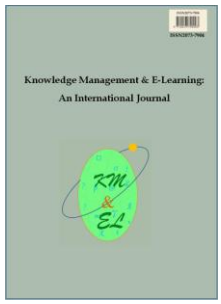
Knowledge Management & E-Learning



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Editorial: Novakian concept mapping in university and professional education

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Abstract: Novakian concept mapping has the potential to make a major impact in the development of higher education as universities strive to support students' generation of powerful knowledge. This can be achieved by increasing the accessibility of multiple perspectives on knowledge that reveal and exploit the epistemic chaos that lies beneath a veneer of curriculum coherence. This veneer has only served to restrict the impact of university teaching so that institutions have typically acted as centres of non-learning. Papers in this special issue will support the development of the application of concept mapping into an era of knowledge transformation, where concept maps can help to challenge redundant non-learning discourses.

Keywords: Concept mapping; Joe Novak; Meaningful learning; Knowledge structures; Visualising learning; Powerful knowledge; Non-learning

Biographical notes: Professor Ian Kinchin is Head of the Department of Higher Education at the University of Surrey. Previously he was at King's Learning Institute (King's College London) where he was involved in the professional development of academic staff, whilst undertaking research into university pedagogy. Ian holds a BSc and MPhil in zoology from the University of London and a PhD in science education from the University of Surrey. His current research interests are focused on the development of the concept of the 'expert student' through the application of concept mapping, as part of an authentic pedagogy for Higher Education. Ian has published research in the fields of zoology, science education and academic faculty development. Ian is the editor of the Journal of Biological Education and an advisory committee member for the series of International Concept Mapping Conferences. He is a Fellow of the Society of Biology; a Senior Fellow of the Higher Education Academy, and is a member of the Governing Council of the Society for Research into Higher Education.

1. Introduction

Concept mapping as developed by Novak (2010) is a powerful graphical technique that can support the development of student understanding through meaningful learning. Whilst it is often claimed that universities aim to generate understanding that can be useful beyond the immediate context in which it is learned (Maton, 2013), it is clear that in practice universities often fail to achieve this. Much of the learning that is achieved can be described as fragmented or segmented in nature (Maton, 2014), promoted by cycles of non-learning (Kinchin, Lygo-Baker, & Hay, 2008) in which facts are acquired by

students without any change in their overall understanding. This failure in learning can be concealed by a veneer of coherence which masks the underlying 'epistemic chaos' within the curriculum (Brady, 2014). This view of the traditional university as a centre of non-learning (Kinchin, Lygo-Baker, & Hay, 2008) is the antithesis of the emerging concept of 'powerful knowledge', which aims to '*free those who have access to it and enable them to envisage alternative and new possibilities'* (Young & Muller, 2013, p. 245). This perspective is summarised as a concept map in Fig. 1.

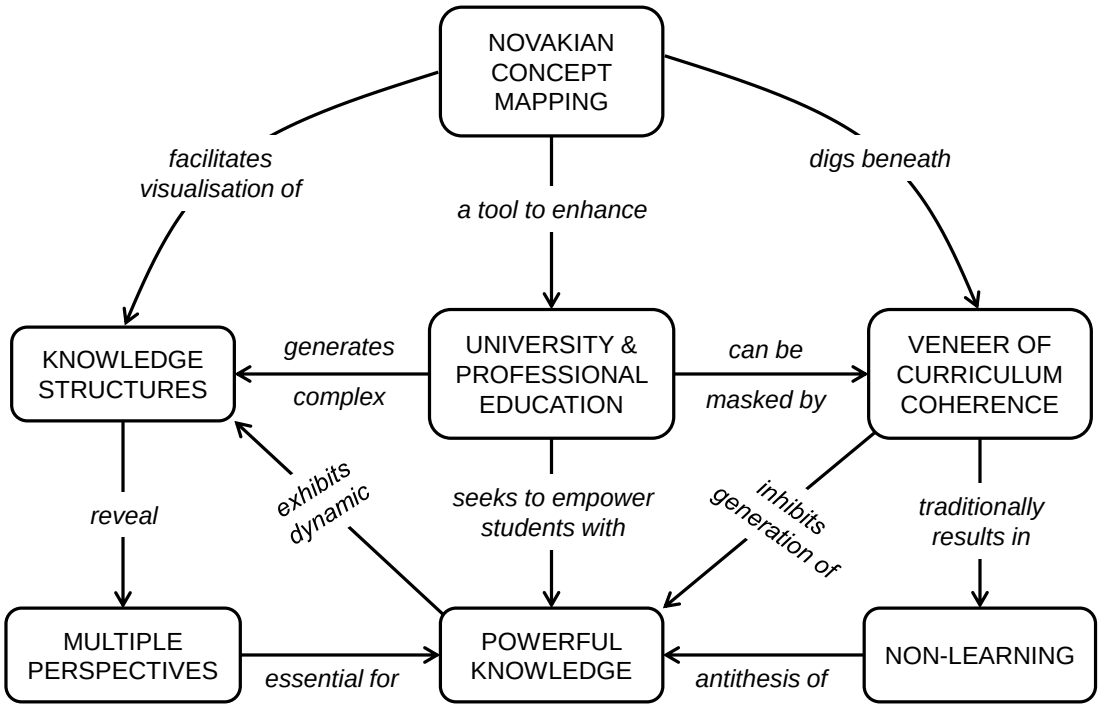

Fig. 1. Concept map relating the application of Novakian concept maps with the development of powerful knowledge

In order to move away from a situation where universities act as centres of non-learning and towards an environment where universities can act as centres of meaningful learning, academics will need to challenge the dominant, managerialist discourses within education. Concept mapping may have a central role in this development. Unlike many classroom tools, concept mapping is grounded in robust educational theory and has been tested in a wide variety of educational contexts and academic disciplines (Novak & Cañas, 2007).

The evolution of the application of concept mapping might be considered to have occurred in three broad steps (Fig. 2). In the first stage (emergence), the tool was developed and trialled extensively, particularly in the field of science education. In the second stage (consolidation), numerous studies have verified that when appropriately applied to pedagogically receptive contexts, concept mapping invariably has a positive influence on the teachers and/or the students involved. During this phase cmap tools (an online, digital application for the creation of concept maps) was released to support users to create and share concept maps, whilst a series of concept mapping conferences have helped the global academic community to collaborate and engage in productive dialogue about concept mapping as a learning tool. The number of research studies into the

application of concept mapping rose considerably during this phase and concept mapping became part of the mainstream of educational research.

At the 6th international conference in Brazil in 2014, comment was made that it was now time for academics to challenge the dominant discourses in education through the application of concept mapping by integrating the tool with contemporary educational theories from both the psychology and the sociology of education. This third phase (transformation) is likely to see concept mapping studies that upset the *status quo* and ask awkward questions about issues that seem to be taken for granted within university curricula. It is within this emerging context of transformation that this special issue is presented.

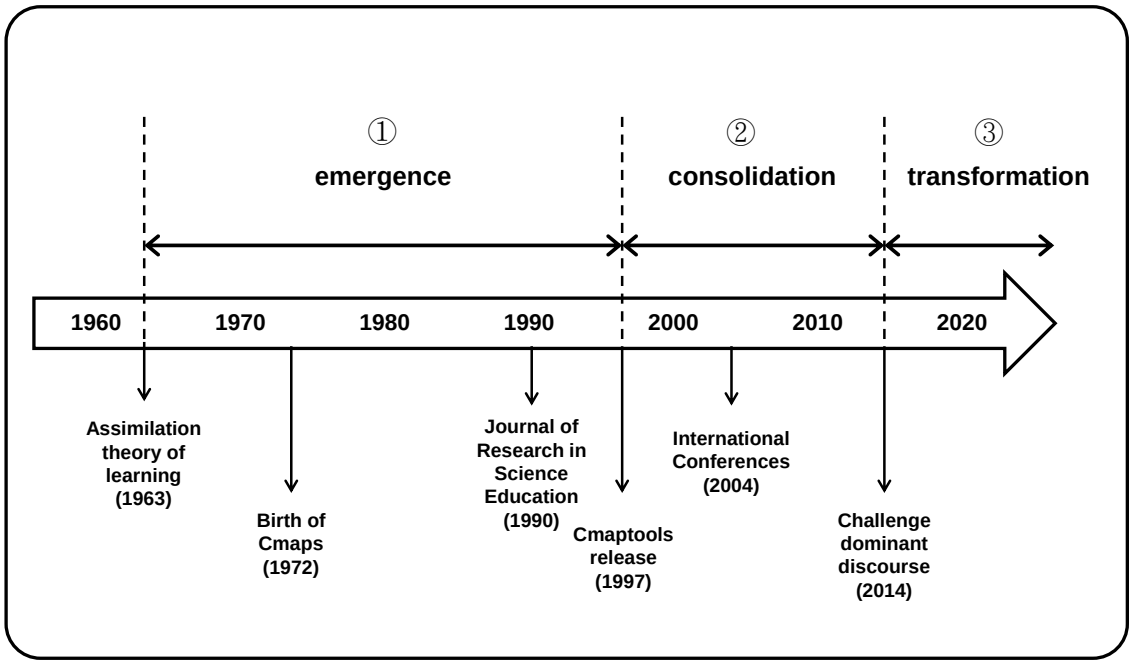

Fig. 2. Historical development of concept mapping from the 60s to today. Adapted from Cordeiro, Aguiar, Cicuto, and Correia (2012)

2. Preview of papers

A number of overlapping themes will be seen to recur throughout the papers in this issue. The issue of how to evaluate concept maps has concerned concept mappers since the birth of the tool. Whilst many authors have applied modifications of Novak's original scoring protocols to their studies, this has always been rather unsatisfactory and reflects the science education origins of the tool – reducing the rich data gained by the mapping process into a numerical value for the ease of analysis. Cañas, Novak, and Reiska revisit the question of map quality and urge researchers to move beyond a simple tally of how many concepts are included to consider some holistic factors such as balance, structure and clarity in deciding whether or not a map is an excellent representation of understanding. Buhmann and Kingsbury extend this line of thinking to propose a systematic approach to concept-map analysis combining topological normalisation,

determination of structural parameters and global morphological classification to develop a standardised, easily applicable and reliable framework for making the inherent structure of a concept map tangible.

In the context of legal education, Hay and Proctor show how the teaching sequence experienced by students features within students' concept mapping structures even though this is only a temporal pattern that has little in common with the knowledge structure of the discipline. This has consequences for the interpretation of student understanding that might be confused with student appreciation of the curriculum structure.

The key topic of formative assessment is addressed in the paper by Anohina-Naumeca. Formative assessment is growing in influence in the development of undergraduate curricula, and the paper investigates the problem that formative assessment of structural knowledge is an absent element in the study process. The paper describes scenarios where concept mapping can be used as a feedback tool in a programme of study.

The paper by Schwendimann discusses how if implemented thoughtfully, concept maps can be versatile tools to support knowledge integration processes towards a deeper understanding of the relations and structures of complex ideas and facilitate life-long learning. The author does warn that waiting until students enter higher education is not the best way of implementing concept maps, and that life-long learning does not start at university. Just as concept maps can demonstrate coherence of complex ideas, they may also be key in demonstrating the coherence of education and learning from primary education through to postgraduate studies.

The papers by Wells, Bernal, and Bressington and by Bridges, Corbet, and Chan, continue the long tradition of concept map application within the health sciences. Wells, Bernal, and Bressington, offer a longitudinal study – a research approach that needs to be more common place if we are to be able to demonstrate the efficacy of concept mapping over time rather than through snap shots of learning and short-term interventions. Again the authors consider gross morphology of the maps as indicators of learning, rather than a more atomised analysis of individual propositions and their occurrences in the data. The paper by Bridges, Corbet, and Chan looks at the issue of curriculum design, looking at problem-based learning in both face-to-face and online contexts. The online potential of concept mapping is also picked up by Filiz, Trumpower, Ghani, Atas, and Vanapalli in their paper, which also revisits the issue of assessment for learning, and whether a digital platform can help to reduce teachers' workloads. Teacher education is then picked up as a theme by Reiska and Soika in their paper where they review a number of projects that have investigated the application of concept mapping to teacher professional development.

The final paper by Martínez-Borreguero, Pérez-Rodríguez, Suero-López, Pardo-Fernández, and Naranjo-Correa, uses concept mapping in the context of Physics education to capture modes of thinking of expert teachers. Again, the visualisation of expert knowledge is used as a tool in the development of problem-solving skills that may be employed within the curriculum.

3. Conclusions

These papers all explore contemporary issues in higher education and consider the development of meaningful learning and the steps that can be taken to promote this, for

example through curriculum design, teacher education and feedback to students. All of these elements of effective teaching can be visualised through the application of concept mapping. Once they are visualised, they become more tangible and malleable so they may reveal alternative perspectives that can contribute to the development of powerful knowledge within our universities. It is evident from reading these papers that curriculum coherence is a major factor that should be discussed more openly within universities and that by making explicit the implicit, educators will develop more powerful voices and will generate evidence with which to be able to challenge the dominant educational discourses that endeavour to maintain the *status quo* of non-learning and prevent university education from realising its potential.

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