

Improving the learning experience by better understanding one's own learning process

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Strategic objectives addressed:

This project addresses the following priority areas from the RMIT University Strategic Plan:

- Designing or redesigning sustainable programs for onshore and offshore delivery, including flexible delivery.
- Redesigning curricula for multichannel delivery.
- Improving student retention or the cohort experience.

The project is aligned with a number of the components of the RMIT University strategy:

- **Global:** the project aims to enhance students' ability to learn and promote lifelong learning. This will enhance their marketability and support the university's reputation.
- **Urban:** the project outputs can be used in a blended approach to teaching, which supports study/work balances and projects students with greater flexibility.
- **Connected:** the project builds relationships with Splunk, a leading international analytics company, and Deakin University's Cognitive Analytics Lab.

More specifically, the project is strongly aligned with the university's Learning and Teaching goals of:

- Encouraging academic and teaching staff to use new knowledge, educational techniques and technologies effectively.
- Developing programs and teaching that inspire and encourage achievement, excitement and commitment to their fields among its students.

In relation to the university's Student Experience goals, the project is aligned with the following:

- Develop in students the deep knowledge and the skills and attributes required for success in their chosen profession or occupation.

The project is particularly aligned with the university's Graduate Attribute of Active and Lifelong Learners. The project will:

- Teach students to apply critically reflective and active outcomes-focused learning.
- Help students to acquire and assess information and its relevance to particular tasks and projects.
- Teach students to take active, personal responsibility for their learning.

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- Mr Simon Duff, Splunk

Funding scheme	LTIF contestable	X
	Program Development Fund	
	RMIT Vietnam Program Development Fund	

1 Executive summary

Understanding one's learning process is a critical skill to perform well in tertiary education. However, this skill is not typically taught in tertiary education as it is assumed that students have acquired it from their primary and secondary schooling.

In our experience, many students do not know how to learn in an effective and efficient manner. In their previous schooling, they learnt the subject matter and were not necessarily taught how to learn. They have difficulties determining the most effective approaches, prioritising their learning tasks, and gauging their progress. This results in dissatisfaction and negative perceptions of learning. In turn, this leads to students failing courses, and, ultimately, this affects the overall student experience and retention rates. Most troubling of all, many students do not achieve their best.

In this project, we design and develop a solution to address this issue: teach students how to analyse their own learning process so they can "troubleshoot" and rectify their own learning problems, better understand their own learning process, and improve their learning outcomes. Central to this approach is their ability for self-reflection.

Self-reflection is a difficult skill to acquire and is usually taught in a qualitative manner through assessments such as self-review and reflective journals (Hatcher & Bringle 1996). As the world advances into a quantifiable era, as evidenced by the "quantified self" movement, it is essential that learners are able to reflect on and analyse their learning using quantitative methods (Duval 2011; Verbert et al. 2013).

Additionally, a scaffolding approach to learn how to self-reflect can be developed by analysing artefacts representing one's progress. This provides a gentler introduction to self-reflection for learning. An integral part of this process is being able to interpret the data represented in the artefact.

In this project we sought to enhance students' self-reflection skills by collecting data about students' learning progress and to teach them to monitor, analyse, and reflect on their own learning. For authenticity, this process is in situ, i.e. in actual courses, and the collection of learning data is carried out in an ethical, passive, and non-intrusive way using a learning analytics system. The learning analytics system presents visualisations of students' learning data and, in consultation with their tutors, students interpret these visualisations to gain insights and better understand their own learning approaches.

Overall, the project prompted some students to reconsider their study approaches. For those who were interested in changing their study practices, they found that TTM was able to assist them with their desired change. More generally, students found the TTM approach and system to be useful to their learning in a variety of ways. It allowed them to both prepare for classes and revise for examinations. During the semester, it allowed them to track their own progress and performance, and compare these to their cohort.

2 Outcomes

The developed approach and the learning analytics system was used in 10 course offerings across a number of different locations (Melbourne and Vietnam), course levels (undergraduate and postgraduate), disciplines (information systems and social science), and delivery modes (blended learning and online). Overall, 343 enrolled students from the 10 course offerings benefitted from the project.

The following project-related publications are forthcoming:

- Cheong, C., & Cheong, F. (Under review). "TTM: A Prototype of a Next Generation Digital Learning Environment to Improve Student Experience", European Conference on Information Systems, Istanbul, Turkey, 12 -15 June 2016.
- Cheong, C. & Cheong, F. (In preparation), "Understanding Study Behaviour Using Learning Analytics". British Journal of Educational Technology.
- Cheong, C. & Cheong, F. (Forthcoming), "Learning Analytics for Student Self-Reflection".
- Cheong, C., Cheong, F., Jayatilleke, B., & Duff, S. (Forthcoming), "Determining Study Patterns Using Learning Analytics".

3 Project outcomes and impacts

3.1 Project aims and summary

At a high level, the aim of the project is to improve the student experience. More specifically, we aim to use learning analytics to empower students to better understand and improve their own learning processes.

In order to achieve this, we adapted an existing learning analytics system we had previously developed, called Task-Test-Monitor (TTM). The system was refined throughout the semesters as students used it. The final version of the system allows students to carry out tutorial tasks and undertake online tests. The analytics component of the system analyses the data and presents visualisations to the students. Screenshots of the existing TTM system can be found in Appendix A.

Course coordinators from the four different courses involved in the project had to adapt their existing approaches and materials (to varying degrees) to the philosophy of the approach and the TTM system. In one (opportunistic) case, a course was completely designed for the TTM approach. Adaptation of existing courses required dividing course materials into smaller tasks to fit TTM's bite-sized learning approach, and the development of multiple-choice tests that are an integral part of the TTM approach.

During the first semester, students were presented with a minimalistic version of TTM. As students used the system, their feedback were gathered to iteratively improve the TTM system (issues/bugs were addressed and new features were implemented) over a number of weeks. This allowed students, as one of the main stakeholders, to have direct input into the development of the system and ensured that the TTM approach and system were developed to fit students' needs. At the end of the first semester, focus groups¹ were conducted to determine students' perceptions of the system and to further improve the system.

At the start of the second semester, students were introduced to the TTM system using a scaffolded approach. In their first class, a demonstration of the basic features of the system was present (how to access tasks, take tests, and obtain test feedback). After a few weeks of usage for students to become familiar with the basic features (and allowing TTM to collect data about each student), a demonstration of the more advanced features were presented to students (e.g. how to get an overview of their performance in a course to date, how to get their performance for each week of the semester, how to compare their performance to that of the class).

At the end of semester 2, students were asked to volunteer to complete a questionnaire survey and be interviewed¹.

3.2 Project outcomes and impact

Results from the focus groups and the in-depth interviews indicated that students found the TTM tasks and tests useful. They used the tests both as preparation for their classes and as a means of revision for their examination. In particular, they liked the immediate formative feedback from TTM.

Students found that TTM provided with a way to study as 87% of the 67 students surveyed agreed with that statement (13% were neutral and none disagreed). 73% of students agreed that TTM provided them with appropriate feedback (21% were neutral and 5% disagreed). 81% of students agreed that TTM helped to keep them up-to-date with their course work (11% were neutral and 8% disagreed).

Students also found the analytics aspect useful as some used it to reflect on their study methods. 46% of students agreed that TTM helped them to reconsider the way they study (28% were neutral and 26% disagreed). 61% of students agreed that TTM helped to change their approach to studying (26% were neutral and 13% disagreed).

¹ This research was conducted with ethics approval from the RMIT Business College Human Ethics Advisory Network.

Students found the social comparison aspect of the analytics (comparing their performance against that of the class) useful as it gave them a sense of how the cohort was performing overall and their relative performance to that. 82% of students made use of the analytics features of TTM. Of those, 33% use them occasionally and 13% used them all the time. 81% of students found these features to be useful. The majority of students (34%) used these features to keep track of their progress towards achieving their desired grade and (27%) to get a sense of how they were performing compared to the entire cohort.

85% of the students believe that self-evaluation of their learning helps them to improve their grades (10% were neutral and 5% disagreed). The survey results also indicated that since using TTM, some students were more interested in self-reflection and analysing their own behaviours compared to before using TTM.

Generally, it seems that TTM, and the project as whole, prompted students to review their study approaches. TTM was also useful in assisting those who wanted to change their approach. Overall, TTM gave students guidance during the semester, as it allowed them to track their own progress and performance, and compare those to their cohort.

4 Dissemination strategies and outputs

The project was disseminated throughout various stages. Stakeholders were engaged through the following activities:

- Training workshops to train academic staff to use the TTM approach and system (held a formal workshop on 23 January 2015, and a number of informal one-on-one presentations).
- Involving students and academic staff delivering the courses in the refinement of the system by consolidating their feedback and updating the system during semester 1 of Melbourne offering of courses.
- Regularly updating and supporting academics involved in the project.

The following presentations about the project were held:

- Presentation to the team from the College of Design and Social Context (DSC) who were awarded the LTIF grant for the project entitled, "Transforming Learning and Teaching with Practical Analytics", on 18 March 2015.
- Presentation of the project as part of the LTIF presentations held by the College of Business on 1 December 2015.
- Presentation of the TTM approach, system, and preliminary results (hosted by the DSC LTIF team as an example of the practical possibilities of a learning analytics system) on 18 November 2015.

A number of publications (at various stages) are also in progress (as described in Section 2).

5 Evaluation of project outcomes

The outcomes of the project indicate that it has successfully achieved its aim (refer to Section 3). Although it was not intended to evaluate the project using the CES results, a number of students chose to provide comments about TTM in the CES on their own accord when asked, "*What are the best aspects of this course?*":

- "*TTM is very helpful and especially good to review on past topics and work.*"
- "*The TTM website developed for this semester is one of the best aspects in this course. The website allowed students to follow and test their understanding of each topic over the course of 11 weeks.*"
- "*[The] TTM system which allows me to learn at my own pace.*"
- "*Individual feedback on progress (TTM).*"

The outcomes of the project also suggest that there is much more that can be done to further extend this project in future directions that will benefit the students, instructors, and RMIT University.

The project has gathered a wealth of data on student learning and that is still being evaluated at the time of writing. The data can continue to be evaluated to investigate various aspects of student learning that transcends the student self-reflection focus of this project. For example, it is possible to analyse students' usage patterns in the TTM system to identify different types of learning behaviours.

Furthermore, and perhaps more interestingly, the TTM system captures data that is not captured elsewhere in the university. Officially, RMIT University, and most likely other educational institutions, capture coarse-grained data about students and their academic performance (i.e. the final mark they achieved in a course). Although this may be useful for academic analytics, it is too coarse-grained for learning analytics. Learning analytics requires capturing data about learning throughout the semester, not only at the end. The TTM system captures such data. It not only tracks student usage data (time, date and frequency of logins, data access, etc.) but also their learning performance data over time (through the tests), and their learning pattern (e.g. do students complete learning tasks before taking tests?, Do they prepare for assignments by revisiting the tasks? Do they revise for exams by revisiting the tests?). By analysing this type of data, it is likely that actionable insights into the student learning process can be discovered.

Overall, the project has been successful and shows promise for a variety of future directions. In the immediate future, the TTM approach and system will continued to be used for learning and teaching purposes as it has been effective for student learning. In the longer term, continued usage of TTM will result in the accrual of historical data, which can then be used for a longitudinal study.

Appendix A

The following are screenshots of the TTM system.

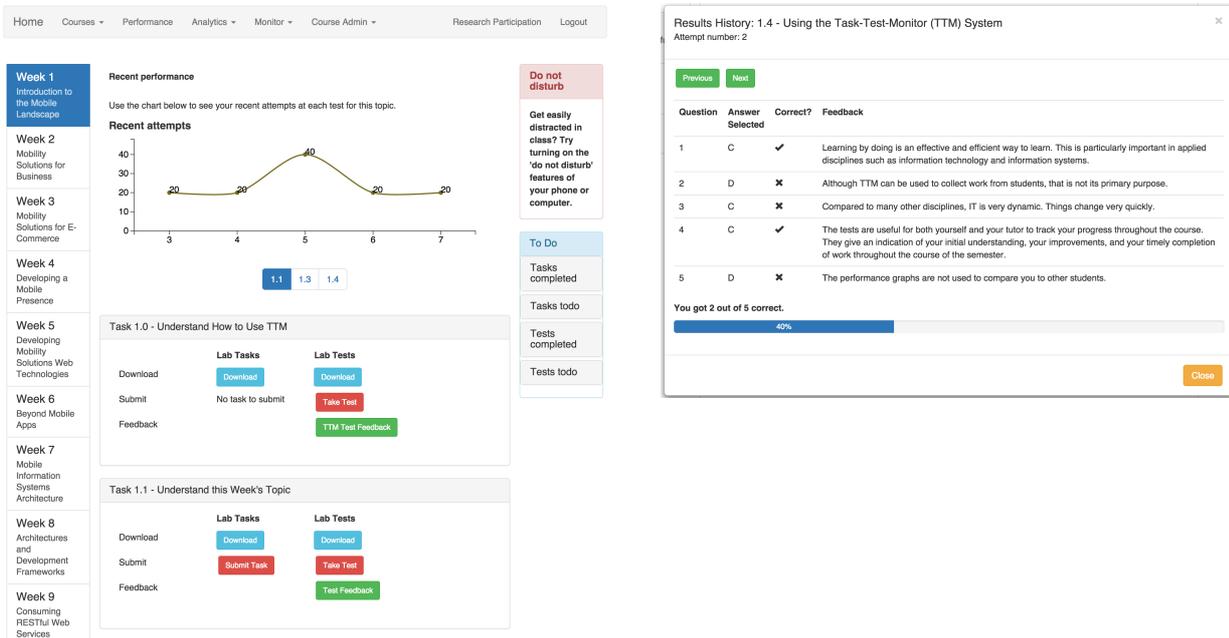


Figure 1. (a) TTM "Course Page" and (b) TTM Test Feedback

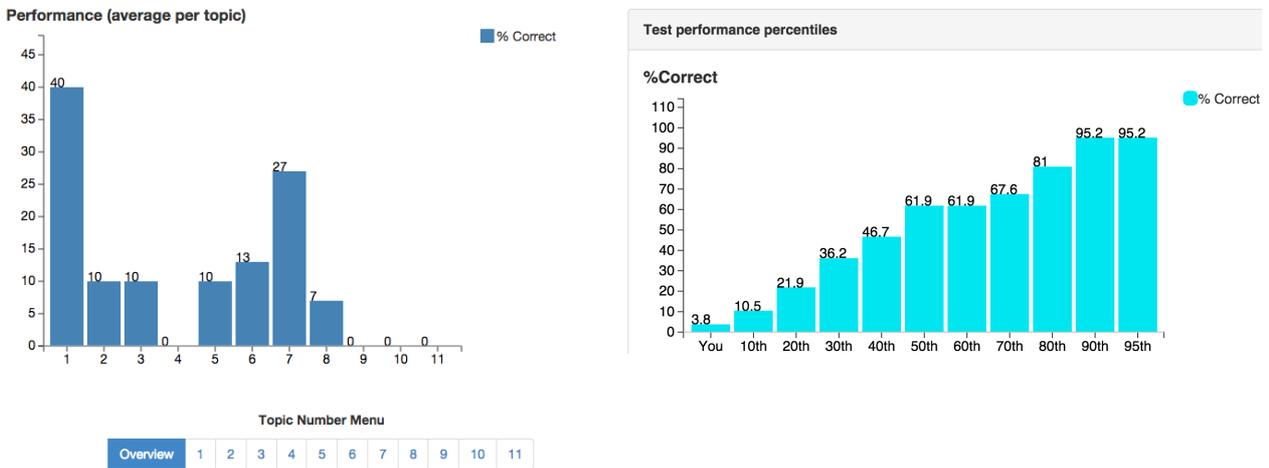


Figure 2. (a) Performance Graph for Entire Semester and (b) Percentile Graph