

GEDC INDUSTRY FORUM

EVENT REPORT

3-5 JULY 2019

Fontainebleau, France



Petrus
COMMUNICATIONS

For information on the Industry Forum or this report, please contact:

Alina Gheorghita

Account Manager at Petrus Communications,
Industry Forum Project Manager

23 Boulevard du Général Leclerc 77300,
Fontainebleau, France
+33 (0) 1 80 96 39 03

www.petruscommunications.com

alina@petruscommunications.com

For more information on the GEDC, please contact:

Hans J. Hoyer

Ph.D. Executive Secretary, GEDC

www.gedcouncil.org

Secretary General, IFEEES

www.ifees.net

h.hoyer.ifees@gedc.info

Report prepared by

Monica Collins

Petrus Communications

Kayla Hellal

Global Engineering Deans Council

July 2019

CONTENTS

ORGANISERS	1
EXECUTIVE SUMMARY.....	3
1. INTRODUCTION.....	5
2. EVENT SESSIONS	6
2.1. An Engineering Approach to Gender Diversity	6
2.2. Student Engagement in the Learning Process Pre-Event Seminar.....	7
2.3. Innovating Beyond Borders.....	8
2.4. Developing Socially Conscious Engineers with Total.....	10
2.5. Industry and Academia are Building Skills for the Future	11
2.6. Sofa Sessions: A Novel Industry Forum Conversation Among Peers	12
2.7. Site Visits	12
3. EXPLORING 6 CRITICAL THEMES	13
3.1. How Dynamic Design Groups Work.....	13
3.2. Evaluating Skills Gained in Problem-Based Learning	15
3.3. Authentic Communication	16
3.4. Educating Engineering Leaders.....	17
3.5. Promoting and Assessing Failure.....	18
3.6. Digital Skills in Engineering Education	19
3.7. Developing Socially Conscious Engineers	20
4. DYNAMIC DESIGN GROUPS: SHARING OUTCOMES INNOVATIVELY AND CREATIVELY	21
5. CONCLUSIONS: WHAT NEXT?	29
5.1. Outputs for Change.....	29
5.2. Delegate Feedback.....	30
5.3. Site Visits	31
5.4. Next Steps.....	32
6. RESOURCES, NETWORKING AND FUTURE EVENTS	33
Appendix I : 2019 GEDC Industry Forum – Fontainebleau Programme	35
Appendix II : 2019 GEDC Industry Forum – Fontainebleau Delegate List	37
Appendix III : Student Engagement in the Learning Process Executive Summary	41

ORGANISERS



The Global Engineering Deans Council (GEDC) was created on 9 May 2008 in Paris as a recognition of the global need for a world-wide forum of engineering deans and rectors. The main goal of the GEDC is to provide engineering deans and rectors with ideas, tools, and “best” practices necessary to become innovative leaders of engineering education.

The GEDC’s goal is to provide a space for leaders of engineering institutions to connect and share the successes and challenges of providing world class engineering education programs in an increasingly interconnected and fast-paced world community.

www.gedcouncil.org

The 2019 GEDC–Industry Forum in Fontainebleau successfully engaged academic and industry leaders in a dialogue focused on how to promote action and build on behavior that further develop the skills required of engineering graduates and leaders. The delegates shared knowledge and best practices while emphasizing on innovation, social consciousness, and effective communication. A truly inspiring event that provided us all with the opportunity to highlight our commitment to better the world through the entrepreneurial and ethical practice of engineering

Dr. Natacha DePaola

Dean of the Armour College of Engineering,
Illinois Institute of Technology, USA and Chair
of the Global Engineering Deans Council



Petrus

COMMUNICATIONS

Petrus Communications is a multi-award winning international agency that specialises in linking our clients, engineering and business employers, with students and the global education community. Created in 2005, Petrus now comprises a team of 30 research, communication and digital experts creating and implementing projects world-wide. We support our clients in building productive and results focused relationships with key university stakeholders, ensuring that their messages are heard and a meaningful dialogue established. Our hallmark is the design and delivery of creative programmes, campaigns and events that lead to impactful outcomes.

www.petruscommunications.com

The discussions taking place during each Industry Forum go to the heart of the issues engineering educators and leaders must address to ensure that new technologies and innovation benefit all, safely and sustainably. From how to develop ethical and socially conscious engineering leaders for the future; to encouraging open, global, innovation; and increasing learner engagement to ensure students become active participants in their education and career; these discussions are great inspiration for the work we do at Petrus. I am incredibly grateful to everyone who made this third Industry Forum so enjoyable, and am excited to follow the progress of our ideas in the lead up to our next event in Canada in July 2020.

Kirsten Williamson

Founder&CEO,
Petrus Communications

EXECUTIVE SUMMARY

The Global Engineering Deans Council (GEDC) Industry Forum is a **community of leaders** from engineering education and industry. Driving the creation of the Industry Forum was the recognition that there is an **existing and widening gap**, especially in engineering and digital fields, between the skills that employers need and those offered by university students and graduates, and by the current workforce.

The GEDC Industry Forum aims to address this challenge. Forum participants work together to create solutions to develop the next generation of engineering experts and leaders with the key skills necessary for today and the future, and to improve how engineering educators and industry innovate together. The approach emphasises dialogue, network, exchange of insights and sharing good practice. The solutions developed address a broad range of approaches from ways to enhance pedagogy and embed skills, to ensuring learning takes place to the appropriate standard.

The third GEDC Industry Forum took place in Fontainebleau, France from the 3rd - 5th July 2019 hosted by Petrus Communications in partnership with the GEDC. It brought **senior delegates together from 18 countries and 5 continents** around the world, including deans and directors from leading engineering universities; senior managers with global responsibility for engineering, research, skills, ethics and recruitment from companies such as Airbus, Huawei, Total, MathWorks and Siemens; as well as stakeholders from NGOs.

The Fontainebleau event focused on the following broad themes:

Socially conscious engineering: Engineers today need the societal awareness necessary to satisfy disparate groups with different moral views and objectives. We discussed ways to develop this awareness, such as providing students with real-world case studies of ethical issues that companies have faced. ¹

Cross-border and open innovation through agile university-industry collaboration: Innovation is no longer confined to one university, company, or nation, but is now increasingly global and open. Delegates shared their experience in developing multi-partner, multi-country research and innovation projects. ²

Building trust and authentic, inclusive communication skills: Open communication, trust and inclusivity need to be at the core of engineering education. Delegates discussed different ways to do this, including through experiential learning; providing students with real situations, case studies, and more. ³

¹ See sections 2.4, 3.7, and 4.6 for some additional ideas discussed.

² See section 2.3 for more information on these experiences.

³ See sections 3.3 and 4.2 for some additional ideas discussed.

The necessary changes and approaches that were agreed included to:

Emphasise the **human aspect of engineering** because ultimately, what engineers produce will be used by humans and should be of service to society. Some ways delegates discussed doing this included educating engineering students about global issues such as those outlined in the United Nation's Sustainable Development Goals (SDGs), joining initiatives such as Global Grand Challenge Scholars Programme, and embedding community activities in engineering education.

Find ways to generate **a shift in culture and mindset in engineering education**, because systemic change is necessary in today's complex, rapidly changing world. The Forum itself was recognised as a step towards achieving this by enabling deeper dialogue and understanding, as well as including employers and stakeholders throughout the learning cycle, and implementing multi-disciplinary activities.

Increase student engagement which will help ensure they become active participants in their education and careers. Introducing more experiential learning and promoting student involvement in extra-curricular activities were some of the ways suggested by delegates to engage students.⁴

Feedback from this Industry Forum was overwhelmingly positive with **92% of delegates satisfied with the event**, and the vast majority of participants (89%) would like to attend future events.

What's Next?

The conclusions will inform the programme for Industry The next GEDC Industry Forum will be hosted by McMaster University, Canada from the 6th to the 8th of July 2020 where we will continue to build on the themes and initiatives above. To stay up to date on the latest Industry Forum news and information, and to access the multiple resources freely available for download, join our dedicated LinkedIn group or check out the website at www.gedc-industryforum.com

A very unique opportunity for academic and industry leaders to engage on emerging trends and best practices in engineering education.

Dora Smith

Senior Director, Global Academic Program, Siemens

⁴ These points are detailed in Section 5 of this report.

1 INTRODUCTION

The Global Engineering Deans Council (GEDC) Industry Forum, created and managed in collaboration by the GEDC and Petrus Communications, is an initiative that brings together the leaders in engineering from across the world to build viable solutions to develop the engineer of the future and to better understand each other's needs.

Driving the creation of the Industry Forum was the recognition that there is an existing and widening gap, especially in engineering and digital fields, between the skills that employers need and those available in university students and graduates, and in the workforce. This skills gap is being exacerbated by changes brought on by the fourth industrial revolution, which is marked by an exponential rate of technological innovation that is bringing about paradigm shifts in the economies, business, society, and individually.

Additionally, as we move through the 21st century, humanity's engineers will encounter a wealth of challenges and opportunities such as those highlighted in the UN's Sustainable Development Goals, or the USA's National Academy of Engineering's Grand Challenges. The coming generations of engineers will need to be able to function and innovate in a multifaceted, ever-changing landscape that requires new perspectives and transformative skills.

To address gaps and build necessary skills, while adapting to the ever-evolving future and enacting meaningful change across societies and generations, requires a holistic understanding of these challenges and opportunities humanity faces. This kind of wisdom and insight cannot be gained through superficial exchanges, which is why the Industry Forum utilises unique dynamic working groups to facilitate the cultivation of authentic connections among industry and academia leaders, and to connect the multitude of experiences among stakeholders.

To date, there have been three Industry Forum events: the first edition in 2017, held in Fontainebleau, France; a regionally-focused Forum in March 2019, held in Bucharest, Romania; and this third edition held in Fontainebleau, France, in July 2019. The first two Industry Forums, as with this 2019 Fontainebleau edition, were highly diverse, interactive events. Each Forum has contributed to the body of knowledge on university-industry collaboration and skill development for future engineers in its own way. This important contribution continues with the latest outputs from the 2019 Fontainebleau Industry Forum, from creative group work, interactions with renowned specialists, and an abundance of social and networking opportunities and dialogue; as captured in this report.

This is an opportunity to recharge ideas and share new approaches. Whether Industry or Academia, we share the same enthusiasms and the same challenges: the drive to always improve the way we work and build a better society for all.

Dr. Andrew Hogg
Deputy Chairman, Group Ethics
Committees at Total

2 EVENT SESSIONS

2.1 An Engineering Approach to Gender Diversity

Pre-Event Seminar led by Rhys Phillips,

Electromagnetism Scientist at Airbus Corporate Technology Office and Member of the Airbus R&T Diversity Tiger Team

Many gender diversity campaigns have taken place over the last 40 years with great intentions and to the benefit of some individuals; however, the percentage of women in engineering, particularly in leadership positions, has not changed. In this seminar, Rhys Phillips, an Electromagnetism Scientist at the Airbus Corporate Technology Office and member of the Airbus R&T Diversity Tiger Team, examined the contributing factors to the persistent gender gap in engineering fields and how the Diversity Tiger Team is actively working to narrow the gap. Beyond a pipeline problem from education to industry, women are also continually facing a barrage of barriers that are perpetuating the gender gap, including: male-oriented language and imagery in job advertisements, continual societal expectations placing greater responsibility of domestic duties on women than their male counterparts, and unconscious bias.

Repeatedly, studies have demonstrated that increasing female participation in all levels of industry provides positive benefits for companies. In cases where boards are comprised of 30 percent women, when critical mass was achieved, and/or when women are CEOs, companies tend to experience improved financial performance. Furthermore, women tend to outperform men on numerous leadership competencies, leaning towards inclusive leadership styles that diminish turnover and improve the performance of diverse teams.

Increased gender diversity is connected to greater ethics and compliance and women in leadership roles have been linked to increases in innovation and group performance, and greater effectiveness in solving difficult problems. Yet, while there is significant growth in computer, technology and engineering-related fields, women are not pursuing these positions fast enough to close the gap.

Before launching actions to address the issue within Airbus' Corporate Technology Office, a team of scientists and engineers got together to use their technical backgrounds and expertise to tackle the problem. They have conducted an extensive literature review, performed statistical analysis on real data and created an innovative new model using Systems Dynamics that can be used to assess the impact of different actions before implementing them. The model will be made available as an open source tool so that the entire engineering sector can benefit. There are several additional

One of the benefits of attending the Industry Forum is to be connected to an elite circle of international engineering educators, and to learn about the experiences of both industry partners and academia.

Lintuo Wu

Director of Global Education Partnership Program, Huawei

things that companies can do to help narrow the gender gap, such as ensuring a 50/50 female-male ratio in interviews and conducting systematic reviews of wording in all job descriptions. Furthermore, it is important for companies to update sexual harassment and workplace policies, provide training courses, and ensure all employees - regardless of gender - have opportunities to balance work and family life. The challenges presented were not exhaustive and companies need to be cognisant of additional obstacles gender equality initiatives may face in the various contexts in which they operate.



2.2

Student Engagement in the Learning Process Pre-Event Seminar

Pre-Event Seminar led by **Monica Collins**, Research Consultant, Petrus Communications with **Antonia Nănău**, Former President, BEST International, and **Sana Djelidi**, Student, IFP School

In the 2019 Forum held in Bucharest, Romania, delegates included four students, and with their engagement during sessions and discussions throughout the event, two things became clear: one, that lifelong learning is essential for individuals to succeed in their careers as well as to tackle the overall skills gap, and two, that students have the desire to be more actively engaged in their education. Based on this feedback, Petrus Communications launched a pilot survey on student engagement in the learning process.⁵ Initial results from the survey were presented during the interactive Student Engagement Pre-Event Seminar, where attendees had given the opportunity to comment on the research, and to discuss how research on these topics could progress in the future.

One of the key findings of the survey was that while respondents (over 90% of whom were students) seemed favourable towards learning by doing, lectures were still their most preferred learning activity. The seminar participants posited that this could be due to students viewing 'fun' learning activities (extracurricular activities, for example) as not educational. Student delegates added that students see professors as their 'main guides' in the learning process, which could also explain the popularity of lectures. Participating delegates agreed that extracurricular activities are important in the learning process, however, and need to be counted towards degree programmes.

The Industry Forum is well attended by a good mix of industry and university representatives. Since almost all the sessions are interactive and dynamic, it offers excellent opportunities to gain visibility with most of the attending institutions.

Stefano Olivieri

Customer Success Manager,
Italy and MENA, **Mathworks**

⁵ For more information, please see the Executive Summary of the survey report in Appendix III.

Another key finding of the survey was that only 3% of respondents indicated that they enjoy ‘company input’ while learning, although when asked if they would like to interact with companies during the learning process, only 1% responded that they would **not** like to interact with companies. This raised the question of what the differences in perception between company input is, and company interaction. To this, student delegates replied that company inputs could perhaps be linked by students to companies inputting on curriculum, and that students are not favourable towards this.

When asked about what could be done going forward to improve upon the initial student engagement in the learning process survey, participants had several proposals. One was to better define different learning activities, because students may not always know what learning activities are when they experience them. This led to a discussion on student awareness in the learning process, as student delegates pointed out that there is often a disconnect in students’ minds about which activities are part of the learning process. For example, students do not often consider internships to be part of the learning process. To make sure students are as engaged as possible, delegates pointed out that it would be ideal for educators to inform students about why they are participating in different learning activities, what skills they should be gaining, and how these skills can be applied in the workplace. Other suggestions included considering alumni engagement in future research, asking students about perceived barriers to learning, as well as asking what types of companies students prefer to interact with.



2.3

Innovating Beyond Borders

University-Industry Cooperation for Global Research and Open Innovation Session

Moderated by: Prof. Şirin Tekinay, GEDC Chair Elect and Professor, **Sabancı University**

Speakers: Jaime Bonilla Ríos, Associate Dean for Continuing Education, Consulting and International Affairs, **Tecnológico de Monterrey**; **Michael Schoenwetter**, Head of R&T Partnerships, **Airbus**; **Bruno Woeran**, EU—Affairs and Innovation Network Manager, **Merinova OY**; **Taiwo Tejumola**, Assistant Professor, **International Space University**

With global challenges spanning beyond borders, there is an increasing need for international collaboration to drive innovation in academia and industry. This panel session on open innovation, moderated by **GEDC Chair Elect Prof. Şirin Tekinay**, included insights from four panellists representing industry, education, and the public sector, who shared their experience on developing multi-partner, multi-country research and innovation projects.

Jaime Bonilla Ríos shared how Tecnológico de Monterrey broke industry's vision of the institution as a teaching university by engaging in an open dialogue with companies. It is not sufficient for industry to simply be looking at universities for human capital and talent development; industry and academia need to come together to solve problems, develop technology and collaborate on research. Tecnológico de Monterrey also fosters entrepreneurship by licensing companies that are able to generate revenue from research. Bonilla emphasised that institutions 'have to show companies [they] are producing things that are working'. This dynamic process requires professors to be able to better connect with industry and understand their needs.

Michael Schoenwetter highlighted Airbus' partnerships with academics, start-ups, and SMEs, as well as their robust global operations, noting 169 nationalities comprise their team and approximately two-thirds of R&D happens outside of Europe. Globalising innovation is a driver for understanding things not known, a way to compensate for skills and competencies not available locally and is a way to find top-notch experts with niche capabilities. Global innovation faces hurdles, including time zone and cultural barriers, and the benefits must outweigh drawbacks.

Airbus has developed R&T hubs and innovation centres in key areas, such as Shenzhen (China) and Silicon Valley (USA), whose success has depended upon developing relationships over time.

Bruno Woeran from Merinova OY drew from his experience as a 'catalyst and translator' between industry and academia. Through engaging in research collaborations, he helps put new thoughts and issues on the table. Companies and academia need to examine the tools they have at their disposal and examine the different ways that they can work together using available means. Using open innovation approaches and knowledge exchange can greatly enrich the collaborative process. One example Woeran cited was having academia spend time on site with industry and providing an opportunity for industry representatives to engage at institutions. He also supported more traditional methods, such as workshops and seminars.

The Industry Forum is truly unique and engaging. Not only does it actively involve the attendees significantly more than straight lectures, but it also provides a great platform for helping attendees truly get to know one another and share ideas, generate future collaborations and more.

Jenna Carpenter

Dean of School of Engineering,
Campbell University

Finally, Taiwo Tejumola, Assistant Professor at the International Space University and previous winner of the Airbus GEDC Diversity Award, shared the ethos from the International Space University (ISU): international, interdisciplinary, and intercultural.⁶ At ISU, students from around the world receive a multi-disciplinary education in all things space: from engineering, to business, economics, law, and beyond. Students not only learn the critical technical skills but are also equipped with a holistic understanding of the role space programs play in society and industry. Tejumola also elaborated on the challenges of breaking down barriers for industry and university collaboration, noting this is particularly challenging in Africa, where technology transfer is always an issue. He offered the models used by Google and Apple, which establish technology hubs around the world, as a way of helping overcome cost problems.

⁶ For more information on the Airbus GEDC Diversity Award, and Taiwo Tejumola's group's win, see <https://www.airbus.com/newsroom/press-releases/en/2017/10/gecd-airbus-diversity-award-2017.html>



2.4

Developing Socially Conscious Engineers with Total

Session led by **Dr. Andrew Hogg**, Deputy Chairman, Group Ethics Committee, Total

Developing Socially Conscious Engineers was an interactive session led by Dr. Andrew Hogg, Deputy Chairman, Group Ethics Committee at Total. Dr. Hogg was also interviewed after speaking to gain more insight into what socially conscious engineering means to him. In his session, Dr. Hogg presented Total's Code of Conduct, which outlines Total's core values of Safety and Respect for Each Other.⁷ The Code of Conduct acts as a reference for employees on the job around the world, and is therefore also the ethical guide for the company because ethics, according to Dr. Hogg, 'is about helping our management and our employees to do the right thing in an increasingly complex world and putting our values into practice'.

The topic of ethics is related to social consciousness because 'ethics has to do with human beings and the role of the engineer inevitably involves an interface between technology/industry and human beings, therefore at some point [an engineer] has to be able to manage that interface, or those relationships'. In order to manage this interface, and be 'of service to society', an engineer needs to be 'conscious and sensitive enough to people's needs to dialogue.' Thus, social consciousness is a requirement of an ethical engineer.

Some of the top skills and attributes of a socially conscious engineer, according to Dr. Hogg, are: being able to take safety into account and acting in a way that respects the safety of people and the environment; complying 'with all laws and regulations in the countries where they operate'; treating resources – both natural and human – with respect; and being 'able to work in collaboration and in a respectful and creative way with colleagues and other stakeholders'.

Universities can help develop socially conscious engineers, by 'creating well-rounded engineers who know their craft but also know how to put their craft into context'. This can be done by exposing students to situations that help them prepare for the real world, similar to what Dr. Hogg did in his Industry Forum session when he presented a real-life past case dealing with ethics and asked delegates to debate courses of action and outcomes. Of course, universities cannot possibly train students for every scenario that exists, but it can expose them 'to a variety of dilemmas that they might be faced with so that when they're faced with the unknown situation they are capable of analysing it and coming up with solutions, which is the trade of an engineer'.

⁷ Total's Code of Conduct can be found online at https://www.total.com/sites/default/files/atoms/files/total_code_of_conduct_va_0.pdf



2.5

Industry and Academia are Building Skills for the Future

Inspiration Session on 'Skills for the Future'

SPEAKERS: **Dr. Ishwar Puri**, Dean of the Faculty of Engineering, **McMaster University**, **Claudia Buzatu**, Academic Alliance and Automation Ready Relationship Manager, **UiPath**, **Olivier Crouzet**, Dean of Studies, **42 born2code**

An inspirational Session on 'Skills for the Future' led by Dr. Ishwar Puri, Dean of the Faculty of Engineering at McMaster University in Canada, explored technology and skills that are changing the way we live, learn, and work. The panellists discussed how universities could evolve to meet the demands of the changing society and workforce.

In 2018, McMaster University integrated a new learning programme, condensing four classes into a 10-credit hour course covering projects over the span of two semesters. The programme is based on three pillars: transforming the curriculum (self-directed and project-based approach), reimagining the classroom (innovative and start-up inspired space and amplifying experiential learning), and increasing hands-on learning opportunities. The integrated learning programme encourages students to enter both national and international competitions. By offering more research opportunities, the school also attracts more women to engineering.

Claudia Buzatu, Academic Alliance and Automation Ready Relationship Manager at UiPath, discussed how to address a gap in the market created by the Fourth Industrial Revolution. She noted that 'it is getting more difficult to find talent on the market, especially when we are... referring to disruptive technologies'. UiPath developed the Academic Alliance programme and a set of courses aimed at creating a new era of teachers and students. UiPath's Robotic Process Automation (RPA) Development course led to creation of the entire system that engages society. Clients and students are invited to investigate a model of platforms that engages the entire RPA ecosystem. Other programmes are targeted at reducing the female gender gap in the market and reintegrating refugees into society.

Olivier Crouzet, Dean of Studies at 42 born2code, covered issues related to digital transformation in education. 42 born2code is an IT school based in Paris with 10 campuses around the world. Nowadays, companies are looking for innovative people who can think out of the box. The school doesn't have lectures, teachers or MOOCs. It is a 100% project-based curriculum where students work on creating software and resolving different development challenges. Besides technical skills, the school seeks to improve students' adaptation, problem-solving, collaboration, critical thinking and creativity skills. The peer learning system works better with more social, cultural, generational and gender diversity.

2.6

Sofa Sessions: A Novel Industry Forum Conversation Among Peers

This year's Industry Forum included a new format for attendees to come together in an informal and intimate setting. The 'Sofa Sessions' provided an opportunity for delegates to share and exchange with peers in confidence on topics of mutual interest. Delegates were invited to propose an issue or subject they would like to discuss with others who are facing similar situations, or who have taken similar initiatives, or indeed have found a solution to a given difficulty. The final conversation themes were decided on during the event and delegates were free to join the conversation that best reflected their interests and goals, or where they felt they were able to share valuable experience.

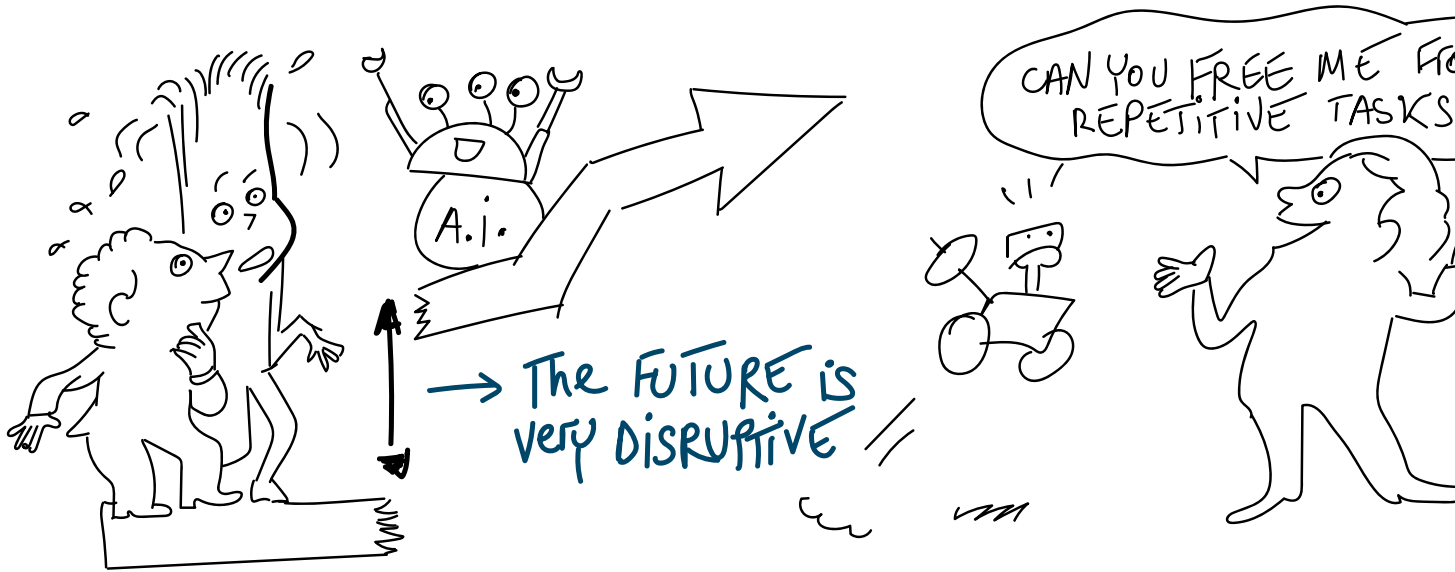


2.7

Site Visits

On Friday 5 July, delegates presented their final ideas to the entire group, and afterwards were able to participate in one of two planned site visits: the Château de Fontainebleau, or the MINES ParisTech Engineering School, where the final day of the event was held.⁸ These visits gave delegates a chance to network and discuss shared ideas while exploring the host city of Fontainebleau and learning more about one of the top engineering schools in France.

⁸ For details on the ideas communicated during the final presentations, please see Section 4.



3 EXPLORING 6 CRITICAL THEMES

3.1 How Dynamic Design Groups Work

After an in-depth reflection on the issues at stake, the Industry Forum working group developed a series of six themes. Divided into small groups, delegates were asked to brainstorm their ideas on each topic, circulating from theme to theme until they had covered each one. Each theme was assigned a facilitator/rapporteur who collected all the ideas, aired, and then made a cohesive summary of the whole. Once the main ideas had been collated and all ideas shared with the assembled company, the scene was set for delegates to decide which theme they wanted to work on, which became the focus for the remainder of the event.

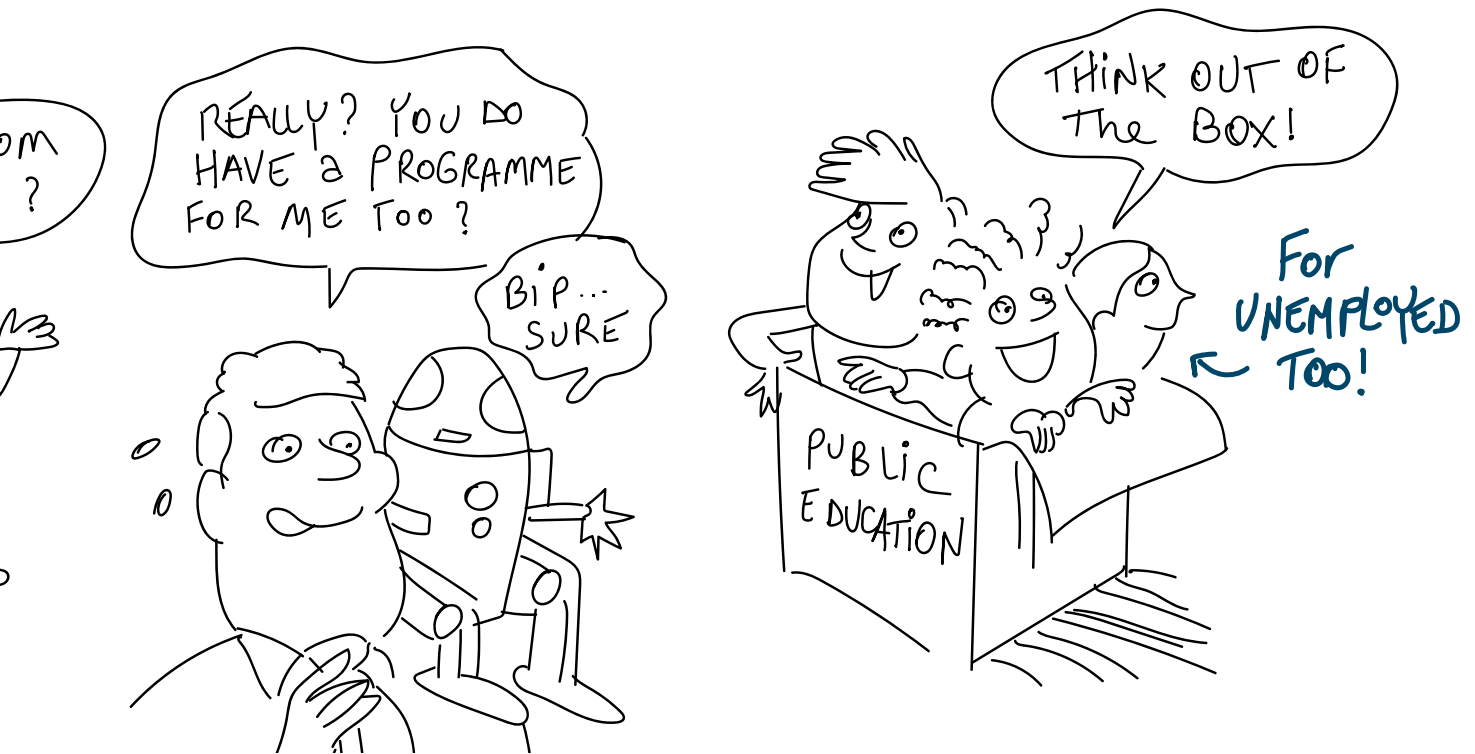
Delegates were challenged to design solutions relative to their chosen theme, coming up with a workable concrete proposal on how to overcome the obstacles identified by all. In keeping with the underlying innovative and creative environment of the event, they were also challenged to make a presentation unlike any they had made before, with an innovative format opening the gateway to innovative thinking; freeing the groups from the constraints of standard conference presentations and reflecting the Industry Forum's goal to move from theory to action. The resulting output was extraordinary in the dynamism of the format and the scope of ideas presented.

Throughout all of the Dynamic Design Group work, Chantal De Barra, International Publications Editor for Research, CEVIPOF, Sciences Po and Petrus Communications Consultant, acted as the overall facilitator. She not only helped keep the groups on track and productive, but was also widely praised in delegate feedback for contributing to the enjoyment of the event.

One of the most valuable aspects of the event was that academia, industry and students got to work together, so we had an opportunity to get an insight into how people think and what they expect from each other.

Fabian Henze

Head of Software Development,
Miele Tehnica



The themes of the 2019 GEDC Industry Forum in Fontainebleau were:

- 1. Evaluating Skills Gained in Problem-Based Learning:** How do we assess the technical and professional skills gained during problem-based learning (PBL) programmes in a way that is scalable, and useful for students and employers?
- 2. Authentic Communication:** Open and transparent communication enables trust building and inclusivity; all are essential for future engineers. How can we work together to embed open communication, trust, and inclusivity into the core of engineering education?
- 3. Educating Engineering Leaders:** How can universities and the private sector come to a common understanding of what leadership skills engineering and technology graduates need for effective, quality project management, and how can these be gained during studies?
- 4. Promoting and Assessing Failure:** Experiencing failure can lead to improved knowledge and understanding and can develop resilience. However, university and corporate assessment methods often leave students afraid to take risks. How can we constructively promote and assess failure, ensuring a learning experience?
- 5. Digital Skills in Engineering Education:** With technology changing so rapidly today, how can universities be sure that they are teaching the right skills and using the right digital tools, in the right way? How should private enterprise be involved?
- 6. Developing Socially Conscious Engineers:** Engineers can tackle challenges such as climate change, urbanisation, poverty reduction, and more, through direct action but also by having the societal awareness necessary to avoid unintentional consequences that create or exacerbate issues. How can universities and industry work together to develop socially conscious engineers?

The facilitator summaries of the brainstorm sessions are below, organised by theme.



3.2

Evaluating Skills Gained in Problem-Based Learning

BRAINSTORM FACILITATOR: Bill Rosehart, Dean, Schulich School of Engineering, University of Calgary

Bill Rosehart's summary tackled the question: how do we assess the technical and professional skills gained during problem-based learning (PBL) programmes in a way that is scalable and useful for both students and employers?

Why does assessing PBL matter? Without assessment, most programmes would fail miserably and could cause movement away from a methodology many stakeholders want to see adopted increasingly into engineering curriculums. One of the topics was assessment granularity, with groups advocating for movement away from granular evaluation and moving to something akin to a 1-2-3-4 scale. In this system, most students would land on a 3, while a 4 would be reserved for truly exceptional work. Many industry and NGO representatives commented that they do not look at transcripts, noting they trust that graduates from specific universities understand the material. Most groups also advocated for moving from a linear assessment model to a circular assessment model—known in industry and leadership-circles as 360 degree feedback. This model is a natural transition from the 'sage at the stage', top-down based approach, to a community of learners.

So, what does the community look like? It starts with self-reflection by maintaining a log or portfolio to demonstrate learning and to track activity throughout a course or programme. It also includes the incorporation of evaluation from student peers, industry, NGOs, and the community. Who is intentionally missing in here is the professor, brought in only in cases of statistical variations or when something looks wrong.

Students need to have clear expectations from the start, understand the problem-solution requirement and have a thorough understanding of the learning outcomes. Most groups suggested either a rubric including qualitative and quantitative analysis or a description to the students, such as: "you should be able to solve this kind of problem at the end of this learning exercise".

Students need to be excited about the project to better connect with and see the value of the problem. This opens the path for them to take more ownership of their learning and diminishes the need to assess how well students are doing because they want to solve the problem. Professors need to train students to give feedback, communicate, and develop teamworking skills. Teams should be created intelligently and in consideration of the backgrounds of the students. It is important to allow students to fail; although, that does not mean they have to fail the course or the programme. This allows for grades to be more than just the outcome and can extend thinking beyond final exams.

Problems can be small and simple or large and complex; however, larger problems require check-ins to ensure everything is not dependent on the final evaluation. These initiatives need to adopt a growth-based assessment and feedback model with sub components of the problems being solved. It is vital to look carefully at how to develop a core group of people to be able to implement this, and getting more people involved in the assessment and the teaching of the course can be useful.



3.3

Authentic Communication

BRAINSTORM FACILITATOR: Dr. Natacha DePaola, Dean, Armour College of Engineering, Illinois Institute of Technology

Dr. Natacha DePaola's brainstorm session summary centred on answering the question: how can we work together to embed open communication, trust and inclusivity into the core of engineering education?

Engineers find themselves communicating in different environments and on different subjects. For example they need to not only communicate the technical side of what they do, but they also need to be equipped with the communication skills for situations requiring engaging with people when managing a project and working with teams. The best way to include and build communication skills in engineering education is through experiential learning: real situations, case studies, etc. Practice, practice, practice is what really will bring people to communicate effectively and understand all the different aspects of being inclusive.

A common topic brought up during discussions was active listening and how important it is because it can help people to know who their audience is, so that they can communicate properly. This also puts people in the position to be open-minded education representatives that are in contact with the humanities, encouraging students to read more, and have more contact with people from different parts of the world, as linguistic differences are important to take into consideration when communicating. Providing coaching to students can also be useful, as well as pitch competitions with multi-disciplinary groups.

Incorporating technology when teaching about communication came up during discussions. There are apps that are specific to helping people to communicate and some of these could possibly provide automatic, immediate feedback, which students seem to prefer. Video could also be used in cases where real world, in-person scenarios are difficult.

Investment in the above is crucial and brainstorm groups highlighted appreciatively the recognition by corporations and industry of the value of investment in helping their employees as well as their student interns improve their communication skills.

DePaola's final comments included the importance of being able to make a difference between, and start embracing and understanding, differences. Open-mindedness was something that particularly resonated with brainstorm groups, and is about being open to learn in general, and the willingness to accept and learn about differences.

She also brought up the important role that student organisations have in building communication skills by regularly providing extracurricular opportunities for training and practice.



3.4

Educating Engineering Leaders

BRAINSTORM FACILITATOR: Jenna Carpenter, Dean, School of Engineering, Campbell University

Jenna Carpenter presented on the question: how can universities and the private sector come to a common understanding of what leadership skills engineering and technology graduates need for effective, quality project management, and how can these be gained during studies?

She focused first on leadership skills, highlighting some key attributes cited by participants, including, but not limited to, emotional intelligence, self-awareness, risk taking, communication skills, design thinking, intellectual capacity, speed, vision, strategy, foresight, inspiration, motivation, inclusivity, innovation, adaptability, entrepreneurial skills, life-long learning, self-disruption, and embracing challenges and change. A lot of leadership skills revolve around teams: building cultures, delegating, mentoring, empowering and engaging team members, setting common goals, crisis management, marketing and business skills, etc. A lot of skills also revolve around decision making, getting people to reach consensus, shared leadership, the ability to listen to different opinions, failure management, and the reality that leadership usually requires a profit revenue focus.

Shifting to the second part of the question, focus turned to how these leadership skills could be incorporated into the undergraduate experience. Proposals included authentic industry-sponsored design projects with industry mentors and customer focus and team project design competitions. Leveraging extracurricular experiences, even outside of engineering programmes, are generally where students develop leadership skills, which one participant dubbed as invisible curriculum. Internships, co-ops, and part-time employment offer another opportunity for leadership development. By developing project portfolios for the purpose of skills development, students can be more cognisant of their own leadership development. Bringing back recent graduates to share their real-world experiences and to provide real examples of how these skills have been useful was another proposal. Communication skills can be developed through required design project presentations to customers and by providing consultancy opportunities on industry projects. Again, engaging industry, be it surveys, focus groups, advisory boards, or authentic conversations, was emphasised. Carpenter also noted the need to provide training for students in all the aforementioned skills as well as to identify students with an interest or proclivity toward leadership and try to provide additional training. Beyond this, developing a common language can help both faculty and students in the transformation process.



3.5

Promoting and Assessing Failure

Dr. Mostefa Laroussi, Associate and Partner, Learning4Business

Dr. Mostefa Laroussi provided feedback on the question: how can we constructively promote and assess failure, ensuring a learning experience?

One of the most important things is to understand failure, which requires the introduction of certain topics, key performance indicators, and points to understand the failure. Failure is a collaborative, not individual concept. Thus, it is the leader's failure if an employee does not achieve something. Laroussi gave the example that a teacher who fails 75% of their class, did not pass on the information well or did not check that the information was well perceived.

On a corporate level, a company has top management and field staff. At the top levels, failure is low, but at the bottom levels, failures become high. Employees on the lower rungs are affected by failure more drastically than top management. Laroussi called for removing or replacing the word failure in the dictionary, as well as creating a module about understanding failure. It is important to talk about failed projects openly to have a better understanding of what causes failure. Universities should incorporate coaches from the industry and learn about workforce issues from them. Case studies examining start-ups' high percentage of failure could also provide additional insight into learning from failure.

Another discussion point is a concept of four key questions to ask about a failure: Why is it failing? Where did it develop? Why did it happen? How did it happen? Evaluating failure in these contexts can help better formulate plan A, B and C, and ultimately find the solution. Failure is part of the skills development that brings learning to another level. A manager was asked to fire an employee because of his failure that caused million-dollar losses. They did not fire him because he has now developed his skills, million-dollar skills. Laroussi concluded that it is important not to rush to find a solution, but to explore the failure instead.



3.6

Digital Skills in Engineering Education

BRAINSTORM FACILITATOR: Dora Smith, Global Senior Director, Siemens

Dora Smith broke down her brainstorm summary into two main takeaways, then addressed ideas that relate to each of these. The first takeaway was the need for a lot more, perhaps tighter, industry collaboration. Related to this idea is working collaboratively on taking certifications, to the level of micro-credentials, and looking for opportunities to progress in some of these areas, with industry's role including providing some of the content for the credentials. There was an idea of developing an industry consortium to put together a digital index or ranking. Smith mentioned an initiative at Siemens where employees try and increase their general digital skills. These kinds of programmes could be done in collaboration with universities.

Sandboxes and innovation centres were also mentioned during brainstorming, because of the important role of meeting in person. Here industry's role includes helping to fund the centres, and providing the tools and materials needed. Lessons learned in sandboxes and innovation centres could then be used to modify and update curricula. Industry should also be more engaged in general in curriculum development, particularly in multi-disciplinary aspects. Faculty internships or reverse sabbaticals are another good idea related to the first takeaway, but industry would need to help provide those.

In terms of the use of technologies in universities, it is important for students to understand the 'why' of the technology, or how and where it can be applied. Industry could help provide more context, lending the use of the tool, with the idea of programming.

The second main takeaway from the brainstorming session is that initiatives need to be student-led. The main idea related to this is role reversal, or of the teacher being the mentor on the side in the classroom and really allowing the students to lead where things are going. There is a different culture and mindset in these student clubs and activities, and some important digital skills are being embedded here. These types of programmes need to be scaled up, and the sandboxes mentioned previously are one great way to do that.

Shorter engagements should also be designed, such as hackathons which are becoming quite popular. It is in these kinds of activities where multi-disciplinary experiences really come together and students can learn how to bring useful digital skills together in a way that can be useful in running successful businesses. Across both main takeaways was the idea that, whether it is student-led, or a product of more engaged industry, collectively there is a need for a more open mindset and more curiosity.



3.7

Developing Socially Conscious Engineers

BRAINSTORM FACILITATOR: Anne-Marie Jolly, Professor Emeritus, University of Orléans

Anne-Marie Jolly tackled the question: how can universities and industry work together to develop socially conscious engineers?

Jolly began her summary by stating that the theme of socially conscious engineers is a highly controversial one because not all universities and companies have the same vision in this area. During brainstorm discussions, several main ideas came up. First, delegates spoke about the necessity of working with communities and/or non-governmental organisations (NGOs) in this field.

There was a realisation that universities and companies have different timescales; projects in companies can be very fast, and there is not always time to envision all the consequences, while a university must teach students over a generally longer period of time. This longer period should be used to bring students together from different fields, for example social science and engineering students and teachers in seminars. This can help better prepare engineering students to work with communities. Once students are prepared at university, they can then discover the true problems companies face. Feedback is also critical, because without it, much of the information and knowledge that could be gained will be lost, especially for teachers in universities.

Furthermore, it is necessary to fight against fake information. Scientists are needed to explain what true facts are, and this is particularly important because of the increase in 'fake news' today. Additionally, it is important to create a mindset of empathy in order to be able to work with communities. Some companies such as MathWorks have social missions that they share with universities that students can participate in, which can help build this mindset.

One method that could be used in universities to teach about social consciousness would be presenting real-world case studies of ethical issues that companies have faced, which would help students to understand not in a theoretical way, but help them realise that they will have to face similar problems when they are in the working world.

Critical thinking and reflection are also essential for students, and they can gain these skills during internships, for example. Making students aware of the role of the whistle-blower is important as well.

Lastly, during discussions some delegates thought that there is opposition between profit and social awareness. It was discovered, however, that this is a subject of research and that the opposition divergences are reducing now, which will make a difference for future engineers.

4

DYNAMIC DESIGN GROUPS

Sharing Outcomes Innovatively and Creatively

The 2019 GEDC Industry Forum in Fontainebleau culminated in the Dynamic Design Groups presenting the solutions that they had designed to address the challenges they had selected. A brief summary of each solution is given in this section.



QUESTION 1

→ INVITE STUDENTS TO FIND SOLUTIONS

ASK MODE!

YES BUT WHAT IS A FAILURE?

→ Learn about FAILURE!

WELCOME TO OUR GREAT FAILURE CLASS ROOM!

Will your e fits!

STAY in the PROBLEM TO FIND SOLUTIONS

→ BUILD MOTIVATION BASED ON PROBLEM-SOLVING

ALLOW FAILURE ... BUT NOT FAILURE OF THE PROGRAMME

ETHICS!

CAREFULLY BUILD TEAMS

→ based on backgrounds

ASSESSMENT GRANULARITY

IN DIGITAL AGES KEEP IT SIMPLE!

GRADUATIONS SHOULD BE MADE by Cies, PAIRS, NGOs ... and NOT TEACHERS!

NO COPIES TO EVALUATE ANY MORE !!

OH GOSH! IS THIS a Real CASE??

Want to Join MY TEAM?

SURE!

MAY I COME TOO?

4.1 Evaluating Skills Gained in Problem-Based Learning



What was your group's solution?

Exploring the opportunity to incorporate the Association of American Colleges and Universities (AAC&U) rubrics (Problem Solving; Inquiry & Analysis; Critical Thinking; Creative Thinking; Written Communication; Oral Communication; Teamwork; Intercultural Knowledge and Competence; Foundations and Skills for Lifelong Learning; Ethical Reasoning) within evaluation mechanisms at respective academic institutions is the group's solution. This solution would also involve industry partners (MathWorks, Siemens, etc.) as part of the discussion to ensure that the appropriate competencies to develop among students are being identified to ensure they are prepared to be successful within the new world of work.

How would this solution work?

This solution would work by first exploring the feasibility of inviting a representative from the AAC&U to present during a GEDC seminar/workshop to provide a historical overview of the development of the competency rubrics and share best practices as to how these can be effectively embedded within the engineering educational model.

What would be the role of stakeholders?

Different stakeholders would need to provide the rubrics, highlight gaps where additional competency rubrics need to be developed, and share best practices about how rubrics may have already been successfully incorporated within student evaluation models (for engineering educators) and within company Human Resources models of assessment (recruitment and selection, or within performance management models).

What would be the immediate next steps towards implementation?

Immediate next steps include sharing the rubrics from the AAC&U with the participants of the 2019 GEDC Industry Forum, and inviting a representative of AAC&U to a future GEDC conference, forum or session. Engaging with employers would also be necessary to determine if there is alignment of rubrics with HR competency models, or performance management assessment models within industry/ employer partners, whose companies/organisations have participated in a past GEDC event.

How could the GEDC help bring your solution to life?

The GEDC could work with the AAC&U to address the following issues with respect to the rubrics and the process for development of the competency rubrics. The following could be explored:

- calibration of rubrics
- rigour in the development of the rubrics
- cultural specificity of the rubrics.

Additionally, the GEDC could support the review of best practices regarding development and implementation of rubrics within the engineering educational model.

4.2 Authentic Communication



MEMBERS

Dr. Natacha DePoala

Claudia Buzatu

Hans J Hoyer

Jenna Carpenter

Monique Beech

What was your group's solution?

Dynamic Design Group two's solution consists principally of a lot of practice. Students should be given the opportunity to practice authentic and respectful communication with different audiences and environments in a structured manner and with mentoring and coaching provided. Open-mindedness, active listening, cross-interdisciplinarity, and cultural sensitivity should be encouraged in order to have empathy for one's audience.

How would this solution work?

In order to practice authentic and respectful communication, several activities can be done with students, including role plays, case studies, coaching and mentorship, and presentations. These types of activities should ideally be embedded in curriculum, and sufficient amounts of feedback should be given to students both from their peers and the faculty. International exchange programmes could also be a good way to develop cultural awareness.

What would be the role of stakeholders?

Students should be prepared to effectively communicate with many stakeholders, including professors, industry, government, family, etc. These stakeholders can facilitate the creation of opportunities and participate in assessment and feedback.

How could the GEDC help bring your solution to life?

The GEDC could help by promoting best practices and good models, maintaining good networks of those interested in the subject, and continuing to host events that bring stakeholders together to further discussions.

What would be the immediate next steps towards implementation?

Next steps include university stakeholders embedding communication opportunities in different places in their curriculum. Goals should be set, and communication training added in a systematic and structured way throughout a student's education. To assess success of programmes, data should be tracked. Student organisations should be made an integral part of the effort.

What obstacles might there be regarding implementation?

Lack of flexibility in the curriculum, faculty resistance, and a lack of training and awareness would be the principal obstacles to implementing this solution.

4.3 Educating Engineering Leaders



MEMBERS

Prof. Şirin Tekinay

Dr. Ishwar Puri

Antonia Nănău

Lintuo Wu

What was your group's solution?

The group focused on developing the “Exemplar”, an engineer with an exceptional engineering mindset programmed for leadership, adaptability and resilience. A leader should be pi-shaped, or one that has the T-shape (multi-disciplinary and disciplinary expertise) extended by the second leg of leadership, continuous development, lifelong learning, adaptability and resilience.

How would this solution work?

Developing the “Exemplar”, the pi-shaped leader, could be done through experiential learning, and scenarios (experiences) pedagogically aiming for learning outcomes mapping onto the adaptive engineering leader's attributes. One way to do this is to pose problems to students on the United Nations Sustainable Development Goals (SDGs). Local solutions to components of SDGs could make excellent projects, for example transportation, environment, etc.

What would be the role of stakeholders?

Universities, public and private sectors should work together, involving the students. Engineering students should be exposed to policy making, engineering disciplines and entrepreneurship training. Entrepreneurial communities should be involved, as most students will follow the founder- to- CEO experience. Alumni, and student clubs such as BEST (Board of European Students of Technology) should also get involved. All these stakeholders should join efforts to offer experiential learning for engineering students.

How could the GEDC help bring your solution to life?

The GEDC can and should keep engaging and bringing together stakeholders to share best practices, and to keep looking for ways to leverage collective strengths. An innovative curriculum award could be instituted, for example a GEDC engineering leadership programme award.

What would be the immediate next steps towards implementation?

Immediate next steps would include creating cross-sector working groups to produce a minimum viable product, a prototype, or if available, best practices in education. At the next GEDC event, for instance, a working group can build a prototype: designing the experience, with microcredentials, and more. Linkages or partnerships with business and leadership education communities will be useful.

What obstacles might there be regarding implementation?

Obstacles could include restrictions and limitations of the current curricula that might prevent the implementation of innovative curricular designs. One solution to this could be offering freedom of choices on curricula. Resistance from faculty and students to the new things could be an obstacle as well. In terms of modifications and additions to the curricula, different industries could require different curricula changes; for instance, large companies and SMEs have different needs.

4.4 Promoting and Assessing Failure



What was your group's solution?

The group's solution is to promote Natural Life Learning in education, and to convert failure into opportunities in order to create fortitude. Natural Life Learning phrase is derived from the learning process of a baby, trying to walk without any shame of failures, being motivated and supported by the environment.

How would this solution work?

Creating a learning environment in which "trying" is considered as a part of the "learning process" and "failure" is considered as an opportunity for development. In this environment, how one reacts and learns from each negative situation is the key that makes the difference. Failure can be taken as feedback to keep going and improving the process, or a reason to quit and be kept down. As long as you keep going, you will keep learning, improving and developing.

With this in mind, Dynamic Design Group four has created the F'↑ (F-Up) Theory, in which the word "FAIL" becomes an acronym for "First Attempt In Learning". Therefore, the F'↑ Theory strongly promotes six key "F" elements; Feedback, Focus, Force, Forward, Future and Fortitude, to recover the failure and attempt learning.

What would be the role of stakeholders?

In this solution, **professors** would promote critical thinking on failure, provide fast feedback, and not stigmatise students. **Parents** would be supportive of taking risks and responsibilities. **Managers** would maintain a positive attitude towards certain risks, and support learning from outcomes. **Students** would need to try their best, communicate, ask for help and feedback, and not be shy to ask for help and feedback. **Peers** in this solution would need to respect others' failures, and offer help and advice.

How could the GEDC help bring your solution to life?

The GEDC could create F'↑ sessions during annual meetings where deans and professionals can share F'↑s. Workshop methodology could be transferred to staff, heads of departments, faculty, and industry.

What would be the next steps towards implementation?

Next steps towards implementation include:

- Having workshops to learn quickly and frequently from mistakes
- Promoting F'↑ sessions to share experiences and create knowledge on how to face situations
- Creating an F'↑ journal.

What obstacles might there be regarding implementation?

Current mindsets about failure and the cultural norm of only sharing successes are obstacles to this solution.

4.5 Digital Skills in Engineering Education



MEMBERS

Bill Rosehart
Anne-Marie Jolly
Dora Smith
Raphael Lucien

What was your group's solution?

Dynamic Design Group five's solution consists of developing different types of microcredentials such as student-led, industry-led, and educator boot camps. Digitalisation should also become an accreditation requirement.

How would this solution work?

For this solution to work, a consistent set of digital competencies should be developed with industry and associations, for example the European Quality Assurance Network for Informatics Education (EQANIE). Industry development of content testing in core competencies should be developed, and successful collaboration should be shared among stakeholders.

What would be the role of stakeholders?

Industry would communicate microcredentials required for hiring on a central platform. **Schools** would need to create capacity in **professor** and **student** workloads, and **students** would need to include microcredentials on their CVs.

How could the GEDC help bring your solution to life?

To help implement this solution, the GEDC could build and/or host a repository of digital badges and microcredentials by engineering discipline.

What would be the immediate next steps towards implementation?

The first step would be to gather information about available microcredentials. Second, gaps would need to be identified so that they could be filled. Finally, there should be a system in place to repeat this cycle.

What obstacles might there be regarding implementation?

Obstacles to the implementation of this solution include bandwidth, cost, and the management of change and the necessary cultural shift. Costs could perhaps be lowered by using alternative methods, however, such as making the solution student-led.

4.6 Developing Socially Conscious Engineers



MEMBERS

Iain Dupere

Sana Djelidi

Xinliang Zha

Halit Vural

What was your group's solution?

The solution to the challenges of developing socially conscious engineers and finding a way to satisfy disparate groups with competing moral views and objectives, would be to develop material with case studies on the topic of moral outcomes versus profit, as well as more complex cases where there is no clear solution and any solutions would have moral detractors.

How would this solution work?

Companies would partner with one or more universities, and one or more charities, to develop material to be taught to students in a combination of ways including inspirational material (for example "The Wonder of Engineering", inspirational students who have overcome great barriers), analysis, and student-led workshops. A charity/charities to work with these groups to connect them to less advantaged people (e.g. the unemployed, refugees, etc.)

What would be the role of stakeholders?

In this solution, **companies** would provide funding and case studies. **University faculty** would be developing and teaching the material, and **students** would be running student-led workshops. **Charities** would work with university faculty and students, and companies to connect them to less advantaged groups, such as the unemployed, refugees, etc.

What would be the immediate next steps towards implementation?

Immediate next steps include bringing together companies, universities, and charitable organisations to work with people who have had fewer opportunities.

What obstacles might there be regarding implementation?

Time would be an obstacle, as time would be required to develop material particularly with a mixture of ethical dilemmas. Resource availability for such an initiative would also be an obstacle.

How could the GEDC help bring your solution to life?

The GEDC could help to bring the groups mentioned above together – companies, universities, and charities.

5 CONCLUSIONS: WHAT NEXT?

5.1 Outputs for Change

Throughout the sessions, groupwork, and informal discussions at the 2019 GEDC Industry Forum in Fontainebleau, a number of commonalities emerged, which are delineated below.

The human aspect of engineering. What engineers produce will ultimately be used by humans, and should be of service to society, as delegate and presenter Dr. Andrew Hogg stated. Communicating with others, empathy, awareness and sensitivities to cultural differences and societal needs, are not generally emphasised or valued during engineering education. This needs to change, according to delegates, who suggested many different ways to do so during the event including: educating engineering students about global issues such as those outlined in the United Nation's Sustainable Development Goals (SDGs), embedding community activities in engineering education, and giving students the opportunity to work in teams that include social science, humanities, and arts students.

Shift in culture and mindset. Among delegates, there was a sense that small incremental shifts in engineering education are no longer sufficient. The world is facing rapid, sometimes dramatic change, and engineering education needs to respond appropriately, through rethinking engineering education as a whole and making systemic changes. This will require a change in culture and mindsets, however, in all stakeholders involved. This shift can at least begin to be achieved through the implementation of bold new programmes where possible.

Increasing student engagement by rethinking educational approaches. Many ideas that came from delegates focused on different ways of teaching and learning that actively involve students more and inform them why they are learning what they are. These include experiential learning, classrooms where teachers are on the side inputting as needed rather than in the front speaking to students constantly, and providing case studies based on real-world issues that students could face in the future. Promoting student involvement in extra-curricular activities (or 'invisible curriculum', as one delegate put it) such as student clubs was important to delegates, who discussed ways in which these activities could be assessed as part of degree programmes, and how students should be informed of the variety of essential skills that can be gained from these activities such as leadership and teamwork.

At the end of the Industry Forum, delegates were also given the opportunity to share their ideas on how to proceed going forward to help progress solutions to challenges. These included:

Publications. Some delegates agreed among themselves to work together to publish some resources on topics discussed at the Industry Forum such as the engineer of the future, and failure as a crucial part of engineering education.

Foundational research for engineering education programmes. In order to implement some of the ideas shared by delegates, some preliminary research needs to be done so that programmes can be introduced into engineering education. This research would include identifying existing microcredentials (and their platforms) available by discipline, as well as collaborating among university, industry leaders, and the Association of American Colleges and Universities (AAC&U) to further develop the AAC&U's rubric for problem-based learning.



5.2 Delegate Feedback

Delegate feedback was gathered from the participants who completed a survey following the 2019 GEDC Industry Forum in Fontainebleau.

- In line with the two past Industry Forum events, overall feedback was positive, with 92% of delegates satisfied with the event. There was also great interest in participating in the next edition of the Industry Forum (89% would like to participate in another GEDC Industry Forum). The vast majority of activities were found to be valuable, and the documents shared during the event were considered useful.
- The most valued aspects of the Industry Forum were the overall interactivity, the networking and brainstorming opportunities, as well as activities at the MINES ParisTech Engineering School campus on the last day of the event.
- Participants consider the impact of the event to be best achieved by providing a report of the event, and developing follow-up activities to keep engagement continuous.
- Providing case studies and/or delegates' good practices during the event, and providing topics in advance were mentioned as things to be improved or added to next editions.

5.3

Site Visits

The GEDC Industry Forum delegates had the opportunity to attend two fascinating site visits in the afternoon on Friday 5th July, as described below.



Château de Fontainebleau

The Château de Fontainebleau is one of the largest French royal châteaux. The medieval castle and subsequent palace served as a residence for the French monarchs from Louis VII to Napoleon III. The Château is now a national museum and a UNESCO World Heritage Site – it is a must-visit for all those attending the Industry Forum.

For more information:

www.chateaudefontainebleau.fr

MINES ParisTech Engineering School

Founded in 1783 by King Louis XVI, MINES ParisTech is one of the oldest and most prestigious engineering schools in France. With campuses in Fontainebleau and Paris, it is distinguished for the outstanding performance of its research centres and the quality of its international partnerships with other prestigious universities in the world, which include Massachusetts Institute of Technology (MIT) and California Institute of Technology (Caltech), among many others. With 18 innovative research centres, the major research themes at MINES ParisTech are essentially based on problems raised by industry, as well as society as a whole.

To find out more:

www.fbleau.mines-paristech.fr



5.4

Next Steps

The GEDC Industry Forum concluded with much enthusiasm among delegates to find opportunities to collaborate and incorporate new methodologies in their faculties and companies. In addition to this report, the GEDC and Petrus will conduct further research into the themes and inspirational sessions covered in Fontainebleau. There is also interest from stakeholders around the globe to host future sessions. The GEDC is creating space for members on the *GEDCExchange* to share more about these topics. We are delighted to announce that the next GEDC Industry Forum will be hosted by McMaster University's Faculty of Engineering, Canada and will take place from the 6th to the 8th of July 2020. We will continue to build on the themes and initiatives developed at previous events. Check out the GEDC Industry Forum website for more information: www.gedc-industryforum.com

A dedicated [LinkedIn group](#) is another platform for stakeholders to engage between Forums.

6

RESOURCES, NETWORKING AND FUTURE EVENTS

Find out more about the free GEDC Industry Forum resources available on www.gedc-industryforum.com/#resources



The 2019 Regional Concept Paper

Discover the rationale for the first regional GEDC Industry Forum to be held in Bucharest, Romania, from the 20th to the 22nd March 2019.



The 2017 GEDC Industry Forum Event Report

This is a comprehensive summary of the knowledge and ideas shared, the discussion outputs and the creative presentations delivered at the 2017 Industry Forum. The report is available to read online, or for download. It is an essential read, and a valuable resource, for anyone engaged in improving and innovating engineering education for the future.



The 2017 GEDC Industry Forum Concept Paper

This document was used to set the stage for the first Industry Forum event by providing a review of the important body of work looking at the globally discussed skills and attributes required in a graduate engineer.



Developing Skills for the Future

A Global Survey from Total Campus

An original piece of research commissioned by Total. The research explores the global perspective on which workplace skills are considered critical for success, as well as the activities likely to best to develop those skills during higher education.



GEDC Industry Forum Engineering Initiatives

An extensive list of good practices in university-industry collaboration provided by Industry Forum delegates.

Join us on the [GEDC Forum LinkedIn Group](#) for all the latest news and valuable insights from events.



GEDC Conference

Santiago (20 – 23 October 2019)

From the 20th to the 23rd October 2019, the city of Santiago in Chile will host the annual Conference of the Global Engineering Deans Council (GEDC). This prestigious event, held for the second time in Latin America, features a world-wide global forum of engineering deans and rectors, industry partners, and other stakeholders in engineering education.



World Engineering Education Forum

Chennai (11 – 16 November 2019)

The 9th World Engineering Education Forum is taking place in Chennai, India from the 11th to the 16th November 2019. The theme of the event is Disruptive Engineering Education for Sustainable Development.

The next GEDC Industry Forum will be hosted by McMaster University's Faculty of Engineering, Canada and will take place from the 6th to the 8th of July 2020. Check out the GEDC Industry Forum website for more information.

www.gedc-industryforum.com



PROGRAMME OVERVIEW

DEVELOPING THE NEXT GENERATION OF ENGINEERING EXPERTS AND LEADERS

This Industry Forum will address how to implement and scale up successful programmes which see universities and the private sector working together to develop the skills needed in future engineering experts and leaders. We'll explore how to develop socially conscious engineering and tech graduates for the future, building trust and authentic, inclusive communication skills as well as strategies to improve cross-border, open innovation through agile university-industry collaboration.

Designed in partnership with the Global Engineering Deans Council, and facilitated by the award-winning team at Petrus Communications, the Forum kicks off late afternoon on Wednesday 3rd July with an expert panel and workshop. This is followed by a day of inspiration, discussion and creative group work on Thursday 4th July facilitated by renowned specialists. Thursday concludes with social and networking opportunities alongside champagne on the CEDEP lawn (weather permitting), live music and dinner. Conclusions, with a strong focus on next steps, will be presented the following morning with departures on Friday 5th July after lunch. Pre-event seminars on Diversity and Student Engagement, as well as cultural and educational visits in the area following the event, are optional parts of the programme.

WEDNESDAY 3 JULY - CEDEP

From 12:00

Lunch is available for those who wish.

13:30 to 15:30

Ample meeting and working space is available at the event venue until the programme begins.

From 15:30

Pre-event Seminars (optional) exploring Diversity and Student Engagement

16:30

Registration & Welcome Coffee

Welcome & Introductions

Our hosts for the event are **Dr. Natacha DePaola**, Dean of the Armour College of Engineering, Illinois Institute of Technology, USA and Chair, Global Engineering Deans Council and **Chantal De Barra**, Head of International Research Publications, CEVIPOF, Sciences Po, France and Petrus Consultant.

17:00

University-Industry Cooperation for Global Research & Open-Innovation

Moderator

Prof. Şirin Tekinay, Vice-Rector Sabancı University and GEDC Chair-Elect, Sabancı University

Speakers

Jaime Bonilla Rios, Associate Dean for Continuing Education, Technological University of Monterrey

Dr. Michael Schoenwetter, Head of R&T Partnerships, Airbus

Bruno Woeran, EU - Affairs & Innovation Network Manager, Merinova OY

Taiwo Tejumola, Assistant Professor, International Space University

Global challenges are facing all of us regardless of national borders, and there is an increasing need for international collaboration to drive innovation in the private sector and with universities. Given the current political climate that may lead to increased isolationism in some areas, how can universities, companies, and other stakeholders best work together to ensure that open and international collaboration and innovation is not only maintained, but also intensified? In this global panel session, speakers from industry, education and the public sector will share their experience on developing productive multi-partner, multi-country research and innovation projects.

18:00

Developing Socially Conscious Engineers: An interactive session moderated by **Dr. Andrew Hogg** Deputy Chairman, Group Ethics Committee, Total

19:30

Get to Know You – Networking & BBQ



THURSDAY 4 JULY - CEDEP

- 08:30** **Inspirational Session on 'Skills for the Future'** to set the scene for the day with a look ahead at the technology, and the skills, that are changing the way we live, learn and work and a provocative exploration of how universities could evolve to meet the skills demands these changes bring.
Dr. Ishwar Puri, Dean of the Faculty of Engineering, McMaster University
Claudia Buzatu, Academic Alliance and Automation Ready Relationship Manager at UiPath
Olivier Crouzet, Dean of Studies, 42 born2code
- 09:30** **Dynamic Design Groups: Rotating Brainstorm and Dialogue**
Today, we know what skills are needed in future engineering and tech graduates; the 2017 Industry Forum Concept Paper provides a comprehensive list. As the required skills have and will continue to evolve, the focus of this interactive session will be on how to stay up to date, and develop needed skills in a meaningful and assessable way in scalable, high impact programmes.
The Student Perspective will be brought into the mix with comments on the Design Group themes and our pilot student engagement survey from Antonia Nanau, Immediate Past President, Board of the European Students of Technology (BEST) and Sana Djelidi, IFP School.
- 12:00** **Taking Up the Challenge: Delegates form Design Groups on problem of choice**
Lunch is with selected Design Group in CEDEP restaurant
- 13:30** **Dynamic Design Group Work continues ...**
- 18:00** **Sofa Sessions** (optional): An innovation at this year's Industry Forum. Bring your professional problem relevant to the theme of the event, and we'll invite the global GEDC Industry Forum community to solve it with you.
- 19:00** **Champagne, live music, and dinner in the CEDEP Gardens and Dome**

FRIDAY 5 JULY

- From 07:00** Breakfast at CEDEP & Design Group final preparations
- 08:30** Leave CEDEP by foot for the MINES ParisTech, Fontainebleau (a 10-minute walk from CEDEP)
- 09:00** **Dynamic Design Groups: Presentations**
- 11:30** **Conclusions & Next Steps**
- 12:00** **Farewell Lunch at the Ecole des Mines**
- From 13:00** Optional **Cultural and Education Site Visits** / Transfers

2019 GEDC INDUSTRY FORUM FONTAINEBLEAU

Delegate List

SPEAKERS

CHANTAL DE BARRA

Sciences Po &
Petrus Communications

CLAUDIA BUZATU

UiPath

JAIME BONILLA RÍOS

Technological University
of Monterrey

OLIVIER CROUZET

42 born2code

DR. NATACHA DEPAOLA

Illinois Institute of Technology
and GEDC

SANA DJELIDI

IFP School

DR. ANDREW HOGG

TOTAL

ANTONIA NĂNĂU

BEST International

RHYS PHILLIPS

Airbus

DR. ISHWAR PURI

McMaster University

MICHAEL SCHOENWETTER

Airbus

TAIWO TEJUMOLA

International Space University

PROF. ŞIRIN TEKINAY

Sabancı University & GEDC

KIRSTEN WILLIAMSON

Petrus Communications

BRUNO WOERAN

Merinova OY

EDUCATION

ISABEL ALARCON

Pontificia Universidad Catolica de Chile

VALERIE ARCHAMBAULT

MINES ParisTech

MONIQUE BEECH

McMaster University

SALWA BEHEIRY

American University of Sharjah

JENNA CARPENTER

Campbell University

PIETER DE VRIES

TU Delft

ARLENE FAJUTRAO DOSEN

McMaster University

IAIN DUPERE

The University of Manchester

ANNE-MARIE JOLLY

Commission des Titres d'Ingénieur

MANIVANNAN KALIAPPAN

IFEES-GEDC

BILL ROSEHART

Schulich School of Engineering
University of Calgary

MARSHALL SHELDON

Cape Peninsula University of
Technology - South Africa

MONIQUE VAN DONZEL

INSEAD

HALIT VURAL

Tishk International University

BI ZHANG

SUSTech

INDUSTRY & STAKEHOLDERS

ZINYAT AGHARZAYEVA

TOTAL

DEMBA BAH

Ministry of Trade Industry Regional
Integration and Employment

MUSA BAH

Ministry of Trade Industry
Regional Integration and Employment

SHEIKH OMAE BALDEH

Center For Socioeconomic Policy
Environmental Research And Social
Development

ZEINAB CAMARA

Ministry of Higher Education Research
Science and Technology

JEAN-MARC DUMAS

Society of Petroleum Engineers

JOHANA DUNLOP

Society of Petroleum Engineers

MARTIN FAYOLAS

Univers Santé

HANS J HOYER

IFEES-GEDC

NATHALIE KENNEDY

Franco-British Chamber of
Commerce and Industry

DR. MOSTEFA LAROUSSI

Learning4Business

ROBERT LEWIS

British Council

RAPHAEL LUCIEN

Facebook Digital Skills
Training Programme

FREDERIC MARTIN

Schlumberger

ARTHUR MOFAKHAMI

Neusca SAS

STEFANO OLIVIERI

MathWorks

SERHAT ÖZKAN

Brisa Bridgestone Sabanci
Tyre Manufacturing and Trading inc

FABRICE SPENNINCK

Garrett - Advancing Motion

DORA SMITH

Siemens

LINTUO WU

Huawei

XINLIANG ZHA

Huawei

Thanks To The Working Group Members



ARLENE FAJUTRAO DOSEN

McMaster University,
Ontario, Canada



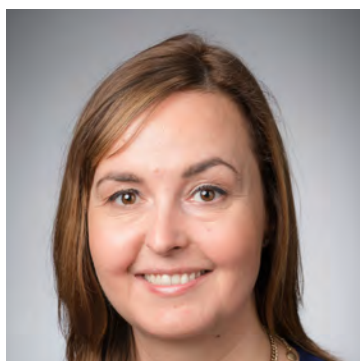
DR. ISHWAR PURI

McMaster University,
Ontario, Canada



JAIME BONILLA RÍOS

Tecnológico de Monterrey,
Monterrey, Mexico



MONIQUE BEECH

McMaster University,
Ontario, Canada



RICHARD TRACY SCHOEPHOERSTER

American University of Sharjah,
United Arab Emirates



PROF. ŞIRIN TEKINAY

Sabancı University,
Istanbul, Turkey



ZHENGHE XU

University of Alberta, Canada &
SUSTech, Shenzhen, China



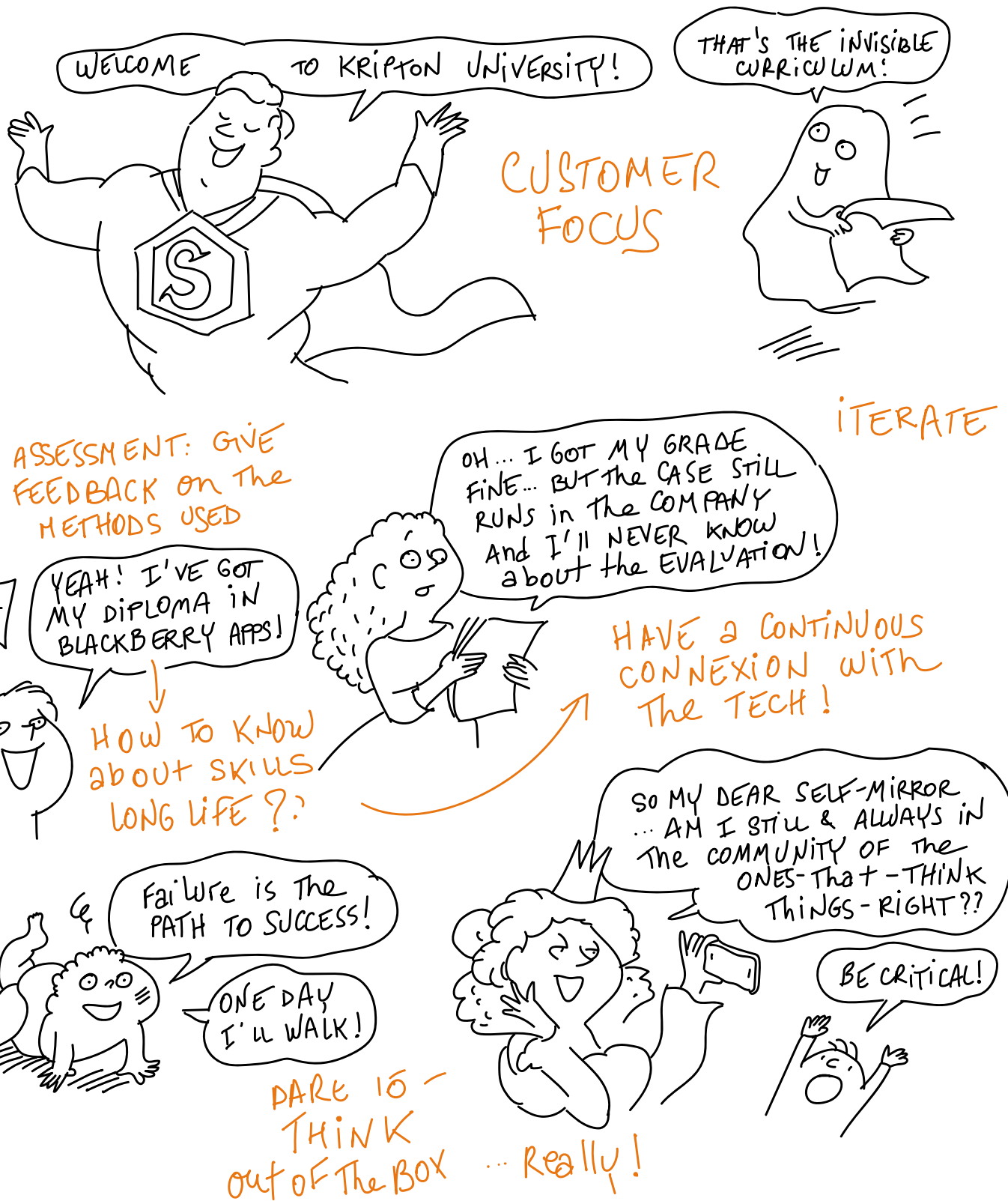
DR. NATACHA DEPAOLA

Illinois Institute of Technology &
Chair, GEDC, USA



HANS JÜRGEN HOYER

GEDC and IFEEES,
United States of America



STUDENT ENGAGEMENT IN THE LEARNING PROCESS - EXECUTIVE SUMMARY

The “Student Engagement in the Learning Process Pilot Survey” was launched by Petrus Communications in June 2019 using social media platforms aimed at students, postgraduates and recent graduates. The objective of the survey was to gain a better understanding of the expectations and behaviour of this audience worldwide.

We want to explore their ideas about student engagement in the learning process, and better understand the expectations and needs of future talent and influencers in relation to new forms of education, digital tool use in education and industry involvement in education and skill development activities.

The results comprise a global sample of 887 respondents surveyed during June 2019. The survey was distributed on online social media channels, including those of the GEDC and IFEES, by email, and by partner student organisations. It covered at least 61 countries.

Key questions:

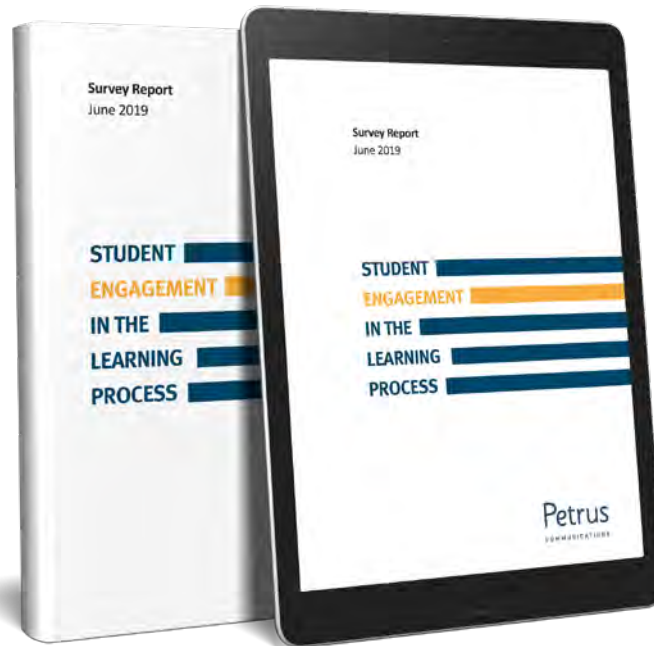
- What do you enjoy while you’re learning?
- Which of the following learning activities have you had the opportunity to experience?
- Which of the below are your top 3 most preferred learning activities?
- How would you like to interact with companies during the learning process?

Key Findings

- The results of this survey indicate that students appreciate the practical aspects of learning as learning by doing was the top choice in terms of respondents’ preferred activities, followed by hearing from an expert, and interactive learning. G-learning, seminars and company input were not so popular.
- The types of learning activities that respondents most commonly experienced were lectures, group projects and learning by doing. Extra-curricular activities, workshops, seminars, video content and online courses such as MOOCs were also identified as fairly common activities experienced during the learning process. G-learning, microlearning and information monitoring were not very frequently experienced by participants. One possible explanation for this is that these learning methods are still in their infancy.
- Most frequently mentioned among respondents’ top 3 preferred learning activities were lectures (12%), learning by doing, work-based learning and workshops. The three least popular learning activities were webinars, microlearning and information monitoring.
- Just over one-fifth of participants are not aware of how frequently they should be completing learning programmes in order to stay up to date during their professional life while almost half see it as necessary at least once a year.
- When asked how they would like to interact with companies during the learning process, the most common answers were internships and apprenticeships.

Activities Considered Important for Effective Learning

- Participants named lectures as their preferred method of learning, and this was also the most common type of learning activity that they had experienced. Learning by doing was also a popular way for participants to want to learn and was the third most popular type of learning that they had experienced.



Opportunity to Experience the Activities

- Although one fifth of participants were unsure how frequently they should be completing learning programmes to stay up to date in their professional career, almost half of participants (49%) believed that they should undergo such programmes at least once per year.

Company Interaction During the Learning Process

- The most popular ways that students wanted to interact with companies during the learning process were internships and apprenticeships, as these were mentioned by 12% and 9% of participants respectively.

Respondent Profiles

- 60% of respondents are **male**, and the overwhelming majority of respondents in this survey are **students** (91%) aged under **24** (94%).
- Just over three quarters of respondents (79%) come from an **Engineering** or **IT** background, and 64% of come from the **Americas** region.
- 81% of respondents have **1 year of work experience or less**.
- **Apprentices, experienced professionals** and **faculty members** make up 4% of respondents.
- Just over half of the respondents (51%) **do not yet have a university degree**.

If you would be interested in contributing to or participating in future research by Petrus Communications on student engagement, please get in touch at contact@gcdc-industryforum.com

