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Author(s): Richard D. Stewart, Natalie Burger, Erica Hansen, and Gavin Johnson

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An Analysis of the Status of Undergraduate Transportation Management Education in the United States

by Richard D. Stewart, Natalie Burger, Erica Hansen, and Gavin Johnson

This paper examines 170 of the non-engineering undergraduate degrees in the fields of supply chain management, logistics, and transportation, including joint majors, present within universities in the United States. The curriculum for each degree was evaluated to determine the extent to which the students were taught transportation and related courses. Each university's website was also examined to catalog additional best practices in education, such as required internships, used to support teaching transportation outside of formal classroom instruction.

BACKGROUND

Frequently, the questions of what is the discipline of transportation and what universities teach it are raised by undergraduate students, parents, and administrators. Transportation as an academic business discipline focuses on the five modes (rail, land, marine, air, and pipeline), examining their economics, operations, and management. Transportation has been a discipline at some U.S. universities for close to a century. Syracuse University started its first transportation and traffic specialization in 1919 and the H. H. Franklin Chaired Professorship in Transportation was endowed in 1920 (Whitman School of Management 2015).

Business logistics has been taught as a distinct subject since the 1960s when companies began to adopt the total cost approach. One of the first business logistics courses was taught at Michigan State University in 1960 (Ballou 2006). Logistics became embraced as an academic subject and at times replaced transportation. Business theory practices focused on the total cost approach evolved, and by the mid-1990s, the concept of supply chain management (SCM) emerged as a distinct discipline at universities. While industry and academics debate if SCM evolved from logistics, includes logistics, or intersects logistics, it is increasingly being recognized as a separate academic discipline (David 2013). SCM theory holds that while disciplines such as transportation, procurement, marketing, warehousing, finance, and distribution can be taught separately they should be integrated because of their interrelationship and interdependency in the supply chain. As Southern concluded in his summary of the transition of transportation to SCM, not all companies have adopted SCM theory but many are moving down that path and more will in the future (Southern 2011).

Business leaders recognize that transportation can greatly affect their bottom line. Transportation as a cost of SCM has increased over the past five years. A shortage of truck drivers, increased regulatory requirements, fuel prices, and congestion have all contributed at various times to the rise in the cost of transportation. Managers are trying to find ways to address this spending, which means that they, and new managers they hire, need to understand the role and operations of transportation (Russell et al. 2014).

Transportation as an academic discipline has waxed and waned over the decades. Rationale for its periods of decline include a lack of understanding of the importance of transportation by academics, few quality textbooks, a movement toward generalization in business schools, and a periodic lack of demand by employers for students with an educational background in transportation (Ferris et al. 1972). The fact that transportation is and has been an academic discipline does not

answer the question of which universities currently offer transportation degrees or even teach transportation courses in a school of business.

A 1977 survey of institutions teaching transportation and business logistics courses by Gilmore found that the demand for these students, measured by post-graduation placement, was as great as any other field in the business schools (Gilmour 1978). The author also found that only 40 programs were offering majors in transportation and/or logistics. Ozment & Keller (2011) published their research on universities that taught transportation, logistics, and supply chain management education. The study focused only on universities that were accredited by the Association to Advance Collegiate Schools of Business (AACSB) (Ozment and Keller 2011).

METHODOLOGY

The University of Wisconsin-Superior (UWS) research team focused on analyzing the best practices in transportation management education at the undergraduate level in non-engineering degrees, starting with determining which universities offered related business degrees. Urban planning degrees and engineering degrees can focus on transportation planning and infrastructure, but the scope of this research did not include those degrees. The first task in this analysis was to create an inventory of universities which advertise that they offer a related undergraduate management major.

The team was unable to find a single comprehensive published inventory of all the universities in the U.S. that provide a list of relevant bachelor's degrees. The research team decided to revisit the Ozment and Keller (2011) sample group and to expand it to include schools that were not accredited by AACSB. The rationale for this expansion was first to try and capture as many programs as possible, and second, while AACSB accreditation is highly regarded, accreditation by one body was not felt to be a sufficient rationale for limiting the study group. The findings would update the Ozment and Keller (2011) study and provide a larger pool of schools.

This list would also provide the research team with a base that could be useful in determining common themes and best practices. In order to address the topic of best practices in transportation education, a decision was made to limit the scope of the research by the following parameters:

- a. Limit the list of universities for further analysis to those offering bachelor's degrees with a major in transportation, logistics, SCM or a combination of those disciplines, and market themselves as teaching transportation, because each of these management disciplines sees transportation as a component of their field of study.
- b. Limit the list to those schools that required all students in the above major to have at least one course in transportation, logistics, or SCM. This would ensure a student with that major would have discipline-specific courses.
- c. Engineering schools may teach a variety of transportation courses as part of a civil, marine, mechanical, or other engineering major. However, it was decided that data collection and analysis of these programs should be part of a future study, and not included in the scope of this research.
- d. Urban planning programs also teach transportation planning courses. However, such programs were not evaluated as the focus of this research was on management degrees.

The UWS team revisited the AACSB university listing and decided to expand the data set. The team examined professional organizations and societies that publish a listing of universities with degrees in the relevant disciplines. The team also looked at the five federal service academies whose graduates are required to have a military service commitment. The services and their respective academies have a longstanding focus on logistics. These academies are U.S. Military Academy (West Point), U.S. Naval Academy, (Annapolis), U.S. Air Force Academy, U.S. Coast Guard Academy, and the U.S. Merchant Marine Academy (Kings Point). State maritime academies were included because of their mission in preparing students to serve in the maritime transportation industry while earning an undergraduate degree. State maritime academies are located in the following states:

Michigan (Great Lakes), Massachusetts, New York, Texas, California, and Maine. The following list includes the sources that were examined:

- a. Universities accredited by the Association to Advance Collegiate Schools of Business (AACSB)
- b. American Society of Transportation and Logistics (AST&L) blanket waiver schools. A blanket waiver school is a university with a degree program that has been reviewed by the AST&L board of examiners and approved. Approval enables graduates to earn the Certified in Transportation and Logistics (CTL) designation upon graduation.
- c. Council of Supply Chain Management, (CSCMP)
- d. Institute of Supply Management, (ISM)
- e. Council of University Transportation Centers, (CUTC)
- f. Society of Logistical Engineers, (SOLE)
- g. The five federal service academies
- h. The state maritime academies

The list of sources was divided by the research team. Each researcher analyzed all universities falling under the source's listing. The AACSB website offers a search into the different types of programs it accredits. When searching the 2015 AACSB University listing for supply chain management, logistics, and transportation programs, the research team initially searched using language from the Ozment and Keller (2011) study, but discovered the search issued zero results. This appears to be because the AACSB has changed its search engines since 2010. The research team then went through the AACSB listing for general business programs, reviewing them for relevant degrees in order to expand the inventory of universities.

Academic institutions listed by the professional organizations were researched. The military academies were examined because of the critical value of logistics to the military. The five federal academies were also reviewed for relevant programs. Lastly, maritime academies were analyzed, as they have been teaching transportation courses for many decades.

An Excel database was created to house the inventory of relevant degrees. Universities that were found to offer SCM, logistics, or transportation programs were added to the inventory. For each university listed, the research team reviewed related university publications and/or websites to collect the following data:

- a. University name
- b. Location
- c. Contact information
- d. Website link to degree details
- e. Degree offered (Note: if more than one relevant bachelor's degree is offered at a university, each degree has an individual listing)
- f. Which source(s) listed in the prior section that the university was listed in

In order to collect the relevant data listed above, the research team examined the websites of each university in the list of sources. Data analysis was complicated by the lack of a common format in how each university's websites are constructed. This fact meant that each website had to be methodically examined to extract the relevant data. Once the relevant program was found, the information on the curriculum found in Tables 2, 3, 4, and 5 was found on that page or a nearby link, in the academic catalog, or a combination of these. The other, more qualitative, data found in Table 5 were found by looking throughout the website of the department or college in which the relevant degree was housed.

LIMITATIONS OF METHODOLOGY

The research team at the University of Wisconsin-Superior decided on investigating the universities' websites to collect data on best practices for transportation education. The research team understood the inherent limitations of using websites as a resource. University websites offer what the people in the university or program find most important to display to the general public. The target markets that universities reach out to include prospective students and also companies that seek graduates with education relevant to the transportation industry. Another issue in accessing the websites was the inconsistent updating of website information. Some websites had been recently updated, others had information that was years old, and frequently there was a mix of old and new data. This made it difficult to determine with absolute certainty that all information gathered was current as of 2015. The reality is that university websites can be more of a marketing tool than a repository of accurate and current information.

When the team looked at individual websites, considerable time was spent following the many different links while looking for critical information. Multiple links had to be reviewed before relevant information was found, if it was found at all.

One of the major difficulties the research team ran into was not always having a clear listing of the required and elective courses offered for one of the relevant degrees. Online catalogs provided courses, but it was not always clear at that link alone. In the course catalog, course numbers and abbreviations were used instead of the full course name. When this happened, it was necessary to look at other links to get the full name and which parameters the course would fall into.

The team felt that accessing university websites designed to convey information about degree programs would provide more data than a survey with typical low return rates. A survey of certain degrees may be useful for future research in order to get more in-depth information on particular programs.

DEGREE ANALYSIS

A summary of the relevant majors collected from university websites can be found in Table 1. All of the listed degrees were advertised in the cited sources as teaching transportation as part of their curriculum. This study's sample includes a total of 162 U.S. universities listing 170 relevant bachelor's degrees that were found after looking at 583 universities. The listing is a significant sample but should not be considered an inclusive listing of all the universities in the U.S. that teach transportation.

Table 1: An Inventory of 170 Bachelor’s Degrees from 162 U.S. Universities in Supply Chain, Logistics, Transportation, or a Combination of Those Disciplines

Degree Titles	Total Number of Each Degree
Logistics and SCM	22
Information Systems and SCM	2
Accountancy and SCM	1
Logistics and Operations	1
Transportation and Logistics	4
Supply Chain Management	90
International Business and Logistics	2
Operations and SCM	29
SCM and Transportation Management	1
Logistics Management	4
Purchasing and SCM	1
International Transportation and Trade	1
Maritime and SCM	2
Transportation and Urban Infrastructure	1
Marine Transportation	2
Industrial Distribution and Logistics	1
Manufacturing and SCM	1
Transportation	1
Logistics Information Systems	1
Logistics and Intermodal Transportation	2
SCM, Logistics, and Transportation	1
Total Number of Degrees	170

ANALYSIS OF COURSES

Ozment and Keller’s (2011) research found that “approximately one-third of the AACSB schools examined had a required introductory transportation logistics supply chain management (TLOG/SCM) course in the business core.” This finding raised the question: Are transportation courses required in these majors? A best practice in teaching transportation would be to offer courses, either mandatory or elective, in transportation. This step analyzed each of the courses offered in the related degrees. Courses may cover more than one discipline. The broad and complex nature of SCM means that a textbook introducing the student to all aspects of SCM will allocate only a small portion of its content to transportation. A typical SCM textbook will have at least one chapter, out of 14 or more, on transportation (Wisner, Tan and Leong 2014). Some textbooks may have two. While the student may have been introduced to the subject of transportation, this course cannot compare to an in-depth course focused on transportation using a transportation textbook. Indeed, it is also common for a transportation or logistics textbook to introduce the subject of SCM in a single chapter (Coyle, Novak and Gibson 2015). This raises the question: are supply chain management courses required for other relevant majors assessed in this study?

The research team reviewed each of the 170 bachelor degree programs and determined the following:

- a. Course name, course number, and amount of credits in required courses that have the name transportation, SCM, or logistics in them must be taken by students in that major as a core course.
- b. Course name, course number, and amount of credits in elective courses that have the name transportation, SCM, or logistics in them may be taken by students in that major.

This step of the research process was undertaken in order to further determine the level of education that is given on the topic of transportation.

Required Course Analysis

Table 2 analyzes all 170 relevant undergraduate degrees that have at least one required course in SCM, logistics, or transportation. The sum of the total number of degrees noted on the table is greater than 170 because some programs require courses in more than one of the relevant areas. The research team took note of required core courses that did not have the words transportation, logistics, or SCM in the title but seemed as though the nature of the topic would be transportation related.

- SCM was the most frequently required course with 81.76% of the universities requiring an SCM course.
- A logistics course is required for 44.70% of the degrees.
- A course in transportation is required for 25.88% of the 170 degrees.
- A total of 1.18% of the degrees analyzed required a combination transportation and SCM course.
- Degree programs that require a combined course of transportation and logistics total 17.66% of the degrees reviewed.
- Degree programs that require separate core courses in both SCM and transportation represent 17.66% of the degrees evaluated.

Table 2: Analysis of 170 Relevant Undergraduate Business Degrees by Required Courses in SCM, Transportation, Logistics and Other Courses

Analysis of Relevant Degree Programs in U.S. by Required Course			
		Number of Degrees	Percentage of all Degrees
1	Degrees with transportation core courses required	44	
	Percentage of all degrees		25.88%
2	Degrees with logistics core courses required	76	
	Percentage of all degrees		44.70%
3	Degrees with SCM core courses required	139	
	Percentage of all degrees		81.76%
4	Degrees with transportation/SCM core courses required	2	
	Percentage of all degrees		1.18%
5	Degrees with logistics/transportation core courses required	30	
	Percentage of all degrees		17.66%
6	Degrees with logistics/SCM core courses required	30	
	Percentage of all degrees		17.66%
7	Degrees with other required core courses that may have transportation component not included in list 1 of this table	47	
	Percentage of all degrees with other required core courses with transportation component		27.65%
8	Degrees that require both transportation & SCM courses	30	
	Percentage of all degrees		17.65%
9	Universities that provide a required transportation course per lists 1,4,5,7. Overlapping has been removed	95	55.88%
10	Universities that do not provide required transportation courses per lists 1,4,5,7	75	44.12%

Degrees Requiring More Than One Relevant Course

The next analysis looked at each of the undergraduate degree programs by the major disciplines of transportation, logistics, and SCM to assess how many of these majors required more than one course in their respective disciplines. The research was done to determine how in-depth the subject matter of the discipline was covered. The results for each of the three disciplines were then compared by percentage, to first, the universe of all the degree programs in their stated major, and secondly, against all 170 degree programs.

Table 3: Analysis of U.S. Undergraduate Programs That Require More Than One Relevant Course in the Respective Subject Area.

Number of transportation programs requiring more than one transportation course	11	
Percentage of the 44 transportation programs		25%
Percentage of total 170 programs		6.4%
Number of logistics programs requiring more than one logistics course	19	
Percentage of the 75 logistics programs		25.33%
Percentage of total 170 programs		11.18%
Number SCM programs that require more than one SCM course	81	
Percentage of the 139 SCM programs		58.27%
Percentage of total 170 degrees		47.65%

Elective Course Analysis

The research team analyzed elective courses offered on the three relevant topics of transportation, logistics, and SCM. Elective courses related to transportation were specifically analyzed. Figure 1 displays the frequency of electives offered relating to the topic of transportation. This graph shows how many degrees offer elective courses related to transportation. For example, there are 71 universities that do not offer an elective course in transportation, logistics, supply chain management, or a combination of those courses. These findings raise the question of why there are not more transportation related electives offered in the degree programs? Further research into each program would be required to determine the rationale for not offering more related electives.

Figure 1: Elective Courses Related to Transportation

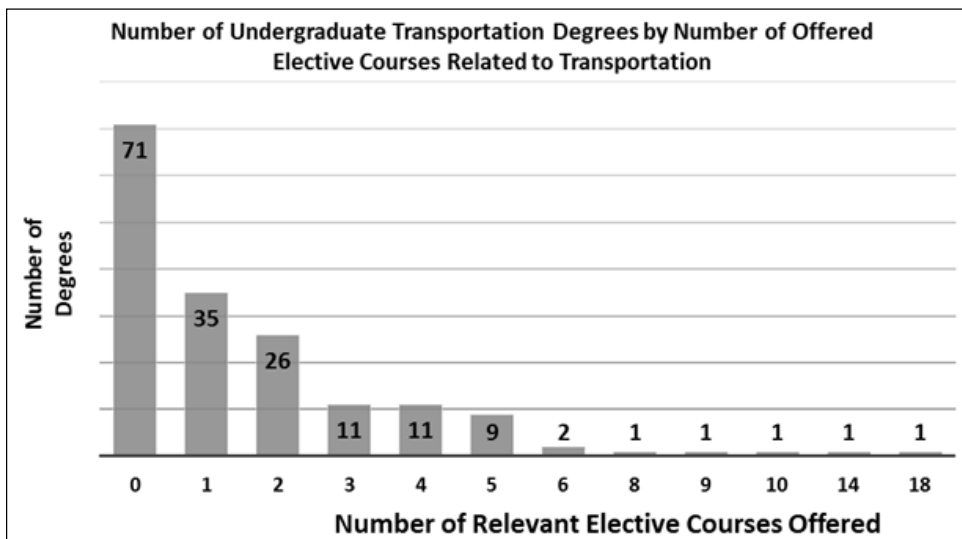
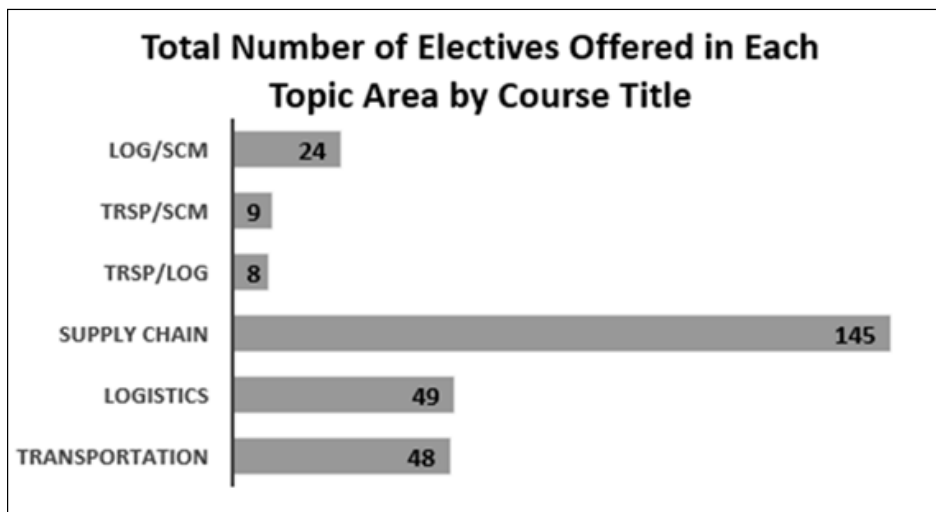


Figure 2 lists the number of electives offered in each of the three relevant topics. Courses were sorted into the topic areas by analyzing the title of each elective course. To be deemed relevant, the elective course needed to have the words transportation, logistics, or supply chain management in the title. Elective courses with a combination of these words were also included. SCM elective courses were by far the most frequently offered electives followed by logistics/SCM combinations and transportation electives last. The study did not assess the frequency of elective course offering, only if electives were listed in the program. Further research would be needed to determine if the elective courses listed are offered on a regular basis, (annually or bi-annually), or infrequently (on demand or every three years or more).

Figure 2: Electives Offered



ADDITIONAL INDICATORS OF BEST PRACTICES IN TEACHING TRANSPORTATION MANAGEMENT

Student Clubs

The research team also looked into whether or not each university offered a student club specific to the relevant degree. Student clubs offer leadership opportunities, interaction with peers, interaction with professionals, frequent publication of newsletters, and the possibility of improved morale. Student clubs may be segmented into two types, branded and non-branded. Branded clubs may have affiliations to professional organizations such as a Student Council of Supply Chain Management (CSCMP) Round Table hosted by the students of a specific university. Non-branded clubs may closely interact with professional organizations, but are not formally branded by a professional organization. The Transportation and Logistics (T&L) Student Club, the student club at the University of Wisconsin, Superior, is an example of this. The research team observed that very few of the student clubs did not offer some type of networking opportunities for the club members. It was determined 111 of the 170 programs had student clubs. No academic literature was found discussing the advantages or limitations of the club’s branding to a professional organization and the impacts on the organization, the students, or the university.

Relations with Professional Organizations

The research team noted that another common practice of transportation management programs is to be affiliated with various industry-specific professional organizations. The initial plan for this information was to categorize the professional organizations into formal and informal interactions. Formal interactions included donations for scholarships, research fellowships, and supporting a student chapter of the organization. Informal interactions would include the organization being listed on the website, or if the students attended a meeting. These types of data were difficult to find on the websites and even more difficult to categorize into these two groups.

It was noted that most universities affiliated with professional organizations had student clubs sponsored by a professional organization. The student clubs could be chapters of the organizations or just a recognized student organization through the university with ties to the professional organization. Many programs had a student chapter of the professional organization, such as American Production and Inventory Control Society (APICS) and CSCMP. The research team noted that in a few schools, professional organizations sponsored case study competitions, as well as research fellowships. A common practice when looking for these affiliations was the types of activities that a professional organization may offer a program. Typical practices included networking with industry professionals, attending seminars and conferences, as well as having speakers on campus. Affiliation was not essential for a student club to engage in these best practices. The activities were usually supported by an active student club or a center within the academic department specific to the program.

Colston (2003) stated, "It has become increasingly important for organizations to be actively involved in workforce education and learning in order to develop and retain a high performing workforce" (Colston 2003). One of the major issues the study found with these partnerships is that there is often a lack of management, and another is the cost associated with these programs. Both are problems that prevent the start or continuation of such programs. When organizations are looking to invest in higher education programs they are looking for high quality programs that can translate to on-the-job application. Richard Burke (2003) wrote a paper that also looked into the importance of partnerships between schools and professional organizations (Burke 2003). He discussed the challenges our country is facing with the switch from a manufacturing economy to a knowledge based economy. The transition stresses the importance of educational-professional partnerships. The author believes that involvement between employers and educational institutions working together to develop programs will create a workforce for today's and tomorrow's global economy.

The association between schools and professional organizations was one of the key indicators the research team looked at in determining whether there were any connections between the school's programs and a related professional organization. A professional organization can have benefits for all parties involved. The school, the student, and the professional organization can all benefit from each other's involvement with one another. One of the many reasons organizations would want to partner with schools is to help develop a workforce that would better suit their needs. The formal involvement also means that the school can learn what employers are looking for in future employees.

We looked into formal and informal connections between schools and professional organizations. The team defined a formal connection as a school and organization having planned networking, meetings, or any other events that connect the two. This information was found on most websites. This was indicated by a student chapter of the organization or some type of logo of the professional organization on the website. An example is Texas A&M University and CSCMP, where the university has a student round table on its campus (Texas A&M CSCMP Student Roundtable Website 2014). The partnership is listed on both of their websites, so the team would consider this a formal partnership. For an informal partnership, the team looked at relationships where there may be contact such as the exchange of newsletters or giving updates to one another. The difficulty in

determining the level of involvement from the university websites resulted in the findings from this portion of the research being a qualitative rather than quantitative set of results.

Admission Requirements

A common feature of business schools is admission requirements. Admission to a school or department of business normally requires the completion of required courses, achieving an acceptable grade point in those required courses, and an acceptable grade point average for all courses taken at the university. The purpose of the admissions process is to limit entry to the school to only those students who have proven they should be capable of success in the higher level courses. The research team assessed if a program required the student to achieve a specific status before being admitted to the college, department, or program. The team found that 132, or 77.65% of the programs, required this admission in order for the student to take upper level courses (300+ and 400+).

Internships

Internships in business schools have long been considered a very valuable educational process, and in majors such as accounting there is an expectation that students will complete an internship. The literature on logistics internships indicate that internships serve three stakeholders: students, companies, and educators. Among other benefits, internships improve business school curriculums (Gerken et al. 2012). Internships have been found to make students more marketable and increase their pay (Gault, Leach and Duey 2010). Hiring managers look at a potential employee's resume for work experience, but the type of knowledge of a specific sector an internship can offer is what sets graduates with internship experience apart. Many new hires may have an idea of what the industry is about from classroom learning, but that cannot replace the basic skills a student gains from experiential learning such as an internship (McCrea 2012). Knemeyer and Murphy's (2001) study on logistics internships assessed company and student expectations for internships and listed multiple benefits for each group. In their conclusion they stated that further research on the structure of logistics internships is needed to develop the future talent pool. However, the survey did not address if companies, institutions, or students believed that internships should be required.

The review of literature establishing the value of internships led to the question of how many of the 170 programs offered internships. From the data available on the universities' websites, the research team noted: whether the program required an internship in order for the students to complete the program, offered an internship as an elective for the program, or did not have an internship specifically as part of the degree progress but the department or college recommended that the students take part in one.

Table 4: Internships Requirements

Analysis of 170 Transportation Management Undergraduate Degrees in the U.S. by Common Internship Practices	Number of Schools	Percentage
Program requires an internship in order to earn the degree	25	14.71%
Program offers internship to be completed as an elective	39	22.94%
Program recommends internship, not specifically part of degree progress	68	40%
Degrees that require an internship and a course in transportation	9	5.29%

Accreditation

It was also noted that many of the relevant programs were housed in a college or school that is accredited by the AACSB. In the 2010 study by Ozment and Keller (2011), there were 59 degree programs accredited by 475 AACSB accredited universities. This number has increased by 62 since the 2010 paper for a total of 121 relevant programs offered by 454 AACSB accredited universities. The 121 programs represent 26.65% of the 454 total programs offered by AACSB universities. The research team also analyzed how many of the programs accredited by AACSB required a course specifically with the word “transportation” in the course name. Based on the analysis, it would appear that non-AACSB accredited programs would be more likely to offer named transportation courses. There was no determination made as to why there was this variation.

Table 5: AACSB and Non-AACSB Relevant Programs and Courses

Analysis of AACSB and non-AACSB accredited Transportation Management Undergraduate degrees in the U.S. (total of 170 programs)	Number of programs	Percentage 170 degrees with relevant major
AACSB accredited relevant programs	121 of the total 170	71.18%
AACSB schools that require a course in transportation (has the name transportation in the title) as a percentage of AACSB relevant programs	29 of the 121	23.9%
Number of AACSB schools that require a course in transportation (has the name transportation in the title) as percentage of all relevant programs	29 of the total 170	17.09%
Number of non-AACSB relevant programs	49 of the total 170	28.82%
Non-AACSB schools that require a course in transportation (has the name transportation in the title) as a percentage of Non-AACSB relevant programs	16 of the total of 49	32.65%
Number of non-AACSB relevant programs that require a course in transportation as percentage of all relevant programs	16 of the total 170	10.66%

FUTURE RESEARCH

This study has raised several questions which could be possible areas of research to build on in the future.

This study found there was not a single database where transportation management degrees could be found. A database that includes all undergraduate transportation degrees could be built with listings of transportation degrees and which academic institutions offer them. Future research should be done to determine which of the disciplines (SCM, logistics, or transportation) is growing or declining and the rationale for the changes.

This study did not replicate the research by Ozment and Keller (2011) on the number of faculty teaching in the relevant disciplines or the number of graduates from the programs. These two topics should be revisited to gain an idea of how these factors have expanded along with the number of programs.

This study does not recommend what level of transportation education students earning a management degree should have. It looked at what related courses are being taught currently. The question of what minimum level of education undergraduate management students should have in transportation remains unanswered.

Student success could also be looked at when comparing students who are required to take a transportation internship. Possible criteria could be job placement, advancement, and job satisfaction.

The study did not assess the benefits or costs of student clubs being formally affiliated with a professional organization or being unaffiliated.

Future research into transportation education could include other undergraduate degrees such as planning, engineering, and economics, as this study did not look into those types of degrees. This could help determine what the optimal level of transportation education is needed to plan and operate our nation's transportation systems efficiently and sustainably.

An area of interest that needs further research is the level of education required for a student to undertake an internship. The research noted that some universities required admission to the school of business, relevant upper level courses, or a combination of them. However, it was also observed that some institutions apparently allowed internships to be taken at any stage of the student's academic career.

CONCLUSIONS

Transportation related business degrees, including SCM, have increased but remain a low percentage of available degrees offered by the 583 universities reviewed. This study found that the number of AACSB accredited business schools offering relevant degrees has increased since the Ozment and Keller (2011) study. UWS researchers found 170 relevant degrees at 162 universities. SCM, a recent discipline, had the most degree programs with a total of 90 that were titled as supply chain management majors.

Of the 170 relevant degrees, transportation courses are the least required for graduation, with 44, or 25.88%, of the 170 degrees requiring at least one core course in this discipline. This finding raises the unanswered question, why, when transportation is such a critical element of the supply chain, is it not taught in more detail? One supposition is that there may be a lack of faculty educated in and willing to teach transportation courses at the undergraduate level. As far back as the 1960s studies have cited a shortage of faculty with the relevant experience and education to teach transportation (Farris et al. 1972). The Ozment and Keller (2011) study found that in AACSB universities about 1.1% of the faculty were teaching TLOG/SCM courses. They also noted the very limited number of Ph.D. programs in the relevant disciplines, creating a lack of new faculty entering the market.

SCM electives are more available than transportation or logistics electives. However, there are electives offered in all the subject areas, although not at every university.

Of the 170 programs researched, 111 offered a related student club, which is 65.29%. The research team observed that very few of the student clubs did not offer some type of networking opportunities for the members of the club. There is a clear indication in these disciplines of involvement in professional organizations, either formally or informally. The review of websites did not allow for an accurate quantitative measure. A survey may be the best tool for determining the numerical level of involvement in each category.

It is interesting to note the low percentage of schools that require an internship to graduate. Internships by their nature require significant resources in order to establish relationships with companies, maintain relationships, prepare students, monitor student internships, and measure the quality of the internship experience. This demand on scarce resources may be a reason why so few schools require internships even though their benefits are well understood and documented.

The number of AACSB accredited business schools offering relevant degrees has increased. Future research should be done to determine if the increase is mostly in teaching SCM rather than other disciplines.

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References

- Ballou, Ronald, H. "The Evolution and Future of Logistics and Supply Chain Management." *Production* 16(3), (2006): 375-386.
- Burke, Richard Kent. "Workforce Education and Training in Southwest Kansas: Perceptions of the CEOs of Businesses, Industries, Professional Services and Governmental Agencies." PhD diss., Kansas State University, 2003.
- Colston, Carol Lynn. "A Descriptive Study of Learning Partnerships between Organizations and Higher Education Institutions to Support Workforce Development and Retention: Organizational Perspectives." PhD. diss. Capella University, 2003.
- Coyle, John, Robert Novack and Brian Gibson. *Transportation: A Global Supply Chain Perspective 8th Edition*, Cengage, Boston, 2015.
- David, Pierre. *International Logistics 4th Edition*, Cicero Books, Berea, Ohio: 2013.
- Farris, Martin T., Gilbert Gifford, Donald Harper, Warren Rose, Hugh Norton, and James Bennett. "Transportation Education: An Evaluation." *Transportation Journal* 11 (4), (1972): 26-39.
- Gerken, Maike, Bart Rienties, Bas Gieshers, and Karen Konings. "Enhancing the Academic Internship Learning Experience for Business Education – A Critical Review and Future Directions, Chapter 2," *Learning at the Crossroads of Theory and Practice, Research on Innovative Learning Practices*, edited by P Van Der Bossche, W.H. Gijsselaers, and R.G. Milter. Springer, Netherlands: 2012.
- Gault, J., R. Leach, and M. Duey. "Effects of Business Internships on Job Marketability: The Employers' Perspective," *Education & Training* 52(1), Accessed January 20, 2015. (2010):76-88. http://digitalcommons.wcupa.edu/cgi/viewcontent.cgi?article=1002&context=mark_facpub
- Gilmour, Peter. "The Current Status of Business Logistics Education." *Transportation Journal* 18(2), (1978): 71-78.
- Knemeyer, Michael, and Paul, Murphy. "Logistics Internships: An Employers Perspective." *Transportation Journal* 41 (1), (2001): 16-26.
- McCrea, Bridget. "What Hiring Managers are Looking for Today." *Supply Chain Management Review, Special Edition*, (2012):1-4. Accessed July 24, 2015. http://www.scmr.com/article/what_hiring_managers_are_looking_for_today/D2
- Ozment, John, and Scott B. Keller. "The Future of Logistics Education." *Transportation Journal* 50 (1), (2011): 65-83.
- Russell, Dawn, John J. Coyle, Kusumal Ruamsook, and Evelyn A. Thomchick. "Logistics: The Real Impact of High Transportation Costs." *CSCMP's Supply Chain Quarterly*. 2014. Accessed July 24, 2015. <http://www.supplychainquarterly.com/archives/2014/01/>

Southern, R. Neil. "Historical Perspective of the Logistics and Supply Chain Management Discipline." *Transportation Journal* 50(1), (2011): 53-64.

Wisner, Joel, Keah-Choon Tan, and Keong Leong. *Principles of Supply Chain Management: A Balanced Approach, 4th Edition*. South-Western, Mason, Ohio, 2014.

Whitman School of Management. "Historical Highlights," Accessed February 10, 2015, https://whitman.syr.edu/programs-and-academics/academics/scm/pdf/MS_SCM_2013_web.pdf

***Richard Stewart** has taught undergraduate and graduate courses in transportation and supply chain management for 30 years. He has been a fleet manager of vessels, a small business owner, a master of oceangoing vessels and a captain in the U.S Naval Reserve. Stewart has been principal investigator for over \$9 million in research grants. He serves on public advisory boards at the federal, state, and local levels. He has authored numerous journal articles and co-authored a textbook and several book chapters.*

***Natalie Burger**, BS, worked as a research assistant in the Transportation and Logistics Research Center and graduated in May 2016. Burger is currently a finance and logistics specialist for Lake Superior Warehouse Inc. in Duluth, Minnesota.*

***Erica Hansen**, BS, worked as a research assistant, in the UW-Superior Transportation and Logistics Research Center and graduated in May 2016. Hansen is now a manager for JB Hunt in Little Rock, Arkansas.*

***Gavin Johnson**, BS, worked as a research assistant in the Transportation and Logistics Research Center and graduated in December 2016. Johnson is now a supply chain manager for Polaris Corporation in Wisconsin.*