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MESSAGE FROM THE ORGANIZING CHAIR

The 2014 GLF-CEM was organized by the Hole School of Construction Engineering in the Department of Civil and Environmental Engineering at the University of Alberta.

I’d like to thank the delegates that were able to attend and contribute to the success of this year’s forum, including the three industry members that shared some important insights with us, and Mike Vorster, who gave a very inspiring talk on teaching and learning. Additionally, I want to thank the Executive Committee members for their support of this event.

This year’s forum marked the inception of three new GLF-CEM committees: the Graduate Program Standards Committee, Trends Committee, and Outreach Committee. The three committee meetings held helped lay the foundation for important work to be undertaken by these committees. This report overviews the three committee meeting sessions for your reference and for use in future work.

I’m looking forward to seeing everyone again in Weimar, Germany in 2015.

Sincerely,

Simaan M. AbouRizk, PhD, PEng, FRSC
Organizing Chairman, GLF-CEM 2014
Professor, Construction Engineering and Management
Canada Research Chair in Operations Simulation
NSERC Industrial Research Chair in Construction Engineering and Management
# LIST OF DELEGATES

## ACADEMIA

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
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<tbody>
<tr>
<td>1</td>
<td>Hans-Joachim Bargstädt</td>
<td>Professor, Construction Engineering &amp; Management</td>
<td>Bauhaus-Universität Weimar</td>
</tr>
<tr>
<td>2</td>
<td>Liu Guiwen</td>
<td>Vice Dean, School of Construction Management and Real Estate, Professor</td>
<td>Chongqing University</td>
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<td></td>
<td></td>
<td>School of Construction Management</td>
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<td>3</td>
<td>Osama Moselhi</td>
<td>Professor, Building, Civil and Environmental Engineering</td>
<td>Concordia University</td>
</tr>
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<td>4</td>
<td>Adel Francis</td>
<td>Professor, Department of Construction Engineering</td>
<td>École de Technologie Supérieure</td>
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<tr>
<td>5</td>
<td>Ahmad Irtishad</td>
<td>Director, OHL School of Construction, College of Engineering and</td>
<td>Florida International University</td>
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<td>Computing</td>
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<tr>
<td>6</td>
<td>Xiaolong Xue</td>
<td>Faculty Member, Department of Construction &amp; Real Estate</td>
<td>Harbin Institute of Technology</td>
</tr>
<tr>
<td>7</td>
<td>Geoffrey Shen</td>
<td>Head - Department of Building &amp; Real Estate, Chair - Professor of</td>
<td>Hong Kong Polytechnic University</td>
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<td></td>
<td></td>
<td>Construction Management, Associate Dean - Faculty of Construction and</td>
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<td>Land Use</td>
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<td>8</td>
<td>Luh-Maan Chang</td>
<td>Professor, Department of Civil Engineering</td>
<td>National Taiwan University</td>
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<td>9</td>
<td>Edward Jaselskis</td>
<td>Jimmy D. Clark Distinguished Professor, Department of Civil, Construction</td>
<td>North Carolina State University</td>
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<td>and Environmental Engineering</td>
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<td>10</td>
<td>Yingbo Ji</td>
<td>School of Economics &amp; Management</td>
<td>North China University of Technology</td>
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<td>11</td>
<td>Makarand Hastak</td>
<td>Head of Construction Engineering and Management, Professor of Civil</td>
<td>Purdue University</td>
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<td>Engineering, Professor-in-Charge, SPARC Laboratory</td>
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<td>12</td>
<td>Martin Skitmore</td>
<td>Professor - Science &amp; Engineering Faculty, Civil Engineering and The</td>
<td>Queensland University of Technology</td>
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<td>Built Environment, Construction &amp; Project Management</td>
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<td>13</td>
<td>Mohamed Al-Hussein</td>
<td>NSERC Industrial Research Chair in the Industrialization of Building Construction, Professor - Hole School of Construction Engineering</td>
<td>University of Alberta</td>
</tr>
<tr>
<td>14</td>
<td>SangUk Han</td>
<td>Assistant Professor, Construction Engineering &amp; Management, Hole School of Construction Engineering</td>
<td>University of Alberta</td>
</tr>
<tr>
<td>15</td>
<td>Ming Lu</td>
<td>Associate Professor, Construction Engineering &amp; Management, Hole School of Construction Engineering</td>
<td>University of Alberta</td>
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<tr>
<td>16</td>
<td>Alireza Bayat</td>
<td>Assistant Professor, Director, Centre of Excellence for Trenchless Technologies (CETT), Ralph Haas / Stantec Fellow in Civil Engineering</td>
<td>University of Alberta</td>
</tr>
<tr>
<td>17</td>
<td>Simaan AbouRizk</td>
<td>Canada Research Chair, Operations Simulation, NSERC Industrial Research Chair in Construction Engineering &amp; Management, Professor, Hole School of Construction Engineering</td>
<td>University of Alberta</td>
</tr>
<tr>
<td>18</td>
<td>Yasser Mohamed</td>
<td>Associate Professor, Construction Engineering &amp; Management, Hole School of Construction Engineering</td>
<td>University of Alberta</td>
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<tr>
<td>19</td>
<td>Paul Goodrum</td>
<td>Nicholas R. Petry Professor of Construction Engineering and Management, Civil, Environmental, and Architectural Engineering</td>
<td>University of Colorado Boulder</td>
</tr>
<tr>
<td>20</td>
<td>Leonhard Bernold</td>
<td>A/Professor</td>
<td>Universidad Técnica Federico Santa María</td>
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<tr>
<td>21</td>
<td>Thomas Froese</td>
<td>Professor, Department of Civil Engineering</td>
<td>University of British Columbia</td>
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<tr>
<td>22</td>
<td>Kasun Hewage</td>
<td>Program Coordinator - Civil Engineering, Associate Professor</td>
<td>University of British Columbia</td>
</tr>
<tr>
<td>23</td>
<td>Janaka Ruwanpura</td>
<td>Vice-Provost (International)</td>
<td>University of Calgary</td>
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<tr>
<td>24</td>
<td>Thomas Ng</td>
<td>Professor, Construction Engineering &amp; Management, Department of Civil Engineering</td>
<td>University of Hong Kong</td>
</tr>
<tr>
<td>25</td>
<td>Mike Kagioglou</td>
<td>Dean of Art, Design and Architecture</td>
<td>University of Huddersfield</td>
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<tr>
<td>26</td>
<td>Carol C. Menassa</td>
<td>Assistant Professor &amp; John L. Tishman CM Faculty Scholar, Construction Engineering and Management, Department of Civil &amp;</td>
<td>University of Michigan</td>
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<tr>
<td>27</td>
<td>Lucio Soibelman</td>
<td>Professor and Chair, Sonny Astani Department of Civil &amp; Environmental Engineering</td>
<td>University of Southern California</td>
</tr>
<tr>
<td>28</td>
<td>Jan Wium</td>
<td>Professor, Chair in Construction Engineering &amp; Management</td>
<td>University of Stellenbosch</td>
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<tr>
<td>29</td>
<td>William O'Brien</td>
<td>Associate Professor, Phil M. Ferguson Centennial Teaching Fellowship in Civil Engineering, Civil, Architectural and Environmental Engineering</td>
<td>University of Texas at Austin</td>
</tr>
<tr>
<td>30</td>
<td>Jeffrey Russell</td>
<td>Professor, Civil &amp; Environmental Engineering, College of Engineering</td>
<td>University of Wisconsin-Madison</td>
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<tr>
<td>31</td>
<td>Mike Vorster</td>
<td>David Burrows Professor Emeritus of Civil &amp; Environmental Engineering, The Charles E. Via, Jr. Department of Civil &amp; Environmental Engineering</td>
<td>Virginia Tech</td>
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<td><strong>GUESTS</strong></td>
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<tr>
<td>32</td>
<td>Rene Morkos</td>
<td>PhD Candidate/Charles H. Leavell Fellow</td>
<td>Stanford University</td>
</tr>
<tr>
<td>33</td>
<td>Konrad Siu</td>
<td>Director, Infrastructure and Funding Strategy</td>
<td>City of Edmonton</td>
</tr>
<tr>
<td>34</td>
<td>Rod Wales</td>
<td>Vice President, Venture Development</td>
<td>Ledcor Group</td>
</tr>
<tr>
<td>35</td>
<td>Ulrich (Rick) Hermann</td>
<td>Manager of Construction Engineering</td>
<td>PCL Industrial Management Inc.</td>
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<td><strong>GLF HOSTS (ADMINISTRATION)</strong></td>
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<tr>
<td>36</td>
<td>Amy Carter</td>
<td>Technical Writer</td>
<td>University of Alberta</td>
</tr>
<tr>
<td>37</td>
<td>Sheng (Sherlock) Mao</td>
<td>Graduate Student</td>
<td>University of Alberta</td>
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<tr>
<td>38</td>
<td>Sean Newstead</td>
<td>Graduate Student</td>
<td>University of Alberta</td>
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June 6 (Friday)

2:00 p.m. GLF Executive Committee Meeting and Meeting of Committee Chairs

5:00 – 7:00 pm Welcome Reception & Delegate Registration
- Introduction of new members
- Short program featuring innovative CEM program initiatives (new members)
- Announcement of member election

June 7 (Saturday)

7:00 – 8:00 am Breakfast

8:00 – 8:30 am General Assembly
- Welcome by Organizing Chair (Simaan AbouRizk, University of Alberta)
- Opening Remarks by GLF Chair (Geoffrey Shen, Hong Kong Polytechnic University)
- Member Election

8:30 – 10:30 am How to Produce More Marketable Graduate Students (General Assembly)
Featuring Presentations by Industry Representatives:
- Konrad Siu, Executive Director, Drainage Design and Construction, City of Edmonton
- Rick Hermann, Manager, Construction Engineering, PCL Industrial Management Inc.
- Rod Wales, Vice President, Venture Development, Ledcor

Followed by Panel Discussion led by:
- Edward Jaselskis, North Carolina State University
- Geoffrey Shen, Hong Kong Polytechnic University
- Hans-Joachim Bargstädt, Bauhaus-University Weimar
- Markarand Hastak, Purdue University
- Lucio Soibelman, University of Southern California

10:30 – 11:00 am Refreshment Break

11:00 – 11:20 am Committee Meetings – Part 1 (General Assembly)
Introduction to Graduate Program Standards, Trends, and Outreach Committees and their objectives by Committee Chairs

11:20 – 12:00 pm Committee Meetings – Part 2 (Parallel Committee Meetings)
Graduate Program Standards Committee
Trends Committee
Outreach Committee
12:00 – 1:30 pm Luncheon and Keynote Address
Mike Vorster, President, C.E.M.P. Central Inc.
Teaching and Learning: The Critical Balance in Effective Education

1:30 – 3:00 pm Committee Meetings – Part 3 (Parallel Committee Meetings)
Graduate Program Standards Committee
Trends Committee
Outreach Committee

3:00 – 3:30 pm Refreshment Break

3:30 – 4:30 pm Committee Meetings – Part 4 (General Assembly)
Presentation of Committee Meeting Findings

4:30 pm Closing Remarks

6:30 pm Reception and Dinner

**June 8 (Sunday)**

8:00 – 9:00 am GLF Delegate Breakfast

9:15 – 11:30 Banff Cave & Basin Tour
Introduction

The objective of the Graduate Program Standards Committee meeting was to discuss two facets of Construction Engineering and Management graduate programs:

- What should we teach and how should we teach it?
  - Should we build/share a common body of knowledge?
- How can we assess our programs?
  - Assess success/need for improvement

Meeting Summary

AM Session - What Do We Teach?

Defining the Scope

Brainstorming session:

What is our common knowledge?

Is a “standard approach” or “common core program” possible?

Must consider different specifics of each university:

- Location
- Faculty
- University requirements
- Students
- Clients
- Research
- Access to industry
- Engineering vs. management programs

How flexible should we be?

How can we work together (two-way) with industry better?

- Can we vet model through industry to ensure we have the outcome they need?
- Not just research – real-world problems
- Technical knowledge AND personal skills are required
- Partnerships through continued education
- Knowledge transfer programs (fight brain drain)
- Programs should focus on being long-term (life-long learners) not short-term (industry will want short-term outcomes); e.g. teach change adaptation not training for specific technologies
The means of delivering courses/teaching methods can develop skills like leadership without changing the curriculum (case studies, group work/discussion, industry input or guest lectures in courses)

Steps to define what we have in common:

- Get names and descriptions of courses
- Consider the needs of the “consumer” (employers) of the “product” (graduates)
- Define key attributes of graduates
- Could build off of existing frameworks or tie in to them (CD10 framework (MIT), ASCE vision documents)

What is our goal/desired outcome? What level do we want to go to?

- Should we aim to create a steering or guidance document?
- Do we want to pursue a method for program accreditation?
- Document for benchmarking programs?
- Better define difference/outcomes of each university?
- Guide for self-assessment (define gaps/areas of strength/differentiation or niche)?
- Define the body of knowledge?

Decisions

After the brainstorming session outlined above, the following decisions were made:

1. The programs should remain flexible/ have core requirements that allow uniqueness and competitiveness between universities
2. The group should produce a white paper that presents guidelines not standards
3. Industry involvement is desired (to promote lifelong learning)
4. It is not practical to require accreditation, but it is agreed that a core knowledge exists
5. The method of teaching is just as, if not more, important as the content

PM Session – What Do We Teach Continued/How Do We Assess?

It may not be possible to give guidelines on teaching methods in the document; could we share experiences/examples of teaching specific content and the outcomes? Maybe it could be something similar to the Exceed Excellence in Engineering Education ASCE Program.

Is diversified knowledge a required attribute (courses outside of engineering)?

Should industry be involved in defining attributes?

CII Executive Leadership Program provides some attributes that could be considered.

What is the minimum core that everyone should teach? Outside of that, flexibility gives flavor to programs.

The group brainstormed the following knowledge areas that should be acquired by students in CEM programs:
Knowledge Areas
• Planning
• Scheduling
• Risk management
• Managing people
• Cost management
• Cost control
• Safety management
• Legal aspects (contracts)
• Project delivery
• Quality management
• Estimating
• Engineering economics
• Productivity management
• IT in construction
• BIM
• Front-end planning
• Construction methods
• Change management
• Equipment (or asset or facility) management
• Plan reading
• Codes and standards
• Dispute and conflict resolution
• Environmental sustainability issues

“Soft Skill” Attributes
• Communication
• Critical thinking
• Ethics
• Negotiation skills
• Managing change
• Problem solving
• Team dynamics

The group then discussed program assessment:
• What is done in different programs?
• Student feedback?
• Benchmarking?

Some benchmarking metrics were brainstormed:

Benchmarking Metrics
• Student/faculty ratio
• Full-time/part-time ratio (faculty and student)
• Number of units to degree (minimum)
• Number of classes
• Frequency of classes
• Average class size (maximum number of students per class)
• Teaching methods
• Industry engagement
• Distance education
• Executive education
• Teaching load (grad/undergrad)
• Internal assessment (student employment, employer questionnaire, alumni)
• Advisory board

Next Steps

Survey

The group decided to conduct a survey of GLF members that will ask for:
• Name of graduate program
• List of classes with detailed description of courses
• Opinion on attributes that graduate students should possess
• Etc.

White Paper

After analyzing the survey results, the group will determine the bare minimum set of graduate attributes, and will then produce a white paper that provides guidelines for CEM programs.
OUTREACH COMMITTEE MEETING MINUTES

Introduction

We believe that collaboration between industry and academia would be improved, if we could work together to develop mechanisms in the following five areas.

1) Faculty development;

- Recognize practical experience in tenure process
- Summer internships
- Sabbaticals in industry and vice versa
- Sharing practical problems
- Team teaching with industrial partner

2) Share knowledge and understanding;

- Shared courses among universities
- Innovation in construction forum
- Industry guest lectures
- Develop real case studies
- Industry attends capstone course presentations and other
- Industry awareness of research
- Non-degree short courses
- Developing executive MBA for construction engineers
- Reasonable restriction durations on proprietary rights
- Reasonable understanding of the relative importance of basic and applied research

3) Improve collaboration;

- Collaboration meetings with industry
- Industry blitz day in university
- Advisory board by industry
- Generate new research ideas from collaboration w. industry
- Collect practices and policies in different countries (university regulations)
- Partnership with industry or government agencies etc.
- Leading edge consulting for industry and government
- Identify cooperation champions with the industry

4) Funding to promote collaboration from funding agency;

- Collect practices and policies in different countries (funding in Canada, Germany, etc.; NSERC, CII, etc.)
- Different limits and restrictions
- Concept of “construction clinic”
Different collaborations with professional and industry associations and governmental agencies

5) **Train students**
Internships in different stages of the study program
Visiting lectures from industry
Field trips
Collaborate final thesis

**Next Steps**

We will gather information around the globe on how to accomplish the preceding by using case studies of success and best practice. This will lead to a set of valuable recommendations.
Introduction

The Trends committee and the need for the GLF to consider trends in general was mandated due to the need for GLF to address one of its key objectives and purposes: Be at the forefront of developments in CEM and –through its engagement with future leaders – ensure the global consideration of issues and how these can be applicable in CEM programmes, research and the collaboration with industry.

The purpose of the trends committee is to:

“Report and articulate construction/Built Environment industry, educational, and research trends that have the potential or already impacting CEM and CM graduate programs. “

Background and Preparation for the Workshop

A workshop virtual team was established to plan the day’s events and through a number of iterations it concluded that to kick start proceedings it would be best to ask delegates to address 3 key questions and provide answers to these before the workshop. The questions were:

1. Prioritize 6 activities, processes, that are most critical (and should be implemented) for CEM to create the Engineer 2025?
2. For each of your 6 items under a), provide the 2 most important or difficult hurdles to overcome by CEM?
3. What are the 6 most critical actions for GLF to provide leadership in moving the CEM community towards creating the Engineer 2025?

A summary document was provided as an initial input. These were:

- The vision for civil engineering for 2025
- Educating the Engineer of 2020
- Engineering for the future

As such the focus of the meeting was formulated around graduates of CEM programmes. The presentation that was made at the general GLF meeting can be found in Appendix 1.

The Workshop

The workshop started by establishing the running order, expected outcomes and an indication of overall outcomes. It was agreed that firstly a summary of all inputs to date on the 3 questions would be presented (see Appendix 2) and then those that have prepared presentation should be given the opportunity to present them (see Appendices 3, 4 and 5 – 5 was not presented at the workshop.)

---

1 Workforce and human capacity, project delivery, corporate strategy, technology and innovation, markets and demand drivers, and social and political influences, etc.

2 Content offered, Web-based learning, distance education, MOOCs, flipped classrooms, etc.
After some deliberation it was agreed that we should establish a consistent definition for the term trend. This was agreed as the following (taken from Oxford and Free Dictionaries):

1. The general direction in which something tends to move.
2. A general tendency or inclination.
3. Current style; vogue: the latest trend in fashion.
4. intr.v. trend·ed, trend·ing, trends
   a. To extend, incline, or veer in a specified direction: The prevailing wind trends east-northeast.
   b. To show a general tendency; tend: "The gender gap was trending down" (James J. Kilpatrick).

The delegates (see a list at the end) spend quite a bit of time trying to scope the exercise and the following 4 themes were identified as covering all the areas that need to be considered:

1. CE/CEM Programmes
2. Needs of the Industry
3. Funding trends in HE and Industry
4. Research

There was also a fifth theme – Industry and Academia working together – which was decided to be incorporated with Needs of the Industry.

The workshop delegates then concentrated in identifying focus areas that would actually allow us to either identify current trends and areas that we should be looking at identifying trends. The following areas were identified:

1. Educational experience – Multidisciplinary
2. Understanding of fundamentals by students
3. Student expectations and talents
4. Educational outcomes
5. Experiential learning
6. Location of CEM programmes i.e. engineering, business, management, arts, etc.
7. Education in data rich environments
8. Online training / distance learning
9. More PhDs going into industry
10. Assessment of lecturers and professors and students
11. UG internship, Grad Residency tied to w/thesis
12. Teaching and Learning techniques (hi-tech / low-tech)
13. Teaching tools
14. Ethics in Curriculum
15. CEM specific student competitions
16. Changes in Curriculum
17. Resident industry instruments
18. Number of UG/G programmes in CEM
19. Professional Registration
20. Availability of funds from government, industry, others
21. Types of funding i.e. horizon 2020, NSERC engage
22. Global collaboration for research, education, study abroad, etc.
23. Curriculum and community engagement
24. Industry partnership in Capstone courses
25. Entrepreneurship and Commercialisation
26. Sustainable Design and Construction
27. Technology based Research
28. Multidisciplinary research
29. System based research
30. Longitudinal research
31. Smart buildings
32. Sensor / big data / VR
33. Safety related topics
34. Industry and Academic collaboration

There was not enough time to relate and connect every focus area to one of the identified themes or to rationalise the list. It was decided to include this as future work.

Next Steps

The workshop agreed that we should be aiming to produce a white-paper of the trends committee ready for presentation at the next GLF meeting Weimer, Germany in June 2015. It was also agreed that the best way forward which be to divide the work according to the identified 4 overarching themes and identify a lead person and also individuals that wanted to contribute. Those include those present at the workshop but it will also be important to engage with the wider GLF community and receive input. The leads and members of the subcommittees are:

1. CEM/CM programmes: Lead: Jeff Russell; members: Guiwen Liu and Leonhard Bernold
2. Needs for Industry: Lead: Rick Hermann; members: Thomas Ng and Rene Morkos
3. Funding Trends Higher Education and Industry: Lead: Kasun Hewage; members: Ming Lu and Janaka Ruwanpura
4. Research: Lead: Jan Wium; members: Guiwen Liu

The exact work to be carried out was not discussed and it will be left to theme leads to ensure appropriate progress and engagement. Mike Kagioglou will liaise with Theme leads throughout the year and with their help edit an overall response. The suggested points in time for virtual meetings to check on progress between the committee chair and theme leads are included below together with suggested key milestones for delivery:

1. July 2014:
   a. Ensure that there is clarity between all leads and agreement on the way forward
2. September 2014
   a. Membership of each theme determined
   b. Outline and standard template for report writing
   c. Initial rationalisation of the 34 identified areas of focus and inclusion of other areas – in other words determining the scope of the theme investigations
   d. Overall plan for delivery by May 2015 and intermediate 3 month plans in getting there with associate deliverables
3. December 2014
   a. First draft and outline of the theme report
   b. Discussion on barriers and determining risk in delivering
   c. Action plan for the next 3 months
4. March 2105
   a. Almost final draft
b. Identify need for any mitigating action

c. Action plan for the next 3 months

d. Discussion on final white-paper preparations
   i. Determine overall structure and delivery dates

e. Determine presentation plans for Weimer

5. May 2015
   a. Final draft of white paper and discussion for finalisation
   b. Final plan for presentation made at GLF

The immediate step now is to circulate the report from the workshop and start engaging the overall GLF membership and arrange the virtual meetings. Next year will be here before we know it!

I am grateful for all the help that was afforded to the Committee to prepare and run the workshop and for all the inputs that were made on the day which provided some food for thought and a very useful way forward and a plan for the next year. We just have to delivery now!

Mike Kagioglou

University of Huddersfield – UK

Chair of Trends Committee and GLF Ex-Com member

List of Trends Committee Workshop Attendees:
   1. Guiwen Liu - Chongqing University
   2. Xiaolong Xue – Harbin Institute of Technology
   3. Lug Chang – National Taiwan University
   4. Rick Hermann – PCL Industrial Management Ltd.
   5. Makarand Hastak – Purdue University
   6. Rene Morkos – Stanford University
   7. Leonhard Bernold – Universidad Tecnica Federico Santa Maria
   8. Ming Lu – University of Alberta
   9. Kasun Hewage – University of British Columbia
   10. Janaka Ruwanpura – University of Calgary
   11. Thomas Ng – University of Hong Kong
   12. Mike Kagioglou – University of Huddersfield
   13. Jan Wium – University of Stellenbosch
   14. Jeff Russell – University of Wisconsin

Acknowledgements

The workshop was also attended by University of Alberta students who were very helpful in collating materials and note taking – thank you.
UPCOMING GLF-CEM

The next GLF-CEM will be hosted by Bauhaus-Universität Weimar under the leadership of Professor Hans-Joachim Bargstädt in June 2015. More details to follow.
APPENDIX A: INDUSTRY MEMBER PRESENTATIONS FROM “HOW TO PRODUCE MORE MARKETABLE GRADUATE STUDENTS” SESSION
How to Produce More Marketable Graduate Students?

(What is appealing in a graduate student for Drainage Services?)

Global Leadership Forum for Construction Engineering and Management Program

June 6-7, 2014
Banff, Alberta, Canada
Topics

• Drainage Design and Construction (DDC)

• What does DDC look for in a graduate student?

• A Strong Partnership
Drainage Design and Construction (DDC), is part of Drainage Services Branch, City of Edmonton.

Design, construct, and project manage underground utilities by tunnel / trenchless technology / open cut.

Long term successful research partnership with the U. of Alberta Hole School of Construction Management.

Challenges: improve productivity, reduce downtime, manage risks, team work, capacity building, succession planning…
What does DDC look for in a graduate student?

Technical Knowledge

Leadership Skills

Personal Attributes
Technical Knowledge

• Project and Construction Management
• Work Process Simulations
• Application of Lean Principles
• Construction Risk Management, Value Engineering, Constructability
• Asset Management
• …
Leadership Skills

- Strategic “Big Picture” Thinking
- Leading People and Team Building
- Mentoring and Coaching
- Change Management
- Conflict Resolution
- ....
Personal Attributes

- Effective Communications Skills
- Work collaboratively in a diverse team environment
- Innovative and creative
- Critical thinking and reasoning capabilities
- Adaptive to change
- ...
A Strong Partnership

Academia

Industry

Research

Education

Practice

Experience

Knowledge + Application

Drainage Services
Financial Services & Utilities
Thank you!

Questions?
How to produce more marketable graduate students – Industry Perspective
Introduction

• PCL is the largest contracting organization in Canada
• Involved in:
  • Heavy industrial
  • Civil infrastructure
  • Buildings markets
• Volume of over $7 billion/year
• Founded in 1906
• Employee owned
• Corporate office in Edmonton, AB
• US head office in Denver, CO
Rick’s background

- Graduated from NAIT Bldg Constr Eng Tech 1981
- Graduated from the University of Alberta in 1985 with a Civil Engineering Degree
- Worked in the construction industry for 30 years
- Experience primarily in heavy industrial sector
- Worked for both the owner and contractor
- With PCL Industrial for 19 years
- Involved with the UofA CEM since its beginning in 1996
Research background

• General Contractor with:
  – 19 Journal Papers
  – 28 Conference Papers
  – 1997 – 2014

• With extreme gratitude to UofA and NSERC
Research Topics

• Decision Support Systems
• Historical Data, Neural Network for Productivity;
• Construction Eqpt Selection;
• Simulation for Module Yard Assembly Work
• Simulation for Heavy Crane Lifts and Tower Cranes
• Scaffold Productivity Analysis
• Formwork pressures using Agilia Concrete
Research Topics

• Automated system for crane ground bearing pressures
• Crane Selection using Robotic Algorithms for Crane Automation
• Heavy Lift Animation automation
• Photogrammetry – Robotic total station for patented module lift frame
• Dynamic FEA for module lifting frame
CEM Graduate Comments

- CEM Programs attract dedicated, intelligent, motivated engineers
- Very analytical and have good problem solving skills
- Thinking outside the box
- Challenging process
- Looking for better way of doing things
• Marketable student qualities vary depending on intended Industry Job
• Buildings / Commercial – primarily subcontract management
• Heavy Industrial – primarily direct hire
  – Approx ½ constr.mgmt staff are engineers
• Government Organizations
• Universities
Marketable Graduates

• Good Work Ethic
• Ability to resolve field technical and management issues
• Ability to read drawings, specifications, visualize work processes
• General knowledge of codes and standards
  – ASME, CSA, OH&S
• Ability to design – formwork, shoring, temporary structures / devices, crane/eqpt selection, scaffolding, innovative constr methods
• Manage information in a fast track project environment
• Constructability / planning
• Organized
• Self starter
• Communication / people skills
• Quality Management system exposure
• Multi-disciplined exposure (Civil, Mech, E&I)
Marketable Graduates

- Good computer skills
- Project Controls
- Work with CAD and 3D BIM models
- Willing to get boots dirty
- Handle stress well
- Skillset for potential project mgr/ Constr Mgr within 10 years
Marketable Graduates

- Traditionally PhD seen as not fitting Constr.
- Recent successes at PCL and UofA opening up opportunities
- Consider extended M Sc with more hands on training – ready to work in industry, possibly internship
Collaboration

• Consider requirement for new professors 6 months to 1 year on-site field construction experience / internship
• Co-sponsored by industry
• Benefit
  – Gain field experience
  – Connect with Industry
  – Identify needs and ideas for research and training
Industry has little understanding how Academia works or is funded

- Funding through Gov’t grants, some from Industry, little from student Univ. fees
- Academia is publication driven
- How academia is evaluated
- Quantify $ value of research work to sell Industry
Research Motivation

- Money
- Interest
- Need
- Time

- Find Industry VP who has money
- Find Industry Champion who is interested and identifies needs (and has more time)
- Industry direct hire / benefit has more motivation for research
Marketable Graduates

• Thank you
2014 GLOBAL LEADERSHIP FORUM

ROD WALES, M.SC., P.ENG.
WHO IS LEDCOR?
INDUSTRY SECTORS WE WORK IN

- BUILDING
- INDUSTRIAL
- PIPELINE
- FORESTRY
- COMMUNICATIONS
- MINING
- INFRASTRUCTURE
- TRANSPORTATION
- PROPERTIES
- ENVIRONMENTAL
WHERE WE OPERATE

LEDCOR OFFICES
Austin
Calgary
Chicago
Edmonton
Fort Nelson
Fort McMurray
Honolulu
Kelowna
Las Vegas
Napa
Regina
Reno
Saskatoon
Seattle
Terrace/Kitimat
Toronto
Vancouver
Victoria
Yellowknife
WHAT IS ATTRACTIVE ABOUT HIRING GRADUATE STUDENTS?

• What did I bring to the table?
• Critical Thinking Skills
• Introduce Technology
• Training and Experience
  • Mix of what can help us today and what can help us in the future
• Information management
• On the job experience
Teaching and learning: The critical balance in effective education.

Mike Vorster. David H. Burrows Professor Emeritus Virginia Tech.
Teaching and learning:
The critical balance in effective education.

Mike Vorster. David H. Burrows Professor Emeritus Virginia Tech.
Teaching and learning: The critical balance in effective education.

“Our only sustainable competitive advantage is our ability to learn faster than the competition.”

and our only true challenge is to cause that learning to happen, faster and more effectively.
Teaching and learning: The critical balance in effective education.

1. Talk a little about teaching
2. Tell a story and get to know a little about learning
3. Put teaching and learning together and explore two issues
4. Wrap it up.
Teaching.

It comes from the heart — but I wish I had known this sooner
Teaching.

“Of the many expectations that society has of the modern university, the most important is that it will teach well.”

President Emeritus, Stanford
“Teachers in grammar or high schools, in colleges or universities, in places large and small, public or private, new or old, have never truly been cherished by this country in a way that is equal to the importance the country so clearly attaches to them.”

President, Yale, 1978 to 1986
Teaching.

“The college teacher, who is my special focus, is, in popular myth, a bumbler prey to malign influences because he is so innocent, a figure unfit for the rigors of what is still constantly called “the real world”.

President, Yale, 1978 to 1986
Teaching.

“At best the popular image of the college teacher …… is that of a rumpled child, fit to tend his grazing herd of adolescents across academic groves but totally lost before machines, money and worldly temptation. He is always dressed out of season, often has an accent.”

President, Yale, 1978 to 1986
The goal of education ought to be the creation of independent, autonomous learners who assume responsibility for their own learning.”
When Linda Silverman and I wrote this paper in 1987, our goal was to offer some insights about teaching and learning. Based on Dr. Silverman's expertise in educational psychology and my experience, we set out to study how students learn in engineering education that would be helpful to some of our colleagues in engineering education. The responses were astonishing. Almost immediately, requests from colleagues all over the world began to flood into our office for data on how students learn engineering education. The paper appeared on the cover of the Journal of Education for Engineering, and it was the most frequently cited paper of its kind over a 10-year period. A self-assessment questionnaire was developed and is still used today by students and teachers.

A problem is the model. The most common model is the visual/audio one. I set up a webpage to explore this further. A recent paper appeared on my web page. It is about how the mind works. It is not a novel approach, but it is new to the field. The paper is about teaching styles. The 1987 paper is still the most cited paper. A recent paper on teaching styles is still cited more than 20 times. The paper is still used by students and teachers.

Deletion of the induction

I have come to believe that preferences and different teaching approaches in the graduate school level are not induced by the teaching/learning process. The problem of teaching and learning is more than simply teaching. It is about how to teach. The paper is about teaching, not learning. The paper is about teaching, not learning.
Teaching.

Richard M. Felder, 1988
Learning styles

First step. Reception
- Sensory. Sights and sounds.
- Intuitive. Insights, hunches

Second step. Processing
- Inductive. Facts first, infer the principles.
- Verbal. Words and sounds.
- Active. Learning by doing.

How we Receive
- Global. One big Ah ha.
- Sequential. Many small steps.

How we Reason
- Deductive. Principles first then applications.
- Reflective Learning by thinking.

How we Learn
- How we Understand
“Learning styles of most engineering students and teaching styles of most engineering professors are incompatible in several dimensions. Many or most engineering students are visual, sensing inductive and active and some of the most creative students are global: most engineering education is auditory, abstract, deductive, passive and sequential."
Teaching.

“Learning styles of most engineering students and teaching styles of most engineering professors are incompatible in several dimensions. Many or most engineering students are visual, sensing inductive and active and some of the most creative students are global: most engineering education is auditory, abstract, deductive, passive and sequential. These mismatches lead to poor student performance, professorial frustration and a loss to society of many potentially excellent engineers.”

Felder 1988
Learning styles
Teaching.

This sombre reading about teaching and the data presented by Felder in subsequent longitudinal studies give the two critical conclusions of this section:

1. When it comes to teaching, one size does not fit all.

2. To improve our effectiveness, we need to understand the dimensions of learning style.

We need to “get Felder right”.
Teaching and learning:
The critical balance in effective education.

1. Talk a little about teaching
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Learning.

The epiphany at Carlisle
Learning.

I teach and you listen.

My responsibility ends when I have spoken.

I cause you to learn.

Your learning is my responsibility. I can, and must do everything possible to make it happen.
Learning.

Are we entitled to assume that the more we teach, the more our students learn: are we, perhaps, teaching too much and our students are learning too little?
Learning.

How would you characterize today's college students? Empowered, confident, self-motivated learners? That is not how I would characterize mine…… Most like, want, indeed need teachers who tell them exactly what to do. Education is something that is done to them. ….. is there something about the way we teach that discourages students’ development as learners.
If the goal of teaching is to promote learning then the role the teacher takes to accomplish that goal changes considerably. Teachers no longer function as exclusive content experts or authoritarian classroom managers ..... They will lecture less and be much more around the classroom than in front of it
Learning.

Ask any faculty member if they are interested in improving their teaching, and the response is almost always defensive. …… What self-respecting, even curmudgeonly, faculty member can respond in any other way other than positively if asked, “Are you interested in how much and how well your students learn?”
Learning.

It is not possible to sample even a modest amount of literature on learning and continue teaching as most of us were taught.
Learning.

Look to change in five areas:

First: The balance of power
Learning.

Look to change in five areas:

First: The balance of power

Willingly and responsibly give up some of their control in the interests of creating motivated, confident, responsible learners.
Learning.

Look to change in five areas:

First: The balance of power

Willingly and responsibly give up some of their control in the interests of creating motivated, confident, responsible learners.

Second: The function of content
Learning.

Look to change in five areas:

First: The balance of power

Willingly and responsibly give up some of their control in the interests of creating motivated confident, responsible learners.

Second: The function of content

If we aim to be learner centered, content still needs to be the focal point but can no longer be the exclusive center.
Learning.

Look to change in five areas:

First: The balance of power
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Third: The teacher
Learning.

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First: The balance of power
Willingly and responsibly give up some of their control in the interests of creating motivated confident, responsible learners.

Second: The function of content
If we aim to be learner centered, content still needs to be the focal point but can no longer be the exclusive center.

Third: The teacher
For both parties dependent relationships are basically unhealthy and ultimately limit the potential for growth.
Learning.

Look to change in five areas:

Fourth: Responsibility for learning
Learning.

Look to change in five areas:

Fourth: Responsibility for learning

Are we creating intellectually mature responsible learners – ones who when they receive an assignment, can analyze it and complete the steps in a timely manner.
Learning.

Look to change in five areas:

Fourth: Responsibility for learning

Are we creating intellectually mature responsible learners – ones who when they receive an assignment, can analyze it and complete the steps in a timely manner.

Fifth: Evaluation
Learning.

Look to change in five areas:

Fourth: Responsibility for learning

Are we creating intellectually mature responsible learners – ones who when they receive an assignment, can analyze it and complete the steps in a timely manner.

Fifth: Evaluation

The assessment horse pulls the learning wagon.

Our points systems convey a powerful message: the only learning worth doing is learning that you get points for doing.
Learning.

So, two critical conclusions from our conversations about learning:

1. We need to focus on our students and on how we can encourage them to become independent learners. Our command of the teaching process must not inhibit this.

2. It is not possible to sample even a modest amount of literature on learning and continue teaching as most of us were taught.

We need to “get Weimer right.”
Teaching and learning: The critical balance in effective education.

1. Talk a little about teaching
2. Tell a story and get to know a little about learning
3. Put teaching and learning together and explore two issues
4. Wrap it up.
Bringing it together.

Lets revisit the “as planned” and the “as built” versions of my talk at the US Army War College.

- I teach at Virginia Tech.
- I cause my students to learn.

Is it right to assume that learning is an automatic and inevitable outcome of teaching?
Bringing it together.

Do nothing

Exhausted faculty and disinterested students.

Faculty teach too much, students learn to little.
Bringing it together.

“I cause my students to learn

I teach at Virginia Tech

“get Felder right”

Handle the “mismatches that lead to poor student performance, professorial frustration and a loss to society.”
Bringing it together.

We need the courage to focus on learning and the patience to try, try again, until we get it right.

As it is with most puzzles, we have the picture on the box – we know what we want to do – and we have the pieces.
Bringing it together.

We have a great opportunity - we teach construction. The world is our classroom. The picture is on the box.
Bringing it together.

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Bringing it together.

So, two conclusions from this section:

1. We truly cannot believe that learning is an automatic and inevitable outcome of teaching.

2. As in sports, we must raise the standard of what we do with what we have got. A knowledge of learning styles (Felder) and of the improvements that can be achieved by moving towards learner centered teaching (Weimer) hold the key.

We teach construction. The picture is on the box. We can excel. We must excel.
Bringing it together.

I cause my students to learn

"get Felder right"  "get Weimer right"

I teach
Teaching and learning: The critical balance in effective education.

1. Talk a little about teaching
2. Tell a story and get to know a little about learning
3. Put teaching and learning together and explore two issues
4. Wrap it up.
1. When it comes to teaching, one size does not fit all.

2. To improve our effectiveness, we need to understand the dimensions of learning style.

3. We need to focus more on our students and on how we can encourage them to become independent learners than on our command of the teaching process.

4. It is not possible to sample even a modest amount of literature on learning and continue teaching as most of us were taught.
5. We cannot believe that learning is an automatic and inevitable outcome of teaching.

6. We must emphasize learning and discovery and raise the standard of what we do with what we have got.

7. There is a role for both classic lectures as well as more adventurous learner centered exercises.

8. Potential exists when we seek to develop independent learners who assume responsibility for their own learning.
Our students will, for their own success, have to be lifelong learners. The attitudes, aptitudes and abilities they need to accept responsibility for their own learning must be acquired on our campuses and in our classrooms.
If we do change, recognize the contributions of far thinking educators like Felder and Weimer and recognize that education is about developing the ability to learn then both faculty and students will do more with what they have got, both now and in the future.

We teach construction. The picture is on the box. We can excel. We must excel.
So .............
APPENDIX C: EVENT PHOTOS
2014 GLOBAL LEADERSHIP FORUM FOR CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAMS
Hosted by the University of Alberta’s Hole School of Construction Engineering
June 6-7, 2014 | Rimrock Resort Hotel | Banff, Alberta, Canada