



# Elevating engineering education via improved pedagogically based course structures.

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## ABSTRACT

### CONTEXT

In late 2018, the authors commenced a project in their School to improve the quality of student experience and enhance staff teaching within the Moodle LMS. This was motivated by the authors' interest in better meeting organisational strategic goals, related learning and teaching plans, and creating an improved pedagogical platform for their School. At the time, the University had also gone through an academic restructure, meaning that significant re-branding and realignment of disciplines had taken place. This project was timely in addressing these multi-dimensional obligations.

### PURPOSE

The overall purpose of this high-level project was to provide course consistency in core structures and improve the educational experience for all students in the school. This consistency was to come primarily through the restructuring and alignment of the user experience, presentation, and provision of resources available to students in each course of study. An additional purpose was to provide a reduction in staff workload through the economic restructuring of resources thereby reducing time in searching for information, and the provision of additional content provided in the template, meant that minimum standards for learning and teaching online were being met at a greater extent. It was anticipated that improved levels of student engagement would also result by virtue of the improved user experience and the ability to individualise the course for each student.

### APPROACH

To commence the project, an internal review of all course Moodle (learning management system, or LMS) shells was conducted and benchmarked against set University standards, known colloquially as Blended, Online and Digital Learning and Teaching (BOLD L&T) practices document. Courses were analysed and thematically grouped to identify where the largest gains could be made in the rollout of this work and greatest benefits realised to student and staff experience.

Course priorities were moderated against University requirements and a final template was designed based on a constructivist pedagogy. Early versions of the templates were road tested by academic staff to seek feedback and to implement further template refinements. Rollout of the template commenced in 2019 and continued through 2020.

### ACTUAL OUTCOMES

Outcomes include a consistent format that is more easily navigated by staff and students, reducing the time spent searching for information. The format has also reduced the data load on the University and student bandwidth systems by reducing the size of the up and download of each course page. The project implementation had negligible impact on academic staff workloads and occurred with minimal disruption to academic staff time.

Students and staff have demonstrated their engagement and indicated their enjoyment and preference for the new interface.

## **SUMMARY**

This paper presents a new LMS course template to address several student, staff and strategic requirements. Its core elements and rationale are presented, together with some preliminary statistics on its implementation and use. Some early success stories are used to provide further context.

## **KEYWORDS**

Student experience; improved teaching delivery, aligning teaching practices

## **Background and Literature Review**

The use and reliance on online learning management systems (LMS) for tertiary education has dramatically increased since the beginning of 2020 and the start of the COVID-19 global pandemic. There is a particular focus on the provision of equivalent online learning experiences to students that would otherwise be learning face-to-face, or with blended delivery styles.

For Federation University, Moodle is the current LMS and provides students with access to materials and content that would previously have been printed out in hard copy. As the technology matured over time, expectations of lecturer ability to engage and effectively use the LMS also increased. However, in practice, not all lecturers kept pace (see Venkatesh, et al., 2003) with the requirements of the technology or university expectations for its effective use. This meant that over time, individual courses developed their differences, with some falling significantly behind in the standards expected by students.

In late 2018, the authors' embarked on a project in the School of Engineering, IT and Physical Sciences to improve the quality of student experience and enhance staff teaching within the Moodle LMS. This was motivated by the authors' interest in better meeting organisational strategic goals, related learning and teaching plans, and creating an improved pedagogical structure for their School. At the time, the University had also gone through an academic restructure, meaning that significant re-branding and realignment of disciplines had taken place. This project was timely in addressing these multi-dimensional obligations.

The overall purpose of this project was to provide consistency across courses in appearance and structure and to improve the educational experience for all students in the school. This consistency was to come primarily through the restructuring and alignment of the user experience (Demir, et al., 2021; Khan, et al., 2021), presentation, and provision of resources available to students in each course of study (Santelli, et al., 2020). An additional purpose was to provide a reduction in staff workload through the economic restructuring of resources and inclusion of specific technologies. Research into learning design or learner centred design has tended not to directly address the workload impacts on staff. Khan, et al., (2021) and Ji, et al., (2020) are examples of having a singular focus without recognising the impact on other areas. Reducing time in searching for information, and the provision of additional content provided in the template, meant that minimum standards for learning and teaching online were being met to a greater extent. It was anticipated that improved levels of student

engagement would also result by virtue of the improved user experience and the ability to individualise the course for each student.

This paper describes the key features of a contemporary LMS Moodle shell template and provides some preliminary information around the success of its roll out and subsequent use by students and staff.

## Implementation

To commence the project, an internal review of all course Moodle (learning management system, or LMS) shells was conducted and benchmarked against set University standards, known colloquially as **B**lended, **O**nLine and **D**igital Learning and Teaching (or **BOLD** L&T) practices document. Courses were analysed and thematically grouped to identify where the largest gains could be made in the rollout of this work and greatest benefits realised to student and staff experience.

Course priorities were moderated against university requirements and a final template was designed based on a constructivist pedagogy. Early versions of the templates were road tested by academic staff to seek feedback and to implement further template refinements. Rollout of the template commenced in 2019 and continued through 2020.

Sequentially, the approach taken was as follows:

Step 1: Establishment of working group between the Associate Dean of Teaching Quality and Learning Designer.

Step 2: Review of the School's online teaching presence against the BOLD L&T guidance documents to identify key issues; collate the issues; and present the case for change to the School leadership.

Step 3: Creation of the new Moodle shells by Learning and Teaching technology support team, including both a Master Template for the School and Master shells for each course to be taught.

Step 4: Collection and analysis of feedback on the first iteration of Moodle shell from a range of university stakeholders, including students, and staff within both academic and professional portfolios.

Step 5: In response to feedback received, changes and updates were made to the Moodle template, in collaboration with the Digital Production team to enhance the use and arrangement of images and graphics.

Step 6: Trialling of the updated template in selected Information Technology and Engineering courses, and collection and analysis of feedback from staff and students involved in those courses.

Step 7: Implementation of final revisions to the Moodle Master Template in response to feedback received.

Step 8: Communications to teaching staff about the finalised Moodle template, roll out schedule across the School, opportunities for training in the new Moodle shell environment and ongoing collection of feedback from staff for continual improvement.

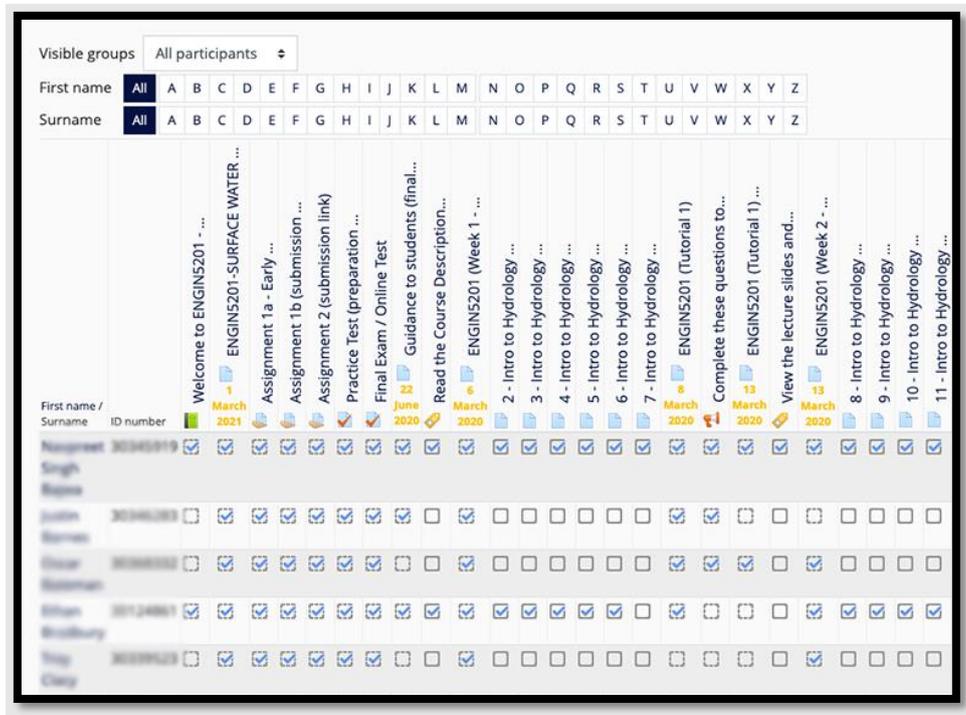
## Results

The new Moodle template has several design features to bring the improved consistency and experience intended. These included the incorporation and interweaving of activity completion settings, course structure, teaching team and progress bars. The subsequent sections explain this further.

## Activity Completion

Activity completion reports display the student completion of selected activities within each Moodle shell. These reports can be downloaded into a spreadsheet format for further analysis if needed. The lecturer pre-configures and tailors the selected activities for each Moodle shell.

Figure 4 shows an example activity completion report.



The screenshot displays a Moodle activity completion report. At the top, there is a filter for 'Visible groups' set to 'All participants'. Below this are two alphabetical index grids for 'First name' and 'Surname', both set to 'All'. The main table lists activities in the columns and students in the rows. The activities include: 'Welcome to ENGIN5201 - ...', 'ENGIN5201 - SURFACE WATER ...', 'Assignment 1a - Early ...', 'Assignment 1b (submission ...)', 'Assignment 2 (submission link)', 'Practice Test (preparation ...)', 'Final Exam / Online Test', 'Guidance to students (final...)', 'Read the Course Description...', 'ENGIN5201 (Week 1 - ...)', '2 - Intro to Hydrology ...', '3 - Intro to Hydrology ...', '4 - Intro to Hydrology ...', '5 - Intro to Hydrology ...', '6 - Intro to Hydrology ...', '7 - Intro to Hydrology ...', 'ENGIN5201 (Tutorial 1)', 'Complete these questions to ...', 'ENGIN5201 (Tutorial 1) ...', 'View the lecture slides and...', 'ENGIN5201 (Week 2 - ...)', '8 - Intro to Hydrology ...', '9 - Intro to Hydrology ...', and '10 - Intro to Hydrology ...'. Each cell in the grid contains a small icon representing the completion status of that activity for that student.

Figure 4: Example activity completion report.

## Progress Bars

Progress bars are designed to enable the tracking student progress on chosen tasks or activities and gives the lecturer the opportunity to monitor the overall student completion of the course.

Figure 5 presents an example of the completion progress interface. Figure 6 presents a different version of the same graphical interface, with a focus on assessment progress only. Figure 7 displays the information on the overall cohort when the “overview of students” button is clicked, of the completion of the activities that being tracked.

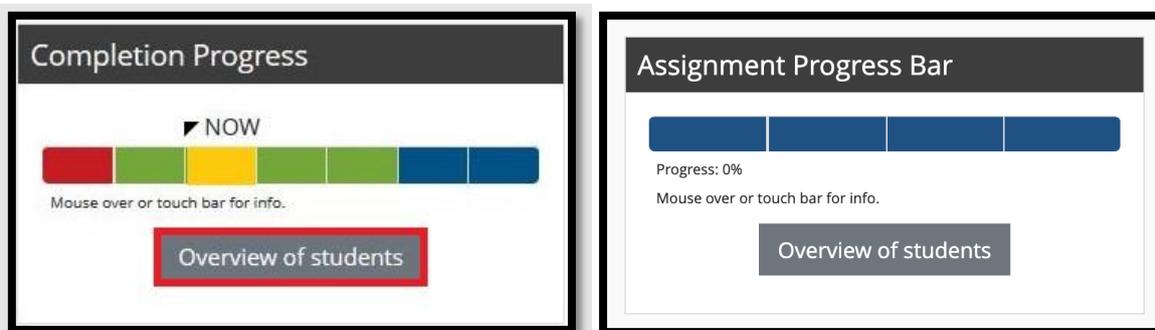
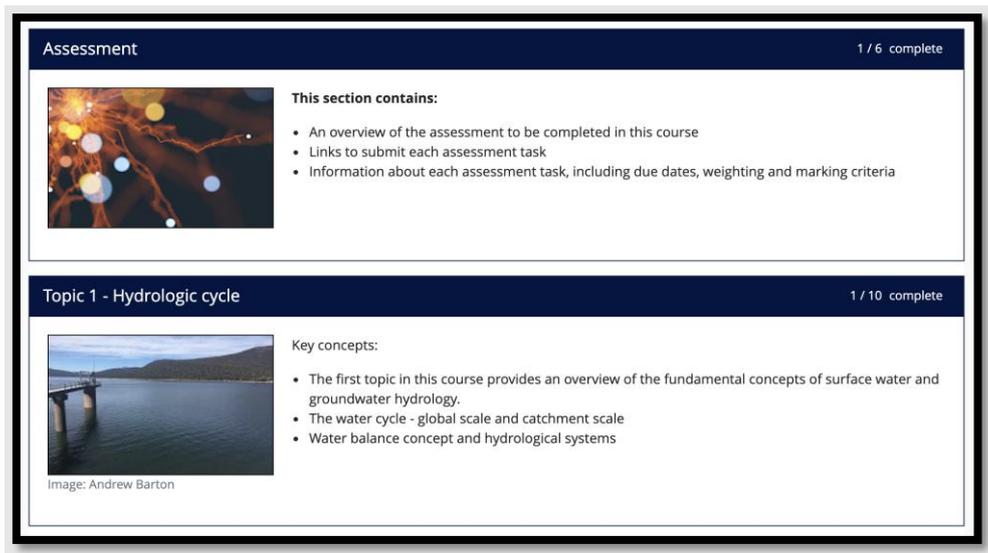


Figure 5: Examples of progress bar. (Image supplied by Learning Technologies Hub of Federation.)



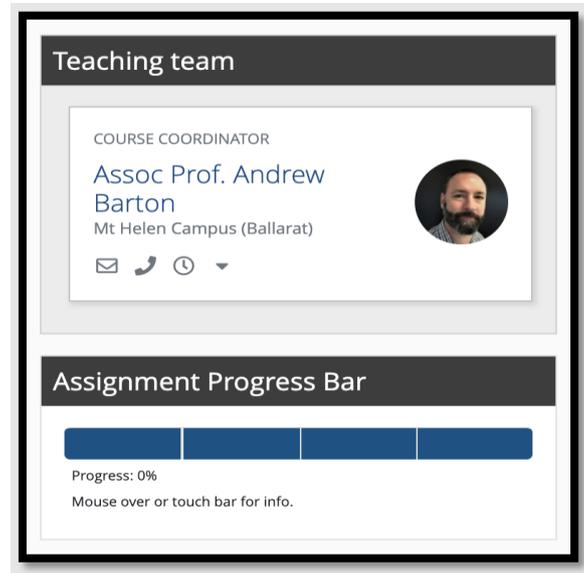


**Figure 9: Example of course structure: assessment and content pages.**

## Teaching team and integration of progress bars

Teaching team information was made available with lecturer information coded in from their professional profiles. The progress bars described above were integrated into the design underneath the teaching team information block for the convenient monitoring or tracking of assessments or course materials.

Figure 10 shows the information relating to the teaching team information and a sample of the progress bar tracking assignment submissions.



**Figure 10: Teaching team block with integrated progress bar.**

## Discussion

### Activity completion report

Activity completion report displays the completion of the activities that have been set up with activity completion settings. This is a two-step process which requires the initial decision of what the student is required to do to 'complete' the activity, for example, in a discussion forum a student might be required to create or respond to a post. This can be manually

marked off by the student, or for more critical activities, it can be automatically marked as complete when the student has made the required actions. The data shown is for the whole course and for the whole cohort. It can be filtered by name and downloaded into a spreadsheet. It is difficult to view the information at a glance, however, the students can view their own information by scrolling down their course or making more than 12 mouse clicks.

## **Progress Bars**

Progress bars, or completion progress blocks as they are also known, are used to view the progress of students within specific activities and tasks inside the course. This involves a three-step process to set up and integrates the activity completion settings. The benefits of the initial once-off workload are shown by the ease of information at a glance for the lecturer with only one mouse click to view the entire class. The student can also monitor their own progress using this technique. As with the activity completion report, the decision of what the student is required to achieve to complete the activity is chosen, then it can be manually marked by the student or automatically checked off subject to the student's actions. The final process is to create the completion progress bar and allocate the items that are essential to be tracked. Common items to track are assessment submissions and critical course content throughout the semester. Figure 5 displays different colours which indicate which tasks are overdue (red), which tasks are completed (green) and which tasks are submitted but not yet graded (yellow). This allows the lecturer to see which students might need to be contacted for extra support or guidance and provides greater student engagement as there is a clear visual guide of where the students are up to within the course and what is required for them to progress further.

## **Teaching team block**

Always present at the top of the course in the right-hand side is the teaching team block. This block pulls the information from the lecturer's profile and is based on how the lecturer is enrolled. If a lecturer is enrolled into the course as a course coordinator, their information immediately changes position to the top of the block, every other lecturer in that block is placed in alphabetical order. This provides a very easy way for students to contact their lecturer or course coordinator and know the appropriate times and methods of contacting that person. A feature of this block is when students click on their lecturer's email address, it automatically opens their email with the inclusion of the course code in the subject line. This saves the student time and provides clarity for the lecturer on which course the student is enquiring about. An important part of this teaching team block is ensuring that the lecturers maintain the currency of their profile information.

## **Course Structure**

Consistent course structures and layout within the School has proven to be the most impactful factor for students, academics and professional staff alike. Students navigating through multiple courses have a common expectation and familiarity of where to locate critical information like course descriptions, assessments, course readings, learning materials and activities. Initial informal student feedback to staff, such as, "*Wow, what did you guys do to Moodle?*", suggests a positive attitude and response to the new course structure. Academic staff have reported that they enjoy working in a course structure that is "*simple, beautiful and elegant*" and that it "*attracts the students to it*" with the design of the structure "*[enhancing] the efficiency of teaching and learning*" within the course. Professional staff that are required to import information or review documents can easily access the correct area by knowing in advance where to find the information or area that they seek without having to go searching for it, saving time and increasing efficiency.

The first section displays only the course name and School header with two discussion forums (one for important announcements and the other for general discussions) and the option for a link to a virtual classroom. This limited information keeps this area streamlined and reduces the download and upload impacts on the university and the student as this header is loaded every single time another page in the course is clicked on.

The second section is the course information area that contains the welcome book for students, the course description, a course readings link, other relevant whole course information and a discussion forum that is designed to be used to introduce everyone to the cohort. This introductory discussion forum can also be used to find out information about the students, their backgrounds and their goals, which can be then built on and tied into the course activities by the lecturer throughout the semester. This is a key feature of the constructivist pedagogy on which these courses are based.

The third section contains all the information related to assessment. Instructions to students, exemplars, support materials and submission portals.

The fourth and subsequent sections contains the course materials, activities and information. This is designed with a constructivist pedagogical model that suits the course or program objectives, as learning is built on throughout the semester. Other complimentary pedagogical styles such as case-based learning, flipped classroom approach, project-based learning can also be implemented depending on the needs of the course or program.

## Conclusion

The contemporary course template described in this paper has softened the impact of COVID-19, as the improved functionality has helped with lecturer online presence and benefitted the increased online activity for both staff and students.

The combination of a clear, consistent course structure, precise lecturer information with easily accessible student progress and engagement statistics for lecturers and students provides quick navigation to essential information and has lowered the bandwidth demands for the University and the individual users.

Initial analytics obtained from the template use, particularly through reduced number of mouse clicks, indicate a reduction in workload for the staff member in administering the course, however, this information is still preliminary with further evidence being collected.

The template described in this paper has generated much positivity amongst staff and students within the school and has set a new standard within the University. Further improvements are highly anticipated with the constructivist pedagogically aligned template now being considered to be rolled out across the University.

## References

- Demir, F., Bruce-Kotey, C. & Alenezi, F. User Experience Matters: Does One size Fit all? Evaluation of Learning Management Systems. *Tech Know Learn* (2021).  
<https://doi.org/10.1007/s10758-021-09518-1>
- Rehan Ahmed Khan, Komal Atta, Madiha Sajjad & Masood Jawaid (2021): Twelve tips to enhance student engagement in synchronous online teaching and learning, *Medical Teacher*, DOI: 10.1080/0142159X.2021.1912310
- Santelli, B., Stewart, K. and Mandernach, J. (2020). Supporting High Quality Teaching in Online Programs. *Journal of Educators Online*, v17 n1.

Venkatesh, V., Morris, M.G., Davis, F.D., & Davis, G.B. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27, 425-478.

Ji, W., Muljana, P.S., & Romero-Hall, E. (2020): The Three-Tier Design Process: Streamlined Guidelines for Designing and Developing a Course in a Learning Management System to Promote Effective Learning, *College Teaching*, DOI: 10.1080/87567555.2020.1865253

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