PROJECT - DESIGN & CONSTRUCTION OF 10m SPAN BRIDGES BY 4TH YR CIVIL ENG. STUDENTS

MODULE CE 4001 - ARCHITECTURAL ENGINEERING LECTURERS - CAROLINE AKIBOYE SIMON CONOLLY

OBJECTIVE: to introduce Civil Engineering students to architecture

Engineering courses necessarily focus on quantitative analysis and detailed design of elements in the context of design codes. The aim of this project is to complement that with a more qualitative and creative look at a practical problem-solving process as a member of a design and construction team.

This project aims to give students the opportunity to develop their skills in working in collaboration, as they would in professional practice, often with design goals, which may be self-generated, or developed from architectural, ecological or aesthetic objectives.
The exercise requires dealing with clients / regulatory authorities (i.e. the college authorities), working to a budget, programming the construction process, sourcing materials, building their designs as full size structures, AND planning their end of life.

2016 TASK:

This year's project was to design, construct and assemble bridges on campus, in self-organized groups of 4-5 students, one group for each structure. The bridges had to span 10m and carry at least one member of the team both ways across the bridge. As is evident in the finished bridges, some were much stronger.

MATERIALS:

The theoretical training in materials, construction and structures is often "supported" by making small models. These can be misleading as models of structural behaviour - they cannot be interpreted with linear scaling relationships to real, full size structures, so students may not appreciate real loads, stresses, deflections, and dynamic behaviour. Students choose suitable materials and work out appropriate constructional details, thus developing a feeling for the intrinsic properties of materials, and how to work, or join them together. This is greatly enhanced working with full-size structures.

Structures, at 10m spans are of realistic scale, light weight, and low cost.

There are a number of practical learning benefits:-

- working to limited budget
- working to limited time
- developing the ability to plan and programme the whole project - design, procurement, prototyping, testing details, fabrication and erection
- where real users are involved, the ability to discuss design intent, and respond to user needs
- testing, and critical evaluation of finished structures (even where the constructions have shortcomings - understanding a failure can be more informative than a structure which succeeds for unknown reasons)
- developing an intuitive "feel" for behaviour, material properties, and how to make connections
- appreciation of what is possible with low-cost materials and self-build, in situations where lack of resources and housing or shelter are pressing needs

The projects benefit from close support by tutors with relevant experience and interests.

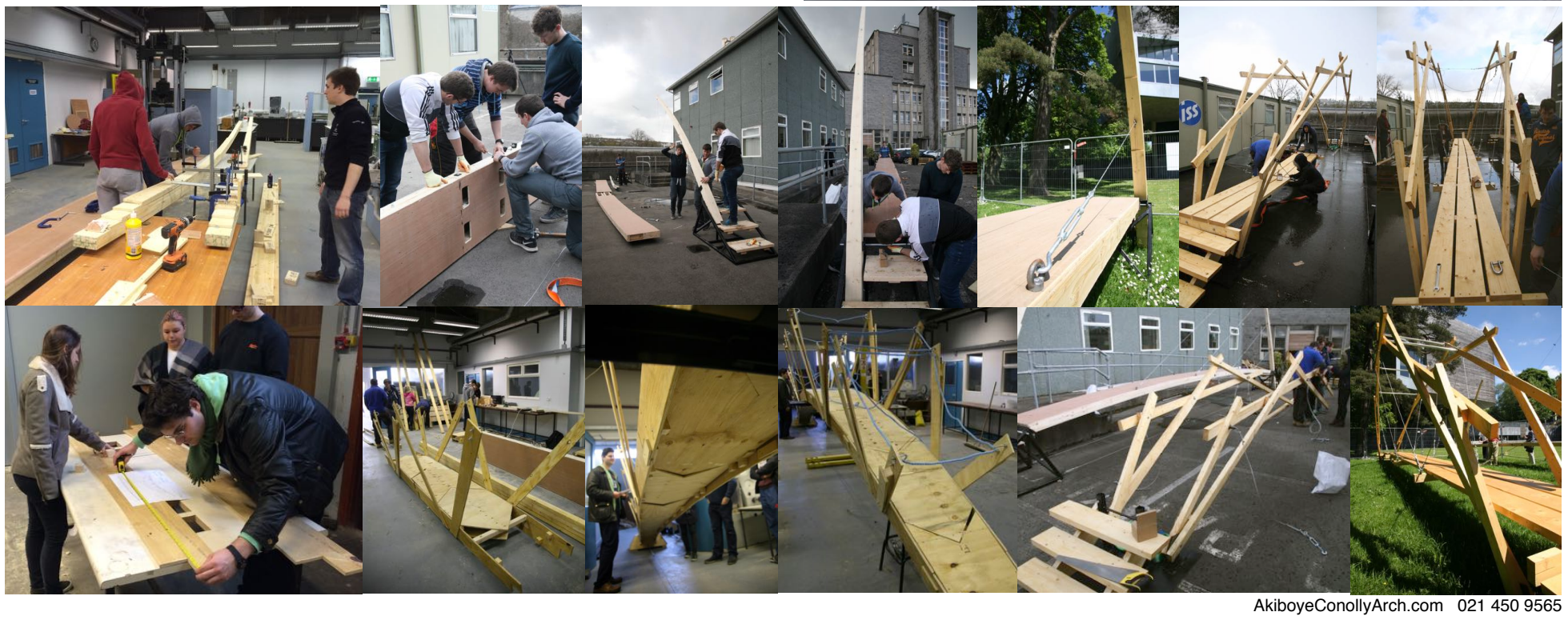
One of the principal achievements of the projects is that students engaging in practical problem-solving as teams of manageable size gained valuable project-management skills.

Further benefits are possible by running joint projects, - it is hoped in the future to engage related courses, such as architecture, arts, surveying, planning, social sciences - so that students learn how to collaborate just as they will have to do in their professional working lives.

Cable stayed bridge with elegantly tapered, curved glue-laminated pylons and box beam deck

Geometric "Leonardo da Vinci" arch bridge with cable-suspended scaffold board deck

"Jigsaw" bridge with compressive arch plywood box deck, braced by rope handrail



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