

Title

Student learning outcomes in the biomedical sciences: the role of capstones

Author

Kelly E. Matthews, Victoria Andrews, Peter Thorn, Kay Colthorpe and Jon Curlewis

Theme/Thread

Teaching and Learning/Graduate outcomes

Key words

capstones, biomedical sciences, student outcomes

Description (not to exceed 75 words)

Evidence-based models for capstones that assess learning outcomes and evaluate the program of study are lacking in the life sciences. A mixed-methods study was designed examining both student and academic staff perceptions around graduate outcomes and capstone course design and delivery. Findings reveal that students value content knowledge over skill development and academics feel more comfortable teaching content versus skills. Implications for designing effective capstones are discussed using two case studies from the biomedical sciences.

Abstract (not to exceed 500 words) indicate the literatures, methods, evidence, and conclusions.

Capstones represent a culminating academic experience meant to amalgamate previously learned skills and content within an academic discipline as well as facilitate the transition from university to the professional workplace (Cuseo, 1998; Hencheid, 2000). Designed effectively, capstones can also reveal the extent to which students are achieving the intended and desired learning outcomes for a given program of study (Rowles, Koch, Hundley & Hamilton, 2004; Forde, 2006; Brown & Benson, 2005). While the idea of a culminating experience to prepare students for the “real world” is not new in higher education, evidence-based models for capstones that assess student learning outcomes and evaluate the program of study are lacking in the life sciences. This is confounded by the general nature of science degree programs that do not have external accrediting bodies to drive academic standards and graduate outcomes. Given the changing nature of modern science, the need for more biomedical science researchers globally (National Research Council, 2003), and the pressures on universities to document student outcomes for quality assurance and accountability purposes (Australian Government, 2009), the implementation of effective capstones can offer some solutions.

This study is reporting initial data from a research project aiming to develop and test effective models for capstones in the biomedical sciences. Specifically, this presents data on graduating biomedical science student beliefs about their learning outcomes, and how this data informs the development of a biomedical sciences capstone course at a research-intensive university in Australia. A mixed methods approach is utilised (Creswell, 1994) examining both student and academic staff perceptions. A survey to capture final year student perceptions of their learning outcomes was administered

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online in 2008 and 2009. Perceptions of academic staff were collected via observations of capstone development meetings and informal interviews.

Preliminary survey analysis reveals that final year biomedical science students value content knowledge over skills like teamwork, scientific writing and communication, and quantitative skills. Findings indicate that students believe content knowledge is emphasised and assessed more in the undergraduate curriculum than skills. They feel more confident about the knowledge they have gained, compared to the skills they have developed. As a result, students place less importance on skill development.

Academics teaching into the biomedical science program feel more confident teaching and assessing content knowledge; however, they adamantly acknowledge the importance of student skill development. The challenges of redesigning curricula, changing pedagogy and assessment practices is overwhelming and they struggle to see how they can do this within the constraints and culture of their environment. While the academics appreciate the opportunity that capstones present to “teach skills”, they feel overwhelmed by the task of developing and implementing a capstone. Gathering graduating student learning data from a capstone course is viewed positively, with academics believing that data could prompt cultural change around teaching and learning.

References

- Australian Government. (2009). *Transforming Australia's Higher Education System*. Retrieved February 5, 2010, from http://www.deewr.gov.au/HigherEducation/Documents/PDF/Additional%20Report%20-%20Transforming%20Aus%20Higher%20ED_webaw.pdf
- Brown, A.H., & Benson, B. (2005). Making sense of the capstone process: Reflections from the front line. *Education*, 125(4): 674-692.
- Creswell, J. W. (1994). *Research design: Qualitative and quantitative approaches*. Thousand Oaks, CA: SAGE.
- Cuseo, J. B., (1998). Objectives and benefits of senior year programs. In *The Senior Year Experience: Facilitating, Integrating, Reflection, Closure and Transition*. Edited by J. Gardner, G. van der Veer and Associates. San Francisco, CA: Jossey Bass Publishers.
- Forde, P.J. (2006). 'The Business Capstone 301 Programme: Development of a Curtin Business School unit that provides a culminating learning experience for final year undergraduate students', *unpublished*
- Henschied, J. (2000). *Professing the disciplines: An analysis of senior seminars and capstone courses*. Monograph No. 30. Columbia, SC: University of South Carolina.
- National Research Council. (2003). *BIO2010: Transforming undergraduate education for future research biologists* Washington D.C.: National Academies press.
- Rowles, CJ, Cyr Koch, D, Hundley, SP & Hamilton, SJ (2004) Toward a model for capstone experiences: Mountaintops, magnets and mandates. *Assessment Update*; 16(1-2), 13-15.

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