Updating understandings of 'teaching': taking account of learners' and teachers' beliefs

Abstract

The paper reviews recent psycho-educational literature to identify features of teacher thinking which enable learners to acquire meaningful knowledge. The review establishes that one powerful mechanism to improve teaching in higher education turns on exploiting adults' epistemic beliefs: beliefs about the nature and acquisition of knowledge. Epistemic beliefs and knowledge construction interact with each other but both can be promoted through focussed teaching. The 4 foci for teaching are (i) surfacing learners' epistemic beliefs as these are the bases of new learning; (ii) actively engaging learners' views of knowledge so that their refinement can be objectives of education practices; (iii) emphasising and evidencing critical thinking; (iv) foregrounding teachers' own epistemic beliefs in their reflections on practice.

Keywords Learners' Epistemic Beliefs, Teachers' Epistemic Beliefs, Critical Thinking, Educational Psychology

The importance assigned to teaching in higher education has never been greater (Hénard and Roseveare 2012). Societal imperatives to improve employment skills, to contribute to economic growth, to engage with quality assurance mechanisms and to account for monies allocated to higher education are triggers for focussing on teaching as cutting-edge practice. However, there is debate about what high-quality teaching is, how it should be judged and how it can be developed. One established mechanism to get leverage on 'teaching' is gathering information about the effects of teaching on students' learning; a logical strategy since students are teaching's immediate 'beneficiaries'. Student evaluations of teaching to elicit diagnostic information are near universal. However, neither tutors nor students are totally persuaded by the leverage of such surveys (Beran and Rokosh 2009; Freeman and Dobbins 2011); the validity of student-survey instrumentation continues to be heavily contested (Galbraith, Merrill, and Kline 2012); and students' opinions about teaching quality correlate poorly with achievement results (Sizemore and Lewandowski 2009). Finally, many of the evaluation instruments are not developed from pedagogical theory (Prosser 2011). If there is insufficient explicit conceptualisation of what teaching *is* it is difficult to gauge its effectiveness.

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Popular conceptions of teaching as the straightforward transmission of information do not recognise teaching as inherently problematic (Loughran 2013) or that the transformation of curricular aims and disciplinary knowledge into accessible subject-matter depends upon teachers' psychological knowledge (Prosser et al. 2005; Richardson 2013). Reduced to its essentials, 'teaching' enables learners to acquire knowledge and to *use* such knowledge at different time points, in different contexts and for different purposes from those in which the knowledge was first acquired. This is not to suggest that the *'learning = content + transfer'* equation is simple to achieve. Not only is there debate about what disciplinary content to privilege, but actual learning requires learners' cognitive engagement (Ludvigsen et al. 2011). So although there is nothing *wrong* with tutor enthusiasm for teaching, good explanations, or stimulating presentations (typical items in survey instruments), such features are incomplete accounts of teaching. While teaching is a mechanism for learners to access knowledge, knowledge cannot be imposed upon or inserted into learners without their cognitive mediations (Somekh and Saunders 2007). Learners' deployment of their own mental resources mediates what they learn. How learners construe content to which they are exposed (which may differ from the authoritative organisation of a given discipline and from how another learner represents knowledge) is central to teaching; and is psychological knowledge of which teachers should be aware. Concomitantly, it is with their own psychological knowledge that teachers transform their understandings of disciplinary knowledge into effective instruction (Gębka 2013). To keep the domain of this review precise, a stipulative (and hence somewhat restricted) definition of teaching as enabling knowledge acquisition (Schneider and Stern 2010) is adopted. The paper contributes to the further theorisation of pedagogy through focussing, conceptually, on what teaching means. The question guiding the review is what features of teacher thinking enable learners to acquire meaningful knowledge?

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Method

Given the role of thinking in conceptualising the research issue, a review of educational psychology research was determined. Methodologically, a realist synthesis (Olson 1994) allowed purposeful sampling and accommodated the thematic appraisal of evidence, to contribute to theorisation of practice. The power of realist synthesis is in the evidence it yields for potential applications to complex contexts in which professional intervention may be helpful. In this instance the focus was the mechanism connecting teacher thinking to student learning. The search approach aimed for theoretical saturation and was justified by the study's focus on what teaching means, psychologically. The discipline of Pedagogical and Educational Research in the European Reference Index for the Humanities (ERIH) was consulted for its Educational Psychology Journals: sources of expert knowledge on cognition, metacognition, epistemic cognition and learning, as these relate to instruction, teaching and education (Nolen 2009). Journals in the ERIH list are judged as having significant visibility. By definition, these articles are written in English, offer empirical or theoretical analyses, and are peer-reviewed. The journals consulted are listed in Table 1. The time lapse (from 2009) captured up-to-date studies. Journals were hand-searched for studies which focused on how we organise information to understand and remember more effectively (Schneider and Stern 2010). Data from journal articles noted sample characteristics (mostly undergraduate college/university students with a few studies of secondary-school-aged learners) and methods (experimental, survey, qualitative, review and theoretical studies). Deep iterative reading, suggested 3 themes captured the findings: the importance of learners' beliefs; the importance of teachers' beliefs, and how increased sophistication in epistemic beliefs can be facilitated.

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Table 1 Journals consulted

Source
1. British Journal of Educational Psychology
2. Cognition and Instruction
3. Contemporary Educational Psychology
4. Educational Psychology: an international…
5. Educational Psychology Review
6. European Journal of Psychology of Education
7. Instructional Science
8. Journal of Educational Psychology
9. Learning and Individual Differences
10. Learning and Instruction
11. Metacognition and Learning
12. Teaching of Psychology

Learners' beliefs in relation to teaching

Teaching assumes that learners are responsible, active agents in acquiring knowledge, although novice students view their learning as the teacher's responsibility (Virtanen and Lindblom-Ylänne 2010). In response to 'teaching', learners interpret encountered data through their prior knowledge and construct knowledge on the bases of their interpretations (Renkl 2009). To promote understanding, learners must do more than listen to teachers. They must read, write, discuss and engage with problems to trigger higher-order cognitive activity (analysis, synthesis, evaluation) to maximise intellectual growth (Slavich and Zimbardo 2012).

Central to cognitive engagement, are learners' beliefs about learning (Edmunds and Richardson 2009; Richardson 2010). These epistemic beliefs (Mason and Bromme 2010) play out in views about knowledge stability (is it firmly established once acquired or something that changes); knowledge structure (is it dispersed bits or a coherent abstract whole); knowledge source (is it transmitted through experts or derived from observation and

reason); the speed of knowledge acquisition (is learning quick or gradual); and the control of knowledge acquisition (is learning capacity genetically predetermined or acquired with experience). Individuals initially have naïve beliefs about the nature of knowing but exposure to increasingly advanced education permits the recognition that 'truth' is uncertain and changeable, and that knowledge is construed rather than given (Greene 2009). Briefly, the trajectory would be from absolutist (knowledge is right or wrong and authorities have the answers), through multiplist (knowledge is mere opinion, and anyone's is valid), and evaluativist (knowledge is evaluated for evidence) (Muis and Franco 2009). While the relationship between knowledge and beliefs is complex, teachers must recognise that learners bring *both* knowledge and belief to the learning situation (Boldrin and Mason 2009). As well as having knowledge derived from exposure to formal teaching, learners will have uncertain ideas based on personal experience in which they believe. If the content being taught is uncontroversial it may not matter if teachers ignore learners' beliefs; but if content is controversial (as in topics for which there is a scientific knowledge base but about which there is controversy in the public domain) learners' personal convictions may be barriers to conceptual change. Teaching thus means not only that disciplinary content is shaped and delivered in accessible ways but also that learners' awareness of their own epistemic perspectives is heightened. This means that as well as articulating the epistemological context of a given course, teachers need to enable learners to identify and monitor their own implicit epistemology on the topic of study (Sizemore and Lewandowski 2009). .

Learners' beliefs impact on their own regulation of learning. Self-regulation involves the learner defining the task, planning an approach to the task, selecting tactics to use in enacting the studying or learning of content, and evaluating the previous stages to self-generate feedback and make adaptations to future implementations. Epistemic beliefs influence how learners frame an activity: how they determine their level of intellectual engagement (sense-making or perfunctory) which in turn affects what learners notice, what knowledge they access and their subsequent educational achievement (Scherr and Hammer 2009; Muis and

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Franco 2009; Greene et al. 2012; Peters and Kitsantas 2010). These beliefs also underpin the criteria/standards which learners set for their achievements (as in, 'I'll be happy if I pass') (Richter and Schmid 2010). Given the fundamental role of epistemic beliefs in learning, the argument for learners to be exposed to cognitive and metacognitive strategy instruction seems unassailable (Askell-Williams, Lawson, and Skrzypiec 2012; Miller and Geraci 2011; Magno 2010; Van der Stel and Veenman 2010).

Teachers' beliefs in relation to teaching

Teachers hold different views as to what teaching involves (Virtanen and Lindblom-Ylänne 2010). These beliefs influence pedagogical practice and provide learners with a model for what it means to know, to think critically and to acquire knowledge (Hennessey, Murphy, and Kulikowich 2013). Traditionally, teachers have viewed learning as receiving a body of knowledge from experts; thereby preferring rigidly structured, teacher-centred practices, dominating class discussions, and creating few opportunities for students to develop their own questions. This perspective continues, although susceptible to professional development (Pugh et al. 2010), and is problematic because it disregards belief; logically leaving learners as epistemically primitive at the end of the course they were at the beginning. If learners believe knowledge to be disconnected bits imparted by the teachers, they see learning as being able to recall a list of facts which, in turn, causes them to privilege memorisation as a study strategy. This results in the construction of inert knowledge. Equally, the need to keep abreast of traditional content transmission may cause learners to believe that learning is the speedy acquisition of knowledge. This may cause them to give inadequate attention to tasks, overlook what they experience as difficult and develop superficial approaches to learning.

On the other hand, teachers who act on a constructivist view of learning share authority with learners, encourage positive exchanges among learners, emphasise the formulation of meaningful questions over answers to others' questions and help learners to develop effective ways of generating and validating knowledge. Teaching which is informed by constructivist

views appears to trigger epistemic growth and improve achievement (Muis and Duffy 2013) because the pedagogic environment legitimises epistemic beliefs as a topic for reflection and discussion. Further, the more democratic, constructivist approach to teaching appears psychologically healthier (Lindblom-Ylänne, Nevgi, and Trigwell 2011). So, while it might seem logical to adopt a heavily didactic stance with students who are informationally dependent on external sources, such a teaching approach serves to make learners even more reliant on teachers (Quiamzade, Mugny, and Falomir-Pichastor 2009) through reducing learner' psychological control (Soenens et al. 2012). This in turn may reduce learners' capability *to judge for themselves* when they do and do not yet know enough (DeBacker and Crowson 2009). Teachers should attenuate control of cognitive closure (the desire to eliminate ambiguity and arrive at definite conclusions) and support learners to forestall premature closure. This need not derogate the teaching role but stresses its subtlety in a constructivist perspective. In presenting interesting activities, providing optimal challenge, highlighting meaningful goals and framing tasks in explicit guidance, teachers expect students think critically, compare alternative ways of solving problems and justify their views: necessary tasks for participation in a democratic society (Bråten et al. 2011). Criticality, corroboration and justification of views require epistemic reflection on the nature and source of knowledge. Even if discomforted by requirements to make critical comment on the credibility, accuracy, and support for an argument (a claim supported by at least one reason), students must come to recognise the appropriateness and relevance of such tasks as mechanisms for developing learner autonomy.

Facilitating epistemic sophistication

One enduring activity in higher education is that learners read, read widely from multiple print and/or online sources, and integrate the information into a coherent meaningful representation of a topic, issue or situation. If new information is incompatible with that already held, learners *may* restructure their preconceptions. But they may not. Constructing

meaning from diverse sources demands a compound of prior knowledge, self-regulatory skill, an appreciation of the contextual nature of language, and the facility to draw inferences and make inter-textual connections (Bråten and Strømsø 2010; Svensson et al. 2009; Dornisch, Sperling, and Zeruth 2011; Jucks and Paus 2012). This higher-order level of literacy continues to challenge learners (Bråten et al. 2011) who may not recognise that different sources are expressing conflicting views or that the scientific credibility of a source is an evaluation criterion (Mason, Ariasi, and Boldrin 2011); both of which are difficult tasks. Examination of their views reveals assumptions about how learners view knowledge and knowing. These assumptions inform learners' judgements about the veracity, complexity or credibility of a source (Mason, Boldrin, and Ariasi 2010). For example, if learners evaluate positively those sources that are popular or longer (as against being authoritative and debating experts' differences), the naïve beliefs hamper progress in knowledge construction. This implies that epistemic beliefs are 'causal': that the more/less sophisticated the belief, the more/less learners are self-regulating. However degrees of epistemic sophistication are not absolute and are not divorced from culturally normative values of what is correct or appropriate behaviour in education contexts. For example, the ethos of not explicitly asking for help (because it isn't 'done' to share one's difficulties) or speaking out in class as little as possible (so as not to reveal one's 'ignorance') or not engaging in debate with the teacher (because the teacher knows more so must be 'right') will interact with task demands and the immediate particulars of a given situation (Bromme, Pieschl, and Stahl 2010; Hofer and Sinatra 2010; Barzilai and Zohar 2012). Recognising this allows teachers to actively surface these views in class and use them as discursive foci to enable learners to appreciate that these perspectives may be shared by others although unhelpful to learning. There is, thus, some risk attached to assigning persons as 'naïve' or 'sophisticated' in their epistemological understanding, while nevertheless being persuaded to engage learners in exploring their epistemological positions to help them to bring their ideas into alignment with canonical understandings of the knowledge being acquired. Indeed, it is through teachers constantly provoking learners to engage with their own and others' (possibly different) epistemological

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positions that all learners, regardless of their socioeconomic, ethnic, scholastic or cultural backgrounds that they get access to powerful and abstract, rather than mundane, knowledge (Mason, Ariasi, and Boldrin 2011).

It is possible for teachers to impact upon learners' beliefs. Refutational text (text which persuasively challenges 'received knowledge') advances domain-related epistemic beliefs (Kienhues, Stadtler, and Bromme 2011; Kowalski and Taylor 2009). Introducing refutational text requires scaffolded implementation: iterative exposure to conflicting accounts with each visitation becoming successively more challenging and learners experiencing correspondingly reduced support. As learners become skilled in coordinating new evidence with prior beliefs, they realise that they have learned something that they didn't think previously was 'right', 'true' or 'possible', thereby developing more balanced and nuanced perspectives (Stadtler et al. 2013; Hennessey, Higley, and Chesnut 2012); through being stimulated to attend to incoherences among different accounts and thereby consider the veracity of their extant knowledge (Strømsø et al. 2013). Further, content-belief consistency (learners' beliefs being consistent with the underlying epistemology of the study domain) produces better learning; because learners engage in more self-regulation (Muis and Franco 2010). In other words, if learners believe knowledge claims require checking against other sources perhaps because the material is complex, learners regulate their cognitions more thoroughly (Strømsø and Bråten 2010; Strømsø et al. 2013).

An important part of teaching is enabling learners to construct/elaborate meaning (Dornisch, Sperling, and Zeruth 2011). A popular mechanism for this is instructional explanation: good explanations are relevant for lecturing, tutoring and preparing teaching activities. Their coherence and (relative) completeness can help learners who may be otherwise overwhelmed by multiple representations (Sánchez, García-Rodicio, and Acuña 2009; Berthold, Eysink, and Renkl 2009). While commonly used in higher education, teachers' explanations have little positive impact on outcomes (Berthold and Renkl 2010) because of teachers' incomplete

diagnosis of learner need or disregard of what learners do/not already know (Wittwer et al. 2010). Having surfaced what an individual learner does/not know, teachers need to respond with learner-tailored explanations (Wittwer, Nückles, and Renkl 2010). Clearly there are limitations to customised explanations when adopting the blunderbuss approach of using 'mass' lectures as a knowledge-transmission forum. Because the learner knowledge base is the single most important cognitive characteristic to influence learning and performance (as demonstrated repeatedly in the studies of novice-expert differences), teachers should be aware that instructional techniques that are effective with inexperienced learners may lose their effectiveness and even have negative consequences when used with more experienced learners (Rey and Fischer 2013); possibly reducing anticipated cognitive benefits of lectures.

However, different levels of prior knowledge in learners can be accommodated (Kalyuga and Renkl 2010). As well as a match between teacher explanation and learner need, an even stronger predictor of explanation effectiveness is learner engagement with the information received (Berthold and Renkl 2010). Shallow processing does not allow new knowledge to be integrated into the knowledge base. As has been argued above, endorsing mental passivity through not requiring students to explicitly invoke their epistemic beliefs may well result in experiences which learners *prefer* (students typically endorse, favourably, 'clear explanations') but which do little for their learning. On the other hand, requiring learners to generate explanations *increases* their own understanding of course materials (Fukaya 2013) because in explanation generation, learners consider the coherence and reasoning in their explanations from another's perspective. Group work enables learners to become proficient in giving explanations. However, merely assigning learners to groups is ineffective in promoting learning. Learners have to understand (and so may need to be taught) that all group members are required to facilitate each other's learning; and are accountable for their contributions as well as for monitoring group progress. This type of structure supports learners in their developing autonomy (Jang, Reeve, and Deci 2010; Summers and Volet 2010). Teachers may need to model for learners the kinds of questions, such as probing, reasoning and

monitoring questions (Gillies and Haynes 2011); which help learners to draw on previous understandings and connect them to new information to promote higher-level thinking and the construction of new knowledge. Positioning learners as central in the activity of learning in the ways reviewed above, points to an essential teaching principle: teachers promote learning not just in what they say and do but in how effective they are in engaging learners to trigger their own cognitive processes to work on information with a view to developing intentional learning.

Methodological Issues

While beliefs about knowledge and knowing have captured the attention of psychologists for some time, teachers' exploitation of epistemic beliefs to enable the learning process is a relatively new phenomenon. A 'health warning' is therefore in order; though it is beyond the scope of this paper to provide a comprehensive methodological critique of epistemic beliefs. Conceptualisation of epistemic beliefs in terms of the four interrelated dimensions used here is not uncontested in the literature. Different theoretical lenses suggest differing dimensions, though the empirical validation of additional dimensions has been unreliable. A further qualification is that epistemic beliefs are not immune to substantive disciplinary differences and/or pedagogical approaches so in the 'softer' disciplines such as History and English Literature where greater discussion may be needed to achieve canonical understanding, the role of epistemic beliefs may be more pressing, pedagogically. Even within a domain, the granularity of the task may trigger different beliefs. For reasons of convenience and efficiency, self-report measures of epistemic beliefs form the basis for much of the research included in this review. These are fraught with difficulty partly because of the stability of the dimensions (discussed above) and partly because of a lack of clarity in responses. For example, responses to self-report questionnaires mask the alignment of the respondent's interpretation of questionnaire with the researchers' theoretical assumptions. Such ambiguity could be particularly gross if the respondent has never been asked to engage in such reflection before and/or if the respondent has difficulty in grasping linguistic or conceptual meaning.

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However some of the studies reported here provide balance to this 'pessimistic' view. Firstly studies which use 'think-aloud' protocols in tandem with online information searching on a controversial topic have evidenced participants spontaneously verbalising epistemic reflections consistent with the simplicity/complexity, certainty/uncertainty, justification, and source of knowledge dimensions (at different levels of sophistication) identified at the start of this paper. Secondly studies which correlate expressed beliefs with competence suggest we can have greater confidence in their validity. The summary position would therefore have to be that there is enough empirical evidence to indicate that epistemic beliefs and learning are interrelated but that more needs to be done to understand the nature of relationship.

Conclusion

Drawing on educational psychology research, this review established that reflecting on 'what knowledge is' and on 'how we come to know' are important aspects of teaching. These aspects are also very hopeful because through capitalising on epistemic beliefs, teachers have a powerful mechanism to improve teaching for the benefit of learners. The take-home message for teachers includes:

1. Learners' beliefs about knowledge and knowing should be surfaced: learners should be aware of their own assumptions and presuppositions as these are the bases of alternative conceptions. Learners need to deliberate on their epistemic beliefs as objects of reflection so that they can reconsider their beliefs when they appear to be inadequate. Learners verbalising what they believe about knowledge and knowing is a first step.

2. Because more sophisticated beliefs facilitate knowledge construction/revision, refining learners' views of knowledge should be an objective of teaching. Learners need practice in identifying questions, attending to evidence, detecting patterns, making systematic comparisons, interpreting increasingly complex data, supporting claims, and drawing justified conclusions. Dealing with complex and controversial problems is the reality of the world: teaching should not 'protect' learners through

transmission of non-problematic information. Learners' integration of refutational text is valuable; as is the requirement that learners explain their understandings and reasoning.

3. While critical thinking has always been an important outcome in higher education, the context in which we now live (of vast amounts of easily accessible information of very variable quality) underlines its importance. Learners need not only to search for information to build new knowledge; but also to evaluate the veracity of the information and the credibility of its sources. Incisive evaluation depends on the epistemic sophistication of the learner.

4. For teachers to privilege learners' epistemic beliefs in the way the literature suggests, teachers need to be aware of their own beliefs. Teachers' beliefs are important because in their practice teachers communicate ideas of knowledge certainty or uncertainty, of knowledge clarity or ambiguity, of knowledge being given or constructed, of knowledge being changing or fixed, and of knowledge being asserted or validated according to standards of enquiry. It is teachers' own reflections on their epistemic beliefs which will enable them to modify their practice when this is seen as necessary or desirable.

There are caveats to this review. It wasn't, and wasn't intended to be, exhaustive. It would therefore be useful to go beyond the European context (a filtering device in this study) to examine more fully the effects of cultural influence. Further, a methodological review (to address questions about the rigour of the research reported) would better support specific recommendations for teaching and inform pedagogical debate. Nevertheless there is sufficient evidence from this review to make plain that generative reform to teaching is sustained through teachers considering their basic epistemological perspectives; since these influence teachers' intentions for learning as well their enactment of teaching. Just as tools fit-for-purpose in days gone by may not be appropriate for analogous tasks today, so teaching in higher education needs to socialise its learners and teachers in an epistemic culture that gives time to real consideration of teachers' and learners' beliefs.

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