Design Engineer Construct
Integrated Management Lab

Leveraging Collaboration in the classroom with BIM
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Outline

• **Challenges** faced in incorporating BIM in the classroom

• **Current Solutions** being practiced

• Importance of **Collaboration** in the construction classroom

• Design and development of **DECIMaL**

• **Core BIM Curriculum** at DEWSC

• **Expanding BIM Curriculum** beyond software

• Challenges faced and **Future Research**
• 4 year undergraduate Construction Management
  • Commercial
  • Residential
  • Heavy Civil and Underground
  • Facilities Management
• American Council of Construction Education (ACCE) accredited
• Architecture and Construction programs part of two different schools
• BIM introduced in Fall 2008
• DECIMaL introduced in Spring 2012
Virtual Design and Construction / Building Information Modeling

The digital representation of design and construction data in the form of information rich geometric models and using the embedded intelligence for simulating the process of building from design to construction and operations, while significantly improving the efficiency and productivity.
Challenges

• “Academia has found it difficult to move as rapidly, perhaps due to the conflicting ideologies of teaching BIM as a single application versus teaching the core concepts behind it.” (Ibrahim 2007)

• “Currently the construction industry hires architects, engineers and construction professionals with prior experience in BIM, making the hiring process very competitive” (Hardin 2009)

Knowing BIM as a software application is not enough for graduates to contribute in the industry if they are not aware of the accompanying processes, concepts and environments.
Collaboration

To be future leaders, the tech savvy generation of Construction Management students have to be adept at learning **people skills** as well as **technical skills**. Fundamentally, if **construction** is considered a **social activity**, then **collaboration** is its critical characteristic and **VDC and BIM** are its drivers.

“It is impossible to separate interpersonal and inter group communication from the construction process” *(Dainty 2006)*
Common Solutions

- Elective or a workshop
- Advanced Degree program
- Restructure existing curriculum

DEWSC has explored the concept of collaboration in the BIM environment through an immersive collaboration environment called the Design Engineer Construct Integrated Management Lab [DECIMaL]
DECIMaL

- Collaborative features such as **collaborative features** such as **co-location, proximity, visual and aural access**, supported by tools and technology that can stimulate collaboration.
- Precedent of a **job site trailer** – ‘the communication hub of a project’
- **Flexibility** of transforming between ‘pod-based’, lecture hall and conference room settings.
- **Switching devices** allow the function of replicating the screen content.
DECIMaL

- Display of any ‘pod’ can be switched to project from the main projector when a team idea needs to be shared with the entire class
- Display of any one ‘pod’ can be shared with the other ‘pods’, if two teams are collaborating
- Display of the projector can be shared with any ‘pod’ for detailed viewing
teams working in ‘pods’

conference & discussions

presentations
# Core BIM Curriculum

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>CON224</td>
<td>‘Working Drawings Analysis’</td>
<td>3 credits</td>
<td>Objective: Overview of <strong>construction drawings</strong> and how they are organized, recognizing various building components, construction methods and the components of major systems</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Understanding <strong>drawings and deliverables</strong> which form the <strong>steps</strong> for complete BIM/technology knowledge</td>
</tr>
<tr>
<td>CON394</td>
<td>‘Introduction to BIM’</td>
<td>1 credit</td>
<td>Objective: Computer application course teaching BIM processes as an overall concept and concentrated on learning <strong>BIM software applications</strong></td>
</tr>
<tr>
<td>CON453</td>
<td>(capstone) ‘Project Management I’</td>
<td>3 credits</td>
<td>Objective: <strong>Collaboration, interaction</strong> and preparing for common real life challenges faced in the industry</td>
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<td></td>
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<td>Application of the skills learned on <strong>case based scenarios</strong></td>
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Better understanding of **skill sets** by incorporating technology.
## Expanded BIM Curriculum

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Concepts covered</th>
<th>Future application of these concepts</th>
<th>DECIMAL use</th>
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</thead>
<tbody>
<tr>
<td><strong>Year II</strong> Microcomputer Applications for Construction</td>
<td><strong>Geometric modeling</strong> to represent operation of construction equipments, Developing a <strong>cost database</strong> in CSI Master Format using Microsoft Access</td>
<td><strong>Spatial requirements</strong> for productivity and safety</td>
<td>No</td>
</tr>
<tr>
<td><strong>Year II</strong> Building Construction Methods, Material &amp; Equipments</td>
<td>Tangibility of materials, <strong>visual understanding</strong> of equipments, developing a sense of how a building comes together, <strong>Identifying roles</strong> in the process of construction</td>
<td><strong>Vertical integration</strong> of courses to foster sense of progression</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Year III</strong> Planning &amp; Scheduling</td>
<td><strong>Project Scheduling</strong> methods such as Bar Charts, CPM and PERT, AOA, AON and VPM techniques; resource allocation and <strong>time/cost analysis</strong></td>
<td>Creating <strong>schedules, and simulating activities</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Year IV</strong> Advanced Estimating</td>
<td>Concepts of pricing and markup, development of <strong>historic costs, life cycle costing, change order and conceptual estimating.</strong> Groups work with Construction companies on real life projects</td>
<td><strong>Costing and Estimating</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Year IV</strong> Heavy Construction Estimating</td>
<td>Methods analysis and <strong>cost estimation for construction of highways</strong>, bridges, tunnels, dams, and other engineering works.</td>
<td>Collaboration and interaction with groups of people</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Future Research

• Challenge #1: Late adopters of technology
• Challenge #2: Students with varying interests.
• Challenge #3: From BIM to Collaboration

At present, the undergraduate Construction Management programs in academia are responding to the industry demands of BIM. Academics must re-instate its position as the leader of the industry and pave the way for future leaders. Educators, students and industry need to work together to establish a culture of collaboration through technology.
References


• Deamer P., Bernstein P. G., (2011), BIM in Academia, Yale School of Architecture, New Haven, CT


Questions?

Thank You!