EPiC Series in Built Environment

Volume 5, 2024, Pages 294–302

Proceedings of 60th Annual Associated Schools of Construction International Conference

Revitalizing Construction Management Education: A Case Study on Comprehensive Curriculum Review and Strategic Alignment

Andrew J. South, Ph.D.; Clifton B. Farnsworth, Ph.D.; Evan D. Bingham, Ph.D.; James P. Smith, Ph.D.; Justin E. Weidman, Ph.D.; Matthew S. Wheelwright, Ph.D.
Brigham Young University
Provo, UT

This paper presents a detailed case study of a comprehensive program review for a Construction and Facilities Management (CFM) baccalaureate degree at a large private university. Addressing the necessity of aligning educational programs with current industry and academic needs, the review process involved extensive stakeholder engagement, industry consultation, and curriculum realignment with updated accreditation standards. It identifies key changes made to the program, including the introduction of flexible emphasis tracks, the integration of cross-cutting curricular themes, and adjustments to program course offerings to enhance students' educational experiences. These strategic updates aim to equip students with relevant skills for current and future industry demands, demonstrating a proactive approach to curriculum development in higher education.

Key Words: Construction Management Education, Curriculum, Program Review, Accreditation

Introduction

Continuous curricular reviews in university programs are essential to ensure relevance and quality of educational offerings—value (Briggs, 2007; Conrad & Wilson, 1985). However, even for programs with a healthy system and cadence of ongoing curriculum review, leaders may find it necessary to address deeper, systemic issues and align their programs with broader educational, technological, and industry trends (Oliver & Hyun, 2011). Comprehensive program reviews are in-depth, holistic evaluations of an academic program that go beyond routine or incremental updates. Yet various logistical, cultural, and resource-related challenges may prevent their execution. By failing to adequately review academic programs, universities risk failing to deliver value at all levels. This can lead to “educated” individuals who are unable to address current and future challenges and lack competitiveness in the global marketplace.

This paper is a case-study, reporting the process and outcomes of a comprehensive program review for the construction and facilities management (CFM) baccalaureate degree at Brigham Young University (BYU). After several significant successive changes occurred in the program and its administrative structure, program faculty and leadership conducted a comprehensive program review.

The review consisted of aligning key aims and learning outcomes, industry consultation and feedback, scans of current best practices from peer institutions, student reviews, staff assessments, and a re-mapping of accreditation requirements. The results showed that, although the overall curriculum had generally kept pace with regular, continuous, and incremental program reviews, several gaps existed. To bridge these gaps, three key action categories were identified: 1) the creation of emphasis tracks for students to select within the CFM program; 2) the incorporation of cross-cutting themes to be consciously integrated across multiple courses at the learning outcome level; and 3) adjustments to required and elective courses and experiential learning offerings in a students' program of study.

Background

The 'Building Construction' program was created at BYU in 1960, an outgrowth of the Industrial Arts non-teaching programs. The program was renamed 'Construction Management' in 1986, based on evolving industry and academic needs. Then in 2014 the Construction Management program was combined with the Facilities and Property Management program to form a single 'Construction and Facilities Management' (CFM) program with two degree emphasis areas. The BYU CFM program has been ABET accredited since 2015, and was ACCE accredited prior, since 1989. In 2019, it was determined that an administrative reorganization may be warranted to strengthen the CFM program. As part of the reorganization planning process, multiple peer institutions were reviewed as exemplars. Through institutional curriculum reviews, interviews, and other campus visits, coupled with an analysis of BYU's operational strengths and organizational structure, it was concluded that changes to the CFM program were necessary. In 2021, the program was administratively reorganized from the School of Technology, the CFM program's home since its founding, and merged into the Civil Engineering (CE) department, resulting in the combined Civil and Construction Engineering (CCE) Department. Both administrative units were already housed in BYU's Engineering College. The merger was motivated by leadership and faculty interests in facilitating better engineering exposure for CFM students and better construction and operations exposure for CE students, streamlining organizational and administrative processes, optimizing resources, and standardizing expectations of faculty within the College of Engineering.

Prior to the reorganization, the CE and CFM programs each had undergraduate enrollments of about 400 students. Additionally, there were 17 faculty positions in the CE department, with 8 faculty positions (4 of which were principally teaching-based) in the CFM program. The two faculties officed and taught in separate buildings on campus. Generally speaking, the CE and CFM students had no interaction through their major study programs. As part of the reorganization, changes were made to all students' study programs. Students in the renamed CCE department could declare enrollment in either the civil engineering or the construction and facilities management undergraduate degree programs, but each program would now have similar prerequisite courses. Additionally, 24 credits of shared department coursework became required, primarily at the 100 and 200 levels. This was meant to allow students to easily switch between department majors in their early semesters as they developed and discovered personal preferences and aptitudes. While much of the content in the programs had not changed, the delivery mode, focus, and overall audience had changed.

In the 18 months following the restructuring, the CFM program committee continued asking internal "why" questions: why we had certain courses, why we did not have others, why we taught some of the course sequences in their current form, etc. The committee continued its process of regular annual reviews and, in 2021 the program had just been re-accredited; but there were enough significant changes in and around the program to warrant a comprehensive review. Interestingly, in preparation for the review, it was learned that none of the faculty currently teaching in the program had ever been

part of such an undertaking. It was estimated that the last such review was at least more than 25 years prior. As a result, the CFM program undergraduate committee conducted a comprehensive review.

Comprehensive Review Process

In this section, the process used by the CFM program undergraduate committee is presented. While no specific process template was followed, components of similar or related processes were incorporated (Allen, 2003; Dyjur & Kalu, 2016). The process is outlined in Figure 1.

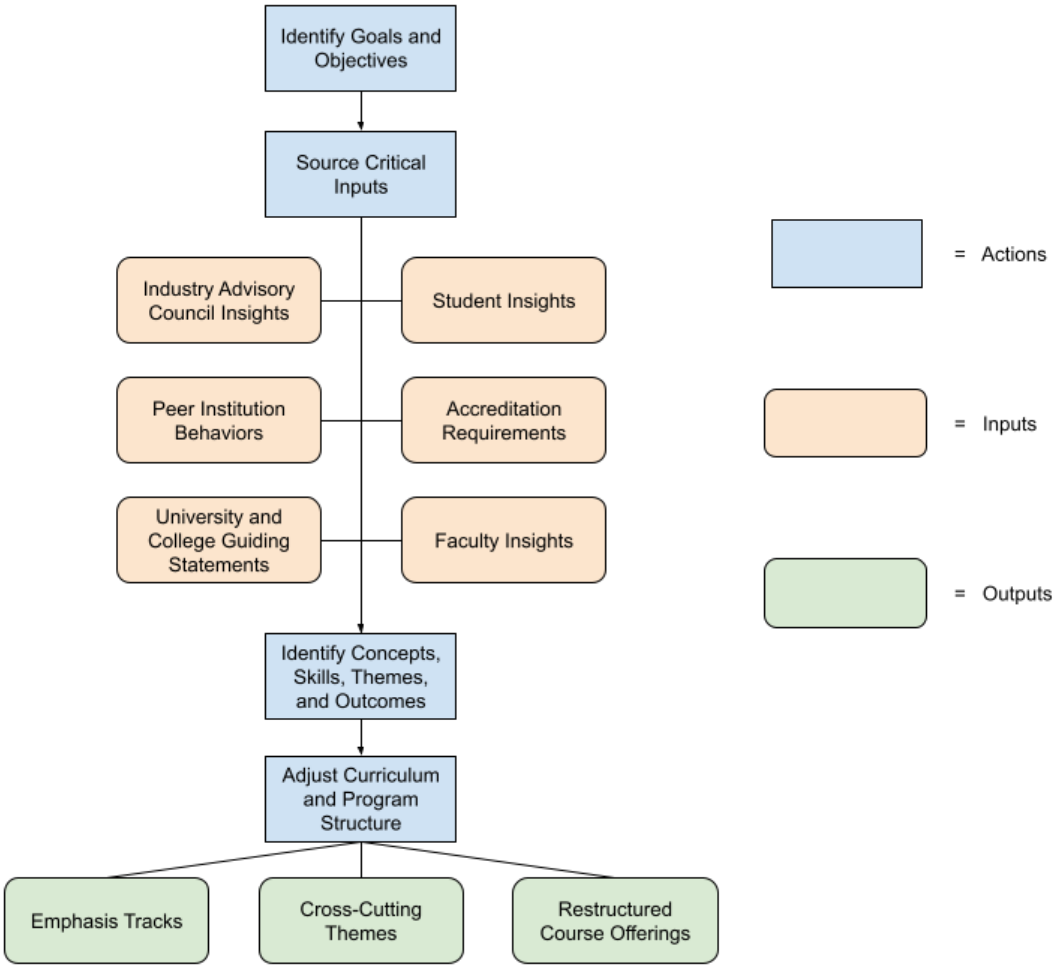

Figure 1: Comprehensive undergraduate program review process

Identify Goals and Objectives

The first step was to outline the primary goals and objectives of the undertaking. Establishing clear objectives was important in ensuring the process was focused, efficient, and effective. These predefined objectives provided overarching direction and facilitated focused stakeholder engagement.

Establishing clear objectives also enhanced the thoroughness of the review. Working together to establish these objectives at the beginning of the process created a collaborative environment and built support among participants for the effort. This collaborative environment, in turn, fostered an open and non-threatening exchange of ideas, such that new ideas and unique or otherwise novel perspectives were allowed and encouraged. An open approach was essential in making the review process purposeful and in delivering meaningful program improvement recommendations. The following five objectives were established by the CFM program committee:

1. Evaluate and align the CFM program with the recently re-stated Mission, Aims, and Strategic Objectives of BYU, including making unique university focus areas more explicit.
2. Re-center the program on student learning, provide flexibility for diverse student interests & career opportunities, and provide students greater ownership of their educational experience.
3. Review learning outcomes' alignment with preparing CFM students for current and changing professions and evaluate the CFM program against updated ABET Student Outcomes.
4. Capitalize on the strengths of new faculty and recent adjustments and trends in the industry.
5. Strengthen CFM student interactions within the CCE department and optimize the CFM program with department resources & course offerings.

Source Critical Inputs

Sourcing critical inputs for the process was the second step. This helped the committee ensure the process was informed, balanced, and reflective of the needs and expectations of all stakeholders. Six critical input categories were identified: industry advisory council insights, student insights, reviews of peer institution behaviors and best practices, accreditation requirements, university and college guiding documents, and faculty insights.

1 - Industry Advisory Council Insights. The BYU CFM program's Industry Advisory Council (IAC) is a collection of approximately 30 industry professionals who provide various types of support to the program. Such councils or boards play an important role in higher education (Zahra et al., 2011). The BYU CFM IAC participates in semi-annual meetings to provide industry perspectives and outlooks, discuss program changes, and review program outcomes. Within the IAC there is a faculty committee that assists throughout the year with course level organization and content reviews. As part of the program review process, focus group meetings were held with the IAC faculty committee, resulting in several notable insights. For example, it was repeatedly expressed that while structural realignment within the CCE department increased CFM students' exposure and depth in engineering practices and principles, a generally positive outcome, care should be exercised that key concepts related to management, economics, leadership, and business should not be lost. These sorts of themes emphasized the value that industry professionals place on students' generalized exposure to many facets of management in the built environment. Another theme addressed balancing exposure to sub-markets within the industry (e.g., residential, commercial, heavy civil) so that students could obtain a conscious understanding of the unique scopes and challenges in the various construction markets; also, taking care that courses appropriately balance specialty trades' skills training with increasing management knowledge requirements. Ultimately, the IAC perspectives highlighted necessary competencies currently in demand and needed in the future (supporting objectives 3 and 4).

2 - Student Insights. Student panel discussions and student surveys provided equally important insights as they reflected direct experiences and perceived outcomes of the educational process. Student panels were organized so students could offer their perspectives on learning outcomes and student's ability to achieve them. These panels are interesting in assessing learning outcomes, particularly when students have yet to take some of the courses (since students don't know what they

don't know). Thus, feedback was captured in categories of what students had achieved, and what students thought was reasonable to achieve. In addition to these panels, end-of-semester student surveys were used to evaluate student perceptions regarding which current course learning outcomes were being achieved. Lastly, and perhaps most reflective of the effectiveness of program objectives generally, was a careful review of 3-year alumni survey results. These efforts helped the program committee identify a diversity of student interests stemming from student demographic shifts over the last 5 years and changes in the distribution of student job placement. Gaining direct student and alumni perspectives allowed proposed program changes to be tailored to enhance student engagement and success (supporting objectives 2 and 3).

3 - Peer Institutions' Best Practices. To understand institutional best practices, multiple peer institutions' program structures and curricula were reviewed. It was overwhelmingly obvious that there are several successful ways to structure CFM programs. At the curriculum level, comparisons indicated that the BYU CFM program should consider changes to strengthen curricula and associated learning outcomes in the areas of infrastructure development and sustainability. Reviews of peer institution behaviors and best practices enabled benchmarking with current standards and resulted in the identification of innovative approaches for select program outcomes to help support academic excellence (supporting objective 3).

4 - Accreditation Requirements. Adherence to accreditation requirements aids programs in meeting established quality and rigor, which is necessary to maintain the program's credibility and value (Natarajan, 2000). This proved to be well-timed, as significant ABET accreditation requirements had recently changed (ABET, 2021). Generally, topical coverage at the program level had expanded in specificity and breadth. For example, the previous treatment of 'sustainability' was undefined but has been updated to explicitly focus on "project sustainability, including materials and methods of construction." Similarly, "finance and accounting principles" were expanded to "financial management including budgeting, cost control, and forecasting." Higher-order thinking also seemed to be better encouraged, exemplified by a change from "materials, labor, and methods of construction" to "construction systems and constructability analysis." Lastly, new or significantly revised topics were explicitly identified for inclusion in the program review process. These were: risk management including identification, analysis, and mitigation; workforce planning and management; and advancements in construction technology. Combining results from recent annual program accreditation reviews and conducting a full review of current accreditation requirements provided helpful insights in the comprehensive review process (supporting objective 3).

5 - Organizational Guiding Documents. Another timely event for BYU, is the upcoming 150th anniversary in 2025. In preparation for this event, the mission and aims of 'a BYU education' have been reemphasized. University administrators have supplied faculty and staff with copies of founding documents and asked for participation in taking stock of how the university is contributing to society. With this recent activity, it has become clear that making values more explicit in and across the program is necessary. Reviewing the University and College guiding documents served as a compass, ensuring that the program's adjustments would be aligned with the institution's broader mission and aims (supporting objective 1).

6 - Faculty Insights. Lastly, early engagement and continuous participation and workshopping by the full program faculty provided diverse perspectives and built ownership in the process and outputs. This collaborative approach is expected to help the faculty maintain their "buy-in" through the ongoing process of implementation. The process was not without challenges, but the commitment to a shared set of objectives allowed faculty to have crucial conversations about structure, courses,

and learning outcomes. For example, how to accomplish an educational rebalancing in a program with prized historical remnants that emphasized multiple trade skills, with the need to deepen students' systems and management thinking. Additionally, how to expand from classical university pedagogy to better incorporate experiential learning (such as internship requirements and capstone-type experiences) and incorporate cross-cutting themes throughout the curriculum. Faculty insights brought unique expertise into the review process, which allowed for curriculum adjustment recommendations that were academically sound and pedagogically effective. Collectively, the material gained in these six input categories formed a comprehensive base of knowledge from which to recommend changes for a robust, relevant, and forward-thinking academic program supporting objectives 1-5.

Identification of Concepts, Skills, Themes, and Outcomes

The third step in the process was to identify what the CFM program should produce. What exactly was the "product" of the CFM baccalaureate program? It was determined that the product was a CFM student-graduate that had value. This may be considered 'societal value' at the macro level; 'industry, economy, or market value' at the meso-level, and 'individual, family and community value' at the micro level (Bowen, 2018). This step began with the question, "What should a student be?" That question was followed by "… then what should a student be able to do." Finally, the most granular question, "then what does a student need to know?" Beginning with the end in mind—the CFM student-graduate—the committee aimed to "engage the curriculum" (Barnett & Coate, 2004), and create a comprehensive list of concepts, skills, themes, and outcomes. Over 150 discrete elements were identified. These elements were then grouped together into content areas. In some cases, elements were duplicated and grouped into multiple content areas, which led to one of the most significant outcomes of the process—cross-cutting themes (discussed later).

Recommend Adjustments to Curriculum and Program Structure

The final step was to evaluate the content areas against courses currently offered, courses that could be offered, and a final category of concepts needing further evaluation and consideration. This evaluation led to specific proposals to adjust curriculum and even larger adjustments to the program structure. To effectively do this, each existing course had to be reviewed at the learning outcome level. A pair of faculty reviewers, generally those faculty members who have had experience in teaching those courses or would likely be teaching them in upcoming semesters, reviewed each course and conducted a qualitative analysis of how well the existing learning outcomes mapped with the organically derived content areas. The reviews were presented to the full committee, and a discussion about each existing course took place. Content areas not mapping to existing courses were also discussed. In these discussions, initial ideas for the addition of new courses, the removal of some courses, and significant alterations in other courses (content and/or pedagogical delivery) were presented. Each pair of reviewers then proposed revised learning outcomes. A final set of discussions culminated in synthesizing and summarizing the full set of recommendations for curriculum adjustments (including course offerings) and program structure. Those recommendations—the outputs—can be summarized into three action categories: 1) the establishment of non-binding emphasis tracks within the degree program, 2) changes in course offerings, and 3) the establishment of cross-cutting themes to be incorporated and annually reviewed at the course outcome level.

Review Process Outputs

The process outlined above took over six months of active work by the CFM program undergraduate committee. While the CFM program committee has a practice of conducting annual program reviews,

this comprehensive review was a much larger task. Each full-time faculty member teaching within the program participated in the process. An outcome of the "all-hands" process was a deep understanding and strong alignment in the proposed recommendations by all participants. In this section, the resulting action categories for the recommendations are presented.

Emphasis Tracks

A construction management undergraduate degree has historically been a "generalist's degree" in the built environment (Betts & Wood-Harper, 1994; Cheng et al., 2006). BYU's program is no exception. This generalist approach is important as CFM professionals work in a host of capacities to coordinate, interact, direct, lead, and manage multiple disciplinary specialties. CFM students develop fundamental knowledge and skills in design and engineering science, construction methodology, management of people, processes, projects, etc. This training is typically leveraged into distinct and often very different career paths and industries. To help students 1) choose and take ownership of their education path, 2) focus their networking and internship experiences, 3) develop greater depth of learning in focused sub-markets, and 4) otherwise build a brand for themselves as they enter the labor market, five elective specialty tracks were proposed: Construction Management, Facilities and Property Management, Real Estate Development, Infrastructure Development and Management, and Architecture and Design.

The proposed specialty emphasis tracks were combinations of program elective courses, purposefully identified to build up area/market competencies. These tracks are non-binding, and students are not "locked-in" to any track as a condition or component of their major program of study. This means students can change or take any combination of program elective courses to fulfill graduation requirements. This accomplishes the goal of providing student flexibility without unnecessary administrative burden. The proposed tracks balanced areas of student interest with current and future industry needs and optimization of faculty and department strengths and competencies.

Changes in Course Offerings

As a result of the overall analysis, significant curricular changes were proposed. It is interesting to note that following the review process, the committee generally felt that the program as reviewed was in generally strong condition. However, 19 of the 27 courses (70%) within the major program received some level of change beyond learning outcomes. These changes included the restructuring of 12 courses, the discontinuance of four courses, the addition of four new courses, the addition of two new elective course slots, and the inclusion of a 2-credit experiential learning requirement. Other proposed alterations included name changes, prerequisite sequence changes, and credit hour changes.

Some of the most significant changes included the development of a systems sequence of courses, by remaking a *Light Structural Framing* course, previously focused on structural framing of residential and light commercial buildings, into a *Structural Systems* course. This new format alters the focus of the course from residential framing trades to a more comprehensive scope of structural building systems. Students will learn about foundation systems, structural wall and floor systems, and roof systems, and their multiple interactions. Coupled with that change was the proposal for consolidating an electrical course, with an HVAC course, into a new *Building Systems* course. Like changes in the *Structural Systems* course, the *Building Systems* course will also shift focus to a systems perspective of buildings. This is a change that has been widely adopted in industry and the academy (Kerzner, 2017). Students will continue to learn about the basic elements and functions of mechanical,

electrical, and plumbing systems, but now from a whole-building perspective. This allows students to better understand the integrative nature of these systems in building design, construction, and operations. An elective junior-level course in advanced building systems was also developed. Other significant changes included the proposed addition of new courses – *Sustainable Design and Architecture*, a *Design Studio* course, and a *Civil Infrastructure Construction* course. These courses are responses to changes in industry trends and student interests.

Cross Cutting Themes

Since BYU's CFM program has developed from the 1960s, various courses have been added to address education objectives in specific areas. However, in the comprehensive review multiple cross-cutting themes were identified that should have more explicit attention and tighter integration across courses rather than being taught primarily in select courses. These themes included:

- Ethics + Integrity
- Safety as a value
- Quality Assurance
- Risk + Management
- Data Collection + Analysis
- Critical Thinking / Problem Solving
- Sustainability
- Innovation
- Design: Processes + Systems
- Modern Technology
- Continuous Improvement
- Professionalism
- Leadership
- Communication
- Teamwork

Teaching themes across the curriculum enhances learning by reinforcing concepts through varied contexts, fostering critical thinking by showing the interconnectivity of knowledge, and promoting a cohesive educational experience (Dannels, 2002). It enables students to develop a comprehensive understanding of subjects, ensuring depth and breadth in their education. This approach cultivates essential skills like communication and analysis, prepares students for the diverse and interdisciplinary nature of professional fields, and encourages adaptability. Additionally, it ensures students gain broader awareness, regardless of their major, and fosters an environment that promotes lifelong learning. As a next step, the BYU CFM faculty have recently mapped each theme across the entire curriculum. This has provided a comprehensive picture of where each theme is currently covered and gaps in coverage, and ultimately identify where additional efforts are warranted.

Conclusions

This case study of BYU's CFM comprehensive program review illustrates the importance of these types of reviews in higher education. The case reported here, driven initially by a need to adapt to organizational changes and evolving market dynamics, led to specific proposals designed to enhance the program's alignment with the industry, enrich the curriculum, and broaden the educational scope and choices for students. The introduction of emphasis tracks, the integration of cross-cutting curricular themes across courses, and the revamping of course content collectively signal a forward-thinking shift towards a more interdisciplinary and pragmatic educational model. This initiative not only invigorates the CFM program's competitiveness but also amplifies its graduates' readiness to excel in a multifaceted professional environment. The process detailed in this case study provides a valuable blueprint for other academic programs navigating similar landscapes of change, which changes may include internal and external environments, such as administration, advancements in the professional industry, student demographics as evidenced by enrollment shifts, new faculty onboarding, or simply a need to refresh a program in an otherwise changing world.

Source inputs used to support the comprehensive review process may vary to some extent. However, the general categories reported here are likely to be found in any academic program. Just as important as the comprehensive review process is having an ongoing commitment to regular data collection about the program and its performance from which to draw critical insights. In this case, semi-annual reviews with the program's Industry Advisory Council, annual student survey data from exiting seniors, the three-year alumni survey, and yearly outputs from accreditation review cycles were critical. These inputs, combined with focused data collection on peer institutions' best practices, and institutional guiding documents, were leveraged with an engaged and collaborative full program faculty and leadership committee. While not a replacement for regular program reviews and accreditation cycles (Briggs, 2007), comprehensive curriculum reviews are a catalyst for meaningful, sustained progress in university education (Oliver & Hyun, 2011). This case study contributes to the body of knowledge by serving as an example of how to perform a robust comprehensive program assessment. We acknowledge the importance of continuous improvement through accreditation but suggest that there are circumstances that require larger holistic attention, and which, when done properly, can invigorate a program, strengthen faculty commitment to a shared vision, reconnect to industry needs, and ultimately provide better educational value to students, communities, and society.

References

ABET. (2021). Criteria for Accrediting Applied and Natural Science Programs (R001 11/27/2021).

Allen, M.J. (2003). *Assessing academic programs in higher education* (Vol. 42). John Wiley & Sons.

Barnett, R., & Coate, K. (2004). *EBOOK: Engaging the curriculum*. McGraw-Hill education (UK).

Betts, M., & Wood-Harper, T. (1994). Re-engineering construction: A new management research agenda. *Construction Management and Economics*, *12*(6), 551–556.

Bowen, H. (2018). *Investment in learning: The individual and social value of American higher education*.

Briggs, C.L. (2007). Curriculum collaboration: A key to continuous program renewal. *The Journal of Higher Education*, *78*(6), 676–711.

Cheng, M.Y., Tsai, M.H., & Xiao, Z.W. (2006). Construction management process reengineering: Organizational human resource planning for multiple projects. *Automation in Construction*, *15*(6), 785–799.

Conrad, C.F., & Wilson, R.F. (1985). Academic Program Reviews: Institutional Approaches, Expectations, and Controversies. *ASHE-ERIC Higher Education Report No. 5*, 1985. ERIC.

Dannels, D. (2002). Communication across the curriculum and in the disciplines: Speaking in engineering. *Communication Education*, *51*(3), 254–268.

Dyjur, P., & Kalu, F. (2016). *Introduction to curriculum review*. Taylor Institute for Teaching and Learning, University of Calgary.

Kerzner, H. (2017). *Project management: A systems approach to planning, scheduling, and controlling*. John Wiley & Sons.

Natarajan, R. (2000). The role of accreditation in promoting quality assurance of technical education. *International Journal of Engineering Education*, *16*(2), 85–96.

Oliver, S.L., & Hyun, E. (2011). Comprehensive curriculum reform in higher education: Collaborative engagement of faculty and administrators. *Journal of Case Studies in Education*, 2.

Zahra, S.A., Newey, L.R., & Shaver, J.M. (2011). Academic advisory boards' contributions to education and learning: Lessons from entrepreneurship centers. *Academy of Management Learning & Education*, *10*(1), 113–129.