

## Effective and innovative use of data to enhance student learning

### Report to SHEEC - May 2016

The purpose of this report is to highlight opportunities for SHEEC to develop its strategic role in terms of using data to manage the enhancement-led approach.

Members asked to consider the value and feasibility of the following opportunities:

- commissioning a review of the sector's readiness for Learning Analytics, similar to the exercise commissioned in Australia, along with a roadmap to sectoral transformation
- championing existing work, such as Jisc's Effective Learning Analytics project and the Erasmus+-funded Supporting Higher Education to Integrate Learning Analytics project, both within institutions and as a sector
- making greater use of existing quantitative data, such as the national statistics published by the Scottish Funding Council (SFC), in terms of informing decision-making and evidencing impact.

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19 May 2016

## 1 Introduction and background

1.1 At the SHEEC meeting that took place on 20 February 2015 the topic of Learning Analytics was highlighted as an area of potential interest. In subsequent discussion at the meeting on 28 May 2015, SHEEC members agreed that the scope of the project should be broadened to encompass institutional data more generally. More recent developments, such as those leading to the publication of the UK Government's White Paper Higher Education: Success as a Knowledge Economy, have further fuelled debate around the relationship between data and quality.

1.2 Work on this project has comprised of three threads:

- familiarisation with Learning Analytics and related fields
- collation of examples of current practice within the sector
- consultation with experts within the sector.

1.3 The second of these threads has resulted in the publication of an ELIR Thematic Report, which is available on the QAA website.<sup>1</sup> The latter of these threads led to a collaboration with the University of Edinburgh, resulting in an event on 2 May 2016. This took place following the Learning Analytics and Knowledge (LAK16) conference, and provided SHEEC members with the opportunity to benefit from current expertise in the field.

1.4 The purpose of this report is to highlight opportunities for SHEEC to develop its strategic role in terms of using data to manage the enhancement-led approach. The report begins by introducing types of data use within higher education institutions (HEIs), and related fields of research, before touching upon current debates around the ethics of such data use. The report then goes on to examine how institutions use their own data, as well as national data, to enhance learning and teaching. Wider initiatives, such as Jisc's Effective Learning Analytics project and the Erasmus+-funded Supporting Higher Education to Integrate Learning Analytics (SHEILA) project, are highlighted as existing areas of work with which SHEEC might promote institutional and sectoral engagement.

1.5 QAA Scotland would like to thank the following individuals for their support with this project:

- Kirsty Campbell, Robert Gordon University
- Professor Frank Coton, University of Glasgow
- Professor Dragan Gašević, University of Edinburgh
- Martin Hawksey, Association of Learning Technologists
- Sheila MacNeill, Glasgow Caledonian University
- Dr Randy Swing, former Director of the Association for Institutional Research
- Dr Ruth Wilson, Robert Gordon University.

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<sup>1</sup> *Thematic Report on Enhancement-led Institutional Review (ELIR) Reports: Use of Institutional Data*, available at: [www.qaa.ac.uk/publications/information-and-guidance/publication?PubID=3084](http://www.qaa.ac.uk/publications/information-and-guidance/publication?PubID=3084).

## 2 Types of data use and related academic fields

2.1 The below definitions have been synthesised from existing literature.

- **Educational Data Management (EDM)** - driven by the increasing availability of 'big data', EDM addresses the technical challenges associated with managing these data, but has also historically maintained a learning and teaching focus (particularly in terms of how patterns of learning can be identified).
- **Learning Analytics (LA)** - builds on EDM, as well as business intelligence, web analytics and related fields. The Society for Learning Analytics Research (SoLAR) defines LA as 'the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs'. Data may include: demographic information about the learner; a learner's 'digital footprint' (for example, evidence of participation in a VLE); and 'learner artefacts' (for example, materials submitted for assessment, VLE forum posts etc.). There is a greater emphasis on how such data can be used for decision-making purposes than there is in EDM. While LA usually does not draw directly on business intelligence (see **Institutional Research** below), insights gained through LA can inform resource decisions.
- **Academic Analytics (AA)** - considers the implications of LA in the context of educational policy. Whereas LA leans towards the use of data in 'real time' to enhance learning, AA looks at how big data can be used in the longer term and on a larger scale (institutional or even national). Stakeholder engagement becomes critical at this level, since broader contextual insights are required in order to fully understand signals emerging from data.
- **Institutional Research (IR)** - a professional field that has a long history in the USA, and which is becoming established in the UK. As with LA and AA, there is a strong emphasis on supporting decision-making. However, IR draws more heavily on business intelligence than the previous fields.

2.2 As these are emerging academic and professional fields, it should be understood that their definitions are still contested: for example, Hutchings, Kinzie and Kuh (2014) describe LA as '...concerned with large-scale patterns of course-taking, student demographics, and other variables that can seem distinctly distant from the substance of learning' (p. 39), and appear to use LA and AA interchangeably. There are also areas of overlap. For more detail and context, Ferguson (2012) and Bienkowski et al (2012) are recommended reading.

2.3 Emergent technology has the potential to equip students with information they can use to enhance their own learning; it can also provide advisory staff with live information on which they can intervene if any students appear to need additional support. In a student body that is growing and diversifying, scalable solutions to a demand for a personalised learning experience are potentially very valuable. Developments in data visualisation are also a driving factor.

2.4 Using data to inform the enhancement of learning and teaching is, of course, not a new phenomenon; rather, these fields have emerged in response to the increasing potential offered by big data and the technology available to manage it. For all of these fields, active academic research is taking place alongside practical application. For the majority of IT vendors working in these areas, higher and further education institutions are key partners in the research and development of the packages they provide. As research is having to keep up with IT development cycles, these fields are fast-paced; important developments have taken place even since the commencement of this project. However, it is critical that analytics are driven by learning theory rather than technology, and consider the data that are needed, rather than just the data that are available.

2.5 Rather than an initiative in its own right, LA can be viewed as a 'power tool' to help evaluate those initiatives already in place (Milliron, 2016). LA can also inform neuroscientific and psychological research, leading to long-term enhancement by improving our understanding of how we learn, including the point at which technology stops becoming useful to the learner (Siemens, 2016).

2.6 A significant issue is that of the shortcomings of data. While data exist in all institutions, the quality of these data vary, as do the infrastructure and culture required to make the most of the rapidly developing possibilities. There are debates concerning the level at which analysis is most effective (institution, course or individual); the resources required in order to ensure that data are of a reliable quality for analysis; and the judgement required in order to act on that analysis. There is a related concern about organisational capacity for conducting meaningful analysis of big data. While (as indicated by the Teaching Excellence Framework) institutions are increasingly expected to use data to evidence excellence, the resources available to conduct analysis are likely to reduce. On a larger scale, McKinsey has predicted that a skills shortage is likely in the next few years, both in terms of conducting deep analyses of big data and making decisions based on those analyses (Manyika, et al., 2011). Sharing of expertise, creativity and good practice is likely to become increasingly important in order to build capacity, but the effort may also yield its own rewards in terms of greater consistency of data reporting, which in turn would allow for more meaningful analysis at the sectoral level.

2.7 The culture of collaboration fostered by the enhancement-led approach puts the Scottish sector in a reasonably good position in terms of sharing and capacity-building. The field of AA, in particular, has the potential to help evidence the impact of the enhancement-led approach. This is perhaps worth consideration during the coming year of active reflection.

### 3 Ethical implications

3.1 The biggest debate around the use of data is that of ethics. One of the recommendations arising from Ferguson's work was that a set of clear guidelines be developed in order to ensure that learner data are managed and used responsibly. In particular, it is worth highlighting two pieces of work in this area: Slade and Prinsloo (2013) and Sclater (2014). Sclater, working on behalf of Jisc, conducted a review of 86 publications related to ethical concerns surrounding LA, from which he identified and categorised 93 individual questions and issues. The resulting code of practice has been adopted by institutions - and the National Union of Students - as a basis for their own codes of practice.

3.2 A major theme emerging from the Jisc code of practice is that there is a particular concern surrounding the ownership and control of data. It is worth noting in particular the second ethical principle recommended by Slade and Prinsloo: 'In stark contrast to seeing students as producers and sources of data, learning analytics should engage students as collaborators and not as mere recipients of interventions and services' (2013, p. 12). Students are of course considered partners in the context of our enhancement-led approach, meaning that, again, we are well placed as a sector to lead in this area.

3.3 The issue of privacy is often conflated with that of ethics and, while there is overlap, work has been conducted specifically on privacy that will be of interest. Hendrik Drachsler and Wolfgang Greller's DELICATE checklist, which was launched at LAK16, provides a useful and positive approach to legal and ethical considerations.<sup>2</sup>

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<sup>2</sup> 'DELICATE checklist 4 privacy released at LAK16', accessed 20 July 2016, available at: [www.laceproject.eu/blog/lace-released-the-delicate-checklist-at-lak16](http://www.laceproject.eu/blog/lace-released-the-delicate-checklist-at-lak16).

3.4 A wider issue is that the value of data (in terms of what an individual might reasonably expect in return), and the social norms that underpin its ethical use, are still developing (Siemens, 2016).

3.5 It is important to recognise that there are also ethical implications associated with inaction. Within an enhancement-led context this is true not only in terms of the learning experience (for example, 'sitting on' data that might empower individual students) but also in terms of the design of the curriculum, and institutional systems and processes.

## 4 Institutional use of internal data

4.1 The below examples of positive practice are taken from ELIR reports, and are also included in the aforementioned ELIR Thematic Report.

### Developments in institutional data management

4.2 The current ELIR cycle has seen many of our institutions investing in the technological infrastructure needed to manage data related to students. Examples include:

- the University of Aberdeen's OneSource, which will also replace other institutional systems (for example, HR, payroll and pensions)
- the University of Edinburgh's PATH system, which draws on a database of academic programmes in order to assist students in choosing their curriculum
- Edinburgh Napier University's development of dashboards and investment in staff training related to its information infrastructure
- the implementation of Glasgow Caledonian University's Integrated Student Information System and the University of Glasgow's MyCampus
- planned improvements at Queen Margaret University
- the planned 'harmonisation of student data into a single management information system' at Scotland's Rural College
- the University of Stirling's Student Engagement Programme, proposed Enhanced Student Record, and Single Source of Course Information
- a number of projects being progressed at the University of Strathclyde (for example, the Corporate Management Information Project, the new Student Information and Management System, and a system allowing for real-time analysis of staff performance)
- the introduction of dashboards for the University of the West of Scotland's Performance Management Information System, which allow staff to analyse and take ownership of data, leading to insights that can support and inform practical development.

4.3 ELIR 2 reports contain similar information regarding the new Business Information System and Course Information Database at the Robert Gordon University, and a Data Improvement Project at the University of the Highlands and Islands, which ran between 2007 and 2010. Some comparable initiatives are linked less explicitly to technology, such as the University of Edinburgh's Business Intelligence/Management Information improvement scheme, including a Student Systems Road Map project aimed at making a range of data more accessible. Improvements in management information at Glasgow School of Art have meant that data can more readily be supplied for programme review.

### Use of data in initiatives concerned with retention, progression and completion

4.4 The University of Aberdeen analyses data about full-time non-continuing students on an annual basis. At Edinburgh Napier, the Retention Steering Group monitors data on

student progression and achievement. Heriot-Watt University has made retention a priority area for the attention of its Learning and Teaching Board, a decision based on institutional data. The University of the Highlands and Islands has appointed three School Enhancement Developers in its Faculty of Science and Technology; data are being used both to evidence the impact of this initiative and to justify its extension into other faculties.

### **Use of data in initiatives concerned with widening participation and articulation**

4.5 The use of data to support widening participation initiatives is highlighted in several ELIR 3 reports, including: the University of Edinburgh, where contextual data have been used in admissions since 2004; Edinburgh Napier University, where there is a particular focus on retention; Glasgow Caledonian University, where data have provided insights about the numbers of hours of paid employment undertaken by its most disadvantaged students in addition to their studies; the University of Glasgow, whose contextualised admissions model has been praised by the SFC, and where the MyCampus system is used to identify disadvantaged students who may need additional support; the Royal Conservatoire of Scotland, where data regarding disadvantaged students were benchmarked against comparable institutions; and the University of Strathclyde where contextualised admissions were introduced in session 2013-14.

4.6 Several institutions are using data as a key element in projects concerned with articulation. Edinburgh Napier is a member of the Edinburgh, Lothian, Fife and Borders Regional Articulation Hub (ELRAH), which manages an articulation database that has improved statistical reporting on students taking this route through further and higher education. At Glasgow Caledonian University data are closely monitored to evidence the efficacy of routes into degrees from Higher National Certificate and Diploma programmes. The Robert Gordon University's ELIR 2 report draws attention to the use of course-specific data in the monitoring and evaluation of its articulating programmes.

### **Use of data in initiatives concerned with equality and diversity**

4.7 Data relating to Equality and Diversity are considered at the highest levels of some institutions. The University of Aberdeen's Senate examines institutional data relating to equality and diversity on an annual basis in order to monitor progress towards institutional goals in this area. At the Robert Gordon University data are considered on a similar basis by the Board of Governors. The Queen Margaret University has an Equality Action Plan that is informed by annually-updated data relating to every stage of the student experience from application to award (including appeals and complaints). In terms of a specific equality and diversity constituency the University of Dundee's Disability Services use data to ensure that their resources are allocated according to student need.

### **Use of data in initiatives concerned with monitoring, review and evaluation**

4.8 Across the sector, ELIR reports indicate that data are being used effectively within the context of the monitoring, review and evaluation of academic programmes. Detailed student cohort analysis is built explicitly into processes at the Glasgow School of Art, Heriot-Watt University, the University of St Andrews, the Robert Gordon University, and the University of the Highlands and Islands.

4.9 At the time of its ELIR, the University of St Andrews was piloting a fact sheet, based on what was described in the report as 'a comprehensive set of metrics', for use in internal review processes; at the University of Edinburgh, report templates for programme monitoring are pre-populated with data on student performance.

4.10 This use of data allows for fine-grained quantitative material to be considered alongside qualitative information, such as student feedback. At the University of Abertay, there is specific recognition that completion rates for student questionnaires are an area for development; at the time of its ELIR 2 review it was planning to introduce an online system for the collection and analysis of these data. The University of Edinburgh and the University of Glasgow are rolling out similar online feedback systems. Heriot-Watt University's method of collecting student feedback enables feedback from those studying with collaborative partners and alternative providers to be disaggregated.

4.11 There is also an understanding that these processes themselves generate valuable data, providing a picture of how academic programmes develop over time and allowing for comparative and/or historical analysis. Programme monitoring data can be used to enhance the review processes themselves, for example at Edinburgh Napier University this understanding has led to more explicit incorporation of student feedback into module review.

### **Student-led initiatives**

4.12 The University of Strathclyde Students' Association produced a 'Best Practice Report' based on analysis of data from their Teaching Excellence Awards, a project praised by the ELIR panel as imaginative and valuable.

4.13 In addition to the above examples of good practice, the current Enhancement Theme is also highlighting institutional initiatives that make effective use of data. Such work is often driven by units with specific responsibility for the development of learning and teaching, such as DELTA at the Robert Gordon University, whose staff have developed a data-led method for identifying areas which may need attention.

## **5 Institutional use of national data**

5.1 It is clear from ELIR reports that, across the sector, data are being used effectively to assist in institutional planning and decision-making. Datasets such as the Key Information Set, which draws heavily on the National Student Survey (NSS) and Destination of Leavers of Higher Education (DLHE) survey, and is published on the Unistats website, are usually disseminated internally. Decision-making processes vary between institutions, but are being enhanced by the technological developments described above, which are helping institutions to identify where better quality data (and/or staff development) are needed.

5.2 Data are also used extensively in benchmarking exercises. UK-wide surveys such as the NSS, Postgraduate Taught Experience Survey, Postgraduate Research Experience Survey, and International Student Barometer are commonly used as benchmarking tools; in some instances, institutions augment these surveys with their own (for example, Heriot-Watt University conducts a survey similar to DLHE in order to track the journeys of those students who have graduated from their international campuses). Development of formal Key Performance Indicator (KPI) sets at the Royal Conservatoire of Scotland and the University of the Highlands and Islands were identified in ELIR reports as positive developments; in the case of the University of the Highlands and Islands, the production of KPIs has been a direct result of the institutional Data Improvement Project, and an enabling factor in other projects such as the Retention and Continuation Project. At Glasgow Caledonian University, programme teams are required to reflect on KPIs as part of routine programme monitoring. Heriot-Watt University uses centrally-produced KPIs to monitor its students' learning experience, benchmarking against Scottish and UK HEIs. At present, this is limited to the UK undergraduate experience, but there are plans to broaden the scope to other student groups. Heriot-Watt University also uses data from the Higher Education Statistics Agency (HESA) and the SFC for benchmarking. At the University of Edinburgh, close attention is paid to ensuring that staff are aware of survey results, as

well as the institutional expertise that is available in terms of interpreting and acting on those results.

5.3 The SFC produces institutional profiles, which draw on data returned to HESA and are linked to outcome agreement as well as SFC's national aspirations. These profiles include the proportions of students from different backgrounds and with protected characteristics, along with figures relating to articulation, retention, learner journeys and leaver destinations, and enable comparison across five years. In addition, the SFC publishes Higher Education Students and Qualifiers at Scottish Institutions, designated by the UK Statistics Agency as National Statistics. This publication outlines key trends over a ten-year period, with an Excel workbook containing the detail available on the SFC website.<sup>3</sup> It is important to recognise that these data have value in terms of both institutional planning and LA.

## 6 Wider initiatives

6.1 The development of the National Articulation Database is one way in which institutions are already working together to address particular issues. This has involved Articulation Hubs (such as the aforementioned ELRAH) across the sector reaching a shared understanding of definitions and methodology related to articulation. This process in itself was complex, and has arguably resulted in more robust data within institutions, as well as producing granular information that have the potential to inform regional planning discussions. Likewise, the SFC/Open University Back on Course project is an example of institutions coming to a shared understanding of data definitions, and their subsequent use, for the benefit of the student and their learner journey. Such initiatives also allow KPIs to be considered in conjunction with college partners by bringing together key academic and support staff.

6.2 Jisc are running a project, Effective Learning Analytics, working with over 50 higher and further education institutions to co-design an LA solution, which is due for delivery in September 2017.<sup>4</sup> As part of the discovery phase of this project, Jisc partnered with a number of commercial VLE providers, including Blackboard, to undertake institutional LA readiness projects. Institutional readiness was assessed according to four categories (culture, processes, people and technology), with the institution assigned one of three degrees of readiness for each category. Glasgow Caledonian University was one of the institutions that participated in this phase of the project, and the resultant report is available on the institution's own website.

6.3 An alternative, but similar, model can be found in the ECAR Analytics Maturity Index for Higher Education, now part of the EDUCAUSE Benchmarking Service.

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<sup>3</sup> Higher Education Students and Qualifiers at Scottish Institutions 2013-14, accessed 20 July 2016, available at: [www.sfc.ac.uk/communications/Statisticalpublications/2015/SFCST042015.aspx](http://www.sfc.ac.uk/communications/Statisticalpublications/2015/SFCST042015.aspx).

<sup>4</sup> Jisc Effective Learning Analytics, accessed 20 July 2016, available at: [www.jisc.ac.uk/rd/projects/effective-learning-analytics](http://www.jisc.ac.uk/rd/projects/effective-learning-analytics). Additionally, those interested in this project are encouraged to join the Jisc Learning Analytics Network email list.

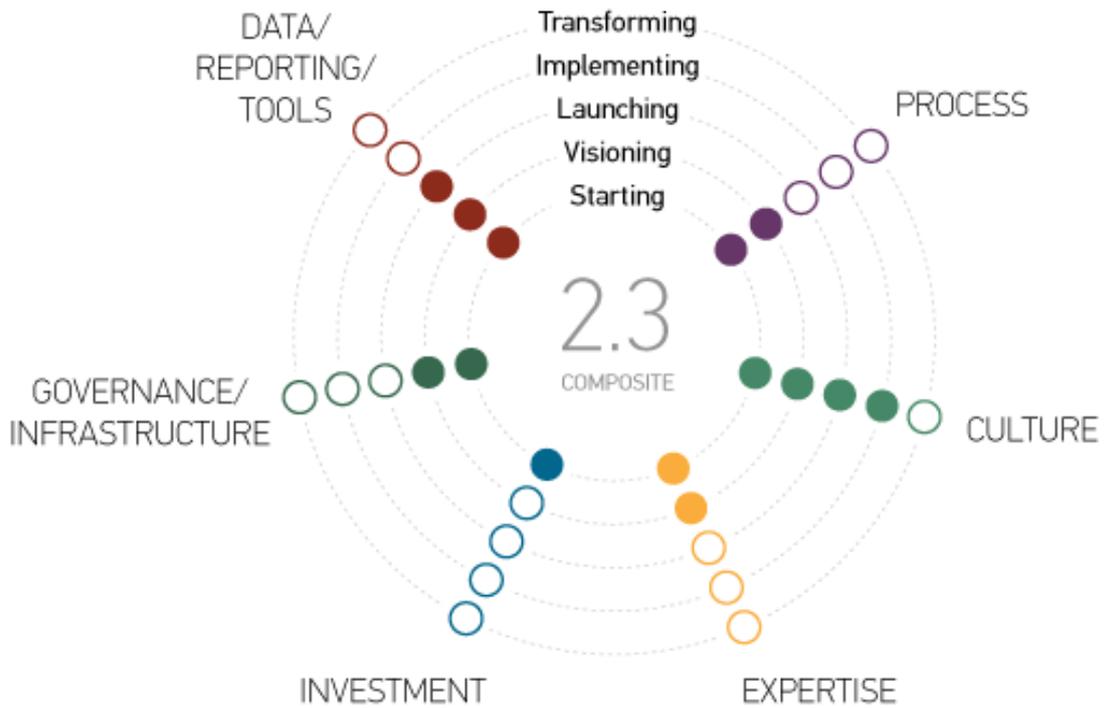


Figure 1: ECAR Analytics Maturity Index for Higher Education

6.4 The University of Edinburgh has been working in partnership with four HEIs across Europe on an Erasmus+-supported project entitled Supporting Higher Education to Integrate Learning Analytics (SHEILA). Using participatory action research and the Rapid Outcome Mapping Approach, this project aims to build a policy development framework for HEIs. The team at Edinburgh will be seeking to consult with Scottish HEIs over the coming summer as part of its research, and will at a later stage be looking for institutions to pilot the framework.<sup>5</sup>

<sup>5</sup> Supporting Higher Education to Integrate Learning Analytics (SHEILA), accessed 20 July 2016, available at: [www.de.ed.ac.uk/project/supporting-higher-education-integrate-learning-analytics-sheila](http://www.de.ed.ac.uk/project/supporting-higher-education-integrate-learning-analytics-sheila).

## 7 Conclusions

7.1 Scotland is well placed to lead in the field of LA: in the most generalised sense, LA is all about enhancement. As noted above, students are valued as partners in the enhancement-led approach - a principle that should, ideally, translate to viewing students as co-owners of their data, offering a sound ethical footing on which to build. The culture of collaboration fostered by the enhancement-led approach, meanwhile, may provide the basis for shared resources and expertise at a time when these are less than abundant, and this sharing may in turn lead to greater consistency in terms of how data are reported, meaning that it can be more readily scaled up in order to identify sectoral trends. We are also able to capitalise on the world-leading research in the field being undertaken at the University of Edinburgh.

7.2 A consistent message being received from experts in the field of LA in particular is that, in order to make the most of what can be offered by these technological advances, two things must be developed. The first is an understanding of what is possible using institutional data and analytical software. This includes understanding the subjectivity of data, the limitations of the technology, and the most appropriate actions to take based on what is presented. The second thing that requires development is strategic capability, at both institutional and sectoral level. These two areas for development are of course linked: the level of data literacy needed is likely to require a commitment to staff development across an institution, as well as consideration of where deeper expertise should sit within the institutional structure: for example, a learning and teaching development unit is likely to be more appropriate than an IT or planning office.

7.3 In terms of leading the sector as a whole, it would be worth considering whether there would be value in an assessment of sectoral readiness. An exercise of this nature was commissioned by the Australian Office of Learning and Teaching and conducted by the SoLAR, and concluded in 2015. The Learning Analytics Sophistication Model shown in Figure 2, also referenced by George Siemens in his presentation to SHEEC on 2 May 2016, illustrates a pathway to sector transformation. Planned research as part of the SHEILA project may give some indication of the state of the sector; SHEEC has the opportunity to lead by championing institutional participation in the project.

7.4 At the institutional level, it is critical that strategy leads technology, rather the other way around (Siemens, 2016). Institutional investment in data infrastructure (including staff development) at this stage is likely to lead to greater efficiency in future, but any technological approach needs to be appropriate for the institution - ideally, developed and tested by the vendor in partnership with the institution (Baker, 2016) to ensure that it is not just fully functional, but purposeful. Vendors report that data analysis works most effectively where an institution already has a clear data strategy in place, along with a culture of data-driven decision-making and a commitment to the ongoing evaluation and tuning of the systems being used (Milliron, 2016) (Shehata, 2016) (Whitmer, 2016). As described above, opportunities exist for institutions to assess their readiness for LA (Jisc, EDUCAUSE) and to develop policy in this area (SHEILA). Again, there is potential for SHEEC to demonstrate leadership in this area by encouraging participation in initiatives such as these.

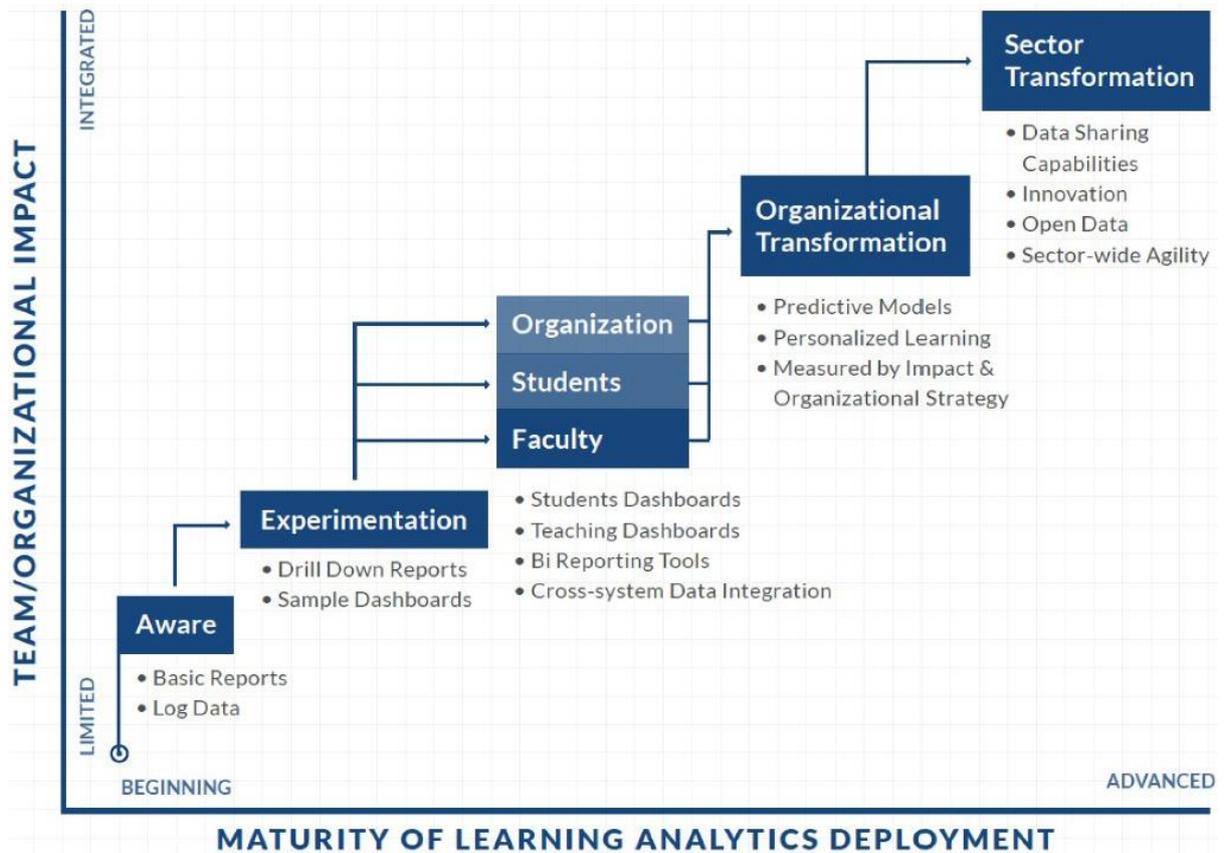


Figure 2: Siemens' Learning Analytics Sophistication Model

7.5 A final, and critical, consideration for SHEEC is whether more might be made of existing institutional and sectoral data to drive and inform enhancement. Numeric data produced by the SFC offers the possibility for longitudinal sectoral analysis, while the M5 Group recently formed by HESA, Jisc and QAA is likely to result in the availability of business intelligence that could be used to enhance learning and teaching.

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