

Improving teaching and learning outcomes through a faculty-based data analytics framework

Faculty of Economic and Management Sciences (EMS)

University of the Free State (UFS)



Corlia Janse van Vuuren - July 2016

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Abstract

The cumulative move towards the use of data analytics in Higher Education creates the opportunity for evidence-based decisions to transform current teaching and learning (TL) practices. Inspired by Chatti et al. (2011) who emphasised the value of data analytics in stimulating academics to reflect on their current teaching practices, an adapted data analytics framework was developed for the Faculty of Economic and Management Sciences at the University of the Free State. This adapted framework added “*teaching analytics*” as a third dimension to the traditional two-dimensional data analytics models (i.e. academic and learning analytics) and also provided for more qualitative data sources within the dimensions of TL analytics. This provided an extended range of data to reflect upon.

Evaluation after implementation of the adapted framework revealed an increased level engagement with the TL data, which facilitated formal and informal discussions in the faculty. This engagement further enabled a higher level of self-reflection in academics which contributed to unexpected scholarly engagement with TL literature, innovative classroom interventions, increased participation in TL awards opportunities and an improved drive towards research and publication in TL. The positive effects were further extended in the faculty by an increase in undergraduate student success rates.

The implementation of the adapted data analytics framework served as a valuable launching pad for improving TL outcomes in the faculty. The challenge remains however to address preconceived ideas about TL in disciplinary environments within the faculty and motivate more staff to be continuously involved in formal TL activities.

Background

Student success and high quality teaching and learning (TL) practices are main focus areas of Higher Education worldwide. In this strive for enhanced quality and associated improved student success, Norris and Baer (2013:5) have described data analytics as “critical” in achieving this aim.

The application of data analytics in Higher Education has been rapidly evolving since its introduction into this environment in the early 2000's. Initially data mining within the educational context was pedagogy neutral (Ferguson 2012:309) as it focused on student data captured on institutional, computerised systems such as demographic data (including financial data), academic data (i.e. ability, performance, history), engagement data (i.e. participation, academic effort) as well as institutional data (i.e. course-specific history/data) (Campbell and Oblinger 2007:4). The aim of these data mining initiatives was mainly to assess student progress, predict student success and identify challenges with student learning (Johnson et al. 2011:28). However, since 2008 more pedagogically-orientated research was introduced presenting an additional pathway within the research field of data analytics (Ferguson 2012:309) and clearly linking it with the Scholarship of Teaching and Learning (SoTL).

Simultaneous with the increased use of data analytics in the higher education environment (also in South Africa) as well as the growing emphasis on the Scholarship of Teaching and Learning (SoTL), I made a career change into the challenging world of teaching and learning. In April 2013 I joined the Faculty of Economic and Management Sciences (EMS) at the UFS as the faculty's teaching and learning manager (TLM). *Improved student success and high quality teaching* were suddenly my main priorities (from being an academic in a small physiotherapy department ...). Quickly I found some comfort in the data analytics literature as it provided me with guidelines to start this mammoth task in the faculty. Using the existing literature on data analytics I started the process of developing an adapted faculty-based data analytics framework to guide Teaching & Learning (TL) in the faculty.



Development of a faculty-based data analytics framework

Data analytics are mostly divided into two distinct types namely learning and academic analytics. Learning analytics focuses on the learner, learning process and learning contexts, whilst academic analytics mostly focuses on data analysis at institutional level (Long & Siemens 2011:34). During the development of the

EMS data analytics framework, a third dimension, namely “teaching analytics” was added to the traditional two-dimensional data analytics models. This “teaching analytics” dimension emerged as a result of the factors identified by the CHE (2014:17-18) as influencing student success such as teaching, curriculum, assessment and learning resources. The inclusion of this new dimension was further inspired by Chatti et al. (2011) who emphasised the value of data analytics in stimulating academics to reflect on their current teaching practices. The framework also provided for more qualitative data sources within the dimensions of TL analytics, thus providing an extended range of data to reflect upon. Details on the final EMS data analytics framework are included in Table 1 below.

Table 1: Operational EMS data analytics framework details

	Focus	Data collection tools
Learning/Learner analytics	Learning material/resources, assessment, student support and student feedback (“student voice”).	CLASSE _{student} survey, module evaluation survey, student support surveys, student focus groups.
Teaching/Teacher analytics	Module (constructive) alignment, stakeholder involvement, graduate attributes, assessment and academic feedback (“academic voice”).	CLASSE _{lecturer} survey, academic survey for student support, stakeholder involvement survey, student employability survey and a structured academic interview.
Academic analytics	Pre-enrolment data, student demographic data, student performance data	Institutional database

The developed EMS data analytics framework was approved at the end of 2013 by Faculty Management for implementation as from 2014.



Implementation EMS data analytics framework

Data collection utilising the EMS data analytics framework commenced in 2014 on a three-year rolling cycle (i.e. data would be collected on all undergraduate modules in the faculty once every three years).

After starting the data collection process, I soon realised that compiling the framework was the easiest part of this process ... Self-reflection further made me acknowledge that I had limited knowledge and skills to analyse and act on this data – I was therefore a DRIP (data-rich-information-poor) individual in a faculty that expected me to bring some insights. I also realised that I had no network in the world of teaching and learning due to my recent career shift. As a miracle the TAU fellowship call came upon my path during this phase – promising me some solutions! I decided, that if accepted for the TAU programme, I would use the opportunity to gain some knowledge and skills from experts as well as start a network of colleagues who could support me on the way forward.



Evaluation of the EMS data analytics framework

As a starting point to my development on the TAU programme, I identified the evaluation of the implementation of the EMS data analytics framework as my specific research project. As I was unfamiliar with programme evaluation (as a research design), and therefore had to do an intensive literature review, but also attended the research-orientated sessions during the TAU programme to gain more insight. This was well supplemented by the continuous support and guidance from my mentor as well as informal engagement with colleagues on the TAU programme (which also allowed me to start the process of building a support network within the field of TL).

The programme evaluation aimed at describing the outcomes achieved in relation to TL after implementation of the EMS data analytics framework. Both quantitative and qualitative data sources are included in the results to define both the intended and unintentional outcomes. Note that specific module and departmental data are not included here as it did not form part of the total programme evaluation (and this TAU project).

The intentional results mainly focused on the student success rate in undergraduate EMS modules, as it was the problem originally identified to be addressed by the framework. Figure 1 illustrates the progressive improvement in undergraduate student success in EMS over the past three years. These improvements can however not be directly linked to the implementation of the EMS data analytics framework as some other

changes were also made during the re-circulation process and implemented in EMS in 2012. These changes included, amongst others:

- Restructuring and decreasing of the number of BCom specialisation fields offered at the UFS.
- Limitation of elective modules in programmes.
- Restructuring of foundational modules to be more discipline-specific.

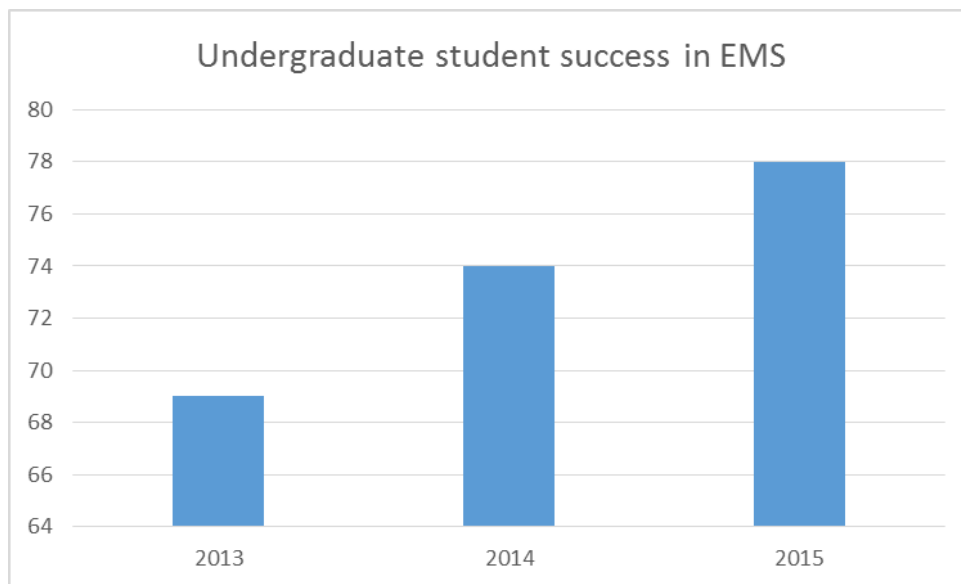


Figure 1: Undergraduate student success in EMS

However, more interesting were the unintentional results obtained from the implementation of the EMS faculty-specific data analytics framework. The implementation of the framework facilitated an increased level engagement with TL data on an individual, but also departmental level. This engagement further enabled a higher level of self-reflection in academics which contributed to unexpected scholarly engagement with TL literature, innovative classroom interventions and improved assessment practices.

This was firstly reflected in an increase in individual consultations with academic staff in the faculty with regard to their module-specific data and/or with regard to TL evidence-based best practices. Secondly, this increased engagement within TL further resulted in greater participation in TL awards opportunities as a “stepping stone” towards more formal research and possible publication in the field of TL. As a result, the number of entries for faculty-specific TL awards increased from two in 2013 to ten in 2016, with staff from EMS winning five institutional TL awards in 2015. This consequently provided the opportunity for the establishment of a SoTL interest group in the faculty in 2016 to support this new interest towards research (and publication) in TL.

These unintentional results from the implementation of the EMS data analytics framework, as revealed during my programme evaluation (and TAU project), made me realise that TAU afforded me the opportunity to become a change agent in my faculty. Due to my involvement in TAU and my resultant personal development in the field of the SoTL, I could identify and react to these developments in the faculty (e.g. establishing a SoTL interest group). TAU furthermore gave me the knowledge and skills to act with more confidence within the field of TL, and I also knew that I was part of an excellent TL network, should more assistance be needed.



The way forward

An in-depth data analysis on module and departmental level, the refinement of the EMS data analytics framework as well as the further development of the SoTL in the faculty will follow-on from this programme evaluation. The challenge remains to provide more specific details regarding the influence of various factors on student success within the faculty as well as to plan, implement and evaluate appropriate interventions to address it. And even though the framework served as the basis from which academic reflection, TL quality enhancement and SoTL were launched, a second challenge remain to involve more academics in these activities on a continuous basis and address preconceived ideas about TL in disciplinary environments within the faculty. The implementation of this framework however served as a valuable launching pad for improving TL outcomes in the faculty.

TAU surely had a significant and direct impact on me as an individual (through the knowledge and skills gained within the field of TL, but more specifically data analytics), but also indirectly on the faculty I am involved in (through the development of the SoTL initiatives as an outcome of my TAU project). TAU gave me the opportunity to explore and learn within the field of TL and connected me with the right people to support me in this endeavor.

This experience has now also given me the confidence to attempt to share my newly gained TL knowledge both nationally and internationally – as I believe it can be very valuable for faculty developers as well as teaching and learning coordinators in a range of contexts.

