

Chapter 3

The Flipped Classroom



Michael O'Grady

Abstract A first year introductory internet and digital media module, taught as an in- and out-service across two Schools and covering a wide range of music courses, resulted in attendance and completion problems on a yearly basis. Students ranged from technical/programmers through to musicians and performers. Keeping them all engaged, motivated and appreciative of the learning materials was a challenge. The Flipped Classroom approach of front-loading weekly learning materials on to the VLE and providing more time for structured tutorial and computer lab work provided a distinct improvement in student marks and satisfaction scores. This Chapter assesses student marks against attendance and VLE engagement from this approach over one academic year. The learning materials provided a broad richness of weekly-themed resources including: screencasts; text; PowerPoint slides; screencasts of slideshows; scholarly articles; blog posts; web articles; and embedded YouTube videos. Students were encouraged to read broadly and assimilate as much as possible from the varying formats of presentation whilst having weekly structured tutorial content. The weekly content creation/linkages were designed to provide additional materials for those on the technical spectrum and additional content for the creatives. Student marks are compared against attendance and also against VLE engagement over the year. Whilst both indicate a benefit with increasing attendance and VLE engagement, there is a greater parity with the latter—attendance in class is less important than perusing the weekly resources. Students were able to perform to first class standards whilst engaging fully with the VLE and having a less-than 50% attendance in class. A broad section of students engaged with materials before the weekly lab sessions and some engaged with hardly any tutorial work at all. VLE access data also shows many students engaged to the early hours of the morning. The Flipped Classroom approach resulted in better module results as well as an improved classroom experience: greater focus on the learning materials and tutorial exercises; much less time surfing and social networking in class; and more time in class for one-to-one assistance.

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3.1 Introduction

This Chapter discusses the introduction of a Flipped Classroom approach to teaching first year digital and internet technology content to music students during the academic year 2014/15. The module, entitled 'Introduction to Digital Media and the Internet' provides broad coverage to a wide range of music students across two Schools (Computing and Engineering as well as Music, Humanities and Media, C&E and MHM respectively). Some courses had this module as core and others as optional. Around 70 students took the module in 14/15, spread over four groups of 1.5 hour sessions per week based in computer labs.

Student backgrounds and courses ranged from the computer-programming BSc Music Technology students who wanted technical detail and coding through to musical artists and performers on BA Popular Music production. The latter were interested in setting up websites, content, promotion, video for marketing and visually expressing their own or their band's music persona, whilst the former were unmotivated to anything 'arty' and performance related, wanting instead to learn code and technically manipulate audio.

The module, based in C&E, was an in-house service module to Engineering colleagues and an external service module for students studying music within MHM. The module was intended, by their various Course Leaders, to be 'all things to all students' in the area of digital/multimedia. However, the reality hadn't live up to the billing, mainly because of the diversity and expectations of students and in part from a demotion in its importance by having the two hours contact time reduced to 90 min. The lost 30 min being assigned to a more difficult and core module on each course. As a result, one of the recurring complaints was that students didn't have enough time in class for one-on-one support to understand and complete their weekly tasks.

This module had been running for over 10 years. The different module leaders taking their own slant on what was taught within the specification. Different versions of the module covered the following:

- technical website production (coding from scratch)—good for techies, bad for performers;
- marketing, visuals, video and DVD production (Photoshop and branding from scratch, lots of visual assets produced)—bad for techies, better for performers;
- making content managed websites to a professional standard, publishing of image and blog content and video creation—the author's approach, good for some, bad for others.

Having taught the module for several years with relatively low levels of student satisfaction (see below), the flipped classroom approach seemed intuitively like a good direction to take. The basic premise was to:

- provide a weekly structured diet of rich and broad content available for pre-reading before the class session;
- some content would overtly appeal to the creative/performance music students and some to the more technically-minded;
- provide an adaptive-release set of weekly tutorial tasks to be completed before or in the class. Initially invisible, students gain access by working through the weekly pre-reading and click the *Reviewed* adaptive-release button at the bottom; and
- minimise the taught/instructional aspects of the 90 min weekly contact and maximise tutorial one-on-one assistance.

The flipped classroom approach was to provide an increased amount of content for each side of the technical/art divide. It required much in-class support and verbal direction (individually and class-wide), with constant prompting and reminders on approaches to take with assignment work. In addition, each student was provided an opportunity to extend their learning (within the direction of their course) with experimental work. Each of the two termly and equally-weighted assignments allowed up to 20% of marks to be assigned towards experimentation—areas of work and learning defined as anything above/beyond the specific course content.

The result of this work was a doubling of student satisfaction from below 50% to around 90% from using this approach. Additionally, the author had access to a relatively large amount of corroborative data from different student-monitoring systems. Although the biggest disappointment was data available via UniLearn, our branded version of the Blackboard™ VLE.

The results (see later) show some interesting findings regarding student behaviour and performance by comparing data from:

- the two equally weighted assignments and their average;
- attendance monitoring of students in timetabled sessions; and
- click-through engagement with different elements of the VLE.

Further data, not covered in this Chapter, related to engagement with the module-specific reading list (MyReading) resources; formal module evaluation questionnaire; and a custom questionnaire.

This Chapter therefore presents an overview of how the module was structured in the VLE, how it was taught, what the students thought, author's conclusions and backed up with a broad range of data.

3.2 The Module

The module provides a broad-brush approach to dealing with the internet, digital content and multimedia as well as providing an introduction to marketing and promotion of individuals/personas/bands/groups via websites, video and social media. The content was tailored specifically to students in the music industry.

The diverse student backgrounds and reduced content time mentioned above provided a challenging learning environment.

Approximately 85–90% of the cohort come from the more technically-orientated BSc-type courses within our School and 10–15% from MHM. The service arrangements were managed by Engineering colleagues who also managed MHM student attachment to the module. The decision to reduce weekly contact hours from 2 to 1.5 h was made so that other core modules (mainly programming for the technical students) could receive an additional 30 min weekly.

The main challenge was to keep all the students on all six courses challenged and engaged, however the courses ranged from BSc Music Technology and Software Development through to BA Music Technology and Popular Music. The latter group including students who were studying music and leading on instruments such as piano, brass, wind, harp etc.

Unfortunately, the module has been polarising student satisfaction for many years; it was not enjoyed by all students, seen as being unchallenging for some and too difficult and technical for others. For many, they developed digital life-skills to help promote a music career that wasn't yet fledged and most enjoyed the video element in term 2. So the challenge was to take roughly the same taught content (agreed by the various course leaders) and make it more engaging and useful to all the students.

3.3 Motivation and Justification of the Flipped Classroom Approach

During 2010–2013, the author was engaged in providing screencast lecture content and summative feedback for students and wanted more exposure to technologies that utilised video and voice recording, not least to gain enhanced broad digital literacy skills. As part of this interest, the author attended an internal Facilitating Online Learning course (FOL) in 2013. It was designed for those wanting to undertake distance learning courses and gain exposure to cutting-edge webinar technology. The desire to attend was primarily to gain exposure to the webinar software (Adobe Connect) and to become more comfortable in front of a webcam for live, recorded virtual meetings and screencasts.

Whilst the webinar element was very empowering, the presentation of materials via a bespoke VLE module was itself presented using the flipped classroom approach and demonstrated an engaging learning environment. This approach entailed:

- Pre-reading of set materials **before** entering the virtual webinar meeting, including occasional completion of tasks (Wikis, Discussions etc.);
- Pre-reading included academic papers, blog articles and embedded video resources;
- Each week's learning materials centred around the practical use and engagement of the VLE and webinar software;
- All class sessions were hosted remotely on the webinar software;

- A set of webinar facilities was demonstrated: chat, polls, live voice and camera; and
- The facilitators also presented applications from their desktop through the webinar software (Word, PowerPoint etc.).

Over 20 years ago, King (1993) referred to the traditional taught lecture as the ‘Sage on the stage’ and commented that whilst some subjects work well with this approach, there was merit in learning stemming from more of a facilitation process, referred to as the ‘Guide on the side’. The flipped classroom approach identifies with the latter and is an instructional approach, combining a greater mix of delivery methodologies of learning resources, including student discussions, group working, collaboration using online tools and encouragement to reflect more. In effect, potentially covering all of Bloom’s Taxonomy (Gilboy et al. 2015).

In their work with HE students in Public Health, Galway et al. (2014) found that students generally liked the flipped approach when learning new content. Over 80% of students preferred the flipped classroom with blended online learning materials and problem-solving exercises in a classroom environment. Some students commented that they were more aware of subject-related news articles, more reflective about what the new material meant, and how it related to learning in other areas/modules. Some of their students also commented that they felt obligated to do the pre-reading before arriving in the session because it is part of the course set-up, otherwise they tended not to engage with reading. Some students can initially have difficulty and/or resent what they perceive as too much reading/learning in the early weeks of such a course and this can impact negatively on student satisfaction (Critz and Knight 2013; Missildine et al. 2013), although this impact tends to lessen as they become used to the pre-loading of weekly work over the course of the academic year.

Significantly improved student satisfaction is also a key factor in the flipped classroom for High School students (Sergis et al. 2018), compared to traditional taught environments. Students gained a greater sense of accomplishment and incentives to participate in the learning process. Lower-performing students gained the highest levels of satisfaction and also benefitting from being more able to engage in deeply collaborative work, probably because of the wider window for improvement.

There were some personal challenges in following the FOL course, many of which would be mirrored for the students:

- Time management of having to do the work before class. The system is less effective if students don’t do the learning;
- More reading and learning over short periods than the author was used to—it was quite a culture shock, something that would be more challenging to students;
- The possibility of having progress and non-progress monitored; and
- Increased contact with colleagues from other Schools—usually infrequent and unplanned but always pleasurable and advantageous.

In short, the flipped classroom requires much time and effort up-front, doesn’t necessarily work well if students don’t engage and is totally different to the way most learning takes place (...during and after the session).

3.4 Establishing the Flipped Classroom Approach

All content was placed on our Virtual Learning Environment (VLE). The University has a formal structure for the menu items in all modules and are as follows:

- Announcements (allowing *sticky* messages to remain at the top);
- Module Information (the module handbook);
- Staff Information;
- Learning Resources (the main weekly learning and tutorial area);
- Assessment; and
- Reading List (branded as *MyReading* internally).

There is now an additional menu item covering lecture Screen Capture which was introduced in 2015 and is not covered in this Chapter.

The Learning Resources area is arranged at the discretion of the module leader and is the main point of call in the teaching week. For this module, it was arranged weekly (teaching weeks rather than admin weeks) and released for viewing the previous week.

For each week created, the folder/container is placed at the top of the page and numbered with the teaching week (1–12 and 13–24, for terms 1 and 2 respectively) and titled appropriately. Students should always be aware of what week they are studying in and what weeks, if any, they have missed—the current week is always at the top.

Each week has three sections:

- An Introductory item with text and possibly containing an embedded descriptive screencast. An introductory screencast was created for several weeks at the beginning and soon dropped due to workload and propensity for it to become outdated the following year;
- A folder with an introduction to the learning content. The folder contains between 4 and 8 separate sequential bite-size items of content. The last item contains a button (*Reviewed*) that, once clicked, forces the Weekly Tutorial work to become visible and available to the individual student; and
- Weekly Tutorial folder—a sequential series of tasks for students to undertake ideally before or during (and after) the weekly session.

All elements (folders, items and adaptive-release buttons) were activated for data recording to determine if a student clicked that particular link. This data was then used to assess VLE engagement and individual performance across the assignment work. Below is a closer look at the two main content folders.

Weekly Learning Content Folder

Each weekly content folder has a set of instructions and guidance prior to students entering. The weekly objectives, learning milestones, linkage with previous weeks' content and advice for assignments can all appear in this introduction text.

Items populating the folder are intended to be viewed sequentially from top to bottom by each student. Learning materials include:

- embedded graphics to demonstrate what type of item resource they were looking at (text, web, video);
- text within the item;
- text and links to uploaded files (Word, pdf, spreadsheet, slides);
- hyperlinks to one or more web resources;
- embedded video—either via the VLE video insert widget feature, or more reliably, via a direct YouTube (or similar) iFrame HTML *embed* code so that the video both displayed and played directly from the page; and
- Screencasts (generally uploaded to YouTube by the author and set to *Unlisted*) explaining some concepts, working through a PowerPoint slideshow or showing how a tutorial exercise is completed.

Some older slideshows (typically no more than four years old) were included in the resources as additional reference items with specific guidance to currency, applicability and comparisons with current screencasts, as appropriate.

Weekly Tutorial Tasks Folder

Initially entitled ‘The Learning Module’ (a direct copy of the FOL course format), the title was soon changed to Weekly Tutorial Tasks. This folder takes students through the weekly tutorial work in a step-by-step way with indexed pages presenting small elements of work; a sort of ‘do this, do that’ approach. There was no new learning content in this section although students were exposed to new techniques with software applications. Also, any screencasts in this folder were more specific about using tools and applications in relation to the weekly tasks and assignments.

After the introductory weeks of a new topic and associated software application(s), students sometimes had difficulty performing the weekly tasks. There is a cognitive disconnect between watching a live demo on the projection screen in class, then remembering the steps and doing the same for themselves on a PC. The Flipped Classroom approach was chosen in part to provide more time in class for this purpose, but non-attendees, less-able and less-motivated students can struggle to grasp the essentials by the end of a session. So, screencasts of the author working through the task solutions were created and made available a week or two later. Students would be reminded at the start of each relevant class that a previous week’s solution was available as a screencast at a certain location within the VLE. It is good to avoid this being a predictable resource to ensure students don’t rely on it as a means to avoid engagement and learning.

Using special ‘Catch-up’ or ‘Problems Solved’ screencasts were also created approximately once per term to cover common issues. These would appear as items in the weekly chronology of the Learning Resources page. The screencasts might show answers to common questions from class sessions, email questions and always bring the subject around to implications for the coming assignment.

Once activated, the initially invisible Weekly Tutorial Tasks folder is similar in appearance to the learning folder in that the student is expected to work their way

down the stated activities. These are very pragmatic instructions such as Open an Adobe Application with the sample file, then make some additions, alterations and experimentation, save and view the work. The author has developed a shorthand for sequential instructions where the symbol '>' is used to concatenate follow-on instructions. An example for making a hyperlink in MS Word is shown below:

1. ...*previous instructions*...;
2. Open a web page in a browser window that will be linked from your document;
3. Select the **URL>Ctrl+C**;
4. In Word, highlight the words(s) providing the **link>Ctrl+K>Ctrl+V>OK>Ctrl+S**;
5. ...*continue*...

There was a very focused chronology of weekly tasks expected of the students, particularly because the finished results of work can vary greatly if the order of work undertaken changes in some interfaces. Sometimes the tasks comprise quickly-produced bullet points with a fuller explanation provided in class or by embedded screencasts.

Some students would have undertaken the necessary learning and attempted the tutorial work in one or more sessions. At the other extreme, some who would not have activated the weekly tutorial folder would be unlikely to have read the planned materials before class.

There was a short learning period of around three weeks before everyone was fully aware of the expectations placed on them regarding pre-reading and the practical work in sessions. One challenge was that this was the only 20 credit module in a 120 credit diet using this approach.

3.5 What the Results Show—The Data

There three main data sources accessed for this analysis:

- Overall module and individual assignment marks—two assignments, equal in weighting and duration plus the resulting averaged module mark;
- Attendance database—each student is required to swipe into each timetabled session; and
- VLE engagement reports (the click data on items, folders and *Reviewed* buttons).

Module Marks

For several years, the module has been split into two separate equally-weighted assignments spread across two terms of 12 weeks each. A term comprises 11 teaching weeks and a centrally placed Guidance Week (similar to a Reading Week). Term 1 dealt with the construction of a content management system (CMS) website to a semi-professional standard including customised layout menu, content, imagery, security, backups etc. Students could do as much technical or creative work as their course and

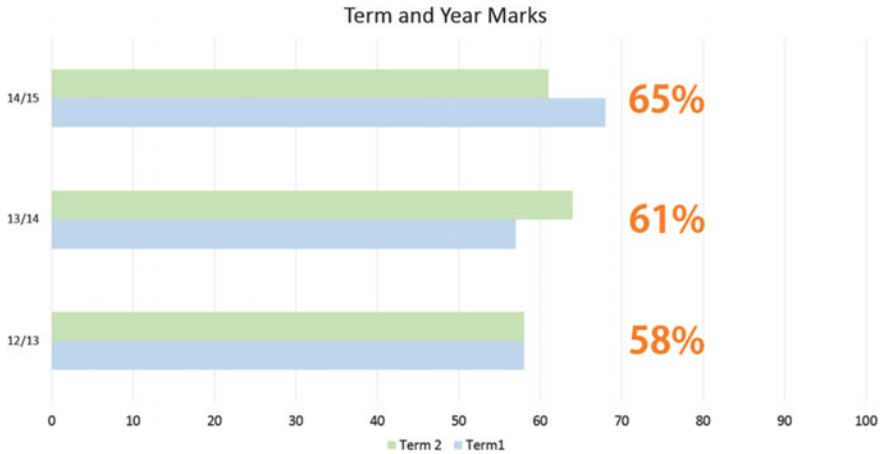


Fig. 3.1 Averages for the module for three years

interest dictated. The theme was at the student’s discretion but they were encouraged to create something that served a module or their current- or future-self (performer or band website). This work is very chronological in the build-up of necessary skills for good website creation. The weekly learning is quite intensive, with much to learn, highly technically orientated and there are opportunities for technical students to engage in learning code.

In the second term students learn about planning for video creation, filming, screencasting and editing digital videos. Again, this serves to aid their future-self, to aid placement job searches in year two or, as many discovered, a chance to have lots of fun. Many of the technical students were encouraged to produce videos along the lines of: ‘A day in the life of a music producer’ or ‘How to engineer a [Hip-Hop] track’. This work was more creative and thoughtful for students than the website and for many, very enjoyable.

Figure 3.1 shows a bar chart of termly assessment and class average marks for the three years up to and including 2014/15. We have recently adopted an institutional target of 75% of students achieving a minimum 60% module marks (the lower boundary of a 2:1 Degree classification) in relation to TEF metrics and a steady growth can be seen over the three academic years from 58, 61 to 65% for the year in question. Additionally, the lower bar in a pair represents the technical website-build work (term 1) whilst the upper bar represents term 2 video work. There seems to be a significant increase in term 1 marks from around 57/58 in the preceding years to 68%. This is attributed to the increased exposure to materials for both the technical and creatively/visually-minded students of the class. It is also partly reflected in the 20% of marks awarded for experimentation and pursuing of specialist knowledge within the assignment, as befits their course and interest.

The yearly cohorts are particularly high achieving (evidenced by UCAS entry points) and passionate group of students, some having the same subject back-

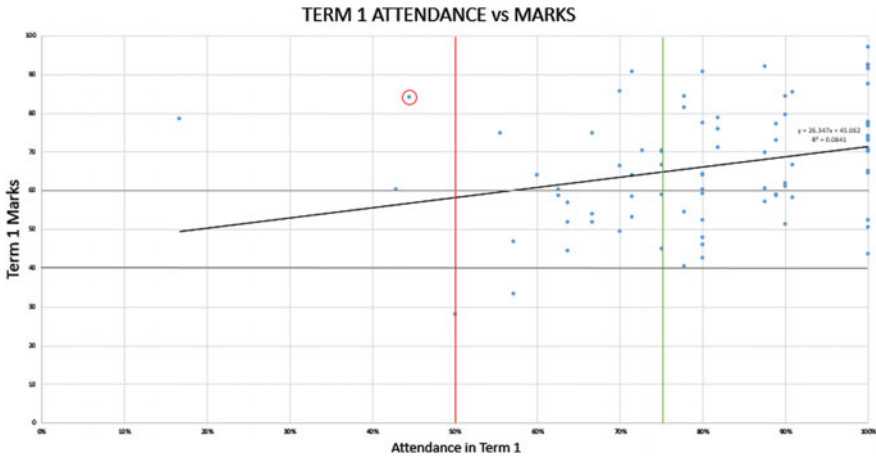


Fig. 3.2 Attendance versus marks for assignment 1

ground as our Web and Multimedia students. They can produce significantly better work than the latter group. However, whilst much of the work handed in is of a high quality, there is a persistent yearly element of students with low final marks due to missing elements of work; they do great work but don't always complete all the sections. Consequently, excellent students can scrape by with averages marks close to the 40% pass.

Attendance Versus Attainment

As an institution, we have had attendance monitoring in all timetabled sessions for several years and it is used to inform student risk algorithms for *support and guidance* interventions. Two key triggers are maintained: (a) students should ideally have an overall attendance record of 75% and (b) if attendance falls below 50% then the student is requested to attend a formal meeting. In reality, there are escalating interventions as attendance falls towards the lower value (invites to attend with support staff for example).

Attendance was very good in term 1 as seen in Fig. 3.2. This shows Attendance in sessions against Assignment Marks for individual students. The upper horizontal line lies at the desired minimum of 60% marks and the lower line lies at the 40% pass.

Figure 3.2 shows clear grouping in the top right corner with approximately a third of students falling in the 50–75% attendance band. Interestingly, there is a 50/50 split in the 50–75% attendance band of those above and below 60% marks indicating that attendance may not be that important when students have access to materials remotely, although it is clear that high attendance and high marks go together in the 75–100% attendance band. Here, 70% of students attain 60% marks or more. Additionally, there are 15 students with 100% attendance, all passing and covering the full range of marks between 40 and 100%. The prescriptive/list nature of all the

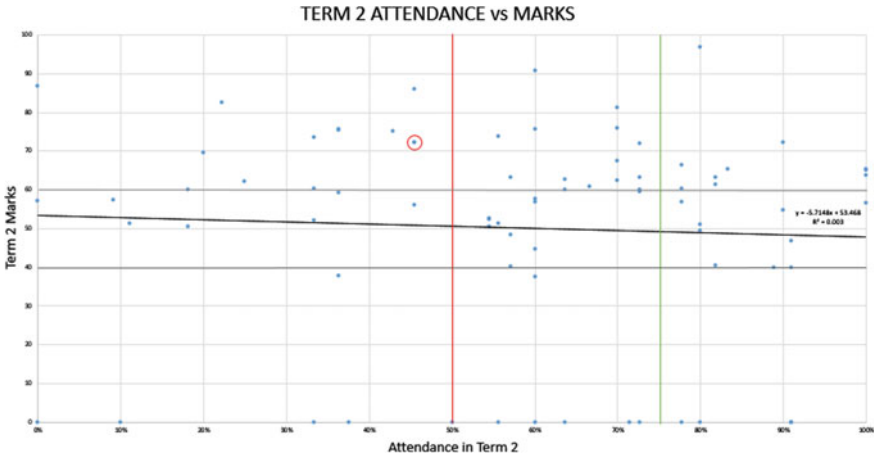


Fig. 3.3 Attendance versus marks for assignment 2

weekly learning items provides a useful checklist for assignment work, especially when students undertake additional experimentation and it is easy for students to ensure they work in ‘one of each’ learning points into their assignments.

The student result marked with a circle is one who will be referred to several times in this Chapter. This student was a particularly consistent high-achiever over both terms but who was a borderline case for a disciplinary attendance interview with the Dean. They managed their time exceptionally well and had high engagement with the VLE, as we’ll see later.

Term 2 (Fig. 3.3) shows a different picture for the cohort, partly because of: the less intensive learning requirements; a more creative assignment including design and documentation; a need to ‘get out of the building’ and film their footage; sometimes the need for managing actors; and the willingness of some students to ‘play the system’ (students who reduce both attendance and VLE engagement then cram their assignment work into the last few weeks).

Figure 3.3 shows a broad spread of marks across the attendance range, notably with 10 having marks higher than 60% and attendance worse than 50%. There are 13 students who, having withdrawn or suspended, have zero marks. Interestingly, the 50/50 weighting allows students to have less than a 40% pass on one assignment element if the other mark compensates. The student with the ring is still attaining just enough to get a First having dropped their attendance to 45%. Clearly, the negative slope defies perceived wisdom, mainly because of the high-attending non-submitters.

Figure 3.3 shows a good set of attainment results, mainly due to the creative and enjoyed nature of this assignment, all but two fully-submitting achieving a pass grade or better.

Keeping all the non-submitters and averaging over the whole year, Fig. 3.4 shows a broad scatter around a relatively shallow incline, showing that grades improve with

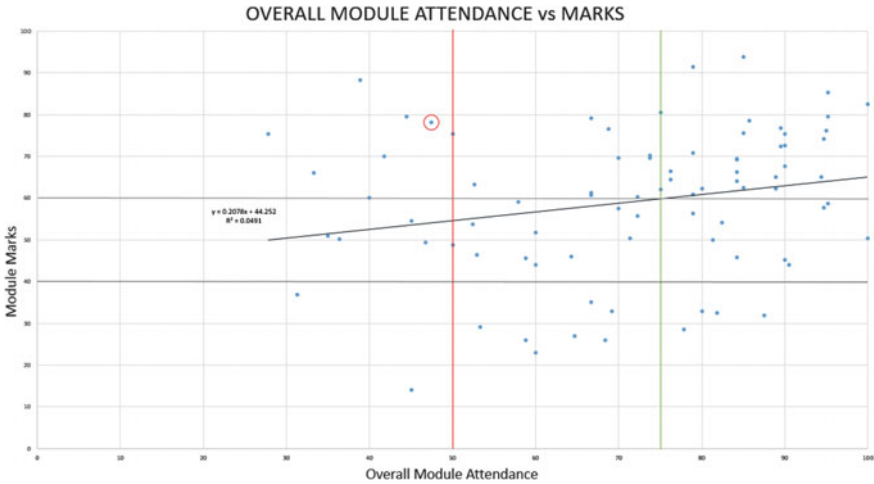


Fig. 3.4 Attendance versus final marks for the module

attendance. There are still four students who have good attendance and fail to make a 40% pass (bottom right corner).

The trend line indicates a 44.3% pass without attendance and only 65% with full attendance though the R^2 value is relatively small at 0.0491. The red-circle student continues to provide an exception to this result.

In conclusion, it is clear that in many cases, good attendance results in good marks, though not always. Weekly engagement with structured learning materials and progressive tutorial content would seem to indicate that good attainment marks result from good attendance and that there are clear exceptions, especially when materials are made available for flexible access and students are good at time management. The term 2 creative work was less successful at engaging students to attend, but again, continued flexible access to resources has resulted in good results in well-motivated students.

VLE Engagement

Some useful high-level information came out of UniLearn (our branded *Blackboard*TM VLE) in relation to overall student engagement. However, pursuit of this data revealed that the dataset for each module only lasted six months before it was overwritten and was not easily obtainable without firstly knowing that such data would be needed at the beginning of a term (which it wasn't). Thus each term's VLE engagement information came from two data sets; one taken after Christmas (term 1) and one in May (term 2) with much work done accessing rolled-back stored data.

Summary engagement data is available for daily click activity, hourly engagement, the number of *Reviewed* buttons clicked and the overall student engagement (total number of clicks). In all, over 220 elements were embedded into the VLE module, most of which were set to record data (one or more student clicks).

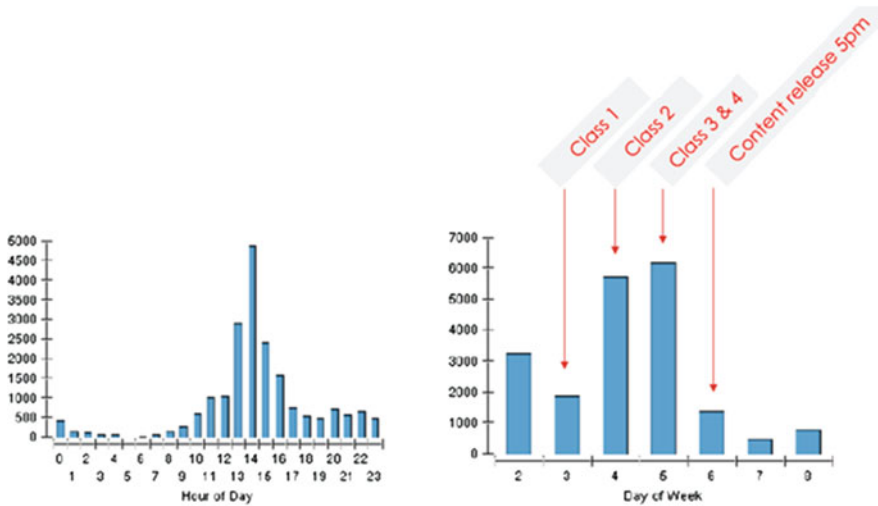


Fig. 3.5 Hourly and daily VLE engagement during term 1

The hourly and daily summative data for term 1 is shown in Fig. 3.5. Hourly engagement (left) shows peak engagement occurs in class times between 11:00 and 17:00 and that around 8% of the peak (around 500 out of 6000) uses occur in the evenings in each hour up to about 01:00. The daily engagement (Fig. 3.5, right) shows high use mid-week with around a quarter of peak daily use coming on Fridays when the materials are released for the following week. Weekend use is low but there is around 50% peak use on Mondays when there were no classes. Clearly students are engaging flexibly with the VLE content.

Term 2 data for hourly and daily engagement summaries show a similar profile with much reduced values, with peaks of around 50% of term 1 engagement. Interestingly, whilst the Thursday engagement reduces from around 6000 to 3500, (class time), the Monday values drop little, from 3200 to 2600, indicating that there is less class engagement (attendance) but students are still using Mondays to work on the module (Fig. 3.6).

The sequential daily engagement in term 1 (Fig. 3.7), where technical content is high, shows a relatively good engagement with a dip to around 45% of peak mid-term and then relatively stable usage at around 60% of peak towards the end-term and assignment hand in. The assignment is handed out in teaching week 2 with 900 click peaks in the weeks either side. There is a non-teaching Guidance Week in the middle of term then a resurgence back up to 600 at the end.

The term 2 graph shows a more relaxed attitude to VLE engagement, running in parallel with the attendance (Fig. 3.8); peak engagement in the first four weeks then a rapid fall-off to the three week Easter holidays and a low resurgence in the last two weeks before assignment hand in.

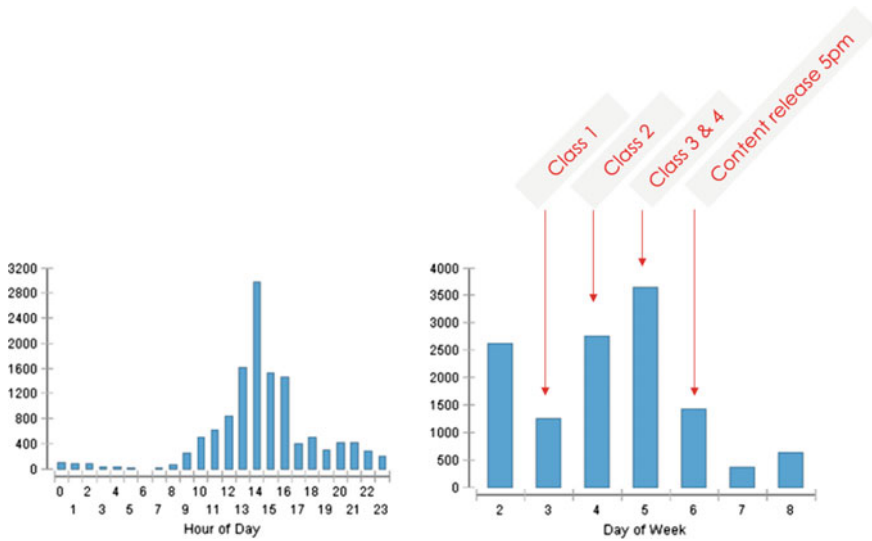


Fig. 3.6 Hourly and daily VLE engagement during term 2

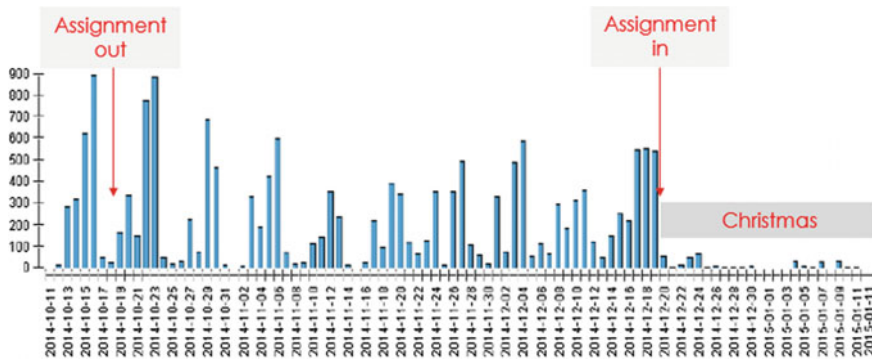


Fig. 3.7 VLE engagement during term 1

VLE Engagement Versus Marks Data

Due to the difficulty obtaining data from Blackboard™, the results are quite crude, although quite revealing. The results below look at the resulting total *Reviewed* button clicks vs attainment marks for each student (Fig. 3.9) followed by the total number of engagement clicks vs attainment marks (Fig. 3.10). The differentiation is that the former highlights only the exposure of the Weekly Tutorial Tasks (by clicking the *Reviewed* button) and the latter addresses all clicks within the VLS for each student.

Figure 3.9 clearly shows that whilst there is broad spread across the chart, there is a correlation between the students’ journey into the weekly tutorial folder and their marks. With 26 *Reviewed* buttons available, our circled student (poor attendance, high

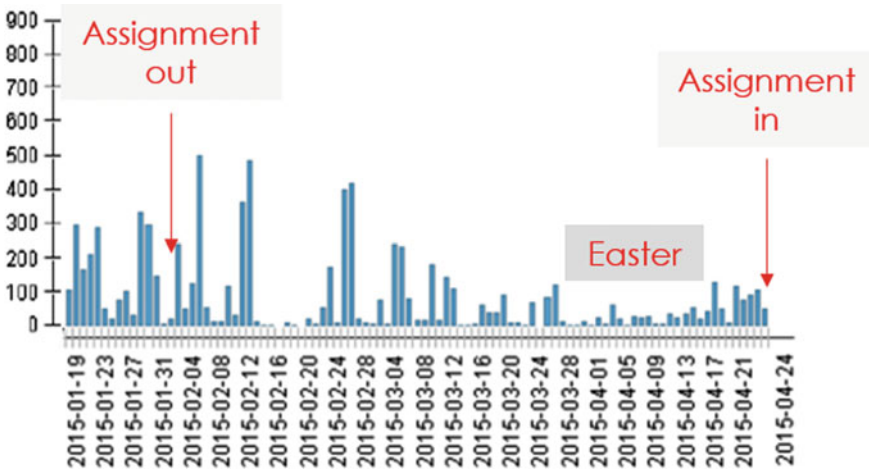


Fig. 3.8 VLE engagement during term 2

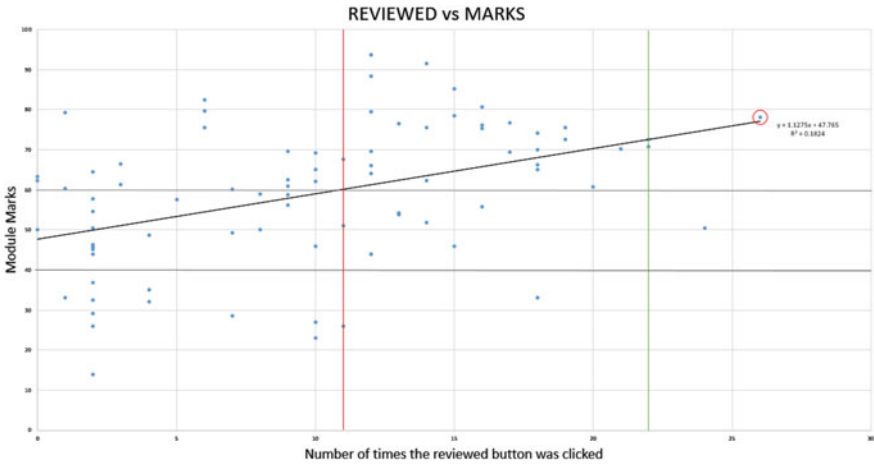


Fig. 3.9 Total reviewed button clicks versus module marks

performance) can be seen as having the highest engagement in this area, seemingly, having looked at all the resources. This tends to support the idea that some students are working strategically through the resources in their own time whilst minimising travel and contact time in class. This is an increasingly common occurrence with a larger proportion of the Huddersfield intake commuting from home due to spiralling costs.

Since the *Reviewed* button does not indicate whether a student worked through the resulting exposed tutorial materials, it does shows that some attained reasonable

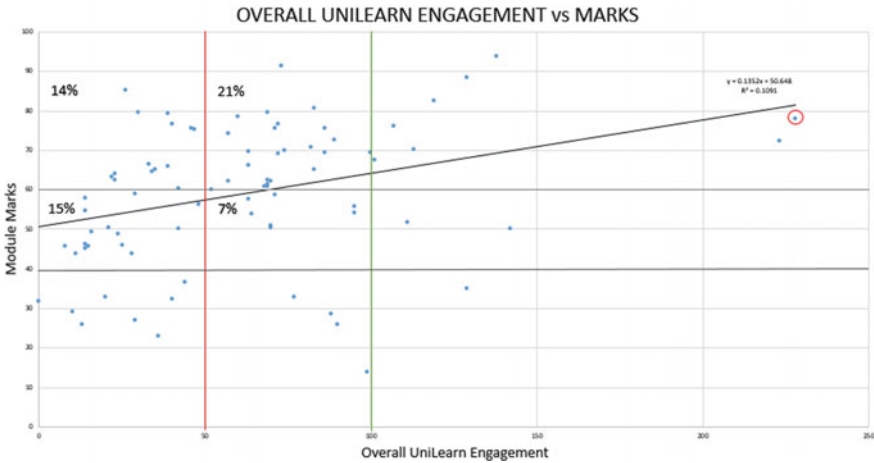


Fig. 3.10 Total engagement clicks versus module marks

marks whilst having entered no more than five weekly tutorial areas (seven students with greater than 60% marks and nine with marks between 40 and 59%).

A vertical line in Fig. 3.9 is placed at 22 Reviewed clicks, representing one click for each teaching week and nominally encompassing the bulk of clicks. A second line is placed nominally at a mid-point of 11 clicks. Analysis of the grades to the left of this line show that there are roughly equal numbers achieving 60% or more (18) with those between 40 and 60% (17) and a relatively large proportion not passing (12). Percentage results are 18, 17 and 12% respectively. However, between 11 and 22 clicks, the resulting values are 27, 6 and 1% showing a dramatic rise in success of those engaging with the content.

Whilst the R^2 Regression value of 0.1824 is high, the line and trend is persuasive, the intersect still resulting in a mark of almost 48%. The trendline slope is 1.1275 which is approximately five times steeper than that of overall attendance slope of 0.2078 (Fig. 3.4). Hence it can be argued that VLE engagement, particularly into areas that are actively opened by students, is of greater significance to student marks than simply attending classes.

Figure 3.10 shows the total engagement clicks within the VLE module per student against their module mark. Approximately 230 clicks were possible and once again, our circled student is leading the way on engagement.

Two vertical lines have been drawn nominally to act as a datum and were chosen partly to reflect the data grouping and be positioned on significant engagement numbers (50 and 100). Without the two data points at around 230 clicks, there seems to be a very broad scatter, which is not helped by the non-passing marks, typically from students who had not submitted assignment 2 (those who had suspended, withdrawn or repeating the module in the following year).

Figure 3.10 also shows that there are roughly equal numbers of students below the 50 click engagement line with marks 40 to 59% (15%) with those attaining 60% and

above (14%). Although not investigated, the author's view is that this group included those with previous skills and experience of the learning materials who didn't need to access the tutorial materials.

Interestingly, the increased VLE engagement between 50 and 100 clicks sees three times more students attaining 60% or more to those between 40 and 59% (21% of students compared to 7% respectively). This is a good indicator that those who have a reasonable engagement with the learning materials attain better marks, not least by having a greater knowledge of what the assignment requires of them. Only 10% of the students (nine) engaged between 100 and 150 clicks with all but one passing and just over half (five) achieving marks of 70% or more.

It is from the above that overall engagement with the VLE is a more significant factor in increasing student performance than attendance in class and that flexible access to materials is a predominant factor in increasing student engagement and attainment.

3.6 Benefits of the Flipped Classroom Approach

There were some early gains with this approach, the first being the engagement of students in class. In previous years, the ratio of taught content to tutorial and support work was roughly 2:1 due to the reduced time in class. There was a tendency for students to become distracted and noisy unless firmly controlled and guided. The flipped classroom approach provided a sea-change; the technical and information-rich nature of term 1 materials resulted in students being eager and engaged with their learning and tasks, to a point where there would be utter silence for long periods. Some students would not want to be disturbed by enquiries to see if they needed any help.

The need to be very organised in advance of the day of materials release (typically Friday of the week before) is almost a reason to put this item in the *Issues* section (following). However, it provided excellent time management practice and was a benefit simply because the teaching week generally remained free of problems—all the hard work was completed the previous week.

Students like having a regimented presentation of materials which is in a predictable format and is consistently available. It's one less thing for them to worry over. Also, providing a one-page weekly timetable across all weeks and the consistent numbering, labelling and naming of the weekly learning items allowed quick access backwards at assignment time.

Students appreciated having the current week's material located at the top of the page. Scrolling down the page to find older materials is an intuitive process—recent learning is near the top and content from many weeks ago is further down the page.

Many students commented that they liked having the materials available in advance of the session, particularly over the weekend so they could take advantage of the 1.5 hour session to do practical work. It would be advantageous to some of the cohort to have materials available for at least a week prior to the class session.

The Learning Resources area provided access to a wide range of material formats; students enjoyed the mix of web articles, digitally-accessed academic papers, blog posts, podcasts, videos and screencasts. The use of a variety of different *voices* (literally and metaphorically) helps students accept new and challenging theories, concepts and techniques. These resources do need careful choice regarding academic level, the potential for mixed messages and relevance. The change of *presenter voice* is important because different experts can not only tell the same story differently, but they approach the content with different backgrounds and motivations, often introducing associated and interesting asides. These are a good opportunity for increasing the engagement and extending wider reading around the subject.

The weekly tutorial work has historically comprised pdf instructions with graphics and screengrabs to allow students to build/create digital assets such as elements of a website, manipulate a digital image, to edit elements of a digital video etc. These are typically sequential step-by-step guides. They were updated yearly to reflect software versions and interface updates, however, with the increased workload arising from the flipped classroom approach, the author decided early on to reference previous year's tutorials as legacy materials, with additional time taken in class to point out the relevance and changes exposed in the older material.

3.7 Issues with Flipped Classroom Approach

There is a need to upload a lot of relevant, appropriate and variable content into the weekly areas in the VLE in advance. It's a lot of work! This can seem relentless at first until the methodology of finding and presenting resources becomes familiar. There is a need to formalise the content structure and to make weekly work tasks *approachable* before the session and also to provide additional challenge within (and beyond) the session. The weekly content needs to be valuable to the students rather than a hasty collection of web links and a mix of format types helps break up the learning process.

Use of Adaptive Release for the weekly tutorial tasks (use of the *Reviewed* button) was not as important a facility with students as it might be with others (say staff on an internal training course). Students were not informed that it would be possible to analyse data on whether they click each *Reviewed* button or not. Telling them this information can often work as an implied threat and can be useful in driving up usage and exposure to the materials. However, students can *play the game* and scroll down the learning resources, click the *Reviewed* button and click on the exposed tutorial tasks simply for the purposes of achieving a better engagement score.

Whilst the benefits of using the flipped classroom are clear, the connection between engagement with the materials and summative marks is also clear, so anything that

can be done to drive students into the content is well worth the effort. Ideally, there needs to be some incentive for students to investigate all the materials; such as a weekly class discussion item, contribution to a Wiki or Discussion Board based on *deeper* materials, creating a logbook that forms part of the assessment strategy etc. This additional work was not done due to workload.

Students have no way of being reminded of what they have read or what sections they have worked through or simply visited. Data access via our version of Blackboard provided very rudimentary data that was difficult to use. Other VLEs may treat these issues better.

The system of presenting learning materials, work tasks and tutorial solutions on a VLE could easily be circumvented by students. Good students may do so to accelerate their learning whilst poorly performing students may dip into see if it is of interest and to see the complexity of materials presented, or not dip in at all. There ideally needs to be a mechanism that encourages or requires students to open and engage with as much of the content as possible; this was a failing in this work and the obvious next-step.

The basic approach of expecting students to engage in pre-reading materials before class provided an additional challenge, which soon became apparent in the first weeks of this methodology. It was the only module (20 credits in 120 for the year) that required students to undertake pre-reading before the class. For many, this was a culture-shock and presented them with time management problems which could be easily avoided if desired. Pre-reading became a polarising activity with some relishing the access to deep and rich materials and others learning the predictability of the system to do the minimum required to attain their desired grade. The flipped classroom approach would be more successful if a greater number of modules were taught this way.

3.8 Personal Reflections

Moving from weekly PowerPoint presentations and tutorial sheets to the flipped classroom was a big workload commitment because of the many new resources needing to be found, evaluated and presented for student dissemination. Existing teaching materials became the focus around the generation of new weekly content but soon became relegated in importance for both myself and students, mainly because they aren't presented in class time. Students may or may not want to look through a series of slides, and it may be possible to collect that snippet of data if the VLE allows. However, one of my colleagues maintains that his students would prefer to watch a video of his presentation rather than watch him present live, so it would be worth testing this hypothesis by converting some slideshows to screencasts and embedding on a content page, then testing.

The process of finding interesting and relevant materials never stopped being fun; mainly because of the updating of my own personal knowledge and also because of the interest and difference it made to the students' learning experience. One of the

challenges with working in the fast-moving technology area is the need to update materials which can quickly become outdated and this is something that needs careful attention each year. It may be useful to have a Current Trends section which resides above the weekly content and has current-interest links and information. Putting new content at the top of this folder provides an archive of previous years' content if it is sectionalised by academic years, making a virtue from additional updating.

All of the weekly preparation work was completed in the week before it was taught, so contact time was far more relaxed for both myself and students in that week. This allowed more time in class for signposting towards upcoming content and assignment work as well as reference previous weeks' content as questions arose. There was also more time to spend dealing with student support as well as suggesting and demonstrating improvements they may consider making towards assignment work. And finally (significantly), interactions were more fun and creative in class and it became easier and quicker to remember student names.

Additional evidence regarding module evaluation scores and comments, use of a data-aware reading list, additional survey information and the use of screencasting to provide assignment feedback and marks justification are not covered in this Chapter but provide additional support of the above findings. Whilst there were significant improvements in student learning in this approach, it is anticipated that additional improvements could be gained by including more-engaging and interactive activities into the weekly tutorial sessions creating a better blended learning experience (gamification, use of Wikis, Discussion Boards, polls etc.).

3.9 Conclusions

Whilst only providing a vehicle for presenting learning materials and weekly tutorial sheets, this flipped classroom approach has proved beneficial for students in: motivating them to engage with the materials; being studious and focussed in lab sessions; and raising metrics such as module marks. The approach in providing such materials was consistent over both terms, the first (technical) half produced high levels of attendance and VLE engagement whilst the second half (creative) suffered from reduced attendance and VLE engagement. Average marks in term 1 increased by about 10% whilst term 2 marks reduced by approximately 3% compared to previous years. It is concluded that creative content needs a greater level of activity planned in the weekly sessions to drive attendance and learning.

Students benefit from having a logical weekly presentation of materials in their VLE. Using a combination of teaching-week numbers and appropriate titles allowed students easy searchable access to a large bank of materials at any time in the year.

Around a quarter of the cohort accessed the weekly materials in the preceding week and many spread their engagement across the weekend and into the early hours of mornings.

VLE engagement seems to be a better indicator of student performance than attendance in class for this cohort. If rules and penalties allow students not to attend

sessions, then some will take advantage and manage their time accordingly and others will decide not to engage with the learning.

The need to actively open the weekly tutorial materials by clicking the *Reviewed* button is easily done without having to undertake the learning. The fact that many did not take this shortcut indicated a distinct lack of engagement by some.

The provision of learning materials provides a rich tapestry to all types of learners with excellent opportunities for asides and extra reading for those interested in the topic. For staff, a great deal of learning and sifting, especially of the myriad web-based opinions, can provide an enjoyable and nourishing activity, not least to keep abreast of current thinking.

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