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Contextual Categorisation of Academics' Conceptions of Teaching

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Abstract

Background: Despite large-class research-based instructional strategies being firmly established in the literature, traditional teacher-centred lecturing remains the norm. This is particularly the case in physics, where Physics Education Research (PER) has blossomed as a discipline in its own right over the last few decades, but research-based strategies are not widely implemented.

This variation in practice is underpinned by variations in beliefs and understandings about teaching. Studies investigating the spectrum of conceptions of teaching held by teachers and, in particular, academics have almost uniformly identified a single dimension from teacher-centred to student-centred. These studies have used a phenomenographic approach to capture the variety of conceptions of teaching, but have excluded contextual issues like class size.

Research Question: How does class size affect academics' conceptions of teaching?

Method: This study used an online survey to compare and contrast respondents' experiences of small and large classes, and in particular lectures. The survey was promoted to Australian university academics from a range of disciplines, predominantly science, technology, engineering, and mathematics (STEM). Responses to the sets of small-class questions were analysed independently from the sets of equivalent large-class questions. For each respondent their small-class responses were categorised, where possible, as either being student-centred or teacher-centred, and likewise, independently, for their large-class responses.

Results: In total, 107 survey responses were received. Of these, 51 had the sets of both their large- and small-class responses unambiguously categorised. Five of these were student-centred regardless of class size, and 17 of these were teacher-centred regardless of class size. All of the remaining 29 responses were teacher-centred in large classes, but student-centred in small classes. Conversely, none of the responses corresponded to a conception of teaching that was student-centred in large classes and teacher-centred in small classes.

Implications: This result demonstrates that the one-dimensional analysis of conceptions of teaching along the spectrum of teacher-centred to student-centred is too simplistic. Conceptions are contextual. At the very least they depend on class size, and perhaps other factors.

It confirms the hierarchy of understanding from teacher-centred to student-centred reported elsewhere in the literature, with the added feature of an intermediate stage of differing focus depending on class size. One recommendation from this finding is that teaching professional development programs should be focused on developing student-centred conceptions and practices in large classes in particular, as this occurs infrequently but leads to the best student learning outcomes. Moreover, further research on context-specific conceptions of teaching need to be explored.

Key words: conceptions of teaching, context, professional development, phenomenography.

Introduction

Conceptions of teaching

A number of studies have explored the variation in teachers' conceptions of teaching. Kember (1997) reviewed 13 such studies and identified a common thread: they all categorised conceptions of teaching along a single dimension anchored at one end with "teacher-centred/content-oriented" conceptions, and at the other with "student-centred/learning-oriented" conceptions (see Table 1 below, adapted directly from Kember (1997: p. 262). Although the various studies Kember reviewed differed in how they divided up this continuum into a hierarchy of discrete categories, the opposite poles of teacher-centred/content-oriented and student-centred/learning-oriented were common to all. (In the remainder of this paper the terms "teacher-centred" and "student-centred" will be used as shorthand).

Table 1: Kember's characterisation of the extremes of the continuum of teachers' conceptions of teaching

Aspect	**Teacher-centred extreme**	**Student-centred extreme**
Teacher	Presenter	Change agent/developer
Teaching	Transfer of information	Development of person and conceptions
Student	Passive recipient	Lecturer responsible for student development
Content	Defined by curriculum	Constructed by students but conceptions can be changed
Knowledge	Possessed by lecturer	Socially constructed

The studies which Kember reviewed showed a high degree of commonality in identifying this continuum from teacher-centred to student-centred conceptions. This is even the more striking when the diversity of the different studies' participants is considered. In total, almost 500 educators (university academics and adult educators) participated. A wide range of disciplines (e.g. physics, social sciences, English, medicine), countries (e.g. Australia, China, Singapore, USA), and experience levels (from new lecturers to award-winning university teachers) were represented. This finding has also been borne out in subsequent studies (Postareff & Lindblom-Ylänne, 2008; Samuelowicz & Bain, 2001). Trigwell and Prosser (1996) developed a survey instrument (the Approaches to Teaching Inventory, or ATI) using items based on this continuum of conceptions and subsequently refined and validated it with more than 2000 university teachers from a range of disciplines, countries, and experience levels (Trigwell & Prosser, 2004, 2006; Trigwell, Prosser & Ginns, 2005).

However, in the ATI, and the other studies, the focus was respondents' conceptions of teaching, without regard to how this may vary with respect to contextual factors, such as class size. This then is the focus of this paper: how does class size affect academics' conceptions of teaching? And why is this question important?

Conceptions of teaching underpin teaching and learning practice

Conceptions of teaching matter. They underpin what academics do as teachers, and affect how students learn. Trigwell and Prosser (1996) found that academics who hold teacher-centred conceptions employ teacher-centred strategies, and likewise for those academics with student-centred conceptions. (Although at least one study has contested this (Murray & Macdonald, 1997)).

Furthermore, in a study of almost 4 000 students, it was found that students of teachers who describe teacher-centred conceptions adopt shallow approaches to learning, whereas students of teachers who report student-centred conceptions have deeper approaches to their learning (Trigwell, Prosser & Waterhouse, 1997).

Student-centred teaching practices lead to better student outcomes

Student-centred strategies lead to better student outcomes. This has been shown in a number of studies in a range of contexts. Hake (1998) published a seminal study of more than 6 000 physics students and found that what he called "interactive-engagement" (student-centred) strategies consistently resulted in greater gains in student conceptual understanding than "traditional" (i.e. teacher-centred) instruction.

Similar results have been found across a range of disciplines (Prince, 2004; Masikunas, Panayiotidis & Burke, 2007; FitzPatrick, Finn & Campisi, 2011) and countries (Abdul et al., 2011; Hussain, Azeem & Shakoor, 2011; Cahyadi, 2004). Student-centred strategies also lead to better student attendance and engagement (Deslauriers, Schelew & Wieman, 2011).

Professional development is ineffective if it ignores participants' teaching conceptions

Henderson and Beach (2011) reviewed several hundred articles from 1995–2008 reporting on different initiatives to reform undergraduate instruction in science, technology, engineering, and mathematics. They identified a number of factors common to successful, and unsuccessful, reforms. Change strategies that do not acknowledge the beliefs of the participants are ineffective. Conversely, those that align with or are deliberately designed to change teachers' conceptions (Ho, Watkins & Kelly, 2001) can be very successful.

Motivation for this study

This study is part of a larger project that aims to understand why traditional, teacher-centred instruction remains the norm (Nunn, 1996; Skovsmose, Valero & Christensen, 2009), especially in lectures, when the evidence against its educational effectiveness seems so compelling. In the authors' view, the primary goal of professional development should be to improve learning outcomes for students. In order to do so, it must address academics' conceptions of teaching. Although teaching conceptions are understood in general terms, this study sought to identify whether academics' conceptions of teaching are dependent upon class size in any

way. This paper will attempt to answer this question, and then conclude with some conjectures about what this might mean for professional development programs.

Methodology

This project builds on the phenomenographic research literature about conceptions of teaching. Phenomenography assumes that different people conceive of or experience the same phenomenon in a small number of qualitatively distinct ways (Marton, 1981).

It is not assumed that any phenomenographic study will absolutely and unambiguously identify the complete conceptions held by the particular individual participants about the phenomenon in question; rather it is acknowledged that the data collected is just a partial snapshot of their views at the particular time of the study, further filtered through the context of how the data was collected.

In this study, the different contexts of small and large classes were deliberately highlighted to draw out any contrasts in how participants may conceive of teaching in these different settings.

Data was collected using an online survey. Although online surveys are static and coarse compared to the more richly detailed information generated by interviews, more typical of phenomenographic research, it did facilitate recruitment of participants from diverse disciplines and geographic locations. Through the survey, participants for follow-up interviews were recruited. These follow-up interviews explore participants' conceptions of teaching in more depth, and are the subject of other publications (Daniel, 2016; Daniel, Mann et al., 2016).

Using an online survey also made it easy to discriminate between respondents' conceptions of teaching small classes versus large classes, because questions about the two contexts could be worded identically. Such transparent even-handedness is difficult to achieve in interviews, where unintended biases in how questions are posed can affect how participants respond. To address the research question of this paper, how respondents answered the set of small class questions was compared and contrasted with how they answered the set of large class questions.

Survey Design

A survey instrument was designed in Survey Monkey™ to explore academics' conceptions of teaching small classes, large classes, and, in particular, lectures. It was promoted to university academics at an Australian university through staff emails and newsletters.

The original survey was constructed by the authors in consultation with a professional form designer. It was then piloted with 6 respondents and reviewed in detail to identify any ambiguous wordings, confusing question sequences, or other issues (Fowler & Jackson, 1992).

The survey consisted of several sections. The first, which will be explored in detail in this paper, was designed to compare and contrast academics' experiences of large versus small classes. The second section focused on academics' experiences of lecturing. The third and final section focused on relevant demographic information.

The first section, designed to contrast small and large classes, had 4 parts, each with a different theme:

- Class size & word associations
- The academic's enjoyment
- The academic's confidence
- Student engagement

In the first part respondents were asked to numerically characterise what they meant by a small and large class (i.e. what is the maximum size of a 'small' class, and the minimum size of a 'large' class), and to generate up to five words or phrases that they associated with large and small classes respectively.

The next three parts, focusing on enjoyment, confidence, and engagement, all had a similar design. In the part focused on enjoyment, respondents could use a Likert-scale to identify to what extent they agreed with the statement that they enjoyed teaching large classes, and why, and then likewise for small classes. The following two parts substituted statements about confidence in teaching, and student engagement, but otherwise followed the same layout.

The importance of reducing response bias and minimising respondent burden was paramount (Bradburn, 1978; Choi & Pak, 2005).

For example, two factors affecting how respondents answer multiple-choice or Likert-scale questions are primacy (the first response is favoured) and social acquiescence (respondents want to agree with the perceived views of the researcher) (Schuman & Presser, 1996; King & Leigh, 2009). These biases can be offset against one another by ranking the Likert-scale from 'strongly disagree' to 'strongly agree'. The primacy effect favours the response listed first (i.e. 'strongly disagree'), whereas the social acquiescence bias instead typically favours 'strongly agree'.

Although 5-point Likert-scales are frequently used (Clason & Dormody, 1994), in this study a 7-point scale was chosen. Although this adds somewhat to the respondent burden, and may therefore lead to satisficing (i.e. choosing the minimally adequate, often just neutral, response (Krosnick, 1991; Krosnick et al., 2002), it was deemed necessary for this study. This was because the scale had not only to differentiate between agree and disagree, but also to discriminate between the intensity of responses to the same statement for small versus large classes. For example, knowing that a particular respondent is confident teaching both large and small classes is not that informative about the differences between these two contexts. By using a 7-point scale (that is, with 3 levels of 'agreement', and 3 levels of 'disagreement'), the contrasting experience between small and large classes could be highlighted.

Context plays a key role in survey design (Schwarz & Sudman, 1992). For this study that meant that it was important to have the pairs of identical questions about large and small classes together in each part, to make it clear that a comparison was intended. Also, each part focused on one particular aspect of the teaching experience (e.g. confidence, enjoyment), and this theme was highlighted at the top of each part to make the focus clear.

Other factors that were important in the survey's design were simplicity of language and the anonymity of respondents. For example, after each Likert-scale response identifying to what extent respondents disagreed or agreed with a statement, they were simply asked "Why is that?" Through an iterative review process between the authors, the professional form designer, and the pilot survey respondents, the questions were revised until they were as simple and clear as possible.

Finally, survey responses were anonymous. This is not only ethically sound but minimises the social desirability bias in which respondents are less likely to report socially undesirable beliefs or behaviours (e.g. lacking confidence, or thinking students are not engaged in their classes).

Data analysis of questions about small and large classes

The survey received 107 responses from a range of disciplines across the university. The sets of responses to only the small class questions were analysed independently of an equivalent analysis of the sets of responses to only the large class questions. These sets of responses (corresponding to one individual respondent) were categorised as being at either extreme of Kember's spectrum: that is, either teacher-centred/content-oriented, or student-centred/learning-oriented. However, some responses, either through their sparseness or the possibility of different interpretations, were categorised as "ambiguous". This term is not used to suggest that the respondents' conceptions were unclear or contradictory, just that the survey instrument was too coarse to discriminate subtleties in their ideas, and only the categorisation of more polarised views could be justified.

In Table 2 some representative responses are shown, and how they were categorised. The set of responses categorised as "ambiguous" came from one respondent, and were categorised as such because they could be interpreted in either a teacher-centred or student-centred way. For example, the teacher could be an animated presenter [dynamic], who's very active at the front of the class [activities], and the students are watching [engagement]. Alternatively, it could be that there is a lot of interaction between the student and teacher [dynamic], the students are doing a variety of different tasks [activities], and the students are very involved [engagement]. Where it was possible to interpret the set of responses in different ways, they were classified as "ambiguous".

Table 2: The categorisation of some sample quotes

Teacher-centred	**Ambiguous**	**Student-centred**
Performance	Dynamic	Individual questions
Keeping [students'] attention	Lots of marking	Knowing [students'] names
Useful information	Activities	Peer learning
Content-driven	Engagement	Interaction
Getting the message across		Personal
		Depth of learning

Results

The respondents clearly had different views of large and small classes. In Figures 1 and 2 below, word clouds (Steinbock, 2006) have been generated from the total set of responses to the large class questions, and separately to the small class questions. In these word clouds, words are listed in alphabetical order, with a size proportional to how frequently they occurred in the text.

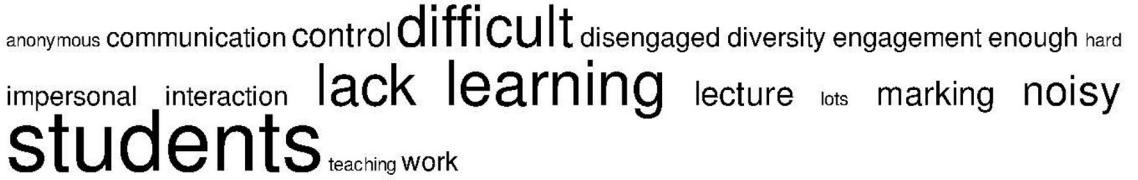

Figure 1: Common words in the large class responses

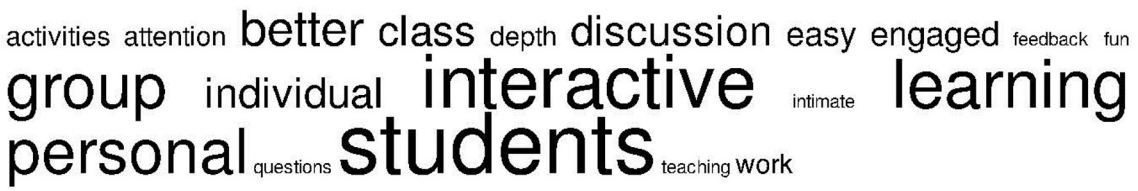

Figure 2: Common words in the small class responses

The connotations of the most common words in the large class responses were quite negative (e.g. "lack", "difficult", "noisy") compared to those for the small classes (e.g. "easy", "better", "engaged"). Although this is an interesting difference, it is difficult to draw insightful conclusions because it is only a comparison of word frequency, without regard to what sense, or in what context, these words were used.

Responses to the large class and small class questions were then categorised more meaningfully as either teacher-centred or student-centred (see Table 3 below). Some responses could not be categorised unambiguously because they could be interpreted in multiple ways. These responses have been shaded in Table 3.

Table 3: Categorisation of responses by class size

$N = 107$		SMALL CLASSES		
		Teacher-centred	**Ambiguous**	**Student-centred**
LARGE CLASSES	**Teacher-centred**	17	34	29
	Ambiguous	0	13	9
	Student-centred	0	0	5

Taking out the "ambiguous" responses to leave only the responses that were categorised unequivocally gives the distribution shown in Table 4 ($N = 51$).

Table 4: Subset of unequivocally categorised responses by class size

$N = 51$		SMALL CLASSES	
		Teacher-centred	**Student-centred**
LARGE CLASSES	**Teacher-centred**	17 (33 %)	29 (57 %)
	Student-centred	–	5 (10 %)

Discussion

These results raise some interesting questions. For example, what is it to be teacher-centred in a large class but student-centred in a small class?

In large classes, teacher-centred instruction could for example simply be the traditional lecture: the sage on the stage (Horton, 2001), whereas student-centred instruction might look more like Peer Instruction (Mazur, 1997): the guide on the side.

Similarly in small classes, teacher-centred instruction could take the form of 'chalk and talk' tutorials where the tutor works through a problem on the board, whereas student-centred instruction could include small group problem-solving sessions, for example.

In Table 5 below, the different quadrants have been characterised by these corresponding representative teaching strategies. As a shorthand, these quadrants have been labelled A, B, and C. Note that the bottom-left quadrant has not been labelled, as not one of the 107 survey respondents demonstrated teacher-centred conceptions in small classes, coupled with student-centred conceptions in large classes. Only the converse was observed. On the spectrum between wholly teacher-centred conceptions and wholly student-centred conceptions there seems to be only one intermediate: teacher-centred conceptions in large classes coupled with student-centred conceptions in small classes.

Table 5: Sample characterisation of different categories of responses

		SMALL CLASSES	
		Teacher-centred	**Student-centred**
LARGE CLASSES	**Teacher-centred**	Traditional lectures: the sage on the stage Chalk and talk tutorials: Tutor solves problems on board A	Traditional lectures: the sage on the stage Problem-solving in small groups B
	Student-centred	Peer instruction in lectures: the guide on the side Chalk and talk tutorials: Tutor solves problems on board	Peer instruction in lectures: the guide on the side Problem-solving in small groups C

The weight of evidence summarised earlier in the introduction (Hake, 1998; Prince, 2004; Masikunas, Panayiotidis & Burke, 2007; FitzPatrick, Finn & Campisi, 2011; Abdul et al., 2011; Hussain, Azeem & Shakoor, 2011; Cahyadi, 2004; Deslauriers, Schelew & Wieman, 2011) shows that student-centred strategies, in both large and small classes (labelled quadrant C in the table), lead to the best student learning outcomes. In the authors' view, shifting academics' conceptions and practice towards this should be the goal of professional development programs. But how best to affect this transition: for example, should there be programs targeted at the $A \rightarrow B$ transition (i.e. for academics with teacher-centred conceptions of teaching, first developing student-centred conceptions and practice only in small classes), and then other programs separately targeting the transition $B \rightarrow C$ (extending small class student-centred conceptions to a context of larger classes)? And is it even possible for individuals' conceptions of teaching to change, or be changed, in this way?

Academics' conceptions of teaching, just like student conceptions of different phenomena, can change (McKenzie, 2003). In fact many successful professional development programs have sought to do just that (Henderson, Beach & Finkelstein, 2011; Ho, Watkins & Kelly, 2001). However, academics advance through these conceptions at different rates (Martin and Ramsden (1992), cit. in Kember (1997)), and it certainly seems unlikely that each transition would be equally easy (Kember, 1997). So perhaps there is some conceptual 'bottleneck', a breakthrough that is difficult to make.

The best candidate from this study is the transition $\mathrm{B} \rightarrow \mathrm{C}$, the development from teacher-centred to student-centred conceptions in large classes. To draw an analogy from chemistry, this could be the "rate-determining step", where academics progress relatively easily from $\mathrm{A} \rightarrow \mathrm{B}$, but only a trickle makes the next step $\mathrm{B} \rightarrow \mathrm{C}$, and so B is the biggest group and C the smallest. Furthermore, the academics with student-centred conceptions (Quadrant C) are probably over-represented in this study because arguably they would value teaching more highly and be more motivated to give up their time to participate in the study in the first place. This self-selection bias means that the proportion of academics holding wholly student-centred conceptions of teaching is probably in fact even smaller, which further reinforces the conjecture that the transition $\mathrm{B} \rightarrow \mathrm{C}$ is a conceptual bottleneck.

If these transitions between groups happened uniformly, the groups should reflect increases in experience levels. However, this isn't apparent in the demographic data for the three groups, which each have at least 40 % of respondents reporting more than 10 years' of academic experience and respondents' "highest qualifications" ranging from undergraduate to doctoral. It is probably too simplistic to expect conceptual development to run to a timetable, when in fact it is the quality, not quantity, of experiences and critical incidents that drive conceptual change.

So if the transition $\mathrm{B} \rightarrow \mathrm{C}$, the development from teacher-centred to student-centred conceptions in large classes, is indeed the conceptual bottleneck the relative sizes of the groups suggest it is, it makes sense to focus professional development programs on enabling that change.

Alternatively, it could be argued that supporting step-wise development would be the most effective. That is, if academics with teacher-centred conceptions regardless of class size (Quadrant A in the table above) could be brought together to focus on developing student-centred conceptions and practice in small classes (i.e. the transition $\mathrm{A} \rightarrow \mathrm{B}$), it would likely be successful as this seems to be a small conceptual shift. Likewise, if academics from Quadrant B (with student-centred views in small classes but teacher-centred views in large classes) could be brought together and supported to develop student-centred conceptions and practice in large classes (i.e. $\mathrm{B} \rightarrow \mathrm{C}$), for these academics this is a small step. And therefore academics with student-centred views regardless of class size (Quadrant C), whose views align with the evidence about best practice, could perhaps be ignored.

However, the outcome of the phenomenographic research (Kember, 1997; Postareff & Lindblom-Ylänne, 2008; Samuelowicz & Bain, 2001; Trigwell & Prosser, 1996, 2004, 2006; Trigwell, Prosser & Ginns, 2005) that frames this study was not to unambiguously categorise participants' conceptions of teaching, rather the outcome was the set of conceptions themselves. To claim that individual participants' conceptions could be unequivocally identified in some absolute way is spurious. And even if they could be, to group academics by the perceived value of their ideas would certainly be perceived as condescending, if not insulting. So step-wise professional development programs targeted at groups of academics with different conceptions is impractical.

Instead, in the authors' view, professional development programs should be targeted at developing student-centred teaching conceptions and practice in large classes, for all academics. From the survey data, it seems this is a conceptual 'bottleneck' that relatively few academics navigate through. By treating all academics equally, it avoids alienating those academics with teacher-centred conceptions by implying that their ideas are of lesser value. Furthermore, it would support academics with student-centred conceptions (Quadrant C) translate these conceptions into practice. Although conceptions and practice generally align (Trigwell & Prosser, 1996), sometimes the practice lags the conception – that is, the conceptions are student-centred but the practice is more teacher-centred (Murray & Macdonald, 1997; Henderson, 2004).

This finding is based upon one analysis of the survey data. Further research and analysis is needed to explore these ideas in more detail. To that end, the survey data was also analysed in two other ways. On one hand, complete sets of responses (i.e. complete survey scripts) were categorised using a typical phenomenographic approach (Marton, 1981, 1986; Bowden & Walsh, 2000) into a spectrum from teacher-centred to student-centred conceptions. On the other hand, individual responses to individual questions were coded for various themes. These two extremes of global and local analysis will be the focus of future publications. In addition, some survey respondents nominated themselves for follow-up interviews, which allowed their ideas about teaching and learning to be explored in more depth (Daniel, 2016; Daniel, Mann et al., 2016).

Conclusion

Analysis of a survey of Australian academics' conceptions of teaching revealed that there seems to be a progression from teacher-centred conceptions, to student-centred conceptions only in a small-class context, to student-centred conceptions regardless of class size. Student-centred conceptions of teaching underpin student-centred practice, which leads to the best student learning outcomes. Professional development programs should be aimed at developing these student-centred conceptions and practice. It has been argued that these programs should be focused on developing student-centred conceptions and practice in large classes in particular, because this is a conceptual bottleneck that few academics navigate through.

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