

HIGH IMPACT EDUCATIONAL PRACTICES IN CONSTRUCTION EDUCATION: AN EVALUATION OF STUDENT INVOLVEMENT AND PERCEIVED VALUE

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Recent focus on high impact practices within the collegiate experience has intensified. The National Survey of Student Engagement (NSSE) defines high impact educational practices (HIEP) as those activities that have the following traits: demand time and effort, facilitate learning outside the classroom, require meaningful interactions, encourage diverse collaboration, and provide frequent and substantial feedback. One U.S. University has made an intensified effort over the past five years to ensure construction management students are meaningfully engaged in multiple HIEPs. A survey to assess the perceived value of HIEPs was administered to forty-eight graduating students in Fall 2017. The results show that over 80% participated in at least two high impact experiences with “service learning” and “industry internship” being most popular. A normalized Borda count was used to evaluate the highest ranked HIEP. The industry internship was perceived by students as most valuable. Students connected with themes that connect HIEPs with faculty and peers over an extended period of time and activities that allow students to connect on and off campus learning. Suggestions for improvement include expanded competition team opportunities and connecting learning outcomes with HIEPs. Future research may include measurement changes in knowledge, skills, and abilities before/after students engage in HIEP.

Keywords: construction education, educational strategies, experiential, high impact

INTRODUCTION

High impact educational practices (HIEP) represent purposeful, engaging, educational activities that supplement the traditional college experience. Each requires time and effort, and all activities have been linked to higher levels of student learning through research studies (Kilgo, Sheets, and Pascarella, 2009; Kuh, 2008; Sandeen, 2012). HIEP's include a variety of activities (Table 1). In the U.S, the National Survey of Student Engagement (NSSE) collects information annually from students regarding the quality of collegiate experiences on a national basis. This survey was established in response to a perceived problem regarding how 'quality' in education has been centred on the wrong things. The NSSE approach attempts to solve this disconnect by asking students directly about their educational experiences, and then using those

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responses as a proxy for college quality. Specifically, they ask questions about students' participation in programs and activities that institutions provide for their learning and personal development. Results indicate student perceptions of how undergraduates spend time and what benefits they realize from attending college. Since 2000, about six million college students at more than 1,500 institutions in the U.S and Canada have completed the NSSE (NSSE, 2007).

Table 1: Activities included in the HIEP

Learning communities	Internships/Co-op
Common book programs	First-year seminars
Collaborative assignments/projects	Problem-based learning
Undergraduate research	Service/Community-based learning
Study abroad/away	Advising/Mentoring
Capstone experiences	Digital/Technological learning
Writing-Intensive courses	ePortfolios

Data from the NSSE study has been used on a global level to make specific recommendations for HIEPs. Specifically, data has been gathered that indicate which practices best add to the educational experience. Studies have also been done that explore how these practices benefit under-served communities in education (Kuh, 2008). Additionally, the results have yielded attempts to better connect learning outcomes with high impact practices to further amplify the potential of HIEP.

While the NSSE data empirically confirmed “best practices” in undergraduate education, no data has been aggregated specific to construction management. This introductory study considers high impact practices in construction management at one U.S institution. What current HIEP are most beneficial from the perspective of the student? Why are the selected HIEP beneficial, and what could be done to improve experiences that engage the student? If these behaviours by students of construction programs could be better understood, the undergraduate educational experience could be improved.

LITERATURE REVIEW

In 1998, the Boyer Commission presented ten recommendations for the “reconstruction” of undergraduate education at research universities (Carnegie Foundation for the Advancement of Teaching, 1998). In that report, the university was considered part of a larger ecosystem that emphasized how students and faculty were on a shared mission of learning and research. All of the ten recommendations would meet the requirements of HIEPs under today’s guidelines:

Make research based learning the standard	Use information technology creatively
Construct an inquiry-based freshman year	Culminate with a capstone experience
Build on the freshman foundation.	Educate graduate students as apprentice teachers
Remove barriers to interdisciplinary education	Change faculty reward systems (to incentivize recommended practices)
Link communication skills and course work	Cultivate a sense of community

The Boyer Commission had determined that undergraduate institutions in the U.S had fallen short of intended outcomes. Outstanding research opportunities were advertised to students, but most would graduate without ever experiencing either. Classes were

taught by either unprepared graduate students or educators who did not fully engage students. Concerns were expressed as to whether or not graduates were able “to think logically, write clearly, or speak coherently” (Carnegie Foundation for the Advancement of Teaching, 1998, 15). Thus, the concept of HIEPs was born in an effort to provide diverse experiences, solve challenging problems, force independence and self-reliance, and foster stimulation (Carnegie Foundation for the Advancement of Teaching, 1998; Kuh, 2008).

Traditional reports on student success have included such items as access to education, retention rates, graduation rates, and grade point averages. These results encourage campus climate, mentoring opportunities for students, and peer to peer engagement. These results tend to not capture learning that is both valued by society and that empowers the individual. Additional measures were needed to address the quality of the educational experience and not just a students’ persistence and completion (University of Indiana, 2007).

George Kuh spotlighted and confirmed a set of “effective educational practices” that correlated with increased educational results for students from a variety of backgrounds (2008). Deemed HIEPs, each of these activities provide increased educational benefits to students. HIEPs address directly the knowledge, capabilities, and personal qualities that will allow a student to contribute to the global economy. Kuh’s results further show that the benefits of HIEPs are increased for underserved communities and for those who enter college with lower test scores.

Kuh focuses on “deep” learning which he defines as learning that emphasizes both acquiring information and understanding the underlying meaning of the information (Kuh, 2008). Of the students who participate in such learning, most tend to earn higher grades and retain, integrate, and transfer the information gained at higher rates (Nelson, Shoup, Kuh, and Schwartz, 2008). Other authors report that HIEP participation is a significant predictor of future career plans and early job attainment (Miller, Rocconi, and Dumford, 2018).

HIEPs are deemed effective with students because they contain five critical items that are especially meaningful (Kuh, 2008):

- Require considerable time and effort on purposeful tasks
- Demand that students interact with faculty and peers over an extended period of time
- Connects students with diverse individuals
- Receive frequent feedback about their performance
- Allows students to see how what they are learning works in different settings and help put the learning in perspective (on and off campus)

These events allow students to connect learning experiences with specific experiences. Such events tend to “blur the boundaries between students’ academic and out-of-class lives” essentially increasing the social and cognitive impact of the experience (Terenzini, Pascarella, and Blimling, 1996). Students have a better perspective on themselves, and they acquire tools to act with confidence as they return to the classroom or move to professional practice.

Other researchers identify the need for HIEPs to be intentional (McNair and Albertine, 2010). They argue that institutions must start with their learning outcomes and the particular academic and developmental needs of their cohorts. Institutional culture and context should also be considered. Developing a purposeful implementation plan

prevents HIEPs from being “a solution in search of a problem” (McNair and Albertine, 2010).

The National Survey of Student Engagement (NSSE, n d) includes three areas that “explore the degree to which students report having made gains in a variety of personal, practical, and general education competency areas as a result of their undergraduate education.” These scales include “general education”, “practical competence”, and “personal and social development”. In addition, NSSE has developed a list of activities that researchers associate with “deep approaches to learning”. Scores in these four areas were normalized to a one-hundred-point scale, with higher numbers indicating that a student reported higher gains in learning or more experiences connected to deep learning. For all four measurement areas, students who participated in more HIEPs indicated consistently higher levels of engagement with deep learning. Gains in “general education”, “practical competence”, and “self-reported deep learning experiences” exceeded “gains in personal and social development” at all levels.

METHODS

Traditional measures of academic success (including retention rates, time to graduation, and grade point average) focus on measures that may not adequately measure the quality of the learning experience in undergraduate education (Carnegie Foundation for the Advancement of Teaching, 1998; Kuh, 2008). Recent efforts in HIEPs have indicated higher perceived learning experiences for students across multiple curriculums. This study explores the use of four HIEPs at a U.S institution within their construction management program. If the value of HIEPs could be better understood, improvements may be possible in construction education.

Since 2014 the construction management program at Auburn University has had a strategic objective to “increase opportunities for students to have an enriching educational experience”. The program has been collecting participation rates in four HIEP’s offered by the program through a graduating senior exit survey. For the 10 semesters surveyed from Fall 2014 through Fall 2017, the high, low and average participation rates in HIEP’s are identified in Table 2.

Table 2: Participation Rates in HIEP’s

	% Participation Rate per Graduating Semester		
	High	Low	Average
High Impact Education Practice			
Construction Specific Service Learning Project	100%	89%	94%
Construction specific study abroad or international experience	70%	11%	31%
Competition Team	63%	20%	40%
Industry internship or co-op	100%	81%	89%

Results show that all the HIEPs have robust participation rates that do vary from semester to semester due to availability of activities.

The purpose of this study was to determine which of four HIEPs in use within an existing construction management program was perceived as the most valuable by the students. Further, the study sought to identify what elements of the HIEPs make the

experiences valuable and what opportunities may exist for improvement from the perspective of the students.

A survey was distributed to sixty graduating seniors in a construction management undergraduate program in the Fall of 2017. The sixty seniors represented the full population available for the study. Forty-eight responses were received. The subjects represented are a homogeneous group having completed the same undergraduate education program aiding in establishment of reliability of the study. Participation in the study was voluntary, and no compensation was provided for participating in the study.

Both quantitative and qualitative measures were used. Descriptive statistics determined which HIEP was highest ranked while qualitative measures were used to evaluate the open-ended questions regarding “what was valuable” and “what could we do differently”. Descriptive research is defined as the “procedures and measures by quantitative data” (Wiersma and Jurs, 2009). The study of education often includes descriptive research with measures of relationships being one common descriptive statistic (Merriam and Simpson, 2000). Qualitative measures of theme identification were used consistent with qualitative research (Ryan and Bernard, 2003).

The instrument used contained four questions:

Which “engaged educational experiences” did you participate in while in the Construction Management Program?

- Construction specific service learning project
- Construction specific study abroad or international experience
- Competition team
- Industry internship or co-op

For the experience in which you participated, force rank the programs in the order that they added value to your education

For the experience, you ranked as “#1”, why was is considered you top program?

What is one thing that we could do different that would enhance engaged educational experiences like the ones shown above?

Results reported initially include a percentage of students who forced ranked each HIEP in order of value to their education. Because not all forty-eight students experienced each HIEP, the sample size for each ranking is different. With multiple sample sizes for each activity, the data was normalized in an effort to judge whether the count was ‘high’ or ‘low’. This provided an appropriate basis for comparison. The normalization approach was simply to use a percentage basis of responses so the number of rankings in a specific HIEP was divided by the total number of people who participated in that HIEP.

The Borda count was then calculated for each HIEP. This approach determines the outcome of a winner of an election by giving each HIEP, for each vote, a number of points corresponding to the number of HIEPs ranked lower (Tsai, Hu and Ke, 2014). For this study, a point-based score of 1 was matched with a top ranking, .75 was matched with a 2nd ranking, .50 was matched with a 3rd ranking, and .25 was matched with a 4th ranking. This approach was consistent with Borda’s original proposal which bases the points on the total number of candidates in an election. The number of votes for each ranking was multiplied by the score, and these totals were added to determine a total point score for each HIEP. The HIEP with the most points is the winner. This approach tends to value broadly-acceptable options rather than those

dictated by the majority essentially making it a consensus-based system (Emerson, 2013).

For the open-ended questions in the survey, responses by students were coded by major theme as identified by the literature review for the five critical items that make HIEP especially effective:

- Theme #1-Require considerable time and effort on purposeful tasks
- Theme #2-Demand that students interact with faculty and peers over an extended period of time
- Theme #3-Connects students with diverse individuals
- Theme #4-Receive frequent feedback about their performance
- Theme #5-Allows students to see how what they are learning works in different settings and put the learning in perspective (on and off campus)

The principle investigator then went through the survey data and cut out all the quotes that pertained to each of the five major themes. Then, the other researcher confirmed the placement of quotes into the major themes identified. Quotes were then sorted by theme matching a common approach to identifying subthemes (Jehn and Doucet, 1996).

RESULTS

Figure 1 shows the results of the forty-eight people who participated in the study. All had completed a construction specific service learning project (48); 44 had completed an industry internship or co-op experience; 26 had competed on a competition team; and 16 had completed some type of international experience. Approximately 47 had completed two HIEPs, 26 had completed three HIEPs while 13 had completed four IEPs. The industry internship and the service learning project specific to construction were the top two experiences when forced ranked by the students.

Figure 1 shows a forced ranking of Construction Specific HIEPs:

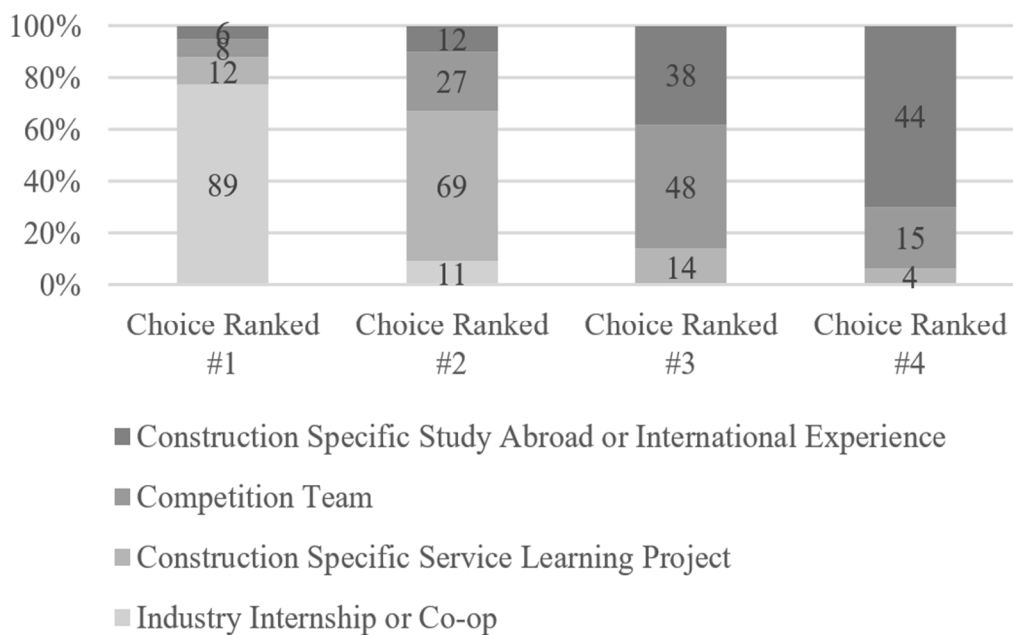


Figure 1: Forced Ranking of Construction Specific HIEPs

Table 3 shows the calculated Borda count for each construction specific HIEP. Essentially, this approach determines the winner in an election context by giving each

HIEP a number of points corresponding to the number of HIEPs ranked lower. This shows that the Industry Internship or Co-op is the most highly valued HIEP and that study abroad or international experience is valued least.

Table 3: Borda Count for Each Construction Specific HIEP

	Borda Count (Normalized)
Industry Internship or Co-op	.97
Construction Specific Service Learning Project	.72
Competition Team	.49
Construction Specific Study Abroad or International Experience	.31

For the qualitative data, connections were made from specific quotes of students to identified key criteria that make HIEPs especially effective:

- Theme #1-Require considerable time and effort on purposeful tasks
- Theme #2-Demand that students interact with faculty and peers over an extended period of time
- Theme #3-Connects students with diverse individuals
- Theme #4-Receive frequent feedback about their performance
- Theme #5-Allows students to see how what they are learning works in different settings and put the learning in perspective (on and off campus)

Students offered 47 comments regarding their HIEPs with 5 of the comments touching multiple themes. The analysis shows that students relate strongly to HIEP Theme #5 (45 occurrences) and moderately to Theme #2 (7 occurrences). One person connected with Theme #1. Examples of student comments and corresponding themes are shown in Table 4.

Table 4: Student Quotes Connected to Criteria that Make HIEPs Effective

Student Quote	Assigned Theme
I enjoyed working with my peers to build both a wood deck and an alligator pond. It helped build my problem solving and teamwork skills. (Service Learning)	Theme #2, Theme #5
It taught me specifics of learning how to design and develop a project as a group and use basic construction training practices and learn development sequences. (Service Learning)	Theme #2, Theme #5
Required you to apply what you learned in a more realistic “industry” like setting. Tested you because you’re on your own without a coach, and you have to work well with other people. They’re also great networking and travel opportunities. (Competition Teams)	Theme #2, Theme #5
Because I had 2-3 months contracted in the field, 10 hours a day, it showed me how the industry really played out. (Internship or co-op)	Theme #1, Theme #5
Learned the most in real world experiences. (Internship or co-op)	Theme #5

DISCUSSION AND CONCLUSIONS

A recent focus has been placed on HIEPs within undergraduate education. These activities demand considerable time and effort, facilitate learning outside the classroom, require meaningful interactions with others, encourage diverse collaboration, and provide frequent and substantial feedback to the students. As a professional degree, construction management is uniquely suited to make connections for HIEPs through connection with industry and the built environment. This study considers one U.S University’s attempt to determine which HIEP is perceived as most valuable by the students. Building on existing studies from the National Center for

Student Engagement which show students in all majors self-identify HIEPs with improved educational growth and professional competence, the study attempted to determine why the HIEP was deemed valuable and what opportunities exist for further improvement of HIEPs within Construction Management.

Over 80% of graduating students participated in at least two high impact experiences with “industry internship” and “service learning” being the most popular by total number of participants. Students in this study had no required internship as part of their curriculum but were required to complete two service learning construction oriented projects during their undergraduate studies. Students had at least two opportunities for study abroad during their curriculum. In addition, approximately 15 teams compete each year providing space for approximately 60 students (distributed over four classes of students).

The number of students participating in either competition teams or an international experience was substantially (on the order of 50% or more) lower than those engaged in internships or service learning. Barriers to international experiences and competition teams exist. Students reported concerns over cost of international experiences and for this study failed to connect the experience with their learning. The authors recognize that the impact of the study abroad experience through improved intercultural competencies and interpersonal accommodation may only be realized after some time. Also, students report a lack of understanding of both the availability to be on a competition team and a lack of opportunity. Many competition teams are limited to 4-6 people, and the costs of operating these teams is high limiting the number of teams in any single academic year.

Based on the Borda count, the students rank the internship or co-op as their top HIEP. While competitions and international experiences were viewed favourably, they were valued less than either internships or service learning. The high value placed on internships and service learning by the students is encouraging for the program as exit survey data shown in Table 1 confirms that this is where the greatest student participation in HIEP’s has occurred.

The qualitative responses also revealed some of the connections students make between HIEPs and identified key criteria that make HIEPs especially effective. Student comments revealed that clear connections are made with practices that demand interaction with others over an extended period of time and those activities that allow students to see how the material they have learned works in a variety of settings allowing them to put the learning in perspective. Students did not make connections with criteria that include requiring considerable time and effort on purposeful tasks, connecting students with diverse individuals, and receiving frequent feedback about their performance. Student’s failure to connect the length of time required for HIEPs may be due to how the time matches other non-HIEPs in which students participate. Results appear to indicate that opportunities for diverse experiences in current HIEPs may not exist at a significant level. Even with activities such as study abroad, no formal immersion with students with individuals with a diverse background occurred.

While the capstone experience the students participate in was not specifically addressed in this forced ranking, several students noted in the qualitative comments that they viewed it as a HIEP. Interestingly, they questioned why more specific HIEPs could not be included as part of the capstone experience. Study is needed to

determine what opportunities may exist and how those opportunities could best be delivered within the format of the capstone experience.

No formal connection currently exists between the HIEPs offered in the construction management curriculum and the learning outcomes defined by the program. Further work should seek to make a clearer connection so that direct and purposeful pathways may be defined for students and institutions. If a link could be established between HIEPs and specific learning outcomes, HIEPs could serve as means to fulfil and/or measure the outcome.

Currently, not all students have access to all HIEPs. Ideally, at least one HIEP would be available to every student at least once per year; every HIEP selected would be done at a high level. Additional work is needed to balance HIEPs across the curriculum, assure availability to all students, and accurately measure the level at which HIEPs are delivered. One way to do this would be to include measurement of changes in key knowledge, skills, and abilities before and after students engage in HIEPs.

For this program, HIEPs are being done above and beyond the typical undergraduate educational experience and are considered outside the parameters of what is formally required. Only one of the HIEPs considered was required, and that activity occurs in a specific class without focus on an overall learning outcome required of the student. Opportunities for enhancement of these opportunities exists, and research suggest this would improve the quality of education for all students. Construction management programs should make HIEPs a reality and a priority for every student.

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