Student and Faculty Perceptions of Integrated E-learning Modules Aimed at Developing an Entrepreneurial Mindset

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Jean Nocito-Gobel, Professor of Civil & Environmental Engineering at the University of New Haven, received her Ph.D. from the University of Massachusetts, Amherst. She has been actively involved in a number of educational initiatives in the Tagliatela College of Engineering including KEEN and PITCH, PI of the ASPIRE grant, and is the coordinator for the first-year Intro to Engineering course. Her professional interests include modeling the transport and fate of contaminants in groundwater and surface water systems, as well as engineering education reform.

Dr. Cheryl Q Li, University of New Haven

Cheryl Qing Li joined University of New Haven in the fall of 2011, where she is an Associate Professor of Mechanical Engineering. Cheryl earned her first Ph.D. in Mechanical Engineering from National University of Singapore in 1997. She served as Assistant Professor and subsequently Associate Professor in Mechatronics Engineering at University of Adelaide, Australia, and Nanyang Technological University, Singapore, respectively. In 2006, she resigned from her faculty job and came to Connecticut for family reunion. Throughout her academic career in Australia and Singapore, she had developed a very strong interest in learning psychology and educational measurement. She then opted for a second Ph.D. in Educational Psychology, specialized in Psychometrics at University of Connecticut. She earned her second Ph.D. in 2010.

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Abstract
Traditional engineering curricula are often packed with predetermined credits limiting students' flexibility to take courses outside their majors. Engineering faculty have expertise and teach in the narrow areas within the discipline in which they were trained. Yet, the desire for engineering graduates to possess skills and mindset that transcend the topics typically included in traditional engineering programs is ever-present. One example of such a challenge is the initiative to equip engineering graduates with an entrepreneurial mindset. In this context, an entrepreneurial mindset is defined by the *KEEN 3C's Framework*: developing students to be *curious* to the opportunities presented by unsolved problems in an ever-changing world; with the skills to make *connections* within and between topics that require a multidisciplinary perspective; while always keeping in mind that an effective solution must *create value* for someone in society.

To tackle this challenge, the University of New Haven developed a series of 18 e-learning modules covering a broad set of topics mapped to attributes of an entrepreneurial mindset. The e-leaning modules were integrated within *regular* engineering and computer science courses in a hybrid format (on-ground and online), providing a supplement to topics generally included in those courses. The e-learning modules are open source, developed with funding from the Kern Family Foundation. Over the past four years, the e-learning modules were deployed outside the University of New Haven at 55 other institutions by 77 faculty. In this paper we present the perceptions of over 1500 students and 50 faculty who participated in the external deployments and submitted meaningful feedback. The data we collected informed improvements made to the modules. Faculty who wish to integrate the modules within their courses in the future will gain insight into successful practices and pitfalls to avoid.

Introduction
The movement to impart an entrepreneurial mindset to engineering students is rapidly gathering momentum. Forty-seven institutions, ranging from large public universities to small private ones, are a part of the Kern Entrepreneurial Engineering Network (KEEN) [1]. Collectively, thousands of engineering faculty at these institutions are developing an entrepreneurial mindset in hundreds of thousands of students by modifying their course content and the approaches they use in instruction. As a part of this greater movement, the University of New Haven has developed 18 e-learning modules on a variety of entrepreneurial topics that collectively address the learning outcomes in the KEEN Framework [2]. With modest support from a mini-grant program, several of the modules were deployed by 77 faculty at 55 institutions over a 3-year period. As part of the deployment, feedback was solicited from both faculty and students regarding their perceptions of and interactions with the modules. This paper summarizes the feedback.

Overview of the E-Learning Modules
The 18 e-learning modules consist of text, case studies, short videos, interactive exercises and a final quiz. The modules are designed to be integrated into existing courses, and faculty should

use a contextual assignment so that students can apply what they learn through the e-learning modules. Each of the modules are accompanied with teaching guides containing sample contextual activities. The modules are discipline-independent and may be integrated into various courses and majors. Since students complete the modules outside of class time, faculty do not need to give up class time to cover the entrepreneurial content. The design, integration, and assessment of the modules has been the content of several papers [3-8].

The content of these modules is briefly summarized as follows:

1. *Adapting a Business to a Changing Climate* – Describes how changing business environments can negatively impact a company and what strategies can be used to adapt to the new conditions.
2. *Applying Systems Thinking to Complex Problems* – Describes the systems-approach when problems are ill-defined or multi-tiered in complexity. Basic tools such as function mapping, decomposition and heuristic rules to make complex problems less complex are introduced.
3. *Building Relationships with Corporations and Communities* – Describes ways of thinking about corporations and communities that make it easier to work with them, approach them without defensiveness and think about how to use their input to improve designs.
4. *Building, Sustaining and Leading Effective Teams and Establishing Performance Goals* – Increases the understanding of personal characteristics and group dynamics on team performance and provides methods to resolve conflicts that might arise in team settings.
5. *Cost of Production and Market Conditions* – Covers how to determine the cost of production. Introduces various market structures, and their impact on the cost of products.
6. *Defining and Protecting Intellectual Property* – Provides a basic working knowledge of intellectual property concepts and law that are essential for engineers and scientists seeking a career in the business world.
7. *Developing a Business Plan That Addresses Stakeholder Interest, Market Potential and Economics* – Informs how to develop a standardized approach for creating, optimizing and presenting business plans for new product and service companies.
8. *Developing Customer Awareness and Quickly Testing Concepts through Customer Engagement* – Introduces the general process of selecting stakeholders, generating requirements, and integrating empathy in design.
9. *Determining Market Risks* – Introduces a variety of risks that are involved with bringing a new product to market and how to mitigate them.
10. *Financing a Business* – Introduces the process of identifying business financing requirements, matching funding methods to requirements, and implementing a plan to secure financing.
11. *Generating New Ideas Based on Societal Needs and Business Opportunities* – Introduces a number of methods that can lead to new business ventures, including recognizing societal trends and market gaps, and discovering different ways to develop solutions to societal needs.

12. *Innovating to Solve Problems Under Organizational Constraints* – Introduces different types of innovation and problem-solving techniques in order to create a portfolio of practical solutions that reflect organizational boundaries and constraints.

13. *Innovative Client-Centered Solutions Through Design Thinking* – Describes two human-centered design thinking cycles and teaches how to apply design-thinking skills to a client-centered challenge.

14. *Learning from Failure* – Describes the difference between business and engineering failures, when it is acceptable to take risks, how to recognize signs of impending failure and avoid it, how to examine past personal and corporate failures, learn from them and persist.

15. *Resolving Ethical Issues* – Defines ethics as a process and argues that the principal reason to behave ethically is to engenders trust. Uses case studies to illustrate how ethical dilemmas arise in engineering, how most engineers respond responsibly, and how a small minority of engineers act irresponsibly. Describes three very different and practical methods for resolving ethical issues.

16. *Role of Product in Value Creation* – Describes the total product concept, one that introduces a contrarian view so as to keep in mind for whom the products are designed, the consumer. Shows how to go beyond the product to better understand the concept of value.

17. *The Elevator Pitch: Advocating for Your Good Ideas* – Introduces the essential skills for preparing and delivering brief, effective pitches to various stakeholders.

18. *Thinking Creatively to Drive Innovation* – Describes how natural curiosity about the changing world and people's needs can drive innovation. Illustrates how creativity is determined more by nurturing than nature and introduces the value of the divergent-convergent thinking process, forming highly diverse teams, and then using collaborative thinking methods.

Perceptions of Online Learning

As digital communication technologies rapidly advance, the implementation of online learning at universities has increased exponentially. A review of the literature shows that faculty perspectives on web-based learning can be categorized into the three areas.

First, faculty feel they need to have a good understanding of the pedagogical practices specific to online learning in order to deliver distance learning successfully [9]. Many experienced instructors used to traditional face-to-face teaching find it challenging when starting online teaching. This challenge could result in a resistance toward embracing the new teaching trend [10]. Some faculty members encounter great difficulties in making a transformational shift in teaching from one of disseminating information to one of creating a dynamic learning environment. They feel pressured to relearn teaching pedagogy suitable for an online learning environment where students co-construct knowledge through interactions [11]. The change in roles and responsibilities in this teaching environment can make faculty feel uncomfortable and intimidated [12].

In addition to the need for learning new teaching pedagogy, faculty also feel challenged in attaining a level of proficiency with the computer technologies needed to develop and deliver online instruction effectively [13]. They need to learn the management of online courses, the design of course layout, and delivery technologies such as audio or video [14]. Faculty members commit tremendous amounts of time to become familiar with the diverse technologies and delivery methods that are available [15]. Providing enough faculty development opportunities is seen as essential for the successful transformation from the classroom to an online learning environment.

Since online course development and instruction take much more preparation time than traditional teaching, adequate institutional support becomes the key fact in engaging more faculty members in online teaching [16, 17]. Institutional support can come in the form of technical support such as help desks, process facilitator or course designer [18]. Institutions can also provide financial compensation for online instruction. Since the effort involved in developing an online course is equivalent to that spent in several traditional courses, [17] found that financial compensation can be a major fact in encouraging more faculty to get involved in online teaching.

On the other hand, students in general feel that online learning leaves the responsibility of learning to themselves. They are responsible for the course outcomes. Students who have this sense of responsibility tend to have positive online learning experiences [19]. They also feel that for them to succeed in an online learning environment, instructors should implement good teaching through good online course design, provide thorough explanations, define goals clearly and seek continued feedback from students [20]. The essential components for successful online learning identified by students include effective communication, assistance in working with other students, active involvement in the content, prompt feedback, time management, clear expectations, motivation, and hands-on learning [21].

Data Collection

Three rounds of mini-grants were awarded nationwide through a competitive process from 2016-19 through an institutional grant awarded to the University of New Haven by the Kern Family Foundation. In addition, funding from CTNext supported focused deployment at a large public institution. For each round, faculty selected to receive the mini-grants were trained at a half-day workshop. During these workshops, the faculty were introduced to the e-learning modules, how to download and integrate them into the Learning Management System at their home institution, how to develop or revise an assignment to serve as a contextual activity related to the module they were deploying, and how to use the rubrics provided to assess student work. Toward the end of the semester in which they deployed a module, faculty and students in their classes completed an electronic feedback survey [Appendices 1 and 2]. The participating faculty also returned a description of their contextual activity, assessment results and samples of student work using the same electronic form [Appendix 1]. Whereas the participating faculty were required to submit

the forms to meet their expected deliverables and receive the final payment of their awarded mini-grant, student response to the feedback survey was voluntary.

Data Analysis

Faculty Feedback

The results of faculty responses collected from fall 2016 to spring 2019 are described in this section. Of the 18 e-learning modules, 12 were deployed during this period. The total number of responses received was 86 with the following breakdown per term: fall 2016 (16), spring 2017 (8), fall 2017 (15), spring 2018 (9), fall 2018 (26), and spring 2019 (12). More than half of the faculty had some prior online teaching or learning experience (60.5% and 52.3% respectively), and about one-quarter had no online experience at all (26.7%). The overall implementation experience with each module and all modules combined are shown in Figure 1. The rating was on a five-point Likert scale (with 5=excellent, 4= very good, 3=good, 2=fair and 1=poor). The results indicate that faculty had a very positive experience deploying these modules.
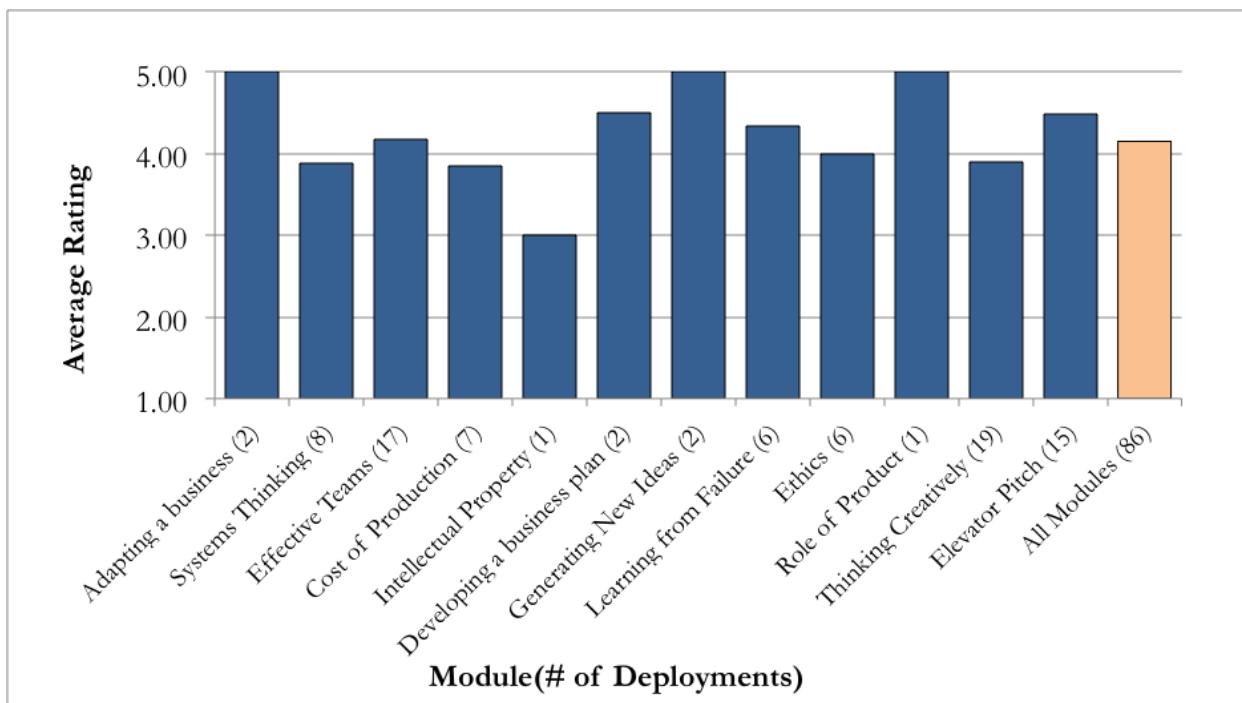

Figure 1 Overall Implementation Experience

Their responses to additional questions on their experience with the modules support the results we observed above. They rated the modules high in terms of value and course enhancement as shown in Figure 2. The rating was on a five-point Likert scale (with 5=strongly agree, and 1=strongly disagree). Furthermore, the faculty showed strong interest in adopting other modules

and indicated that they would recommend the ones they deployed to others. While Figure 2 shows aggregated results, Figure 3 displays responses for each module, which indicates that the results were reasonably similar across all modules. Responses for the Intellectual Property and Ethics modules had a few outliers.
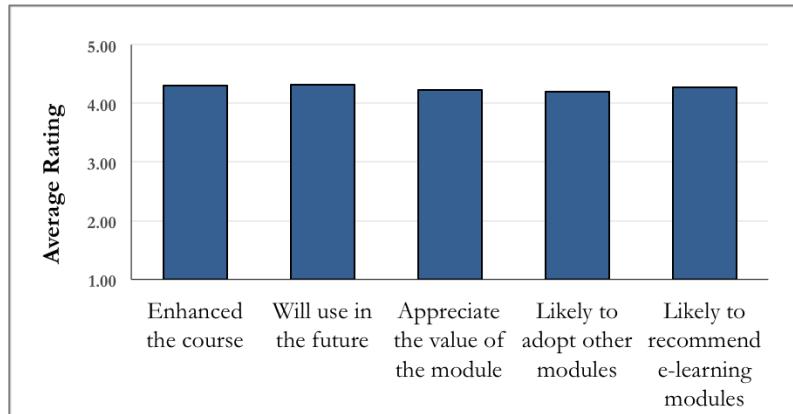

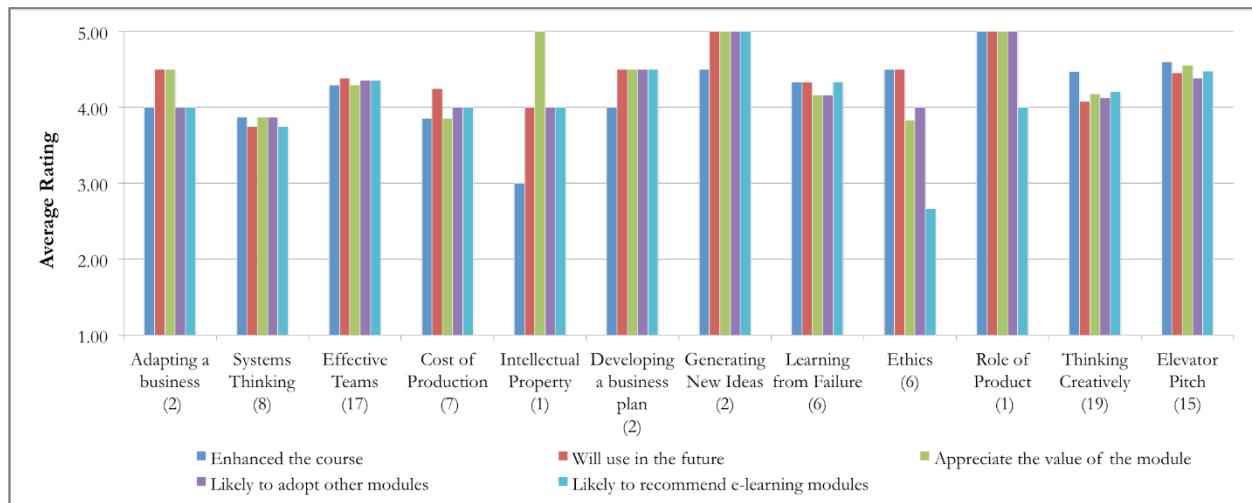**Figure 2** Faculty Rating of User Experience

Figure 3 Faculty Rating of User Experience for Each Module

We also asked faculty to provide feedback on how useful they found the module with respect to several objectives using a five-point Likert scale (with 5=very useful, and 1=not useful at all) and the results were very encouraging as shown in Figure 4. For all objectives, the faculty rated these modules above 4, which clearly indicate that on average the faculty found the modules very beneficial in improving their courses. Responses for each module are reasonably consistent as shown in Figure 5. An outlier was the rating for "Develop EML" for the Ethics module.

We also asked the faculty to assess the modules with respect to enhancing student learning in the context of their class by reporting on student behavior on the four criteria shown in Table 1. As the data shows, the majority of faculty indicated that the modules are generally effective in enabling engineering students to learn the concepts covered in the modules in various ways.
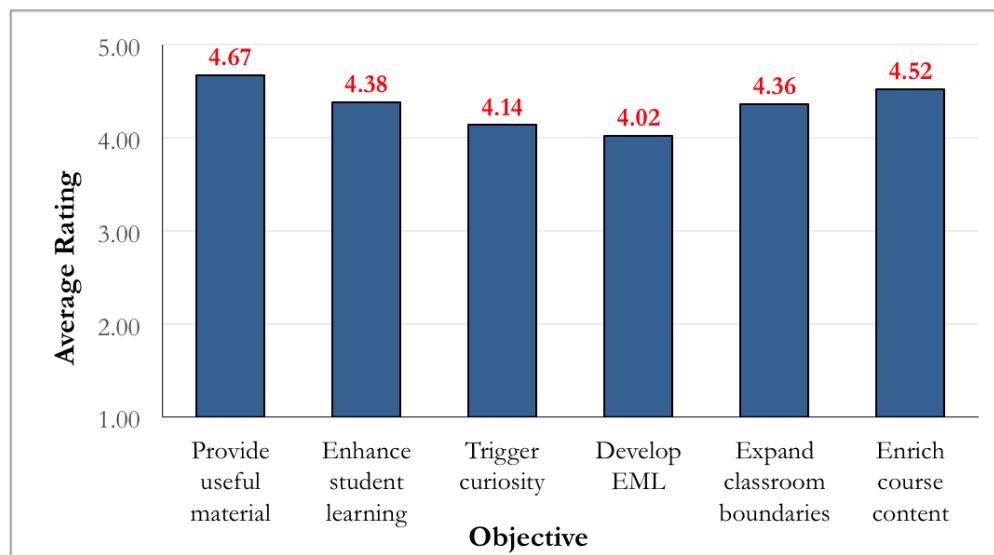
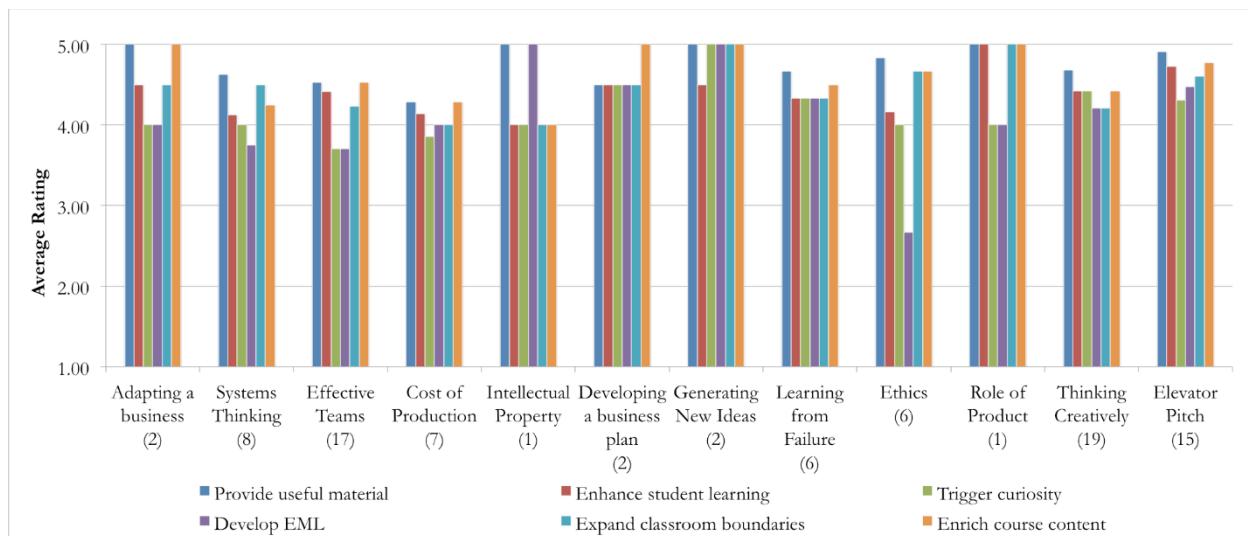**Figure 4** Benefits of the e-Learning Modules - Faculty Rating

Figure 5 Benefits by Module - Faculty Rating

Table 1 Overall Response for Each Response Category

e-learning module enhanced student learning in the context of your class by:	# of deployments	% of total deployments
Students connected the module content to real-life experiences (e.g., they discussed how what they learned was applicable in their current or future careers)	55	64.0%
Students talked to others within the classroom about the module and contextual activity	53	61.6%
Students were actively engaged in the contextual activity as evidenced by questions they asked	52	60.5%
No evidence that the e-learning module enhanced student learning	3	3.5%

Finally, we asked faculty to report on the challenges they experienced during the deployment of the e-learning modules and their responses are shown in Table 2. In general, the faculty did not have difficulty in integrating the module into their courses. Most of the challenges reported were related to student perception and attitude.

Table 2 Overall Reponses for Each Challenge Category

The challenges experiences during the deployment of the e-learning module were:	# of deployments	% of total deployments
No particular difficulty was encountered in integrating the module into my course	36	41.9%
Students found completing the module and related activities to be a burden	16	18.6%
Students had difficulty in connecting the module to the content of the course	11	12.8%
I had difficulty in integrating the module topic into my course	7	8.1%
Students felt overwhelmed by having to complete the module	6	7.0%
I felt overwhelmed by having to remind students to complete the module	4	4.7%

Student Feedback

An analysis of student responses collected from fall 2017 to spring 2019 is described in this section. Of the 1596 responses received, 1548 indicated that they had completed the module. Table 3 shows the distribution of responses by module. The number of responses for the modules *Intellectual Property* and *Role of Product* was very small.

Table 3 Total Number of Responses by Module - Student

Module	# of responses
Adapting a Business	43
Systems Thinking	137
Effective Teams	354
Cost of Production	92
Intellectual Property	6
Developing a business plan	55
Generating New Ideas	49
Learning from Failure	248
Ethics	182
Thinking Creatively	143
Elevator Pitch	239
Role of Product	2
No module selected	48
Total	**1596**

As discussed previously, faculty are expected to use a contextual assignment to guide students in applying what they learn through the e-learning modules. We asked the students about their perceptions on the use and effectiveness of the contextual activity as well as their perceived value of the e-learning modules on a five-point Likert scale (with 5=strongly agree and 1=strongly disagree). We also asked whether they were supportive of having more classes with integrated e-learning modules. The results show that students generally found the modules of value, although lower compared to faculty, and they also found the assignments effective in reinforcing what they learned in the module. The students were divided almost equally on their perception about having more courses with e-learning modules (yes=51.5%; no=48.5%). Since completing the modules outside of class required extra work, it is not surprising that a significant proportion of students did not want more courses with integrated e-learning modules.

Table 4 Average Student Ratings of e-Learning Modules

Module	The instructor reinforced what you learned in the e-learning module through an assignment or a project	The assignment or the project was effective in reinforcing what you learned in the e-learning module.	I found the e-learning module of value.	Would you like to learn more professional skills through additional e-learning modules embedded in the courses you take
Adapting a Business	3.92	3.83	3.62	67.4%
Systems Thinking	3.80	3.65	3.20	46.0%
Effective Teams	4.04	3.92	3.63	59.3%
Cost of Production	3.55	3.59	3.34	47.8%
Intellectual Property	4.17	4.17	3.50	16.7%
Developing a business plan	4.26	4.15	3.87	50.9%
Generating New Ideas	3.77	3.67	3.23	46.9%
Learning from Failure	3.72	3.57	3.23	43.6%
Ethics	3.79	3.74	3.64	43.4%
Thinking Creatively	3.62	3.48	3.21	40.6%
Elevator Pitch	3.93	3.84	3.63	53.6%
Role of Product	4.00	4.00	4.00	50.0%
Responses w/ module selected (1548)	**3.87**	**3.78**	**3.47**	**41.8%**
All Responses (1596)	**3.85**	**3.75**	**3.47**	**51.50%**

Student feedback was also sought to evaluate instructional design of the module and how much time they spent on the module content as well as the contextual activity. The results shown in Table 5 indicate that the various elements that make up the module content were utilized almost about the right amount, and the students spent between two and three hours on the module and the activity separately.

Table 5 Average Student Rating on Module Format and Student Workload

Module:	5=far too much; 4= too much; 3=about right; 2=too little; 1=far too little				1: 0-2 hrs; 4: 3-5 hrs; 7: 6-8 hrs; 9: More than 8 hours	
	The readings on each page	The additional readings accessed via web links	Videos	The overall length of the module	Time spent on e-learning module (hours)	Time spent on contextual activity (hours)
Adapting a Business	3.27	3.29	3.46	3.29	2.14	2.07
Systems Thinking	3.13	3.25	2.90	3.31	2.87	2.06
Effective Teams	3.21	3.26	3.03	3.41	2.66	2.35
Cost of Production	3.20	3.44	3.24	3.48	3.13	1.99
Intellectual Property	3.50	3.50	3.17	3.50	3.00	2.50
Developing a business plan	3.22	3.28	3.11	3.30	3.37	2.68
Generating New Ideas	3.06	3.04	2.94	3.19	1.86	2.04
Learning from Failure	3.29	3.48	3.04	3.47	2.73	1.80
Ethics	3.25	3.33	3.06	3.47	2.52	1.74
Thinking Creatively	3.12	3.22	3.06	3.27	2.48	2.13
Elevator Pitch	3.24	3.32	3.06	3.34	2.41	2.33
Role of Product	3.00	3.00	3.00	3.00	2.50	2.50
Responses for all modules (1314)	**3.23**	**3.31**	**3.10**	**3.37**	**2.65**	**2.15**
All Responses (1336)	**3.22**	**3.31**	**3.06**	**3.39**	**2.64**	**2.11**

Lessons Learned and Recommendations

The feedback received from faculty and students is invaluable to our efforts to refine the modules and promote broad deployment efforts. Prior to the external deployments, feedback was collected from internal deployments at the University of New Haven. This informed early modifications. The feedback presented here is valuable in aggregate, though some modules present too little data and broader deployment would be needed before making conclusions.

Overall, faculty rated the modules very positively, felt that the modules contributed to the course, and were likely to recommend the modules to other faculty. Student ratings were more widespread, with them finding the modules to have value, but on average, half do not desire to learn further content via this mode. It is interesting to note that the time students reported as spending on the modules were significantly lower than the time range recommended for the modules by the faculty team leading this effort. This probably indicates that students are speeding through the content, not viewing all the videos, not being diligent about reading materials presented through links, and therefore missing details within the modules that could deepen learning.

The modules were developed with the intent of assisting faculty incorporate topics and content not necessarily in their area of expertise. We see that across the board all faculty that participated in the deployments and provided feedback felt that the e-learning modules provided useful material and enriched course content. One point particularly of importance with regards to *entrepreneurial mindset development* is the need to assist both faculty and students in making the connection between the module content and the desired mindset. We see, for instance, that the module on *Ethics* received the lowest ratings when it came to be seen as *contributing to EML*. The faculty deploying that specific module also expressed hesitation at deploying other e-learning modules. The Ethics module is rather long, so the lack of enthusiasm for deploying other modules in classes based on deploying only the Ethics module is not surprising. Only a single deployment of the Intellectual Property module occurred at a large public institution, so the feedback for that is also not reliable.

We acknowledge some limitations in our data collection practices. The faculty providing feedback were incentivized to do so as part of the grant agreements. Though we provided training and guidance to the faculty deploying modules, the integration strategies varied widely, and we cannot attest to how well the guidance was followed. Furthermore, for any given module the courses in which it was implemented, and the reinforcing activities used were up to the individual and as such we cannot isolate the ratings to be solely based on the module content. We have found at our own institution that the enthusiasm of the instructors with respect to the e-learning module deployed in their class can have a significant impact on how students view the module and its content, and this is likely true at other institutions as well. Lastly, the student data was collected voluntarily; in some instances, the responses were not correctly identifiable.

References

1. Kern Entrepreneurial Engineering Network (2020) retrieved from https://engineeringunleashed.com/partners.aspx

2. KEEN Framework (2020) retrieved from https://keenwarehouseprod.blob.core.windows.net/keen-downloads/KEEN_Framework_spread.pdf

3. Harichandran, R. S., & Carnasciali, M., & Erdil, N. O., & Li, C. Q., & Nocito-Gobel, J., & Daniels, S. D. (2015, June), *Developing Entrepreneurial Thinking in Engineering Students by Utilizing Integrated Online Modules.* Paper presented at 2015 ASEE Annual Conference & Exposition, Seattle, Washington. 10.18260/p.23838

4. Erdil, N. O., & Harichandran, R. S., & Nocito-Gobel, J., & Carnasciali, M., & Li, C. Q. (2016, June), *Integrating e-Learning Modules into Engineering Courses to Develop an Entrepreneurial Mindset in Students.* Paper presented at 2016 ASEE Annual Conference & Exposition, New Orleans, Louisiana. 10.18260/p.25800

5. Erdil, N. O., & Harichandran, R. S., & Nocito-Gobel, J., & Li, C. Q., & Carnasciali, M. (2017, June), *Impact of Integrated E-Learning Modules in Developing an Entrepreneurial Mindset based on Deployment at 25 Institutions.* Paper presented at 2017 ASEE Annual Conference & Exposition, Columbus, Ohio. https://peer.asee.org/28467

6. Carnasciali, M., & Harichandran, R. S., & Erdil, N. O., & Nocito-Gobel, J., & Li, C. Q. (2018, June), *Integrated e-Learning Modules for Developing an Entrepreneurial Mindset: Direct Assessment of Student Learning.* Paper presented at 2018 ASEE Annual Conference & Exposition , Salt Lake City, Utah. https://peer.asee.org/30675

7. Harichandran, R. S., Erdil, N. O., Carnasciali, M-I., Nocito-Gobel, J., and Li, Q. (2018), *Developing an entrepreneurial mindset in engineering students using integrated e-learning modules.* Advances in Engineering Education, 7(1).

8. Harichandran, R. S., & Erdil, N. O., & Carnasciali, M., & Li, C. Q., & Nocito-Gobel, J., & Rana, A. (2019, June), *EML Indices to Assess Student Learning through Integrated e-Learning Modules.* Paper presented at 2019 ASEE Annual Conference & Exposition , Tampa, Florida. https://peer.asee.org/32704

9. Redmond, P. (2011). *From face-to-face teaching to online teaching: Pedagogical transitions.* In G. Williams, P. Statham, N. Brown & B. Cleland (Eds.), Changing Demands, Changing Directions. Proceedings ascilite Hobart 2011. (pp.1050-1060).

10. McQuiggan, C. A. (2007), *The role of faculty development in online teaching's potential to question teaching beliefs and assumptions.* Online Journal of Distance Learning Administration, 10(3).

11. Vaughan, N. D. (2010). *A blended community of inquiry approach: Linking student engagement and course redesign.* The Internet and Higher Education, 13(1-2), 60-65.

12. Yang, Y., & Cornelious, L. F. (2005*). Preparing instructors for quality online instruction.* Online Journal of Distance Learning Administration, 8(1), 1–16

13. Levy, S. (2003). *Six factors to consider when planning online distance learning programs in higher education.* Online Journal of Distance Learning Administration, VI (I), Spring 2003.

14. Rockwell, S. Kay; Schauer, Jolene; Fritz, Susan; and Marx, David B. (2002). *Faculty Education, Assistance and Support Needed to Deliver Education via Distance*. Online Journal of Distance Learning Administration, Volume III, Number II, Spring

15. Orey, M., and Amiel, T. (2006). *Do You Have the Time? Investigating Online Classroom Workload*. Journal of Educational Technology Systems. Volume: 35 issue: 1, page(s): 31-43

16. Bower, B.L. (2001). *Distance education: facing the faculty challenge*. The Online Journal of Distance Learning Administration. IV (II).

17. Sellani, R.J., and Harrington, W. (2002). *Addressing administrator/faculty conflict in an academic online environment.* The Internet and Higher Education, Volume 5, Issue 2, Summer 2002, Pages 131-145

18. Goodyear, P., Salmon, G., Spector, J.M., Steeples, C., & Tickner, S. (2001). *Competences for online teaching: a special report*. Educational Technology, Research and Development, 49 (1), 65-72.

19. Blackmon, Stephanie J., and Claire Major, (2012). *Student experiences in online courses, A Qualitative Research Synthesis*. The Quarterly Review of Distance Education, Volume 13(2), pp. 77–85

20. Crews, Tena B., Kelly Wilkinson, and Jason Neill (2015). *Principles for Good Practice in Undergraduate Education*. MERLOT Journal of Online Learning and Teaching, Vol. 11, No. 1, pp. 87–103

21. Crews, Tena B., Tiffany M. Bordonada, and Kelly Wilkinson (2017). *Student Feedback on Quality Matters Standards for Online Course Design*. EDUCAUSE Review. https://er.educause.edu/articles/2017/6/student-feedback-on-quality-matters-standards-for-online-course-design

Appendices

APPENDIX 1: Instructor Feedback Form

INTEGRATED e-LEARNING MODULES INSTRUCTOR FEEDBACK FORM

Please complete and submit this form with the following documentation:

– Your revised course syllabus reflecting integration of e-Learning module

– Any new or modified course assignment including the contextual activity linked to the module topic

Module Title *

Institution *

Course Code *

Course Title *

Deployment Term *

Instructor *

Pre-Survey Date *

MM / DD / YYYY

Deployment Start Date *

MM / DD / YYYY

Deployment End Date *

MM / DD / YYYY

Post-Survey Date *

MM / DD / YYYY

Please Provide your feedback on the following items:

1. Choose which Entrepreneurial Minded Learning (EML) outcomes you think this module targeted. (Check all that apply.)

CURIOSITY

☐ Demonstrate constant curiosity about our changing world

☐ Explore a contrarian view of accepted solution

☐ Other

CONNECTIONS

☐ Integrate information from many sources to gain information

☐ Assess and manage risk

☐ Other

CREATING VALUE

☐ Identify unexpected opportunities to create extraordinary value

☐ Persist through and learn through failure

☐ Other

Briefly explain why you think the module targeted the items you identified above.

2. In addition to having students complete the module, you employed multiple activities to engage students, reinforce, and assess learning as part of deployment of this module in your class. Choose the Entrepreneurial Minded Learning complementary skills (Opportunity and Impact) your activities targeted.

OPPORTUNITY

☐ Identify an opportunity

☐ Investigate the market

☐ Create a preliminary business model

☐ Evaluate technical feasibility, customer value, societal benefits, economical viability

☐ Test concepts quickly via customer engagement

☐ Assess policy and regulatory issues

IMPACT

☐ Communicate an engineering solution in economic terms

☐ Communicate an engineering solution in terms of societal benefits

☐ Validate market interest

☐ Develop partnerships and build a team

☐ Identify supply chains distribution methods

☐ Protect intellectual property

7. Please describe the challenges you experienced, if any, during the deployment of the online module.

- ☐ Students felt overwhelmed to complete the module.
- ☐ I felt overwhelmed to reinforce completion of the module.
- ☐ Students found completing the module and related activities to be a burden.
- ☐ Students had difficulty in connecting the module to the content of the course.
- ☐ I had difficulty in integrating the module topic into my course.
- ☐ Other

  [   ]

8. If you were to deploy this module again in this course, please let us know what you would do differently in the deployment process.

[   ]

9. Please list any suggestions for additions, subtractions and changes in the content of the module that will make the module better suited for it's topic.

[   ]

10. Identify, if experienced, any technical issues with accessing the module material in your Learning Management System (Blackboard, Canvas, Moodle, etc.). (Check all that apply.)

- ☐ 1. No technical issues encountered.
- ☐ 2. Issues encountered during the content import.
- ☐ 3. Module content did not display properly in my LMS.
- ☐ 4. Students experienced technical problems while completing the online module.
- ☐ 5. Links for online surveys were not received.
- ☐ 6. Survey links did not work.
- ☐ Other

  [   ]

If you selected 2, 3, or 4, please let us know the nature of the problem.

[   ]

11. Please rate how useful you found the e-Learning module in each of the following:

	Very Useful	Somewhat Useful	Neutral	Not Very Useful	Not At All Useful
Providing material that leads to student learning in the module topic	○	○	○	○	○
Enhancing student learning in the context of your class	○	○	○	○	○
Triggering student curiosity into new areas	○	○	○	○	○
Developing an entrepreneurial mindset in students	○	○	○	○	○
Expanding the boundaries of traditional classroom-based learning	○	○	○	○	○
Enriching course content without giving up class time for other topics	○	○	○	○	○

12. Do you have any prior teaching/learning experience with e-Learning? (Check all that apply.)

- ☐ Teaching
- ☐ Learning
- ☐ None

13. Please select how much you agree/disagree with each statement.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Overall, I found the e-Learning module enhanced my course.	○	○	○	○	○
I was able to appreciate the value of e-Learning by deploying this module.	○	○	○	○	○
I am likely to adopt e-Learning modules on other topics of interest.	○	○	○	○	○
I am likely to recommend these e-Learning modules to my colleagues.	○	○	○	○	○

14. Please list topics not included in the module list drop down menu above that you think would be useful as an EML module in your courses.

[   ]

15. Please add any other comments you want to share with us regarding the e-Learning modules.

16. Please rate your overall experience in implementing this e-Learning module.

○ Excellent

○ Very good

○ Good

○ Fair

○ Poor

Would you be willing to let us use your comments as a testimonial? *

☐ Yes

☐ No

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SELECT FILES

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APPENDIX 2: Student Feedback Form

1. In which academic term did you take the course where you completed the e-learning module?
2. Which e-learning module did you complete? (complete survey one per module)
3. What is your major?
4. How much time on average did you spend on this e-learning module? (e-learning module refers to the content that was made available to you online)
5. How much time on average did you spend on the class assignment(s) related to this e-module? (do not include time spent on the online portion of the module)
6. Please select how much you agree/disagree with each statement. (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, & I don't know)
    a. The instructor reinforced what you learned in the e-learning module through an assignment or a project
    b. The assignment or the project was effective in reinforcing what you learned in the e-learning module.
    c. I found the e-learning module of value.
7. Please tell us what you think about the amount of the following elements in the e-learning module (Far Too Much, Too Much, About Right, Too Little, Far Too Little)
    a. The readings on each page
    b. The additional readings accessed via web links
    c. Videos
    d. The overall length of the module
8. Would you like to learn more professional skills through additional e-learning modules embedded in the courses you take?
9. Please explain what about the embedded e-Learning modules you liked that made you respond to the prior question with a "yes" (open ended response)
10. Please explain what about the embedded e-Learning modules you did not like that made you respond to the prior question with a "no" (open ended response)
11. Please add any other comments/suggestions you want to share with us regarding the e-learning modules. (Open ended response)
12. In order to help us sort through the data, please provide the name of your University?