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Assessing an Assessment: A Case Study of the NSSE 'Experiences with Information Literacy' Module

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Debbie Morrow currently serves as Liaison Librarian to the School of Engineering and the other units within the Padnos College of Engineering & Computing at Grand Valley State University, to the Mathematics, Statistics, and Physics departments, and to the Honors College at GVSU. In that position her primary role is to support students in courses in her liaison areas both in and outside of their classrooms. Helping students make connections between information literacy skills and the "life long learning" skills ABET seeks to see in engineering program graduates is an ongoing challenge. Prior to becoming a Liaison Librarian, Debbie served as Systems Librarian at GVSU and at Michigan Technological University for a combined 25 years. She earned her MLIS at the University of Illinois Urbana-Champaign in 1983.

Assessing an Assessment: A Case Study of the NSSE 'Experiences with Information Literacy' Topical Module

Abstract

This case study explores anomalous results from an administration of the 'Experiences with Information Literacy' (IL) add-on Topical Module to the National Survey of Student Engagement (NSSE) at Grand Valley State University (Allendale, Michigan) in 2016, and finds that wording of NSSE survey questions can significantly influence results in certain contexts. Overall, summary responses for participating students compared positively to the aggregate means for all participating Large Public institutions in the 2016 NSSE cohort, on both the core NSSE survey and the IL module. However, analysis of local responses to the IL module questions broken out by individual colleges within the university revealed an anomaly. Students in GVSU's College of Engineering and Computing appeared to report very low engagement on nearly all of the items in the IL module; further disaggregated into separate programs comprising the college, data appeared to perhaps indicate that Engineering students' educational experience with respect to information literacy learning at GVSU is qualitatively different from that of their peers in other academic and professional disciplines, even within their own college, which also includes Computer Science and Occupational Safety and Health. In 2018 Senior GVSU Engineering majors received a modified NSSE-IL survey (with permission obtained from NSSE), to explore whether Senior GVSU Engineering majors may be graduating with lesser information literacy learning preparation than other GVSU graduates. Results suggest that revising NSSE-IL framing questions does result in some significant changes in rates of certain responses, some tending in a positive direction toward the institutional mean, others tending negatively away from it. We conclude that NSSE-IL in 2016 has in fact allowed us to observe an anomaly, that Seniors in one specific program do not share a perception of information literacy experiences in common with their peers in other programs at the same institution; this, in spite of wording in the survey instrument that includes built-in assumptions that, taken at face value, could have led to an inaccurate or misleading profile of GVSU Engineering graduates' experience.

Introduction

Higher education in the twenty first century is increasingly driven to engage in continuous improvement cycles toward goals of delivering an excellent educational experience, effective learning, and well-prepared graduates [1]. Assessment of every aspect of curricular, co-curricular, and larger educational environmental aspects is the norm. Evidence-based decision-making leads those working in every aspect of higher education today to seek out or devise assessment tools and plans to observe efficacy and introduce well-considered evidence-based changes where room for improvement in outcomes seems indicated. The National Survey of Student Engagement, or NSSE, is a widely applied instrument in the U.S. and Canada. NSSE allows participating institutions to get a periodic high-level snapshot of how their incoming First-year and near-graduation (Senior) students compare to one another, and compare to those from other similar institutions, in their self-perceptions of educational engagement in an assortment of

experiential categories. There is also the option to disaggregate and analyze the data gathered at one's own institution and examine it for patterns and variations between both curricular and co-curricular programs. At Grand Valley State University in 2016 a potential room-for-improvement flag appeared to be raised when upper-division students (but not First-year students) in one program, the School of Engineering, reported engagement with aspects of information literacy (IL) well below the mean for Senior peers in all other GVSU programs and colleges. In an exploratory discussion with the Dean of the College of Engineering and Computing, questions were posed. Are GVSU Engineering majors in fact significantly less exposed to, and engaged with, information literacy learning experiences than all other GVSU students near the time of graduation? Or, is it perhaps something about the instrument used to elicit their survey responses that is delivering an anomalous result? Following is a review of literature related to NSSE and the 'Experiences with Information Literacy' NSSE add-on Topical Module (hereafter NSSE-IL), and a case study exploring the IL module as it relates to GVSU Senior Engineering students' lived college experiences in their major as they approach graduation. The purpose of the study is to discern whether the wording of NSSE-IL fails to capture an accurate profile of students' IL experience in one very specific program context.

Background and literature review

National Survey of Student Engagement (NSSE)

NSSE's origins lie in discussions and studies undertaken in the late 1990s as an initiative of The Pew Charitable Trusts, with its first full-scale administration in 2000 [2], [3]. In a report entitled *Promoting Engagement for All Students: The Imperative to Look Within – 2008 Results*, NSSE Director Alexander C. McCormick observed, "A robust finding from decades of research on college students holds that student experiences and outcomes are more varied among students within institutions than among institutions" [4]. A theme developed throughout the 52-page report is that NSSE data should not simply use summary institutional results to compare one's own institution to others. Rather, real value can come from examining the raw data to "look within," with the goal of better understanding the range of experience and perceptions among students obtaining a college education together within the same institution. Head *et al.* [5] have recently labelled this as a distinction between "macro" assessment, comparisons among institutions, e.g. the NSSE participants comprising the cohort for one year; and "meso" assessment, analysis of variations within one institution and among its programs.

A general update to the original NSSE survey was developed and first administered in 2013, streamlining the original instrument to a core set of prompts, and offering an initial suite of add-on Topical Modules from which each participating institution could optionally append up to two in a given year [6]. Topical Modules were conceived as short sets of prompts eliciting feedback on student engagement in areas such as Civic Engagement, Experiences with Writing, and Learning with Technology to name a few in the original suite.

Information literacy as a NSSE component

George Kuh, of the original NSSE design team, and research analyst Robert Gonyea, who joined the NSSE project in 1999, conducted a study presented at the ACRL Eleventh National

Conference in 2003, in which they focused specifically on "The Role of the Academic Library in Promoting Student Engagement in Learning" [7]. Kuh and Gonyea describe predecessor assessments to NSSE that included a Library Experiences Scale and an Information Literacy Scale. In 2004 a College Student Surveys Project, formed by the Executive Committee of the Institute for Information Literacy, targeted NSSE as the best survey of student engagement for attempting to assess student engagement with information literacy, because of NSSE's widespread administration in the most colleges and universities [8]. NSSE itself did not originally, and does not now, include IL explicitly in its core survey. With close examination of existing NSSE questions relating at least obliquely to IL behaviors, and input from academic librarians and library and information science (LIS) educators, 10 IL items were added experimentally to the 2006 NSSE; the IL items were not permanently incorporated into NSSE due to a concern for the overall length of the NSSE survey instrument [8]. Boruff-Jones *et al*. [8] report that the goals for an Information Literacy module, in any form, would include assessing engagement in practices associated with information literacy, alignment of survey items with national information literacy standards, and assisting in the assessment efforts of postsecondary libraries.

Development of an information literacy module became focused on fitting within the criteria for the new NSSE Topical Modules. The first experimental version of a NSSE-IL module was tested in 2013, and the first official administration was taken by nearly 53,000 students at 84 U.S. and Canadian institutions in 2014 [9]. Overall results of the 2013 trial suggested that while faculty are perceived by their students as emphasizing the development of information literacy skills and practices, those teachings don't necessarily translate into student actions [9]. Such findings support efforts to develop improved information literacy instruction approaches. Zoellner [10] analyzes publicly available (institution-level summary) data for NSSE-IL from 2014 and 2015, identifying statistically significant differences between responses of First-year and Senior students, and finding behaviors requiring higher-order thinking to be the least frequently exhibited for both groups. Fosnacht [11] further explores NSSE-IL and draws findings from a latent class analysis of responses from a large sub-set of the 2014 students comprising First-year students only, concluding that the results are in alignment with prior research indicating that First-year students enter college with a considerable range of information literacy proficiency. In another study, Fosnacht [12] makes a detailed analysis of the 2014 and 2015 NSSE-IL data from 44,700 Seniors, and concludes that NSSE-IL is a psychometrically valid instrument for assessing students' engagement with information literacy principles and practices.

NSSE 'Experiences with Information Literacy' Topical Module

In its initial form, NSSE-IL included 14 response items, a modest, and optional, addition to the approximately 80 experiential and 30 demographic items in the core survey instrument. The structure of NSSE-IL uses two framing questions, each with multiple response items in the form of 4-point Likert scales, and a final summative question with a 4-point Likert scale for response. Framing question (1.) is, "During the current school year, about how often have you done the following?" Eight items, (a.)-(h.), offer the response options *Never, Sometimes, Often, Very Often* to prompts such as "a. Completed an assignment that used an information source (book, article, website, etc.) other than required course readings." Framing question (2.) is, "During the school year, how much have your instructors emphasized the following?" Five items, (a.)-(e.),

offer the response options *Very little, Some, Quite a bit, Very Much* to prompts such as "a. Not plagiarizing another's work." Summative question (3.) asks, "How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?" Response options are *Very little, Some, Quite a bit, Very Much.* Values associated with the Likert scale options in all cases range from 1 on the *Never/Very little* end to 4 on the *Very Often/Very much* end. Compiled data is presented in the form of means calculated from the assigned values, where a value of, for example, 3.35 would indicate that respondents as a group tended to select the *Often/Quite a bit* Likert scale option for that item.

It is noted here that an Association of College and Research Libraries (ACRL) task force was convened in 2019 to consider changes to NSSE-IL that would "better align with the ACRL Framework for Information Literacy in Higher Education" [13], the most recent expression of higher education information literacy standards at the national level.[1] This NSSE-IL case study, focused on GVSU close-to-graduation Engineering majors (Seniors), involves only the original 2014-2019 version of the IL module, and probes elements of the instrument that remain essentially constant in the newer version.

No studies have been identified reporting on analysis of locally disaggregated NSSE-IL data with respect to measuring self-perceptions of information literacy experiences and behaviors of First-year students or Senior majors in any discipline, including engineering. Just one study was identified using NSSE survey data prior to 2010 to compare first-year and fourth-year undergraduate experiences of Engineering majors to all other majors [14]; as this was prior to introduction of the revised NSSE core and Topical Modules in 2013, information literacy behaviors are not addressed as such at all. Thus, as a case study, the present study attempts to probe an area of common concern among engineering librarians in colleges and universities, and to understand what can and cannot accurately be learned from the NSSE-IL module regarding Engineering students' IL experiences in one particular context.

NSSE and NSSE-IL at GVSU

NSSE has been administered at GVSU periodically since 2005, generally every three years. Per NSSE protocol, the survey is administered in the first half of the calendar year; at GVSU, the survey is open for 5-6 weeks during February-March. Per protocol, students invited to participate are first-year undergraduates in their second semester of college and undergraduates in their final semester before graduation. While completing a Bachelor's degree in eight fall-winter academic semesters over four years is the ideal, not every student is able to fit that pattern, and not every higher educational curriculum is configured in this traditional mold. Thus, each participating institution has some latitude to define the population that will comprise their pool of invited students, applying criteria such as defining "graduating Senior" status by using credits completed as a proxy. GVSU used the following as parameters in 2016 for identifying first-year and near-

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[1] The revised NSSE-IL survey is being piloted in winter/early spring 2020. The overall structure of the module remains unchanged, though several items (e.g. "k. Identified information that was biased, misleading, or deceptive") are added under question (1.), and question (3.) prompts for responses to distinct items (a.)-(c.). The added prompts probe the use of social media as sources, and the practice of rigorous critical evaluation of information for credibility. These are concerns that are integral to the ACRL Framework for Information Literacy, that have escalated in information literacy significance in the years since 2014, and that are realities acknowledged and presaged by Fosnacht [9].

graduation students as the population invited to participate: First year students were defined as enrolled degree-seeking students since Fall 2015, with fewer than 24 earned credit hours; Senior students were degree-seeking students enrolled for both Fall 2015 and Winter 2016, with at least 110 earned credit hours [15]. Same or similar criteria have been applied in all triennial NSSE deployments at GVSU.

The NSSE-IL module was newly available in 2014, and the GVSU University Libraries expressed strong interest and support for including this new module in an upcoming iteration of NSSE in order to inform our IL program development efforts. University Institutional Analysis solicited stakeholder input during Fall 2015, and the IL module was eventually selected for inclusion in the scheduled 2016 survey of GVSU students. NSSE was next administered in 2019, and NSSE-IL was not selected for inclusion that year. Thus, there is to date only one GVSU institution-wide set of NSSE-IL data.

At the institution level, among Large Public institutions participating in NSSE-IL in 2016 (n=23), GVSU Senior students' averages were on par with or significantly above the group average (p<.05), with an effect size approaching or exceeding .3 in size, on 13 out of 14 response items [16]. At this macro level of assessment, the institution could presumably conclude that its general education and disciplinary curricula collectively are at least moderately successful in engaging students in information literacy experiences, as compared to the aggregated Large Public institutions also administering NSSE-IL in 2016. What Head *et al.* [5] define as macro assessments, including NSSE and the add-on modules, are those that allow for comparisons across multiple institutions, and enable benchmarking or comparing impact of same interventions across different institutions, for example within a consortium or other geographical affiliation. At the cross-institution level, however, little can be discerned about the efficacy of different programs or curricula within any one institution. To address a goal of, for example, validating the need for IL instruction within a range of classes or programs in an institution, meso-level assessment uses data from a variety of tools and methods and analyzes for correlations to retention, GPA, etc.[5].

The GVSU Office of Institutional Analysis provided the University Libraries with a breakdown of GVSU 2016 NSSE-IL data by the colleges comprising the university. Among the seven disciplinary colleges, responses by Senior students in each college on all fourteen response items were on par with or statistically significantly above the overall GVSU institutional average (p<.05), with an effect size approaching or exceeding .3 in size in most cases, with one dramatically outstanding exception, the Seniors in the College of Engineering and Computing (CEC), as illustrated in Table 1 below. Numbers in cells represent the means of the numeric values from 1-4, assigned to the Likert scale options, for the respondents from each college and GVSU as a whole (columns). The shaded cells represent statistically significant differences above or below the GVSU mean, denoted by plus (+) or minus (-) signs shown below the mean in that cell.

Table 1. 2016 NSSE-IL summary of Seniors by GVSU Disciplinary Colleges[2]

	CEC	CCPS	COE	CHP	CLAS	CON	SCB	GVSU
# of responses	n=83	n=81	n=148	n=71	n=250	n=54	n=119	N=878
1. During the current school year, about how often have you done the following? . . .								
a. Completed an assignment that used an information source (book, article, website, etc.) other than required course readings	2.99 -	3.59 +	3.26	3.32	3.36	3.39	3.26	3.35
b. Worked on a paper or project that had multiple smaller assignments such as an outline, annotated bibliography, rough draft, etc.	2.58 -	2.95	3.08	3.1	3.09	2.91	2.94	2.99
c. Received feedback from an instructor that improved your use of information resources (source selection, proper citation, etc.)	2.52 -	2.88	2.92	2.92	2.98 +	2.75	2.76	2.86
d. Completed an assignment that used the library's electronic collection of articles, books, and journals (JSTOR, EBSCO, LexisNexis, ProQuest, etc.)	2.03 -	3.29	3.12	3.32 +	3.18 +	3.18	2.77 -	3.06
e. Decided not to use an information source in a course assignment due to its questionable quality	2.34	2.31	2.28	2.1	2.3	2.09	2.29	2.26
f. Changed the focus of a paper or project based on information you found while researching the topic	2.03 -	2.6	2.43	2.38	2.46	2.5	2.24	2.4
g. Looked for a reference that was cited in something you read	2.34 -	2.83	2.53	2.73	2.61	2.59	2.57	2.66
h. identified how a book, article, or creative work has contributed to a field of study	2.00 -	2.56	2.52	2.42	2.53	2.41	2.31	2.42
2. During the current school year, how much have your instructors emphasized the following? . . .								
a. Not plagiarizing another author's work	3.15 -	3.26	3.3	3.65 +	3.4	3.86 +	3.37	3.43
b. Appropriately citing the sources used in a paper or project	2.74 -	3.52	3.39	3.65 +	3.42	3.75 +	3.34	3.41
c. Using scholarly or peer-reviewed sources in your course assignments	2.88 -	3.5	3.48	3.77 +	3.54	3.77 +	3.31 -	3.5
d. Questioning the quality of information sources	2.71 -	3.07	3.02	3.05	3.07	361 +	2.9	3.07
e. Using practices (terminology, methods, writing style, etc.) of a specific major or field of study	3.18	3.12	3.04 -	3.4 +	3.11	3.57 +	2.91	3.19
3. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?								
	3.25	3.29	3.27	3.57 +	3.34	3.52	3.18	3.33

The College of Engineering and Computing comprises three (ABET accredited) programs, the School of Engineering (SOE), the School of Computing and Information Systems (CIS), and an Occupational Safety and Health Management program (OSH). Institutional Analysis was able to provide a further breakdown of NSSE-IL results from Seniors by respondents' reported majors within the college as compared with the overall institutional averages for Seniors; the results are illustrated in Table 2.

Table 2. 2016 NSSE-IL summary of Seniors by programs within the College of Engineering and Computing (COE) compared with GVSU Seniors overall

	SOE	CIS	OSH	GVSU
# of responses	n=50	n=28	n=6	N=878
1. During the current school year, about how often have you done the following?...				
a. Completed an assignment that used an information source (book, article, website, etc.) other than required course readings	3.05 -	2.95	2.00 -	3.35
b. Worked on a paper or project that had multiple smaller assignments such as an outline, annotated bibliography, rough draft, etc.	2.68 -	2.48 -	1.67 -	2.99
c. Received feedback from an instructor that improved your use of information resources (source selection, proper citation, etc.)	2.59 -	2.38 -	2.33	2.86
d. Completed an assignment that used the library's electronic collection of articles, books, and journals (JSTOR, EBSCO, LexisNexis, ProQuest, etc.)	2.09 -	1.95 -	1.67 -	3.06
e. Decided not to use an information source in a course assignment due to its questionable quality	2.30	2.43	2.00	2.26
f. Changed the focus of a paper or project based on information you found while researching the topic	1.89 -	2.24	2.67	2.40
g. Looked for a reference that was cited in something you read	2.32 -	2.38	2.33	2.66
h. identified how a book, article, or creative work has contributed to a field of study	2.05 -	1.91 -	1.67	2.42
2. During the current school year, how much have your instructors emphasized the following?...				
a. Not plagiarizing another author's work	3.11 -	3.29	2.67	3.43
b. Appropriately citing the sources used in a paper or project	2.64 -	2.95 -	3.00 -	3.41
c. Using scholarly or peer-reviewed sources in your course assignments	2.75 -	3.10	3.33	3.50
d. Questioning the quality of information sources	2.59 -	2.90	3.00	3.07
e. Using practices (terminology, methods, writing style, etc.) of a specific major or field of study	3.25	3.10	2.33	3.19
3. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?				
	3.21	3.38	3.33	3.33

Across all three program areas, responses at best were within a standard deviation of the institutional mean for an item, and sometimes significantly below the overall means for the university's Seniors. Among the programs in this college no response items were significantly above the institutional mean. Leading the group with multiple significantly below-mean responses, on 11 out of 14 items, was the School of Engineering (SOE). However, the response to the final NSSE-IL module item, "How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?", confounded what appeared to be a concerning low level of experiences with application of information literacy concepts within the College of Engineering and Computing's programs. As illustrated in Table 2, CEC Seniors in all three of the college's programs responded to this prompt firmly in the *Quite a bit* range, similar to all GVSU Seniors in the aggregate. This disparity between reported behavior (question (1) and (2) items) and summative perception of preparedness (question (3) responses) prompted a closer examination of the context of Engineering majors and their curriculum, to ascertain what factors might explain very negative appearing self-reports unique to one specific group or disciplinary program. This study focuses only on the School of Engineering, in part because of the very unique profile it presented, and in part because of different expectations regarding information literacy in computer science education and the extremely small number of students in the OSH program.

General Education and engineering curriculum characteristics at GVSU

GVSU is a comparatively young institution, chartered in 1960 with the goal of providing four-year public higher education in the state's second largest metropolitan region [17]. Areas of stability and growth for the university from earliest days were, on one hand, a foundation in principles of liberal education, and on the other, providing professional education in support of needs expressed by various industries and services in the area. A thriving engineering and manufacturing environment in the region suggested a demand for engineering graduates; by the mid-1980s an engineering degree program that included a co-operative paid internship partnership with local businesses was established. The School of Engineering is relatively small, within an institution of 26,000 students; it comprises fewer than 1000 pre-engineering, Bachelor of Science in Engineering (BSE), and Master of Science in Engineering (MSE) students. In recent years there are typically 120-150 Seniors graduating annually. The School offers five engineering emphases as majors, but is not segmented into deeply siloed separate departments.

As First-year students, prospective Engineering majors must complete a series of foundational courses within and outside of the School of Engineering before they can apply for full (or "secondary") admission as Engineering majors. All things being equal, fully admitted Engineering students begin their major in earnest with Co-op 1 during the Spring/Summer term ending their Sophomore year, and then alternate co-op semesters with conventional classroom/lab semesters through the Fall of the Senior year. The degree program is completed with a two-semester capstone sequence, Senior Design 1 (Winter) and 2 (Spring/Summer). For more than thirty years a mandatory three-semester co-op requirement has become a hallmark of GVSU's BSE programs, providing a full year of direct hands-on experiential learning in the field, ideally with the same employer and increasing levels of responsibility, at the undergraduate level. Likewise, the two semesters of Senior Design comprise actual industry-sponsored projects

with deliverables, that are assigned to multi-disciplinary teams of 4-6 students. Teams must research and develop solutions, get sponsor approval, complete building and testing, and receive sponsor sign-off to graduate. At the same time, completing any undergraduate degree at GVSU requires successfully fulfilling requirements in a Writing Across the Curriculum program and the General Education program. Students in professional programs such as engineering, nursing, social work, etc. are not exempted from elements of a liberal education. Table 3 shows the structure of the Engineering program; what isn't evident from the table is that 1st-4th year in Engineering may actually be the second through fifth year of a student's time in college, depending on whether they are calculus-ready at matriculation, and succeed along the way in carrying full course loads to meet requirements in and outside of the Engineering curriculum.

Table 3. GVSU School of Engineering curriculum structure

	Fall (Sep.-Dec.)	Winter (Jan.-Apr.)	Spring/Summer (May-Aug.)
1st year	Foundational Courses	Foundational Courses	
2nd year	Foundational Courses	Foundational Courses	*secondary admission to SOE **Co-op 1**
3rd year	Program Courses	**Co-op 2**	Program Courses
4th year	**Co-op 3**	Program Courses & **Senior Design 1**	Program Courses & **Senior Design 2**

Thus, for prospective engineering majors and for the students who have met requirements for full secondary admission to the Engineering degree program, there is a constant tension between the intensive demands of any engineering curriculum - math, statistics, physics, chemistry, an array of engineering courses varying by engineering emphasis - and fitting in general education courses likely to be in areas of the humanities and social sciences, and at times doubling as one of two required writing-intensive 'Supplemental Writing Skills' courses. The inclusion of three semesters dedicated to mandatory fulltime paid and credit-bearing co-op employment means that Engineering majors are in school year-round for their final three years in college. The minimum earned hours to complete a BA or BS at GVSU is 120, and the median is 124. In contrast, GVSU BSE degree graduates average over 150 earned credits [15], and have completed twelve months of on-the-job co-op experience.

In examining the administration of NSSE at GVSU, and considering the particular characteristics of the curricular trajectory for GVSU's engineering majors, in particular those who would have been offered the invitation to respond to the survey as "Seniors," two points of interest came to light. First, NSSE is administered to students at participating institutions in a given year based on lists selected by each institution of their First-year and Senior students; the objective is to gather data early in students' college careers and as they approach graduation. At GVSU (and probably many other institutions within a certain niche) it isn't always accurate to assume that someone in their eighth semester since enrollment is necessarily about to graduate, so the list of GVSU Seniors comprises all students who have completed 110 credits. As indicated previously, the Engineering curriculum requires completion of an unusually high number of credits to earn the BSE degree; an Engineering student with 110 credits completed very likely is still three to four

semesters from graduating. Second, NSSE is administered at participating institutions in a given year during Winter/Early Spring, purportedly in a Senior student's final semester. An Engineering major who is, in fact, in their final Senior Design Project sequence in Winter semester, has typically spent the previous (i.e. Fall) semester in their Co-op 3 rotation, on the job 40-50 hours per week, and not in a lecture-discussion based classroom. These two realities are not emulated in the same way in the other College of Engineering and Computing programs, or in any other curricula across the university.

Case Study

Research questions

In an attempt to evaluate more meaningfully the actual experiences with information literacy of GVSU School of Engineering majors nearing completion of a BSE degree, the following research questions, RQ1-RQ3, were posed with respect to administration of the NSSE-IL instrument at this institution:

- RQ1: If the population of GVSU's Engineering Seniors was defined as Engineering majors *in their final semester of their capstone sequence* would the results differ significantly from the original 2016 Engineering Senior student responses?

- RQ2: If the *time frame focus of NSSE-IL questions (1) and (2) was changed* to accommodate the unusual classroom schedules of GVSU's Engineering majors would the results differ significantly from the original 2016 Engineering Senior student responses?

- RQ3: If asked directly about *using information in their major*, would the results differ significantly from 2016 GVSU Engineering Senior student responses to NSSE-IL question (3)?

Methodology

The NSSE Experiences with Information Literacy module, along with current and previous iterations of the core NSSE survey and all add-on modules, are available for viewing on the NSSE website [18]. The original NSSE-IL module administered at GVSU in 2016 included questions with prompts soliciting a total of 14 responses, described previously, and summarized in Table 4 below.

Table 4. Summary of NSSE-IL Topical Module (2016 version)

Question	# Response items	Likert scale response options
1. During the current school year, about how often have you done the following?	8 response items, a.-h.	Never (1), Sometimes (2), Often (3), Very Often (4)
2. During the current school year, how much have your instructors emphasized the following?	5 response items, a.-e.	Very little (1), Some (2), Quite a bit (3), Very Much (4)
3. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?	1 response item, no sub-prompts.	Very little (1), Some (2), Quite a bit (3), Very Much (4)

One clear problem point for eliciting meaningful input from Engineering majors close to graduating is the question frame, "During the current school year…" for all of the behaviors and perceptions prompts, i.e. question frames (1) and (2). Across the university, "the current school year" comprises Fall and Winter semesters, with a Spring/Summer term rounding out the school year. Institution wide, Spring/Summer enrollment is characteristically much lower than for the Fall-Winter academic year, with students using the summer months to find paid work or engage in internships. For fully-admitted Engineering majors Spring/Summer terms become fully part of their school years for three years, and are considered part of the school year that follows the preceding Fall and Winter semesters; a new school year begins in Fall. For Senior Engineering majors invited to participate in NSSE in February-March, they have just returned from Co-op 3 during the Fall, and their classroom time for the "current school year" has been approximately six weeks. So NSSE-IL questions (1) and (2), prompting for "how much" and "how often" responses logically elicit perceptions of a low level of occurrence.

The School of Engineering's program is rigorous, and carries an unusually high earned credit requirement to complete a BSE. GVSU's Engineering majors have a gratifyingly high rate of immediate employment upon graduation, and recent alumni receive largely positive evaluations from industry employers in periodic surveys. Recognizing these facts, it seemed worthwhile to discern to what extent the NSSE-IL module might be failing to adequately represent the perceptions of Senior Engineering majors regarding IL experiences in comparison to their peers in every other GVSU college. Permission was licensed from NSSE for modification and limited local administration of the 2016 'Experiences with Information Literacy' Topical Module.

The dean of the GVSU College of Engineering and Computing gave approval to survey a deliberately defined group of Engineering students in 2018 for the purposes of generating responses that could be compared to those of Engineering students responding to NSSE-IL in 2016. Administration and NSSE-IL modifications included:

- Survey invitees to include only, and all, May 2018-enrolled students in Engineering Senior Design Project 2 (N=126), the final Senior capstone course for completing a GVSU BSE degree (addresses RQ1)
- Survey to be administered in June 2018, midway into the final semester for the cohort of Senior Engineering majors nearing graduation (addresses RQ1)
- Survey framing questions altered to reflect the unique structure of the School of Engineering's curriculum, including the mandatory three-semester co-op rotation (addresses RQ2, RQ3)
- Note: no changes occurred in the overall curriculum structure or course requirements between 2016 and 2018 relating in any manner to the focus of the research questions RQ1-RQ3 or the NSSE-IL revision parameters applied locally in 2018.

 A comparison between the original instrument prompts and the locally revised version for this study is provided in Table 5. Italicized words and phrases in the 2018 revised survey questions and item prompts indicate revised wordings.

Table 5. Prompts in 2016 NSSE-IL Module and 2018 GVSU-Revised NSSE-IL Module

2016 NSSE-IL wording	2018 GVSU-Revised NSSE-IL wording
1. During the current school year, about how often have you done the following?	**1.** *Since full (secondary) admission to the GVSU School of Engineering,* **about how often have you done the following** *in your EGR courses?*
a. Completed an assignment that used an information source (book, article, website, etc.) other than required course readings	a. [no revision]
b. Worked on a paper or project that had multiple smaller assignments such as an outline, annotated bibliography, rough draft, etc.	b. [no revision]
c. Received feedback from an instructor that improved your use of information resources (source selection, proper citation, etc.)	c. [no revision]
d. Completed an assignment that used the library's electronic collection of articles, books, and journals (JSTOR, EBSCO, LexisNexis, ProQuest, etc.)	d. Completed an assignment that used the library's electronic collection of articles, books, and journals (JSTOR, EBSCO, *Knovel*, ProQuest, etc.)
e. Decided not to use an information source in a course assignment due to its questionable quality	e. [no revision]
f. Changed the focus of a paper or project based on information you found while researching the topic	f. [no revision]
g. Looked for a reference that was cited in something you read	g. [no revision]
h. identified how a book, article, or creative work has contributed to a field of study	h. [no revision]
2. During the current school year, how much have your instructors emphasized the following?	**2.** *Since full (secondary) admission to the GVSU School of Engineering,* **how much have your instructors emphasized the following** *in your EGR courses?*
a. Not plagiarizing another author's work	a. [no revision]
b. Appropriately citing the sources used in a paper or project	b. [no revision]
c. Using scholarly or peer-reviewed sources in your course assignments	c. [no revision]
d. Questioning the quality of information sources	d. [no revision]
e. Using practices (terminology, methods, writing style, etc.) of a specific major or field of study	e. Using practices (terminology, methods, writing style, etc.) of *your* specific major or field of study
3. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?	**3rev. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information** *in your major* **effectively?**

The NSSE-IL revisions were pretested among several colleagues and non-engineering-major library student employees for clarity. The survey was created in Qualtrics, and distribution was managed by the GVSU Office of Institutional Analysis. The survey was open for four weeks, and invitees received one invitation and two follow-up reminders.

Data analysis

NSSE-IL data from 2016 included 44 usable responses by Senior Engineering majors, where at least 110 completed credits served as a proxy for Senior-near-graduation status (N=50, 88% response rate). Participants in the locally modified NSSE-IL contributed 31 usable responses (N=126, 27% response rate). To maximize the ability to observe any statistically real differences between the small cohorts, the four response levels for each question (*Never* or *Very little*, *Sometimes* or *Some*, *Often* or *Quite a bit*, and *Very Often* or *Very much*) were collapsed into two categories, *Never/Sometimes* and *Often/Very Often*. These two response categories were then analyzed against 2016 (NSSE-IL) and 2018 (GVSU-revised NSSE-IL) survey responses. Frequencies and percentages were found for each response category in each year. Chi-Square tests were performed for each question to determine whether the responses to the survey were dependent on the year the survey was taken. A comparison between the *Often/Very Often* percentages in 2016 and 2018 is summarized in Table 6 below. Where there is statistically sufficient evidence of a real positive or negative change in response selections, the Probability column notes the p-value and direction of change. Table 7 illustrates the change directions between the 2016 (NSSE-IL) and 2018 (GVSU-revised NSSE-IL) responses with respect to responses by GVSU Seniors overall in 2016.

Table 6. Comparison: Response frequencies on 2016 NSSE-IL Module and 2018 GVSU-Revised NSSE-IL Module – GVSU Engineering Seniors

2016 NSSE-IL (n=44)	Percent Very often/Often	2018 GVSU-Revised NSSE-IL (n=31)	Percent Very often/Often	Prob-ability
1. During the current school year, about how often have you done the following?		**1. Since full (secondary) admission to the GVSU School of Engineering, about how often have you done the following in your EGR courses?**		
a. Completed an assignment that used an information source (book, article, website, etc.) other than required course readings	67.44	*a. no revision*	45.16	
b. Worked on a paper or project that had multiple smaller assignments such as an outline, annotated bibliography, rough draft, etc.	52.27	*b. no revision*	64.52	
c. Received feedback from an instructor that improved your use of information resources (source selection, proper citation, etc.)	45.45	*c. no revision*	67.74	
d. Completed an assignment that used the library's electronic collection of articles, books, and journals (JSTOR, EBSCO, LexisNexis, ProQuest, etc.)	32.56	d. Completed an assignment that used the library's electronic collection of articles, books, and journals (JSTOR, EBSCO, Knovel, ProQuest, etc.)	77.42	0.0001 +
e. Decided not to use an information source in a course assignment due to its questionable quality	40.91	*e. no revision*	77.42	0.0017 +
f. Changed the focus of a paper or project based on information you found while researching the topic	27.27	*f. no revision*	70.97	0.0002 +
g. Looked for a reference that was cited in something you read	38.64	*g. no revision*	70.97	0.0058 +
h. Identified how a book, article, or creative work has contributed to a field of study	32.56	*h. no revision*	80.65	<.0001 +
Table 6 continues…				

Table 6. Comparison… (continued)				
2. During the current school year, how much have your instructors emphasized the following?		**2. Since full (secondary) admission to the GVSU School of Engineering, how much have your instructors emphasized the following in your EGR courses?**		
a. Not plagiarizing another author's work	77.27	*a. no revision*	30.00	<.0001 -
b. Appropriately citing the sources used in a paper or project	56.82	*b. no revision*	50.00	
c. Using scholarly or peer-reviewed sources in your course assignments	61.36	*c. no revision*	41.38	
d. Questioning the quality of information sources	56.82	*d. no revision*	66.67	
e. Using practices (terminology, methods, writing style, etc.) of a specific major or field of study	77.27	e. Using practices (terminology, methods, writing style, etc.) of your specific major or field of study	40.00	0.0012 -
3. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information effectively?	84.09	**3rev. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information in your major effectively?**	36.67	<.0001 -

Table 7. Illustration of changes between GVSU Engineering Seniors in 2016 and 2018rev. estimated with respect to 2016 GVSU Seniors overall

NSSE-IL item	SOE Sr 2016		NSSE-IL rev. item	SOE Sr 2018rev
1.a.	-		1.a.	-
1.b.	-		1.b.	-
1.c.	-		1.c.	-
1.d.	-		1.d.	=
1.e.	=		1.e.	=
1.f.	-		1.f.	=
1.g.	-		1.g.	=
1.h	-		1.h	=
2.a.	-		2.a.	-
2.b.	-		2.b.	-
2.c.	-		2.c.	-
2.d.	-		2.d.	-
2.e.	=		2.e.	-
3.	=		3rev.	-

Key:	=	Statistically similar to 2016 GVSU Seniors overall
	-	Significantly below 2016 GVSU Seniors overall
	-	Significantly below 2016 GVSU Engineering Seniors

Discussion

Overall, out of 13 total response prompts for questions (1) and (2), six prompts elicited no evidence of a significant change in responses between the two survey groups. Another five items, all in the question (1) prompt group, showed evidence of an increased proportion of *Very Often/Often* responses in 2018 over 2016. Two items, both in the question (2) prompt group, showed evidence of a decreased proportion of *Very often/Often* responses, as did a comparison between 2016 responses to question (3) and the 2018 modified question (3rev).

Research question RQ1 asked, "If the population of GVSU's Engineering Seniors were defined as Engineering majors *in their final semester of their capstone sequence* would the results differ significantly from the original 2016 Engineering Senior student responses?" RQ1 is only answered in broad terms. By design, 2018 data are generated entirely and only by near-to-graduating Seniors, whereas in 2016 Engineering "Seniors" who responded were a less homogenous group with respect to probable time-to-graduation. Differences from 2016 to 2018 in the rate of *Very often/Often* responses occurred about half of the time, some positively and some negatively, but the shifts cannot readily be attributed only to more specifically targeting the participant population. Nevertheless, it is the case that Engineering Seniors in their final semester

(2018) did respond differently than a sample of Engineering majors with possibly only 110 credits of an eventual 150+ completed (2016). Future meso assessments of IL experiences of Engineering Seniors cannot rely on macro NSSE-IL data for meaningful assessment.

Research question RQ2 asked, "If the *time frame focus of NSSE-IL questions (1) and (2) were changed* to accommodate the unusual classroom schedules of GVSU's Engineering majors would the results differ significantly from the original 2016 Engineering Senior student responses?" The indication inferred from the data is confirmation in the affirmative of RQ2, that posing a different frame appears to result in some meaningfully different student responses to the prompt items. Revising the how-often/how-much framing questions to encompass the entire time spent in major (3+ years) and focusing specifically on courses in the major (rather than all classes including those outside of the major and only "in the current school year"), leads to some significantly different response rates to half (6 of 13) of the items in questions (1) and (2) compared to those from the official NSSE-IL in 2016 (recall Table 6). In question (1), which prompts for self-reports of student actions (behaviors) in eight areas, three (1.a.-c.) showed no change in response, but five (1.d.-h.) showed a greater likelihood of reporting behaviors performed *Very often/Often*. In question (2), prompting for perceived emphasis by engineering course instructors on five IL practices, three (2.b.-d.) showed no change in response choice, and two (2.a., e.) showed a decreased likelihood of reporting *Very much/Quite a bit* responses compared to the 2016 data. The estimated change directions in 2018 with respect to 2016 NSSE-IL participating GVSU Seniors overall is illustrated in Table 7 (it still remains to make proper statistical analysis of 2018 data in comparison to 2016 NSSE-IL overall institutional level means). As an estimate, it appears that 2018 responses 1.f.-h. may have risen to approach par with the institutional means, but that 2.a. and 2.e. may have moved further downward with respect to the GVSU mean; and mean response rates to the remaining items haven't changed, leaving many still significantly below the institutional means for those items in 2018 as was the case in 2016. Future study may also make use of the NSSE-IL instrument structure that has items 1.a.-d. address information use, and 1.e.-h. address information evaluation; the underlying purpose of the module's design is to focus on the processes of how students develop information literacy skills, rather than attempting to directly test their knowledge [12]. Meso assessments could more closely study specifically the student and faculty behaviors that were consistently reported at levels significantly below the institutional means overall.

Research question RQ3 asked, "If asked directly about *using information in their major*, would the results differ significantly from 2016 GVSU Engineering Senior student responses to NSSE-IL question (3)?" The anomaly that initiated pursuit of this study was that in 2016, GVSU Engineering Seniors reported that their "experience at this institution contributed to [their] knowledge, skills, and personal development in using information effectively" either *Very much* or *Quite a bit* at a rate comparable to all participating GVSU Seniors in that year; this in spite of reporting significantly below the aggregate mean in 11 of 13 behaviors and experiences prompts. After reframing question (3) as, " 3rev. How much has your experience at this institution contributed to your knowledge, skills, and personal development in using information *in your major* effectively," we see a substantially lower *Very much/Quite a bit* response rate in 2018. Thus, RQ3 is answered in the affirmative; asked about using information specifically in their major, students' responses differed significantly, in a negative direction away from the 2016 mean. This signals an opportunity to explore more deeply what GVSU Engineering students near

graduation really perceive about information literacy competencies gained during college for their lives generally, and as they prepare to enter their professions specifically. Do Engineering Seniors in fact perceive themselves to be adequately prepared to go on after graduation as successful lifelong learners, as suggested by the 2016 NSSE-IL question (3) response? And conversely, does the 2018 downward change in the question (3rev.) response suggest that they perceive that their knowledge, skills, and personal development in using information *in their major* has been insufficient? Or alternatively, that their preparation is adequate, but has come from elsewhere, e.g. their extensive co-op employment experience while earning their BSE degrees? And what are their perceptions of the information literacy experiences they have had elsewhere in their liberal arts curriculum, and the value of those experiences as they prepare to leave college? These questions could be addressed through methods such as focus groups or individual follow-up interviews, potentially a future meso assessment project.

Limitations

As a case study, this close examination of the performance of a particular survey-based instrument in the context of one specific sample of respondents in a relatively rare context cannot claim to challenge the validity or reliability of the instrument, the NSSE-IL Topical Module; or to provide conclusions generalizable to a wider population. As an examination of the instrument itself, this study also does not serve to provide data from which conclusions can be drawn about the efficacy or adequacy of information literacy education at GVSU, within the GVSU School of Engineering, or for Engineering majors as a group.

Conclusion

An initial question driving this study was a concern as to whether one institution's engineering program or students were seriously divergent from all other of the university's programs in their experiences with information literacy in their college career at the same institution, or whether a particular survey used to assess those experiences might be producing anomalous data due to its wording, in spite of being deemed a fully validated and reliable instrument. The study takes a close look at both the GVSU Engineering curriculum and at wording of the NSSE-IL survey questions. The study finds that in the particular case of one institution's rather specialized Engineering curriculum structure, the discipline-agnostic questions as presented in the NSSE-IL survey instrument may not be answerable in a way that avoids inaccurate, or unmeaningful, or misleading data. As noted by a former GVSU University Libraries Head of Instructional Services, large scale national assessments of student educational experience generally (e.g. NSSE) or IL skills specifically (e.g. Standardized Assessment of Information Literacy Skills, or 'SAILS'), that we have used periodically, can miss local details; in the GVSU University Libraries we have worked intentionally to develop "unique, customized assessment of activities in support of student information literacy outcomes because the libraries' programs and facilities have unique characteristics" [19]. In the present case, the local details of the GVSU School of Engineering's curriculum structure deserves information literacy assessment through different means than the NSSE-IL instrument. While the macro-level NSSE and NSSE-IL data in 2016 showed that GVSU students in the aggregate compared favorably to students in a cohort of broadly similar institutions, beginning to disaggregate our local data suggested deeper questioning at a meso-level might be possible and valuable. Drilling down into the raw NSSE-IL

2016 data revealed a local uniqueness, and offered the opportunity to do more localized assessment by "looking within," an opportunity that might have been lost by taking the assessment results at face value. Understanding the limitations of macro-level assessment, and of macro-level summary data, and taking advantage of the potential for exploring within and beyond raw NSSE-IL data at a local, meso level, can lead to answers, or perhaps more importantly, to better questions that can be asked, and studied using other tools and methods.

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