



## Attendance Monitoring - Supporting Students Effectively

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### Abstract

The student population is changing. They have new and competing demands for their attention. To meet the educational needs of our future students, we need to better understand their constraints. These encompass both the barriers to, and incentives for, effective performance during their study. This paper presents analysis of an attendance monitoring project undertaken in the department of psychology at Heriot-Watt University in Edinburgh. A novel and bespoke monitoring system was developed. The software processes data from handheld barcode scanners, the student record system and timetabling software. It was designed to provide (semi-) automated reports to students, module coordinators and personal tutors regarding non-attendance incidents. Our ethos in the development of the system was to support students who may be struggling with the demands on them, while providing richer information to understand the underlying motives for their behaviours. Data has been collected over a period of eighteen months, so far. Results are presented concerning three main areas, i) technical lessons learnt, ii) attendance data collected, and iii) system implementation recommendations. The Technical implementation of the project required careful negotiation of the practical and institutional 'corporate' policies and infrastructure. Summary results from our (four-year Scottish) degree students revealed non-attendance levels of 56.2%, 39%, 36.7% and 47.3% respectively for our 1st, 2nd, 3rd and 4th years. Broader systems findings suggest limitations in 'barcode' scanning but offer considerable promise from a deeper understanding of the factors revealed. Conclusions are drawn, and recommendations made for those interested in adopting similar 'smarter' technologies in support of their students.

**Keywords:** *Attendance Monitoring, Student, Support, Performance.*

### 1. Introduction

Within higher education, student attendance has been shown to be a key factor impacting performance [1]. Poor class attendance is well recognised as a widespread problem [2] in higher education. Durden and Ellis [1] comment further that excessive absence (more than four classes) has a non-linear effect and is associated with poor performance. However, it seems only fair to recognise the nature of the student body has changed in recent years, and it is now composed of a broader range of the potential population. For example, with social inclusion measures and widening access programmes. Thus, many of today's students find themselves with increasing reasons not to participate in scheduled contact time. Such factors may include, for example, financial pressures to work in order to fund study, existing responsibilities as a carer, or age-old issues like an over-indulgence in alcohol 'the night before'.

In recognition of the differing demands on students, numerous higher education institutions have introduced measures to provide support. These range from 'lecture capture' (support for flexible learning) measures through to attendance monitoring (measurement and support). Lecture capture provides students with a 'catch up' opportunity when they have been unable to attend a class [3]. Typically, it is provided via an asynchronous video of the contact time session. Concerns have been raised that lecture capture might encourage non-attendance by its very availability [4], but is too early in the adoption of this technology to draw a definitive conclusion on this point. Initial indications are that such concerns may be unfounded [5].

Recording of attendance data for students is becoming increasingly common in higher education. If implemented effectively it offers the promise of higher quality data, reduced staff workload, and increased opportunities to engage with non-attenders. The use of attendance monitoring systems is not without debate though. It might be stated that effective students will succeed regardless of good or bad attendance during contact times. Similarly, some disciplines may be more or less susceptible to potential negatives from (more than token) non-attendance. It has been suggested that enforced attendance may be counterproductive if associated with, for example, unprofessional behaviour [6]. It seems important here to try to understand the underlying motives for decisions not to attend classes. While on the one hand, monitoring of attendance would seem to erode the 'independent adult learner' ethic; on the other hand, many report students with poor attendance, achieving low grades.



## 1.1 Objectives

The purposes of this research were twofold, i) to develop and test a system to monitor attendance of our students (to evidence existing anecdotal reports), and ii) to utilise the data provided to support student outcomes and experience (via enhanced engagement with non-attenders).

## 2. Method

### 2.1 Participants

At the time of writing, 301 students are studying psychology at Heriot-Watt University. Of which, 56 are in Year 1, with 87, 80 and 71; in years 2, 3 and 4 respectively. 229 identify as female (76.1%).

### 2.2 Equipment

The system used two substantive items of equipment, i) Institution-issued student identity cards, with unique barcodes; and ii) a rechargeable barcode scanner (Opticon Model: OPN-2001, <<https://opticon.com/product/opn-2001/>>). The device increments a text file with the scanned barcode and an associated time and date string. Additionally, a collection of Python scripts interface with institutional data systems and generate a master attendance database.

### 2.3 Procedure

The system was developed in two stages, with guidance provided to staff as to how it is intended to function. During the first year, a pilot phase was conducted using only first year students. Analysis was undertaken 'by hand' for the six discipline-specific modules. The hardware and available data were deemed to be effective, and therefore the Department-wide system was produced in the second stage. Currently, during lectures (tutorials are not at this time evaluated) the small handheld barcode scanner is handed around the class. Students scan their identity card and pass on the device. Once a week, the four scanners are collected, and their data downloaded.

The analysis software had two main stages. Before the Semester, information is extracted from institutional data to i) associate scanned barcodes with specific students, ii) to define the timetable, and iii) confirm expected attendance behaviours for modules. The next stage is the weekly processing of the raw scanner data. This was executed via a series of Python scripts performing the following tasks:

1. Comparison of raw data to local attendance database
2. Cross-reference of raw records to both individual and timetable records
3. Timestamp matches to the scheduled class times were recorded as a successful attendance match
4. Separate scripts provide lists of non-attenders, attendees per module (for module leaders), attendees per tutor (for personal tutors)
5. Obtained data was then uploaded to the Institutional intranet, and staff informed of its availability
6. Automatic emails were then generated from the programme leader to students who missed more than three sessions (per module). The emails were framed 'how can we help', rather than 'you have missed too many classes'.

Personal tutors and module leaders were encouraged to follow up non-attenders to determine what had prevented the students from participation.

## 3. Results

Attendance data is presented by both semester and year of study (with non-psychology courses excluded), see Fig 1. Summary results from our (four-year Scottish) degree students revealed non-attendance levels of 68%, 51.5%, 47.3% and 50.9% respectively for our 1st, 2nd, 3rd and 4th years.

A one-way ANOVA was performed to investigate attendance differences between modules. Parametric assumptions were not met for either Semester 1 or 2 data, therefore, Kruskal-Wallis was adopted. For Semester 1, significant differences were identified for attendance to the different modules (Chi-squared = 83.39,  $df = 12$ ,  $p < 0.0001$ ). Post-hocs are not fully discussed for brevity, however, the data formed two clusters with small group of modules with significantly better attendance, and another with significantly worse. Considering Semester 2, significant differences were also revealed (Chi-squared = 78.29,  $df = 11$ ,  $p < 0.0001$ ). Post-hocs revealed the data in three clusters although with rather clearer delineation between groups.



Subjective feedback from students may be categorised into positive and negative features. Indicative negative comments considered, staff forgetting to record data, lost ID cards and denial of absence. Positives may be summarised as, acknowledgement of behaviour, explanations/rationalisations (e.g., frequent illness) and thanks and plans to re-engage.

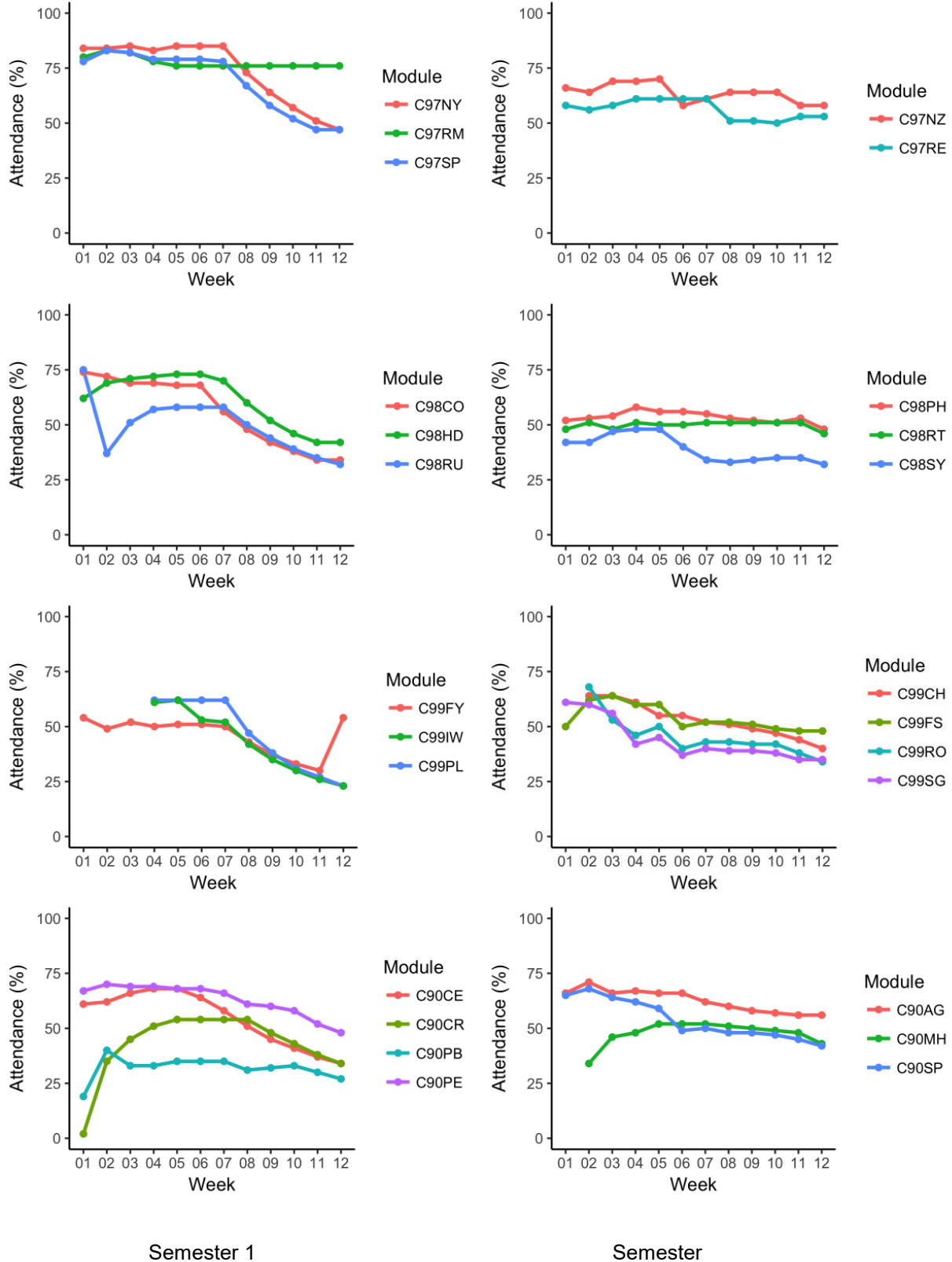


Fig 1. Attendance (C97 = Year 1, C98 = Year 2, C99 = Year 3, C90 = Year 4).



#### 4. Discussion

Adoption of an attendance monitoring system requires careful consideration. Potential benefits identified in this project include, i) accurate, consistent data collection, ii) reduced staff workload, iii) enriched data (facilitating staff to easily follow up and re-engage absentees), iv) ease of monitoring visa-dependent students (those with specific Government reporting requirements), v) the potential to enforce punitive measures (for example, failure to qualify for coursework marking or exam attendance; or disciplinary measures and potential programme dismissal). However, several negative features also emerged. For example, i) false negatives (when a student had attended but forgotten their ID card), ii) false positives (a student attends to scan their card, and then leaves the class), iii) data errors (scanning failures), iv) institutional considerations (students are allowed to change modules until week 3 of the semester, rendering data collection largely moot up to that point), v) adverse student reactions. Regarding this last point, the automatically generated emails for non-attenders provoked a range of student reactions. Some indicated they were grateful to receive a reminder or to have the opportunity to state valid non-attendance reasons (e.g., hospital attendance or jury service). Others negatively interpreted the emails as raising anxiety or stress. It should be stated that the project team were at pains to emphasise the system was introduced to support students struggling to attend; and no punitive steps were to be taken (outside of existing University regulations).

The System has limitations, as highlighted above. Recommendations to address some of these are as follows. The project team are considering class-specific codes instead of ID card barcode scanners. These would be released during classes to allow for students to enter the codes online. Such a system would allow for forgotten ID cards. Any system will be 'gamed' by unscrupulous students. However, the effort required to do so is deemed sufficient to minimise such behaviour. While the system is relatively novel for the students, automated emails are rather bland and generic. It is considered that there is substantial research scope to identify the best balance of specificity (with respect to modules), frequency, and tone to best promote positive behaviour change. The project team will be exploring these options to refine our system.

#### 5. Conclusions

This paper reports on the introduction of an attendance monitoring system for psychology students at Heriot-Watt University. The project achieved its first aim to develop and test the system as functioning. The second aim of the project was to utilise the data collected to enrich student outcomes and experience. To date, it's too early to report on changes in outcomes. However, the system has facilitated a richer and more detailed picture of the breadth of the issue; and enabled staff to constructively engage with a substantive proportion of the 'disengaged' students, drawing them back to classes and/or support systems.

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