

Experiential learning in engineering education: a case study at NIU

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ABSTRACT: The field of engineering education has gone through several re-engineering efforts under various names. Some of the popular names in the past have been *sustainable engineering* and *concurrent engineering*. While each of these names has a different flavour to it, the underlying principle of effective engineering education has been its ability to provide practical and functional learning opportunities to students. Experiential learning, which encompasses all types of practice-based learning opportunities, is the founding principle of a successful engineering education model. Of Northern Illinois University's seven colleges, the College of Engineering and Engineering Technology (CEET) is the youngest and smallest. The College is 25 years old, and has focused on its position statement of *Theory Meets Practice* to create a niche for its programmes in engineering and technology. Outlined in this article is the unique strategy adopted by the College to provide experiential learning opportunities to its students.

Keywords: Engineering research, industrial partnerships, experiential learning, engineering

INTRODUCTION

Northern Illinois University's (NIU) College of Engineering and Engineering Technology (CEET) has created productive partnerships with almost 200 area companies, and the College continues to address issues of economic development, innovation, and workforce training for its industrial partners. These industrial partners, in addition to serving on various advisory boards, are active in providing research opportunities to students and faculty, and also sponsor design projects for CEET students.

Placement of students graduating from the College always has been high, and industries consistently return to hire additional graduates. However, in the current economic climate, companies are finding it hard to employ full-time engineers, due to the associated costs and uncertainty of making a long-term commitment to employees.

Also, there is a high percentage of international students enrolled in the College's graduate programmes. It has been observed that companies want to assess the quality of these graduates before giving them full-time employment and applying for the H-1B visa that is required for international students to be able to work in the country after graduation. International students also have an opportunity to pursue work opportunities under the Optional Practical Training (OPT) model, which entitles them to have work privileges as authorised and approved by the immigration and university policies.

These students need an opportunity to demonstrate their skills and impress their prospective employers in order to gain future full-time employment. Their chances of success are enhanced by them getting involved in activities that blend theoretical knowledge with real-life practical experiences. An initiative is described in this article that enhances problem-based experiential learning for all participants, thereby increasing their functionality [1].

The College also has an active research programme for the undergraduate students. These students can enhance their skills by participating in research-oriented assignments in business and industrial sectors. The model described below addresses all of the above concerns and strengthens the relationships between academia and the business sector, which is an important ingredient for area economic development.

Also, there is an expressed need by the industrial sector for the graduating engineers to be exposed to experiential learning opportunities. Experiential learning not only makes the students technically functional, but also enables them to be better engineers as a result of their understanding of the real-life content of their engineering education [1-3].

ENGINEERS IN RESIDENCE (EIR) PROGRAMME

The Engineers in Residence (EIR) programme was conceptualised two years ago, while the economy was in a downturn, and students were struggling to find employment opportunities. The model was a way to provide low-cost research expertise to industries without burdening those companies with benefits and other costs usually associated with hiring a new employee. The model is based on providing 20 hours a week of work, to be concentrated upon a research area sponsored by the company. The student is usually on the university payroll. The company is charged a lump sum cost for a nine-month appointment. The assignment usually coincides with the academic year, but can be negotiated to coincide with the calendar year, depending upon the mutual agreement between the employee and the employer. It has been observed that after one year, many students participating in the EIR model become potential full-time employees for the company upon graduation. The company gets an opportunity to evaluate the skills of the EIR candidates and feels increasingly comfortable in hiring a person who may require further support from the company to process immigration formalities for international students.

Every student is assigned a faculty advisor, enabling them to go above and beyond their own personal skills to provide research solutions to the problems indicated by the company. If needed, the department chair may also provide assistance. The College's own facilities, comprised of 43 state-of-the-art laboratories, and about 120 engineering software programs, are also made available to the student to do his or her work. The research areas, which coincide with faculty expertise, are compiled and shared with the prospective companies, in order for them to focus their interest in areas of mutual expertise. The students work on real-life issues and seek advice from their peers, mentors and faculty advisors to enrich their theoretical knowledge with practical, hands-on experience, thereby making them better engineers [2][4].

SAMPLE OF CURRENT PROJECTS

Examples of some of the College's EIR projects are described below. The purpose is to understand the scope of work and technical expertise required to enter into EIR agreements. Also, the active involvement of industry in assessing and evaluating the project enhances its relevance and efficiency [5]. The projects highlight the skill sets expected of students who participate in EIR projects.

Project 1: To Analyse the Quotation Process and Production System

This company specialises in cold heading, hot forming and forging tooling. The company has been supplying steel and carbide tooling to the fastener industry for more than 28 years. It has CNC (computer numerical control) machines to perform turning and milling operations, and grinding, EDM (electrical discharge machining), and other tooling capabilities are available in-house.

Project Objectives

The objective of this research study was to optimise the quotation process. In order for the company to be profitable, it is necessary to develop accurate and timely quotations to attract new customers, and to provide excellent service to continuing customers. By under-quoting, the company may incur loss; by over-quoting, the company can lose a customer. The primary objective of this study was to streamline the existing quotation process. To prepare a good quote, the time standards for each operation, cost of individual components from the BOM (bill of materials), labour costs, and other pertinent information were assessed and analysed.

Project Activities

Through preliminary discussions, it was confirmed that the time standards used in the *as-is* case are questionable (or can be improved). Consequently, the first major project task was to develop time standards for operations involved at the company and validate these standards with their team. In order to accomplish this, the project team studied all the operations, product types or families, material used, etc. A detailed process map for each product type or family was developed. Time standards were then established based on the process map. Both the team from NIU and the company worked closely to agree upon the standards and the process maps.

Upon completing the first task, the following steps were taken to streamline the quotation process:

1. Developed business process flow map for the entire quotation process (from initial customer inquiry to order confirmation);
2. Identified methods or procedures to shorten the time to prepare quotes;
3. Tested the new procedures and verified if they were viable to implement.

In addition to streamlining the quotation process, this research also attempted to investigate current procedures followed for scheduling and product changeovers. The objectives of these initiatives were to improve resource utilisation, shorten downtime of the resources, and minimise waste.

Project Deliverables

The project deliverables included documentation of all the procedures, and, if necessary, the training of appropriate personnel to follow the new procedures.

Project 2: Implement the Throughput Related Process Improvements for the Assembly Operation Area

Project Objectives

The ultimate objective of this project was to study the two main assembly lines, and to redesign current processes that allow improvements in throughput. The research work included process mapping, time standards, line balancing, 5S (workplace organisation methodology), lean manufacturing, etc. This time study served as the input for calculating time standards and performing analysis to improve performance, maximise efficiency, reduce costs, and to increase throughput.

The primary objectives of the project were to:

1. Develop value stream mapping for the area under study documenting the current state.
2. Perform a complete time study for the assembly area.
3. Analyse throughput and line balancing for the assembly line.
4. Provide recommendations for improvement.
5. Develop and document a future state process map.

Project Activities

The planned activities undertaken by the NIU team, with support from the supervisors of assembly area, were to:

1. Develop a value stream map to document the current state of the assembly process.
2. Perform a time study and collect data.
3. Calculate time standards.
4. Analyse throughput and line balancing.
5. Perform cost analysis for alternatives of improvements.
6. Develop a future state process map that documents improvements.
7. Write a technical report and prepare a presentation.

Project 3: Implement Quality Management Systems for a Machine Tool and Production Company Serving OEM (original equipment manufacturers) and Volume Users

Programme Objectives

The primary objective of this research endeavour was to prepare the company to develop a quality management system, which would help them to get certified in AS9100 and ISO/TS 16949. The AS9100 is a set of quality management system requirements for design and manufacture of aerospace products. Quality and reliability are critical factors for components manufactured for the aerospace industry. An effective quality management system is essential to minimise risks and to provide reliable products and services to the aerospace industry.

The aim of ISO/TS16949 is to align automotive quality standards in the United States and other countries within the global automotive industry. The project included developing quality standards for their management with a general theme of optimisation and continuous improvement. The project also reviewed the supply chain and production systems.

Programme Activities

In order to accomplish the primary objectives, tasks were undertaken to:

1. Review current system and procedures.
2. Conduct gap analysis.
3. Develop an action plan to close the gap.
4. Create procedures/processes.
5. Recommend changes through a formal report and offer to participate in the implantation process.
6. Audit changes and revise as required.
7. Provide recommendations and appropriate training.

The final deliverable of the project was to develop standard operating procedures to follow different processes in the facility. During the course of this project, many process improvement opportunities were explored, implemented and reported.

Project 4: A Systematic Approach to Assessing Energy Consumption for a Company

Programme Objectives

The primary objective of the proposed research project was to analyse the energy consumption of different furnaces in the facility. Energy consumed is a function of the number of parts loaded in a batch, total weight of the parts in the batch, material composition, customer specifications, the profile used, etc. Some furnaces use electricity, while others use gas to heat. The project studied both electrically and gas heated furnaces. When some furnace types were available in multiple identical units, one furnace of every type was studied. By understanding how energy is consumed by each furnace, the company was in a better position to prepare accurate quotes. Prior to the project, the company did not have a mechanism to measure the energy consumed by each furnace and adopted an *ad hoc* approach to preparing quotes. The findings of this study enabled the company to assess the energy consumed and helped them to prepare accurate quotes, thereby rendering them more profitable and productive.

Project Activities

The following activities were undertaken to complete the proposed project:

1. Understand the flow of materials in the facility, different heat treatment processes, different types of furnaces, etc.
2. Identify the set of furnaces that should be studied, and prepare a priority list to follow.
3. Observe the profile, cycle times, and pertinent details for several batches of orders.
4. Conduct interviews with practitioners to understand what they might think affects the cycle time.
5. Identify the factors that affect the amount of energy consumed.
6. Identify appropriate energy meters to collect data on energy consumed for several orders.
7. Validate and verify the results with historical data, where appropriate.
8. Discuss the findings with practitioners from the company and repeat the study for fine-tuning, if necessary.

The final deliverable was a report outlining both the cost per unit of energy consumed for different furnaces, and a plan for optimising the costs. The above information provided a sample of the kind of projects CEET accepts under the EIR programme. The purpose was to establish a mutually beneficial relationship with the industry partners and to stimulate research and innovation in a cost-effective manner.

INDUSTRIAL FEEDBACK

The College has received very positive feedback from companies who have partnered with CEET for the EIR programme. A sample of comments from the several companies involved in EIR is below:

- The Chief Financial Officer of one of the participating companies expressed his *strongest support* for the cost-effectiveness of the EIR programme: *The [EIR] student has identified processes and procedures to reduce quote time turnaround by 38% ...the savings to the company is approximately US\$27,000 per year.*
- The Vice President of Manufacturing for another participating company said that *the Engineering in Residence programme was EXACTLY what we needed.* She called the participating EIR students *professional and mature*, saying that they *have fit with the company better than any of us had hoped.*
- The Distribution Director for a participating company said that he likes *the fact that it brings the business community together with the college community*, and that the EIR students are *respectful, intelligent and understanding.* The Industrial and Automation Supervisor at the same company said that the *[EIR] interns have provided us great opportunities to take projects to a higher level.*

The comments substantiate the ability of the College's faculty and students to handle challenging research assignments sponsored by industry, and also reflect a mindset of industry/academia partnership, which will be critical to economic development and sustainability. Upon talking to the students, it was established that they found their experience to be fulfilling. They better understood the concept of applied research and were appreciative of the fact that faculty were available for consultation when needed. Some of the students participating in the programme felt they were better prepared for their careers and that they had a competitive advantage in their job search. Several of the students perceived EIR as an ideal vehicle for their final launch into the work sector. Also, the increased confidence and sustained motivation were some of the other attributes seen in participating students.

SAMPLE MEMORANDUM OF UNDERSTANDING (MOU)

The agreement is necessary to address intellectual property issues associated with the EIR projects and must be approved by the legal entities of the participating members (CEET and the sponsoring industry).

AGREEMENT

THIS AGREEMENT is made between the Board of Trustees of Northern Illinois University, hereinafter called the "UNIVERSITY," with principal offices at DeKalb, Illinois 60115, and [COMPANY NAME], hereinafter called the "SPONSOR," with principal offices at [ADDRESS].

WITNESSETH:

WHEREAS, the SPONSOR and the UNIVERSITY desire to enter into an agreement pertaining to a Project investigation in accordance with the Statement of Work in Appendix A; and

WHEREAS, the investigation is to be funded by the SPONSOR and carried out by the UNIVERSITY under the terms and conditions specified herein; and

WHEREAS, the performance of such investigation is of mutual interest to the SPONSOR and the UNIVERSITY, and is consistent with the instructional, scholarship and research objectives of the UNIVERSITY as a non-profit, tax-exempt educational institution.

NOW, THEREFORE, in consideration of the mutual covenants and promises herein contained, the parties hereby agree as follows:

1. STATEMENT OF WORK

The UNIVERSITY agrees to use reasonable efforts to perform the project as described in the Statement of Work, which is incorporated herein and attached as Appendix A. These efforts are hereinafter called the "Project". The UNIVERSITY shall perform this effort consistent with reasonable standards of professionalism applied in related fields. The Project is titled, "*Lean' Process Improvement for Medical/Surgical Unit*" at [COMPANY NAME].

2. PRINCIPAL INVESTIGATOR

The Principal Investigator assigned by the University for directing the performance of the Project is [FACULTY NAME]. If for any reason the Principal Investigator withdraws from serving as principal investigator, the UNIVERSITY and the SPONSOR shall endeavor to agree upon a successor. If the parties are unable to agree upon a successor, SPONSOR shall have the right to terminate this Agreement in the manner provided in the paragraph 9 entitled Termination.

3. PERIOD OF PERFORMANCE

The work shall be performed during the period from [DATES]. This date may be extended under the same terms or such other terms as may be mutually agreed upon.

4. COST OF RESEARCH

The SPONSOR agrees to pay the UNIVERSITY the fixed sum of [SAMPLE PRICE] for the performance of this Project. Payments are to be made in accordance with the following schedule:

1. Upon execution: [PRICE].
2. Thereafter, as follows: [PRICE] within thirty (30) days after delivery of the final product.
3. The UNIVERSITY shall retain title to equipment and all other items purchased with funds provided by the SPONSOR.

Checks are to be made payable to Northern Illinois University.

The UNIVERSITY is not obligated to expend any other funds on the Project, and the SPONSOR is not obligated to pay the UNIVERSITY in excess of the above stated amount.

5. RIGHTS IN WORK PRODUCT

All original Project results, data, records and work product generated by the UNIVERSITY under this Agreement, including all tangible and intangible property, shall be owned by the UNIVERSITY in accordance with UNIVERSITY policy.

6. INVENTIONS AND PATENTS

- A. The UNIVERSITY shall own all inventions, discoveries, and other developments hereafter called "Inventions", the UNIVERSITY generates under this Agreement.
- B. The UNIVERSITY shall disclose in writing any inventions resulting from the Project to the SPONSOR at the same time as the Principal Investigator discloses them in writing to the UNIVERSITY personnel responsible for patent matters. The disclosure to the SPONSOR shall be in the form of a written report and shall identify this Agreement and the Principal Investigator. The report shall be sufficiently complete in technical detail to convey a

clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical or biological characteristics of the Invention.

- C. If the SPONSOR directs that a patent application or application for other intellectual property relating to the Invention be filed, the UNIVERSITY shall promptly prepare, file, and prosecute such U.S. and foreign application(s) in the UNIVERSITY'S name. The SPONSOR shall bear all costs incurred in connection with such preparation, filing, prosecution, and maintenance of U.S. and foreign application(s) which are owned by the UNIVERSITY. The SPONSOR shall cooperate with the UNIVERSITY to assure that such application(s) will cover, to the best of SPONSOR'S knowledge, all items of commercial interest and importance.
- D. If the SPONSOR elects not to exercise its option as described below or decides to discontinue the financial support of the prosecution of maintenance of the protection, the UNIVERSITY shall be free to file continued prosecution of or maintain any such application(s), and to maintain any protection issuing thereon in the U.S. and in any foreign country at the UNIVERSITY'S sole expense, without further obligation to SPONSOR.

7. GRANT OF RIGHTS

- A. The UNIVERSITY hereby grants the SPONSOR a royalty-free, non-exclusive license to use the Invention within its own organization for any noncommercial purpose.
- B. The UNIVERSITY hereby grants the SPONSOR the first option, at the SPONSOR'S sole election, for either (a) a non-exclusive, royalty-bearing license to use the Invention for any purpose except sublicensing, or (b) an exclusive, royalty-bearing license with a right to sublicense. Terms and conditions of these licenses are to be negotiated in good faith and agreed upon between the UNIVERSITY and the SPONSOR. Provided the SPONSOR has participated in bearing patent expenses as described in Article 6 above, this option shall extend for a period of sixty (60) days from the termination date of this Agreement.
- C. In the event that the SPONSOR acquires an exclusive license or right under subsection B of this Article, the UNIVERSITY will retain the right to continue to use any such Inventions within the UNIVERSITY for any noncommercial purpose.

8. CONFIDENTIAL INFORMATION

- A. Prior to disclosure of Property Information to University by SPONSOR, SPONSOR shall notify Principal Investigator of its intent to disclose Proprietary Information. The Principal Investigator shall have the right to decline receipt of said information. Said Proprietary Information shall be sent only to Principal Investigator. Information disclosed orally shall be considered. Proprietary Information is only if such information is stated to be so at the time of disclosure and is confirmed in writing as being Proprietary Information within thirty (30) days after the initial disclosure.
- B. Each party to this Agreement agrees to treat Proprietary Information received from the other with the same degree of care with which it treats its own Proprietary Information and further agrees not to disclose such Proprietary Information to a third party without prior written consent from the party disclosing Proprietary Information.
- C. The foregoing obligations of non-disclosure do not apply to Proprietary Information which:
 - (a) Was known to the recipient prior to the disclosure hereunder;
 - (b) Was received from a third party not under and obligation of confidence to recipient;
 - (c) Is in the public domain at the time of disclosure hereunder or subsequently entered the public domain without the fault of the recipient;
 - (d) Has been independently developed by an employee of recipient that has not had access directly or indirectly to Proprietary Information, and recipient can substantiate any claim of independent development by written evidence; or
 - (e) Is required to be disclosed by law.
- D. Unless otherwise agreed to in writing, neither party hereto shall have any obligation of confidentiality under this Agreement after the earliest of either the fifth anniversary of the conclusion of Period of Performance or termination in accordance with Article 9.

9. TERMINATION

This Project may be terminated by either party upon thirty (30) days written notice. In the event of termination by the SPONSOR, the UNIVERSITY will be reimbursed for all costs incurred and all non-cancellable commitments at the time of termination. In the event of termination by the UNIVERSITY, any unexpended or unobligated balance of funds advanced by the SPONSOR shall be refunded to the SPONSOR. The provisions of Articles 5, 6, 7 and 10 shall survive any termination of the Agreement.

10. USE OF THE NAME OF THE PARTIES

Neither the SPONSOR nor the UNIVERSITY shall make use of the existence of the Agreement, nor use the other's name or the name of any member of its staff, for publicity or advertising purposes except with the consent of and to the extent approved by the other party. For the UNIVERSITY, such approval will be obtained from the Director, Office of Sponsored Projects.

11. PUBLICATION

The UNIVERSITY shall have the right to publish or otherwise disclose the results of this Project, provided that the Principal Investigator first provides the SPONSOR with a copy of the proposed publication at least thirty (30) days in advance of submission for publication. The SPONSOR shall have thirty (30) days after the receipt of the publication or presentation to review it. The Principal Investigator shall modify said publication in order to comply with reasonable requests by the SPONSOR. Upon notice by the SPONSOR that the SPONSOR reasonably believes a patent application relating to an Invention should be filed prior to the publication or presentation, the SPONSOR can request the UNIVERSITY to delay and the UNIVERSITY agrees to delay submission of the publication or presentation for up to sixty (60) days from the date the SPONSOR so notifies the UNIVERSITY or until a patent application or applications are filed, whichever comes first.

12. REPORTS

A final report will be submitted to the SPONSOR by the Principal Investigator within one hundred twenty (120) days of the termination of this Agreement.

13. WARRANTIES AND INDEMNIFICATION

THE UNIVERSITY MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, REGARDING ITS PERFORMANCE UNDER THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO THE MARKETABILITY, USE OR FITNESS FOR ANY PARTICULAR PURPOSE OF THE PROJECT RESULTS DEVELOPED UNDER THIS AGREEMENT, OR THAT SUCH RESULTS DO NOT INFRINGE UPON ANY THIRD PARTY'S PROPERTY RIGHTS. The SPONSOR agrees to indemnify and hold harmless the UNIVERSITY and its employees and agents against any and all costs, damages and expenses, including attorney's fees, arising from any claims, damages and liabilities asserted by third parties arising from the SPONSOR'S use of said results.

14. ASSIGNMENT

Neither party shall assign its rights under this agreement without the prior written consent of the other party. Notwithstanding the foregoing, University hereby consents to the assignment of this agreement by Sponsor to any present or future wholly-owned affiliate of Sponsor or to any successor in interest of the entire business of Sponsor as a result of a merger, consolidation or purchase as long as the assignee expressly accepts in writing all the obligations and responsibilities of Sponsor under this agreement.

15. GOVERNING LAW

This agreement shall be interpreted and construed in accordance with the laws of the State of Illinois. This agreement is subject to all applicable rules and regulations of the Board of Trustees of Northern Illinois University and the laws of the United States and the State of Illinois.

16. ENTIRE AGREEMENT

This agreement contains all the terms and conditions agreed upon by the parties hereto, and no agreement, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or be binding upon any of the parties hereto, unless in writing executed by the parties hereto.

IN WITNESS WHEREOF, the parties have executed this agreement on the dates indicated below by representatives authorized to make such commitments on behalf of the respective party.

BENEFITS OF THE EIR PROGRAMME

The EIR programme provides several benefits to students. It enhances their ability to be more functional and hit the ground running at a job, from day one. This programme has enhanced the image and reputation of NIU's College of Engineering and Engineering Technology by substantiating the true partnership concept to the industry. This programme has enabled the students and faculty at CEET to work with companies in addressing their research priorities and needs at relatively subsidised rates. Also, the programme has increased the experiential learning aspect of the academic programmes by enabling students to solve real-life problems and by engaging in experiential learning [6].

Also, the students experiencing research-based learning are better prepared for a global economy [7]. The following are the key benefits of the programme:

1. Experiential learning
2. Exposure to real-life work environment
3. Topic for master's thesis
4. Increased motivation and confidence
5. Faculty/Industrial collaboration opportunities
6. Employment opportunities
7. Increased funding for College's departments
8. Financial support to the College's students.

CONCLUSIONS

The EIR programme has enjoyed tremendous success since its launch two years ago. All of the stakeholders of the College, including government partners, industries, students and alumni, have endorsed the programme at the highest level. Students are excited about the experiential learning aspect of the programme and value the connections made during the experience. The departments are pleased with the funding associated with the programme and faculty are elated with the research opportunities and the chance to earn extra income. This is a successful venture that brings industry and academia together to promote research and innovation.

REFERENCES

1. Kolb, A. and Kolb, D., Learning styles and learning spaces: enhancing experiential learning in higher education. *Academy of Management Learning and Educ.*, 4, 2, 193-212 (2005).
2. Kolb, D., *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall (1984).
3. Mills, J. and Treagust, D., Engineering education - is problem-based or project-based learning the answer? *Australasian J. of Engng Educ.* (2003-2004), http://www.aeee.com.au/journal/2003/mills_treagust03.pdf.
4. Harrisberger, L., *Experiential Learning in Engineering Education*. Washington, DC: American Society for Engineers Education, May (1976).
5. Reeves, T.C. and Laffey, J.M., Design, assessment and evaluation of a problem based learning environment in undergraduate engineering. *Higher Educ. Research and Development*, 18, 2, 219-232 (1999).
6. Dutson, A., Magleby, S., Sorensen, C. and Todd, R., A review of literature on teaching engineering design through project-oriented capstone courses. *J. of Engng. Educ.*, 76, 1, 17-28 (1997).
7. Jamieson, L. and Lohmann, J., *Creating a Culture for Scholarly and Systematic Innovation in Engineering Education: Ensuring U.S. Engineering Has the Right People with the Right Talent for a Global Society*. Washington, DC: American Society for Engineering Education (2009).

BIOGRAPHIES



Dr Omar Ghrayeb is the Associate Dean of Outreach and Undergraduate Programs of Northern Illinois University's College of Engineering and Engineering Technology. He works closely with the industrial sector and spearheads the EIR programme. He is committed to promoting experiential learning as part of engineering education and works with several companies in the area to bring real-life projects into the classroom. His expertise is in process innovation and production planning.



Dr Promod Vohra is the Dean of Northern Illinois University's College of Engineering and Engineering Technology. His commitment to applied research and global engineering education is reflected in his work and philosophy. Dr Vohra has widely published and serves on several national and international committees and boards. He believes the engineering profession must act as a catalyst of innovation and create a new economy for the globe.