception. While individual students were not tracked longitudinally from matriculation in the lower-division programs through graduation from the upper-division program, making total student counts and degree completion probabilities difficult to determine, some metrics that support the inference that the collaboration has been successful are available. For example, from the Fall 2010 semester, when the informal program articulation agreement was implemented, to the Spring 2012 semester, the percentage of students matriculating from the lower-division programs into the upper-division program has improved from 5.5% of the upper program's composition to 18.8% of the composition. Over the same period, the percentage of former Vincennes students graduating from the Purdue program improved from 16.7% of the total number of candidates for graduation to 28.5% of that total. These figures suggest an increase in the proportion of Vincennes students in the Purdue program, and it reasonable to assume that the increase is due at least in part to the curricular changes that were implemented.

A more thorough longitudinal study, determining percentages of students matriculating in both the

lower-division and upper-division programs who actually complete their degrees, would be a logical step for further investigation. Such a study might also consider the influential independent variables identified by Christie and Hutcheson (2003) and determine the validity of those variables as predictors of degree completion by tracking them for the students in the program. Another problem of interest is that of examining placement data to determine whether the two-year graduates stayed apace with their counterparts in the completion program in terms of job attainment.

Additional steps left to pursue in the development of the joint program are the formal articulation process, as well as the potential development of a joint industrial advisory board for the provision of external input from industry as a component of the accreditation process. However, Purdue University already has several articulation agreements currently approved with other two-year community colleges in the state; industrial advisory committees are in existence, as well.

The divestiture and articulation process described herein can be extended to technology programs at other institutions, although certain limitations to doing so exist. Among these limitations are the degree of physical separation between campuses and the openness of the institutions themselves to the articulation process and to curricular change. It should be noted that challenges due to physical separation can be mitigated to some extent through the delivery of courses through distance learning methods.

FINAL THOUGHTS

As is frequently found in treatises such as the present one, there are usually additional questions that result; several of these we have attempted to answer pre-emptively, but others will require additional research and study.

Some lingering questions could be as fundamental as: Does taking a new approach in integrating the curriculum shared by two educational institutions make fiscal sense? Or even: Are there educational or philosophical reasons why trying to craft an almost seamless academic program between a major land-grant university and a highly technical associate degree granting university is a viable approach?

In Indiana, the state legislature is considering bills that would allow the Commission for Higher Education (ICHE) to approve or disapprove degree programs – both new and existing – that require more than 60 hours for an associate's degree and 120 semester hours for a bachelor's degree. It was found that several special degree programs in the state required as many as 138 to 141 hours to complete. This "credit creep" which burdens students and their families and which puts a strain on the state's financial aid structure has gotten out

of hand; in some cases in the state, it has become almost impossible for students receiving financial aid to complete their degrees since such aid is available for only eight semesters (Indiana Business Council, 2012). What we are proposing in this new approach is just one way in which a more efficient and fiscally effective delivery of a shared academic program could be achieved. To be sure, other states have long used some sort of plus-two system to allow students to begin their higher education at a more local educational institution such as a community college and then matriculate to a university for upper division coursework. However, there is little evidence that such articulation in aviation technology has previously existed. The view that the Purdue University Department of Aviation Technology has taken with the AOT degree is that students will develop a high level of technical ability and complete their general education during the first two years (in Indiana's case, 60 hours) at an associate degree college or university. Then, by utilizing upper division courses in management and/or operations baccalaureate graduates of the program will be ready to assume the role of a mid-level manager at an earlier date. Such a strategy will add depth as well as breadth to the educational schema, but the coursework must be very coordinated.

The philosophical underpinnings for this new and more integrated approach are centered in the literature on vocational/technical education specifically in the dimension of liberal versus useful studies. There have been numerous opponents to

the inclusion of vocational training of any kind in a tertiary educational setting; the hue and cry from these challengers seems to be that the proper place for such training is on the job and such endeavors can best be considered as work followed by reward. The claim made is that the presence of such occupational education in an undergraduate program only extends its narrowness. However, a clue to a better answer may be found in Aristotle. He granted that:

it is good to know how to play the flute, but be cautioned against playing it too well. This caution against excellence may be surprising, but to...achieve skill in playing the flute takes so much time and effort that there is danger of neglecting other worthwhile activities, especially intellectual or rational ones. (Brubacher, 1977, p. 75)

We are not suggesting that the notion of learning for learning's sake be given up. Instead, forward thinking academics need to view any future partnerships in aviation programs not as just merely a two-plus-two relationship of technical training followed by a few more years of learning for a bachelor's degree, but rather as a new and totally integrated educational process. Articulation, matriculation, and transfer of credits must become streamlined, needless duplication in course content must be eliminated, and great care must be taken in developing a unified educational experience for each and every student.

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