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Title Learning gain: from concept to measurement

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Background

Current trends in higher education policy emphasise quality and accountability, and have put forward a series of potential measures for exploring the quality of higher education provision. Amongst these measures, learning gain is one concept that has attracted significant attention internationally. This has prompted scholarly interest into the conceptual underpinnings of learning gain, as well as into the development of an associated measurement framework, to establish the extent to which a contextually-relevant framework is practical and scalable.

Paper Aim

The present paper puts forward a definition and associated conceptual framework for non-subject-specific learning gain, derived as part of a larger collaborative research project (LEGACY – Learning and Employability Gain Assessment Community), and accompanies it with a measurement framework, tested in a large-scale longitudinal survey.

The paper will therefore identify the conceptual dimensions of learning gain, as applicable to the English system, and will present the process of choosing measurement instruments to complement the theoretical framework. It will then report on achieved measurement characteristics of these instruments, focusing on validity, reliability, and the achieved underlying structure of the measurement scales.

Conceptual framework

We propose a definition of non-subject-specific learning gain as the change in abilities, skills, attitudes and competencies that students experience while in higher education. The comprehensive conceptual framework that we introduce focuses on dimensions of non-subject-specific learning, that are relevant to the English higher education system in particular, and does not include dimensions related to subject-specific content knowledge.

The framework rests on a set of interacting components and dimensions of skills, abilities, attitudes and competencies, structured as follows. The components range from the cognitive domain to the affective domain: the first component (cognitive) is focused on thinking and reasoning abilities; the second component (meta-cognitive) includes self-regulation, self-management, resilience, and learning-to-learn capabilities; the third component (affective) reflects emotional and social engagement with study subject; finally, the fourth component (socio-communicative) includes aspects of network belonging, and communication practices and skills. The three dimensions are construed as cross-cutting and as interacting with at least some of the above components. They are:

openness (focusing on epistemological beliefs), research (focusing on attitude to sharing ideas and research), and moral (including aspects such as moral reasoning).

Measurement model development

One of the aims of our research is to explore the extent to which non-subject specific learning gain may be measured at scale. Therefore, the comprehensiveness of the conceptual framework renders it too large for direct measurement. As a result, a choice has been made as to which aspects of the framework to include in a measurement model. This choice was based on qualitative interviews with higher education students (reported elsewhere), a close reading of the international evidence on attempts to capture learning gain, and also on the availability of measurement instruments that may be used at scale.

The measurement model derived from this choice process spans all four of the components, and two of the three dimensions, and employs twelve separate measurement instruments: some used with permission from other authors (e.g. deep learning, critical processing, grit); some adapted from existing instruments (e.g. epistemological beliefs, conceptions of writing, social and emotional engagement); others compiled from an existing item bank (reasoning ability); and others derived specifically for the purposes of this research (self-management, attitude to research).

Measurement model testing

To test the quality of the developed measurement model, we undertake reliability analyses of the individual measurement instruments, as well as a confirmatory factor analysis that empirically tests the hypothesised structure of the measured constructs against the collected survey data.

Sample for analysis

A survey of 11 higher education institution was conducted October 2016 to March 2017, reaching over 6,000 undergraduate and graduate students, in four main disciplinary areas (Business, Chemistry, English and Medicine). All measurement instruments mentioned above were implemented in an on-line survey, to which 4,805 students responded in full. The analyses reported in this paper are based on this complete-response data set.

Reliability results

A large majority of the measurement scales (10) displayed moderately-high to high reliability indices, indicating high internal consistency. Two of the scales (writing conceptions and epistemological beliefs) did not yield reliable results initially. In the former case, a reliable solution was achieved by separating the scale into two, one scale and one independent item (also see results of the confirmatory factor analysis below); in the latter, no solution was attainable, highlighting existing problems with measuring epistemological beliefs quickly and at scale, which we address later.

Measurement structure

All twelve measurement scales were subjected to a confirmatory factor analysis, testing their theorised structure against the collected data: first individually, and subsequently in a full measurement model. Individual analyses resulted in confirmed factor structures for a wide majority of the twelve measurement scales, with no or only minor modifications required in order to attain

good model fit. In particular, the reasoning ability scale was confirmed as a unidimensional scale, despite its reliance on different items types (e.g. verbal reasoning; letters and numbers-related reasoning). The two scales with low reliability previously did not initially yield good model fit results. For the writing conceptions scale, removing one item and treating it separately resulted in an improved and acceptable model fit. The epistemological beliefs scale did not, however, result in good model fit, in either unidimensional, or two-dimensional structures. As a result, it was omitted from the analysis of the full measurement model. This fully-saturated measurement model was then analysed in the same manner, retaining the model modifications from individual analyses, and resulted in an acceptable model fit, indicating that the overall conceptual and measurement framework matched the empirical data.

Conclusions

These results lend support to the conceptual framework introduced in this paper, and also to the accompanying measurement structure, with some limitations concerning one of the twelve instruments. We discuss the implications of this in relation to the feasibility of using such measurement at scale, as well as the need for planned further work, that connects the conceptual framework and the measurement model to other (subject-specific) higher education outcomes such as degree outcomes.