A multi-level longitudinal analysis of 80,000 online learners: Affective-Behaviour-Cognition models of learning gains

Conference or Workshop Item

A multi-level longitudinal analysis of 80,000 online learners: Affective-Behaviour-Cognition models of learning gains

Jekaterina Rogaten, Bart Rienties, Denise Whitelock, Simon J. Cross and Allison Littlejohn.

Open University, UK

Summary

Short theoretical framework

Challenges that Higher Education sector is currently facing are in understanding what counts for an excellent educational outcome, how students' learning can be measured effectively, and how these measurements might be used to guide current investments and inform future developments (McGrath et al., 2015). One way of measuring the 'value' of education is by looking at students' learning gains, which can be defined as change in knowledge, skills and personal development across time (e.g., Andrews et al., 2011; Boyas et al., 2012). While there is a body of research using concept of learning gain to examine effectiveness of any particular teaching practice (e.g., Beck & Blumer, 2012; Cahill et al., 2014) there is lack of research that uses learning gains as a conceptual way of measuring 'value' of education. Although learning gains are intuitively easy to understand, modelling of learning gains is conceptually and methodologically challenging as there is lack of valid and reliable measures that could be applied systematically across higher education sector (McGrath et al., 2015). Furthermore, educational research has mainly looked at cognitive gain largely ignoring affective changes (attitude) (e.g., Rogaten et al., 2013; Tempelaar et al.,2012) and behaviour (Tempelaar et al., 2015a). The advancement in development of comprehensive framework and valid, reliable and scalable measures of learning gains will be useful for teachers, learners, higher education institutions and the sector as a whole in further improving and personalising higher education (e.g., Bowman, 2010; Pascarella et al., 2011).

Aims of the study and research questions

At the Open University UK, using principles of learning analytics, we are currently developing and testing an Affective-Behaviour-Cognition learning gains model using longitudinal approach. The main aim of the research is to examine whether learning gains occur on all three levels of Affective-Behaviour-Cognition model and whether any particular student or course characteristics can predict learning gains or lack of learning and dropout.

Methodology

80,000+ participants in this study were part-time distance learning undergraduate students. The data for each participant was retrieved from university database for academic years 2013/14 and 2014/15. Proxy for the affective learning gain was students' response to the end of the module satisfaction survey. Proxy for the behavioural learning gain was VLE engagement data. Proxy for the cognitive learning gain were students' grades. The data was analysed using multilevel modelling in MLwiN.

Results

In the preliminary analysis three separate 4-level models were estimated for each of the learning gains. Level 1 was 'topic of study', level 2 was 'year of study', level 3 was 'student' and level 4 was *a)* satisfaction with teaching, learning and assessment for the affective learning gain model, *b)* average number of visits and length of visits for the behaviour learning gain model, and *c)* tutor marked assessment and teacher marked assessment grades for cognitive learning gain model. The preliminary findings indicated that students with higher prior academic achievements attained the highest cognitive learning gains and that the cognitive gain is also predicted by previous educational qualifications together with the learning design employed by the module in question. Similarly, preliminary findings indicate that behavioural gains are relatively well predicted by VLE engagement, and assessment submissions in particular. However, the more complex affective learning gains seem to be relatively difficult to measure and predict based upon our initial secondary data.

Discussion and conclusion

In all, the results or preliminary analyses largely supported Affective-Behaviour-Cognition model of learning gains although some aspects of the model still need to be refined. Nevertheless, this study has three key methodological strengths. Firstly, this research goes beyond looking just at knowledge acquisition but also looks at changes in behaviour and affect that are important components of learning. As such, this study provides a more comprehensive view of students' learning gains. Secondly, having longitudinal data for each of the Affective-Behaviour-Cognition learning gains eliminates limitations associated with the cross-sectional research and allows development of a more robust predictive model. Finally, introduction of additional testing and assessment of learning gains across institutions can be costly. The approach used in this study for measuring learning gains is a practical and scalable solution. Most of the universities already collect data that can be used as proxies for measuring affective, behavioural and cognitive learning gains and this research presents a methodologically solid approach for utilising the existing data to understand learning. Further research will include triangulation of qualitative diary and discussion forum data with secondary data to further refine affective component of a model.

Abstract:

One of the challenges facing higher education is understanding what counts for an excellent educational outcome. Historically academic performance was a variable of choice for measuring 'excellence' in education, but more recently a concept of learning gain, which can be defined as change in knowledge, skills and personal development across time (e.g., Andrews et al., 2011; Boyas et al., 2012) gained momentum. Educational research also mainly looked at cognitive gain largely ignoring affective changes (attitude) and behaviour (Tempelaar et al., 2015a). Current research aims to address this gap by developing and testing an Affective-Behaviour-Cognition model of learning gains using longitudinal multilevel modelling. The learner-generated affective-behaviour-cognition data was retrieved from university database for 80,000+ undergraduate students who started their degree in autumn 2013/14. The preliminary multilevel modelling revealed that cognitive and behaviour learning gains are well explained by the hypothesised Affective-Behaviour-Cognition model, whereas the more complex affective learning gains model needs further refinement. The main strength of this research is that approach used is a practical and scalable solution that could be used by teachers, learners, higher education institutions and the sector as a whole in facilitating students' learning gains by further improving and personalising provision of higher education.

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