Lessons Learned from Tangible Curriculum Week

Introduction

Charles Sturt University (CSU) is establishing Engineering from scratch on a fast-track timeline, and as such innovative approaches are necessary to see the program designed and implemented by the required deadlines A cornerstone of the curriculum development was Tangible Curriculum Week (TCW), which occurred at an airport hotel in Sydney the week of Monday February 9th, 2014. The goal of TCW was to bring together leaders in civil engineering education and civil engineering practice with academic and support staff from CSU to explore what might be possible if a new civil engineering program could be established based on engineering education research, and current best practices. Implementing the resulting curriculum in a university without any current or previous engineering course provides the added advantage of bypassing the normal constraints. Having the first student cohort starting the course less than 400 days after TCW provided the additional pressure necessary to keep everyone focused on producing satisfactory outcomes by the end of the week.

This paper describes the participants, process, and lessons learned from a Tangible Curriculum Week (TCW). It does not describe in detail that curriculum that resulted from this process; the curriculum itself is described elsewhere at this conference (Morgan & Lindsay, 2015).

The Origin of TCW: The CSU Engineering Context

CSU has been exploring the possibility of introducing engineering degrees for over five years. Presently there is no Engineering school represented west of the Blue Mountains; students in regional NSW must either relocate to the coast, or study by distance through an institution that offers an external study mode. As a university whose geographical footprint is primarily this area, it is to CSU that local industry and local government turn for a solution to a shortage of Engineers in the regions.

The process of determining overall strategic viability of a new engineering program for CSU clearly indicated that any new engineering degree needed to be significantly different to the offerings of existing engineering schools. This difference is in part due to different demands and drivers for the program, acknowledging that many of these are shared with other universities who operate in a regional environment.

More importantly, establishing 'greenfields' engineering program provides significant opportunity for innovation and alternative practice, and in doing so the opportunity to future-proof the operations of the program. While there is significant diversity amongst the Engineering programs around Australia, the underlying core model is substantially similar, and as such most institutions are subject to similar pressures as the higher education landscape evolves. The prospect of establishing a program with a different core model gives the opportunity to get ahead of the curve on responding to engineering education trends.

The feasibility process had provided the following constraints upon the program:

- It was to be a Civil Engineering program, to reflect the discipline demand within the CSU geographical footprint

- It was to be a Masters' level exit point, to reflect perceived global trends towards professional degrees being at this level, and to match a desire for graduate attributes beyond technical competence

- It was to satisfy the Engineers Australia stage one competencies for Professional Engineers (Engineers Australia, 2011), to allow for accreditation.

- It was to have a strong embedded work placement stream, to more quickly address workforce shortages, and to intrinsically avoid a perceived trend away from industry exposure for engineering students

- It was to be ready to accept the first intake of students to commence on Monday, February 29th, 2016

Beyond these constraints, there was a genuine appetite for innovation in curriculum design and delivery – the challenge was how to fit this to CSU's intended timeline. A Foundation Professor had been appointed in April 2014; the formal go ahead for the program was given in October 2014, and students were to commence in February 2016. By the time a full cohort of academic staff could be recruited, deadlines for curriculum approval would have passed; an alternative method for developing the curriculum was necessary – the Tangible Curriculum Week.

The Approach

The goal of Tangible Curriculum Week was to draft a curriculum in a much shorter time than the normal academic process, without simply creating a copy of any existing program, and creating a curriculum that would have clearly defined points of distinction. The first challenge was to bring together team of people, each experts in their own way, who collectively represent all aspects important to the successful design of a new, and different civil engineering course. These aspects include disciplinary coverage, experience with first-year engineering students, experience with capstone design subjects and projects, and academic as well as industrial experience.

The second challenge was to create a working environment for a group of people who *largely* did not know each other at the start of the week to achieve a consensus in a week of face-to-face meetings. Significant effort was expended to build trust among members of the group, and to create a safe environment for even farfetched ideas to be pitched, developed or expanded upon, and/or shot down. The process included paid participants with an expectation of pre-work in a common on-line workspace. In addition to the on-line pre-work environment, there was a social icebreaker to facilitate all participants getting to know each other. The combination of these events resulted in respect for expertise in the room, and a fairly quick bonding of the participants into a team. The consequence was a group willing to play *what if we didn't have to* ___ (fill in your favourite pet peeve), and also *what if we could* ___(insert the next item from your wish list) games, and a group committed to achieving a workable curriculum by the end of the week.

The Participants

Most of the Tangible Curriculum Week participants were chosen from the AAEE community, and recruited based on personal connections. As members of the AAEE community, these are the academics most likely to be open to an innovative approach in the teaching aspect of university life. They also are the academics with the best grasp of the status of engineering education research and teaching best practices. Although significant industry experience serendipitously came with this particular group of academics, this might not always be true.

Other participants of TCW included industry partners – very important for discussions related to work placements and readiness of cadet engineer; and people with significant engagement with Engineers Australia– essential in terms of the ability of the proposed course to produce students with stage one competencies.

The team also included educational designers and course directors from Charles Sturt University – important as a reality check on how university processes might deal with a radically different curriculum; and the Vice Chancellor's schedule also allowed him to join TCW for an hour on the last day. In addition to some specific input (he is a Civil Engineer), the VC's presence sent a clear message of the university's commitment to support the course (including, potentially need for an increased time to a self supporting program).

Non-CSU participants were paid for their time in order to make to remove any uncertainty as to ownership of the outcomes of Tangible Curriculum Week. Compensation also has the effect of increasing motivation to participate, and commitment to achieving successful outcomes. In particular, it "gives permission" to allocate time away from other tasks to focus upon preparation for TCW.

The participants for TCW were drawn from all across Australia, with representatives from every mainland state. The CSU internal delegates were similarly distributed across CSU's multiple campuses; as such the first opportunity for the group to meet face to face would be on the first morning of TCW.

Pre-work for TCW

In order to maximise the value of the scarce face-to-face time of TCW, preparations for the event began weeks in advance through online and asynchronous means. Each attendees' preparation for TCW included participation in a wiki. Descriptions were posted on the wiki for each member of the team, and many of these descriptions were expanded/corrected into a brief bio by that participant. Each participant could peruse the bio of each of the other participants. This process helped establish a sense of respect among the participants. Reviewing the experience and qualifications of the various team members also promoted optimism that TCW could indeed produce positive outcomes. Participants were encouraged to post and respond to thoughts or position statements, as well as suggestions, and proposals posted by the facilitator (or by other team members). As a result, individuals were able to learn about each other even before the start of TCW, and were reassured that, even outrageous, ideas would be met with reason and respect, and perhaps even be expanded into more workable possibilities. This has significant impact on the ability to build a team quickly.

Another important effect of the pre-work phase was eliminating the possibility that "we can't progress on this since we don't have the correct materials." As a result of the wiki discussions, everyone did our homework, and every team member was well aware of the expectations and the time constraints, and could decide what to bring to the meeting (or, as was done in most cases, could post items to the wiki in advance of the meeting).

TCW Schedule

The first task in the schedule was to take the participants through the Forming stage of the team process. While most participants knew some of the other participants (eg other CSU people, or other AAEE people), only the CSU Foundation Professor was familiar with the majority of attendees. The nature of the task (and the attendees chosen for it) was such that attendees were open-minded towards new ideas and new people; it was now a matter of familiarising the team with itself.

The first activity of TCW was a "Little Known Unusual Fact" icebreaker. As part of the pre-work, all attendees had submitted an interesting factoid about themselves, such as "I'm choir mistress at my local church" or "I once taught with a live scorpion on my shoulder". Each attendee is given a list of all of these facts, and there is a group session where we introduce ourselves and attempt to match each fact to a person and vice versa. Thanks to an initial level of comfort among and between team members, the icebreaker activity allowed the team to gel

quickly, to develop connections and trust early, and in some cases to realise that we were kindred spirits. It is worth noting that the attendees explicitly did not want to debrief this exercise at its completion, instead preferring to fill outstanding matches on their worksheets through subsequent meal breaks rather than being told who was whom.

The location for TCW also resulted from a design choice. In addition to simplifying travel logistics, hosting and housing the team in a hotel, i.e., not at anyone's home institution allowed logistics issues to be shared, limited distractions, and increased the time participants spent with each other. As a part of TCW, we had morning and afternoon tea together, and we had lunch together. We all stayed in the same hotel, therefore, we ran into each other at breakfast, and we ran into each other during breaks before, after, and between meetings. As a result, we had the maximum possible opportunity to develop and exercise our common bonds. TCW also included social outings including dinner downtown, a walk around the harbour, etc. allowing further bonding of the team. This combination of interactions allowed development of the team as a whole, but also allowed for subgroups to explore ideas together and to develop proposals between whole team meetings.

In summary, the process was one of pre-work preparation on the part of the participants; a day of letting go of sacred cows; three days of brainstorming (including a regular dose of lobbing grenades over the wall just as it seemed we might be getting close, and also the ability to revisit previously dismissed ideas – *"hang on, if we ___, then maybe ___ will actually work"*); and making the facilitator very nervous that we might not actually ever reach a conclusion that different could work. The net result of this process did not obviously include the possibility of consensus on final day. Nevertheless, careful attention to team building, participant ownership of the process, and a committed group of participants, plus the chaotic process described above did allow the team to reach a consensus on the last day. This process also made possible the outcome that we might end up with a course with NO exams & NO lectures.

Nothing Off Limits

A core element to the functioning of TCW was that no idea or topic was off limits. As a group, we had a mandate to explore the furthest corners of the design space, with an understanding that the outcomes we were seeking were most likely to be found outside our personal comfort zones. To support this exploration, however, it was necessary to build a team culture that allowed (and indeed encouraged) presentation and discussion of ideas that could potentially be confrontational.

Regular parts of the TCW agenda included a KILLING SACRED COWS discussion (started on the wiki and continued live throughout TCW), and invitations to lob grenades over the wall ("I have been thinking about all of the reasons the idea we almost had at the consensus stage before lunch can not possibly work"). These discussions often included an added dimension of humour (which also served as our primary/only defensive mechanism), but served primarily as a way of opening the door to "everything is on the table" discussions, and reminding everyone that the country does not need another engineering school just like all the others. This is not to say that the country does not need the others, rather it is permission to dream of a program that can be truly different (surely there is room for one school that pushes the envelope, a school that goes where no (wo)man has gone before, and a school that validates and expands the research that AAEE and other engineering education communities promote – not as experiments, but as a way of being.

A key reflection from the week was the number of conflicts that eventually resolved themselves to be matters of labelling rather than concepts. For instance, there was significant disagreement amongst the group as to the relative importance of problem definition vs problem solving in the engineering design process, which was ultimately resolved when it was realised that the overall steps involved were agreed upon, but that each side of the debate considered the "middle" steps to belong to a different phase.

This early conflict established a useful template for the week overall: "everyone here is an expert, so if someone says something I think is completely wrong, it's probably a mismatch of frameworks and taxonomy, rather than them being an idiot". This outlook was essential as the discussions moved from areas of new innovation, where there are no well-established frameworks, and as such attendees were having to develop ideas from the beginning.

The Curriculum Model that was Developed

The key outcome of Tangible Curriculum Week was the idea of separating the content from the application of the content throughout the course. If the content is made available to the students in bite-sized pieces, then they can learn this content largely on their own (with academics available for tutorials and individual help – especially during the face-to-face first 18 months). This process allows a project-based-learning approach to be used in which students apply knowledge to solving realistic (during the first 18 months) and later real (during work placements) problems. In this paradigm, students may not acquire knowledge in advance of the project, rather, they may realise the need for the knowledge, go away and learn it *just-in-time*, and then come back and apply the new knowledge to the problem or project at hand. Of course, they also might access the content on an *as inspired* basis, e.g., as inspired by current events such as the 2015 earthquakes in Nepal.

The implementation of such a course implies the need to change the role of the academics involved in the course. Rather than the traditional role of Lecturer, the demands on the academics shift their role to that of a learning coach, a designer of learning opportunities and resources, and a facilitator of learning. The details of the course that was developed as a result of TCW are reported in another paper (Morgan & Lindsay, 2015).

Lessons Learned from Tangible Curriculum Week

Ultimately, TCW resulted in a curriculum model that has since been developed into a workable curriculum that will be ready on time for students in February 2016. Beyond the product outcome, there were a number of procedural lessons learned:

- It is possible to bring a fairly large group together on a short timeframe by dangling an appropriate carrot (i.e., help us to build the kind of brave new world that is only possible if you lend us your expertise and your time);
- You cannot drive this type of group toward a specific product. Although the end product meets the goals stated at the start of the week, the structure of the resulting curriculum is radically different than would have been predicted;
- The process needed to solidify the group trust necessary for the interaction to lead to a truly new model takes time (it must be safe enough to challenge any sacred cow or to propose a wild idea);
- The combination of pre-work, and paid, committed participants guaranteed a curriculum;
- Continued use of the wiki to capture the outcomes and thinking of the week provides a head start on the implementation process; and
- The desires of industry and academia are not irreconcilable, even when both are expressing their "outside the box" thinking;

Conclusion

Tangible Curriculum Week was a key step in the fast-tracking of the CSU Engineering curriculum. Bringing together a team of industry, academic and institutional experts with a deliberate mission to develop a program like no other provides a sense of mission; building a team culture that allows for controversial thinking allows that mission to be achieved.

The CSU Engineering curriculum that is being implemented follows the model from TCW; the process outlined in this paper worked, and its product has survived the university's governance processes largely unchanged. This is not a happy coincidence; it is a consequence of the people, process and opportunity that coalesced at Tangible Curriculum Week.

References

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Acknowledgements