

Using Threshold Concepts Framework to impart disciplinary discourse: a case study from the technology-dominated field of geographical information systems (GIS)

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Surface learning approaches are noticed to be adopted by students in disciplines that are dominated by user-friendly technological tools (Srivastava 2013). The use of the Threshold Concepts Framework (TCF) can facilitate an opportunity to promote deep-level conceptual understanding in such disciplines. In the past few years, the TCF has become a popular learning framework because it draws on a number of theoretical perspectives both from different learning theories and the ways students learn across a diverse range of disciplines. The initial phase of research on learning using the TCF emphasised the identification of threshold concepts within disciplines. However, this emphasis has now shifted towards implementing the TCF in learning activities; and subsequently measuring the effectiveness of TCF in such settings. This paper presents a case study from an introductory course on GIS to showcase the implementation of the TCF.

Geographical information systems (GIS), also referred as geographical information science and technology (GIS&T), is an area which is broadly sub-divided into a technological component (mainly in the form of user-friendly software packages), a theoretical component that draws on principles from a wide range of disciplines, and an application component that is resided within numerous disciplines. A testing of the TCF within GIS therefore invites further attention across a range of technology-dependent disciplines.

The framework used in the case study demonstrates that the TCF within GIS can play a vital role in improving the conceptual understanding of new learners. The identification of threshold concepts within GIS has already been reported (Srivastava 2013). The next step implements threshold concepts in assessment-feedback regimes, and relating students' understanding with their performances in assessment tasks. Moreover, students overall learning can be quantified by measuring their level of learning of discrete concepts and the associated disciplinary discourse as evidenced by students in their assessment tasks given that TC understanding is likely to incorporate an enhanced and extended use of natural, symbolic, or artificial language which is characteristics of a discipline (Baillie *et al.* 2013; Srivastava 2013).

The case study presented in this paper utilises the TCF to design activities that engage students for learning (Srivastava and Tait 2012; Srivastava In press), and subsequently during the course these activities are formatively and summatively assessed. Additionally, the students are assessed through a variety of tasks where the TCF is implemented. For example, one assessment task included 421 online questions designed to cover key GIS concepts; these questions were attempted more than 2000 times during the semester by over 150 students. Such implementation provides an opportunity to measure the effectiveness of TCF for students' learning that can be evaluated by measuring the level of disciplinary discourse demonstrated by students. This paper presents the TCF as a mechanism to promote and systematically enhance disciplinary discourse, the ability to use discipline-specific language, in the geographical information sciences by evaluating students' understanding of specific TC's in GIS through analysis of students' final assessment task where students have to provide a professional report about the use of GIS to address a real-world issue.

References

- Baillie C, Bowden J, Meyer JF (2013) Threshold capabilities: threshold concepts and knowledge capability linked through variation theory. *Higher Education* **65**, 227-246. doi:10.1007/s10734-012-9540-5

Srivastava SK (2013) Threshold concepts in geographical information systems: a step towards conceptual understanding. *Journal of Geography in Higher Education* **37**, 367-384.
doi:10.1080/03098265.2013.775569

Srivastava SK (In press) Techniques for developing resources to understand geographic and projected coordinate systems. *Journal of Spatial Science*. doi:10.1080/14498596.2014.845538

Srivastava SK, Tait C (2012) An Activity-Based Learning Approach for Key Geographical Information Systems (GIS) Concepts. *Journal of Geography in Higher Education* **36**, 527-545.
doi:10.1080/03098265.2012.654468