Research in Hospitality Management

ISSN: 2224-3534 (Print) 2415-5152 (Online) Journal homepage: informahealthcare.com/journals/rrhm20

A traditional versus a constructivist conception of assessment

Wichard Zwaal & Hans Otting

To cite this article: Wichard Zwaal & Hans Otting (2013) A traditional versus a constructivist conception of assessment, Research in Hospitality Management, 2:1-2, 29-38, DOI: 10.1080/22243534.2013.11828288

To link to this article: https://doi.org/10.1080/22243534.2013.11828288

Published online: 18 Jan 2017.

Submit your article to this journal

Article views: 4908

View related articles

Full Terms & Conditions of access and use can be found at
https://informahealthcare.com/action/journalInformation?journalCode=rrhm20

Research in Hospitality Management 2012, 2(1/3): 29–38
Printed in South Africa — All rights reserved

Copyright © NISC (Pty) Ltd

RHM
ISSN 2224-3534
http://dx.doi.org/10.2989/RHM.2012.2.1/2.7.1184

A traditional versus a constructivist conception of assessment

Wichard Zwaal* and Hans Otting

Stenden University of Applied Sciences, Leeuwarden, The Netherlands
**Corresponding author, email: wichard.zwaal@stenden.com*

This paper reports a study on conceptions of assessment held by students and instructors. The conceptions of assessment are considered to be one of the four interrelated sets of conceptions which together constitute the conception of education.The three other sets are the conceptions of (1) knowledge, (2) learning, and (3) instruction.Conceptions of knowledge were measured using an adapted version of the Epistemic Beliefs Questionnaire (EBQ). Conceptions of learning and instruction were measured with the Teaching and Learning Conceptions Questionnaire (TLCQ) developed by Elliott (2002)[1], and Chan (2004)[2]. Since no instrument was available to measure conceptions of assessment, an experimental Conceptions of Assessment Scale (CAS) was developed and tested. Students filled out a 32-item forced-choice version, while instructors filled out a 25-item version in a four-point rating format. On all three instruments a dichotomy was created to distinguish subjects with 'traditional' conceptions from the ones with more 'constructivist' views. Results indicate that students and instructors hold different conceptions of assessment. Students have more traditional conceptions of assessment than instructors. With regard to conceptions of knowledge, students are more traditional than instructors. The conceptions of teaching and learning also show students to be more traditional than instructors. With respect to the congruency of conceptions of education, students seem to be equally (in) consistent as the instructors. An important implication of the present study is to pay more attention to the alignment between the educational philosophy of an institute and the conceptions of education held by its students and instructors.

[1] Chan K-W, Elliott RG. 2002. Exploratory study of Hong Kong teacher education students' epistemological beliefs: cultural perspectives and implications on beliefs research. *Contemporary Educational Psychology* 27: 392–414.
[2] Chan K-W. 2004. Pre-service teachers' epistemological beliefs and conceptions about teaching and learning: cultural implications for research in teacher education. Paper presented at the NZARE AARE Conference, Auckland. *Australian Journal of Teacher Education* 29(1): 1–13.

Keywords: alignment in education and assessment, congruency in knowledge, educational beliefs, teaching and learning

Introduction

Conceptions of education

Every educational programme can be considered to be an operationalisation of a particular educational philosophy. Using the main areas of philosophy as a framework, we could say that the educational philosophy consists of particular ideas about knowledge and knowing (epistemology), the nature of being (ontology), acting (ethics), reasoning (logic), and the supernatural (metaphysics). In this paper only the first of these five areas will be more closely examined. While epistemology is often defined as covering both the nature of knowledge as well as the nature of knowing (Hofer and Pintrich, 1997; Hofer, 2000), we prefer to split the two parts. Our definition of epistemology will be restricted to the first part, which concerns a subject's conceptions of knowledge. The second part, on the nature and process of knowing, will be categorised as conceptions of learning. Both sets of conceptions are supplemented by two further sets of conceptions, about instruction and assessment, together creating what we identify as a conception of education (see Figure 1).

We further assume that all conceptions of education are located on a continuum ranging from a traditional to a constructivist orientation toward education (Samuelowicz and Bain, 2002). Some indicators for each of these two broad orientations are included in Figure 1.

The success of a particular conception of education as propagated by a particular institution will depend on the successful implementation of its principles and policies. Implementation in turn will depend on the acceptance and actions by staff and students. We hypothesise that if the institutional and individual conceptions of education are in alignment, improved performance will be realised.

Beside the match between the conceptions of education held by the institution on one side and by the students and instructors involved on the other, we are also interested in the internal structure of the four constituent parts of a subject's conception of education. More specifically, we like to find out whether someone can have a traditional conception of knowledge while at the same time embracing a constructivist view on assessment. Is the orientation on all four subsets of conceptions independent of or dependent on each other?

First, the different sets of conceptions will be explained, starting with conceptions of assessment.

Conceptions of assessment

Conceptions of assessment have to do with the format,

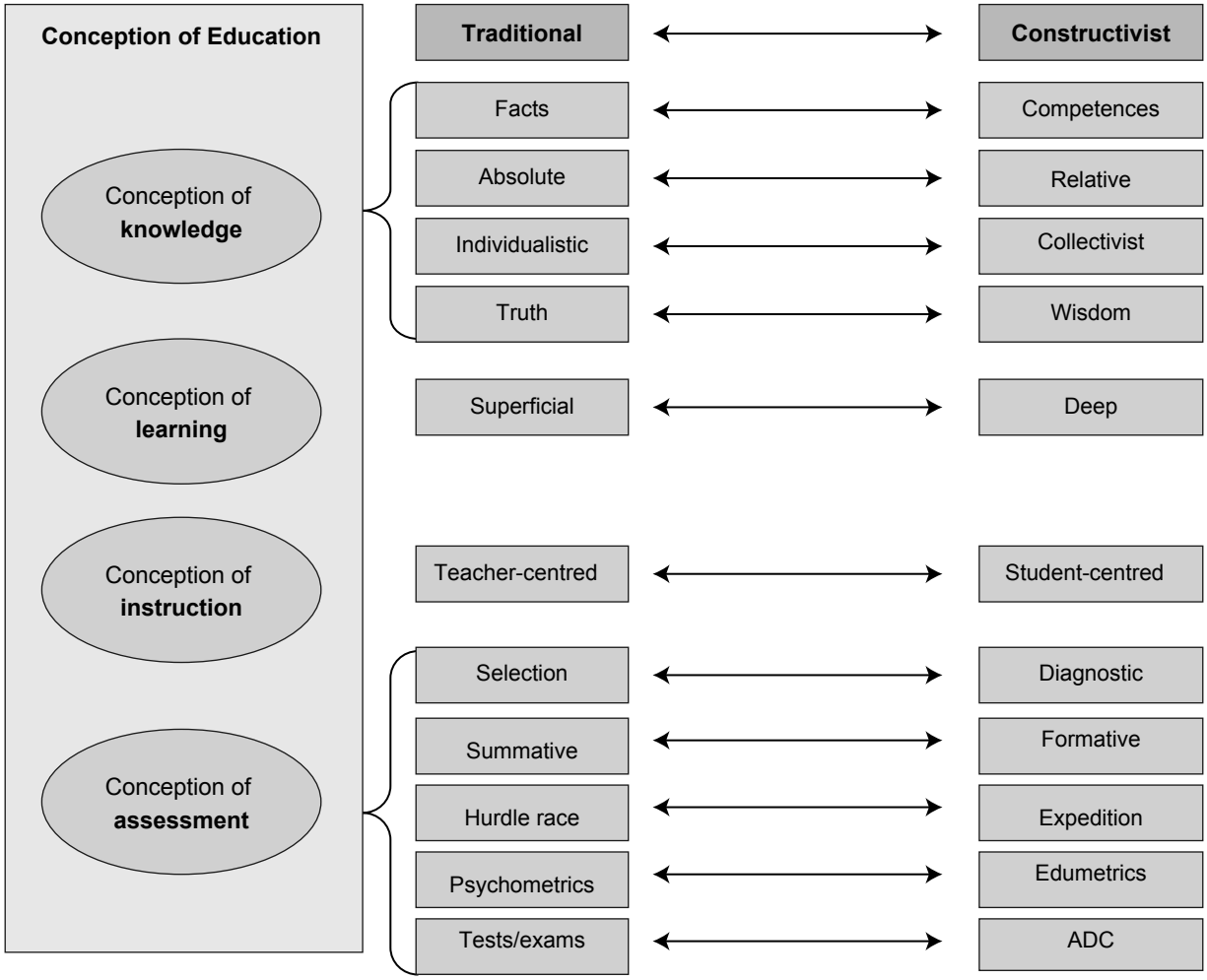

Figure 1. The four constituent parts of a subjects' conceptions of education

function and timing of assessment. The goals of assessment and the content of the subject matter will determine the format and tools to be used. In a traditional orientation, the focus is expected to be on acquiring factual knowledge, which is measured by tests and exams. Constructivist assessment is expected to focus more on competencies (as integrated units of knowledge, skills and affections) and more complex tools like assessment and development-centred exercises. With respect to the function of assessment, a distinction can be made between summative and formative uses, the former focusing on pass/fail decisions and selection, the latter more targeted at diagnosing strengths and weaknesses, assessment for learning and adapting programmes to students (allocating them to appropriate tasks). The timing of assessment can differ from the more traditional approach, in which the test is disconnected from and put at the end of the learning process, to the constructivist stance, where assessment is closely linked with learning and instruction, including active participation through self and peer assessment. Testing in the traditional approach can be seen as an individualistic hurdle race, in which students can fail at any new hurdle, while in the more constructivist expedition model, students and instructors both take up the responsibility to get to the finish as a team. A final distinction made in Figure 1 is a shift in focus from traditional psychometrics toward what has been called edumetrics, expanding the traditional criteria of reliability and validity with aspects like consequential validity and learning-value.

Overall, the development from a traditional to a constructivist conception of education has been summarised, particularly with respect to assessment, as a shift from a test culture to an assessment culture (Birenbaum and Dochy, 1996) or from a measurement model toward a standards model (Taylor, 1994; Maclellan, 2001). To be able to make a successful transition from the traditional toward the constructivist conceptions of assessment, there needs to be alignment with the other sets of conceptions (Biggs, 2003). And although much research is available documenting the notion that assessment has a profound influence on the behaviour of both students and instructors, much less is known about the mutual relations between conceptions of assessment, conceptions of knowledge, and conceptions of teaching and learning. Can students and instructors combine a traditional conception of knowledge with a constructivist view of assessment? Does the trend toward a constructivist conception of

education equally affect all sets of conceptions? And what about the differences in conceptions between students and their instructors?

One of the few studies on conceptions of assessment was performed by Brown (2004), who identified four different conceptions held by teachers: improvement of teaching and learning, school accountability, student accountability and treating assessment as irrelevant. On average, teachers agreed with the improvement and school accountability conceptions, disagreed that assessment was for student accountability and rejected the view that assessment was irrelevant (Brown, 2004). Improvement, school and student accountability conceptions were positively correlated (Brown, 2004) but no link was made with conceptions of knowledge, conceptions of learning, or conceptions of instruction. In another study on academics' orientations to assessment practice, Samuelowicz and Bain (2002) came up with six categories, each with a different profile on six belief dimensions. The six orientations were clustered into three groups: (1) assessing the students' ability to reproduce information presented in lectures and textbooks; (2) assessing the students' ability to reproduce structured knowledge and apply it modified situations; and (3) assessing the students' ability to integrate, transform and use knowledge purposefully (Samuelowicz and Bain, 2002: 180–181). With respect to the relationship between orientations to teaching and learning and orientations to assessment practice, they remark: 'The Spearman rank correlation between the two sets of orientations was 0.81, confirming that, in our sample, orientations to assessment practice were closely related to orientations to teaching and learning' (Samuelowicz and Bain, 2002: 192).

In her study on the perceptions about assessment for learning of tutors and students, Maclellan (2001) asked about the purpose, content, timing, mode, marking, feedback and assessor. Results showed 'considerable differences between staff and students. On a Mann–Whitney *U*-Test, perceptions of assessment were significantly different on 32 out of the 39 items'(Maclellan, 2001: 313). In her attempt to deduce the respective 'views' of the two groups she indicates several inconsistencies in the opinions expressed by staff and students separately and comparatively. She seems to be particularly worried about 'the very underdeveloped conception of what assessment is' held by the students (Maclellan, 2001: 317). An important aspect of getting students involved in the process of self-directed learning would be to get them seriously engaged in the assessment process. Training students to become qualified self- and peer-assessors was tested in a study by Bloxhamand West (2004). In their study, a team's grade for a poster presentation was determined by (a) the grade awarded to them by other students, and (b) the quality of the feedback they themselves provided to another team. Results showed no significant differences in marks awarded by students and tutors and a greater understanding of performance and the use of assessment criteria (Boxham and West, 2004: 726). That the initial perception of assessment tools will change as soon as students have had positive experiences with it was demonstrated in a study by Struyven et al. (2006).

Gijbels, et al. (2005) performed a meta-analysis on the effects of problem-based learning (PBL) from the angle of assessment. Problem-based learning can be considered to incorporate all the principles of a constructivist conception of education (Otting and Zwaal, 2006). Gijbels et al. (2005) investigated the differential effect of PBL on 'the three levels of the knowledge structure: (a) understanding of concepts, (b) understanding of the principles that link concepts, and (c) linking of concepts and principles to conditions and procedures for application. Problem-based learning had the most positive effects when the focal constructs being assessed were at the level of understanding principles that link concepts' (Gijbels et al., 2005:27). In their study on the effect of PBL on students' learning approaches, Nijhuis et al. (2005) conclude that when changing a course from an assignment-based format into a problem-based format, a significant decrease in deep learning occurred and that the PBL course led to a significantly higher incidence of surface learning (Nijhuis et al., 2005: 82). Another study in a PBL context (Segers et al., 1999) showed a significant correlation between students' scores on a Knowledge Test and their scores on the Overall Test, which according to the authors, implies that 'we should not relinquish traditional assessment techniques' (Segers et al., 1999: 281).

Conceptions of knowledge

Research on conceptions of knowledge or epistemological beliefs, a core set of beliefs about knowledge and knowing, can be traced back to the work of Perry (1981), who initiated the study of personal epistemology by conceptualising the epistemological development of students during their years in undergraduate education. Perry found that students developed from simple and certain views of knowledge to more complex and relativistic ways of understanding knowledge and knowing. However, his conceptualisation of knowledge was unilateral and was afterwards replaced by ideas about the multi-dimensionality of epistemological beliefs. Schommer (1990; 1994) and Schommer and Easter (2006) conceptualised personal epistemology as a system of multi-dimensional epistemological beliefs. These epistemological beliefs (structure of knowledge, stability of knowledge, source of knowledge, speed of learning, and ability to learn) are more or less independent.

The dimensionality of epistemic beliefs is an issue of controversy both from an empirical and from a theoretical point of view. Besides the dimensionality, several studies address the domain in general and the domain or discipline-specific nature of epistemological beliefs (Hofer, 2000), or explore the dimensionality of epistemological beliefs in different classroom contexts (Hofer, 2004). Lately, new and improved epistemic beliefs questionnaires have been developed (Schraw et al., 2002; Chan and Elliott, 2004).

The study of epistemological beliefs is important because epistemological beliefs may play an important role in influencing students' learning behaviours and practices. Constructivist approaches to education and the immersion of students in constructivist learning environments promote awareness of and changes to epistemological beliefs (Howard, 2000; Brownlee et al., 2003). Sophisticated epistemological beliefs are positively influenced by constructivist approaches to knowledge and learning, whereas naïve epistemological beliefs are linked to the traditional transmissive approach to teaching (Tickle et al., 2005). Epistemological beliefs interact with and develop through students' participation

in educational practices. Therefore, teachers should pay sufficient attention to the development of these beliefs. Students with naïve epistemological beliefs are more likely to hold beliefs that knowledge is simple and unchanging and can be quickly learned, whereas students with a more sophisticated personal epistemology believe that knowledge is uncertain and complex. The acquisition of knowledge requires the students' engagement in more complex reasoning and knowledge construction processes.

Conceptions of teaching and learning

Students' conceptions of teaching and learning can be seen as a framework through which students describe and experience the learning environment. The study of the conceptions of teaching and learning is important because these conceptions may influence what and how students learn and their consequent academic achievements. The present conception of teaching and learning has been influenced by research in cognitive science. Recent insights in learning (Segers, 2004; Dolmans et al., 2005) have shown that:

- Learning should build on the student's prior knowledge and should be a constructive process;
- Learning should be a self-regulated and self-directed process;
- Learning should be context-bound and should be a fundamentally social process;
- Learning should be more than a process of knowledge acquisition. It should be a collaborative process and a process of enculturation in a community of learners and practitioners; and
- Learning should not only be a cognitive process but also a motivational and emotional process.

Research in the area of conceptions of teaching and learning suggests different categorisations of teachers' and students' conceptions of teaching and learning. The shift of focus from a teacher-centred and content-oriented model to a student-centred and learning-oriented model can be seen as a continuum. Kember (1997) has proposed a five category model of teaching and learning.His model of conceptions of teaching and learning distinguishes betweentwo teacher-centred orientations, a transitional orientation, and two student-centred orientations. However, research by Samuelowicz and Bain (2001) shows that there seems to be a 'hard' divide instead of a 'soft' transitional stage between the teacher-centred and student-centred orientations. In this paper, we will use a simplified categorisation: a traditional and a constructivist conception of teaching and learning. The traditional conception of teaching and learning is generally described as a teacher-centred approach to teaching,stressing information transmission combined with a surface approach to learning,whereas the constructivist conception of teaching and learning is seen as a student-centred approach to teaching, focusing on conceptual change, and has been linked to a deep approach to learning (Trigwell et al., 1999; Samuelowicz and Bain, 2001; Chan, 2003; Chan and Elliott, 2004).

Research questions

There have been few, if any, empirical studies on conceptions of assessment. So our first objective is to test and validate the Conceptions of Assessment Scale (CAS). The objective is to establish a preliminary key for the CAS, using the TLCQ as a frame of reference (concurrent validity). Construct validity is measured by investigating the relational structure between the CAS, TLCQ and EBQ, each representing one subset of conceptions of education.

The main question addressed in the present study is about the differences and similarities in conceptions of assessment held by students and instructors. We will also check whether there are any systematic differences in conception of assessment between men and women, students of different nationalities and juniors versus seniors.

The second topic is the congruency in the three sets of conceptions of education: (1) knowledge, (2) teaching and learning, and (3) assessment. To what degree do students and instructors demonstrate a consistent constructivist or traditional orientation toward the three sets of educational conceptions?

Method

Three instruments were used to measure the three constituent parts of students' conceptions of education. The adapted epistemic beliefs questionnaire (EBQ) as developed by Chan (2000) and Chan and Elliott (2002) was used to assess conceptions of knowledge. The EBQ is an adapted version from Schommer's (1990) original 64-item instrument. It contains 30 statements about 'the nature of knowledge' and 'the nature of knowing' (Hofer, 2000), rated on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree).

The teaching and learning conceptions questionnaire (TLCQ) was also adopted from Chan (2003) and Chan and Elliott (2004). The TLCQ is a 30-item questionnaire that measures two different conceptions of teaching and learning: a traditional and a constructivist conception of teaching and learning.

The conceptions of assessment scale (CAS) was developed by the authors and is based on an extensive literature review and empirical testing among students and instructors. In the student version of the CAS, 32 items were included and students were forced to choose either the first (A) or second (B) statement (forced-choice format). To determine which of the two statements should be considered to reflect the constructivist orientation, we applied two methods. First, some experts in the area of educational measurement were asked to indicate which of the two alternatives A or B would reflect a more constructivist orientation. Based on sufficient agreement among the expert judgments, a provisional key was accepted. The second approach was to use the outcomes of the TLCQ as a criterion. The two groups identified as the 'traditionalists' and 'constructivists', using the two TLCQ scales, were examined with regard to their preferences for either of the two alternatives (A or B) on each of the CAS items. Inspection of the cross-tabulation and chi-square test indicated that seven items did not sufficiently discriminate between constructivists and traditionalists or should be keyed in reverse to the expert opinion. None of these seven items were included in the instructor version of the CAS and were rejected from further analysis.

The format of the instructor version of the CAS was also adapted. The force-choice format was replaced with a 4-point rating scale, with the following description:

1 = I quite agree with the statement on the left

2 = I agree somewhat more with the statement on the left than I do with the one on the right

3 = I agree somewhat more with the statement on the right than I do with the one on the left
4 = I quite agree with the statement on the right.

To enable comparison of the conceptions of students and instructors, the four-point scale was dichotomised, with 1 and 2 indicating a preference for statement A and options 3 and 4 reflecting a preference for statement B.

The procedure of examining the differential preferences of the 'traditional' group as compared to the 'constructivist' group – both created based on the two TLCQ scales – was repeated. Results indicated that 15 items showed a significant relationship between conception of teaching and learning and preference for either of the two statements in the CAS. We interpreted this as a kind of concurrent validation of the CAS key.

The 15 items of the CAS are shown in Table 1.

For some items, the first statement is keyed as representing the constructivist conception of assessment, while for other items the first statement would indicate the traditional conception. All answers are coded with +1 for endorsing the constructivist statement and –1 for choosing the traditional option, so the sum score can range from –15 (traditionalist) to +15 (constructivist).

Table 1: Conceptions of Assessment Scale (CAS)

1	A. Assessment should indicate whether you passed or failed B. Assessment should provide information on your strengths and weaknesses (C)
2	A. A test should rather ask for facts than for competencies B. A test should rather ask for competencies than for facts (C)
3	A. Assessment should focus on discovering the truth B. Assessment should focus on developing wisdom (C)
4	A. Assessment is all about understanding (C) B. Assessment is all about measurement
5	A. Competency is better tested with tests and examinations B. Competency is better tested with assignments and projects (C)
6	A. If a subject isn't tested I will not spend any time on it B. If I am interested in a topic I will study it, even if it isn't tested (C)
7	A. Assessments should cover just one discipline or subject area B. Assessments should be multi-disciplinary and cover several subject areas (C)
8	A. Assessment should be focused on learning processes (C) B. Assessment should be focused on learning results
9	A. Assessments are accurate indicators of student learning B. Assessments only give a rough indication of student learning (C)
10	A. Assessments measure higher order thinking skills (C) B. Assessments measure facts and details
11	A. Frequent assessments stimulate the learning process (C) B. Frequent assessments hinder the learning process
12	A. My peers have more information about my learning achievements than the lecturers (C) B. The lecturers have more information about my learning achievements that my peers
13	A. I am unable to evaluate the learning process of my group members B. I am able to evaluate the learning process of my group members (C)
14	A. Working in teams decreases my study results B. Working in teams increases my study results (C)
15	A. I'd rather do an individual test than work on a group assignment B. I'd rather work on a group assignment than do an individual test (C)

Note: (C) indicates the statement keyed as the constructivist option.

Procedure

The questionnaire was filled out by the students and instructors during PBL sessions, lectures, workshops or at home. Adequate time was provided for finalising the questionnaire. The participation of students and instructors was voluntary. In total, 617 students and 85 instructors participated in this study.

Results

Subjects

The subjects in this study were 617 students (33% male) and 85 instructors (35% female) from a middle-sized university in the Netherlands. The age of the students ranged from 17 to 29 (mean = 20.4; sd = 2.11) and of the instructors from 20 to 63 (mean = 43.8; sd = 10.6). Students came from 15 different countries, with the vast majority (85%) having Dutch nationality. Among the instructors,five nationalities were represented, with 94% being Dutch.

Conceptions of assessment

The observed range of CAS scores in the current sample of 617 students runs from a minimum of –11 to a maximum of +15 (mean = 4.7;sd = 4.9). In the sample of 85 instructors the range in CAS scores is from –11 to+14, with a mean of 5.95 and sd of 4.7 (see Table 2).

A *t*-test was performed to compare the mean CAS score of students and instructors. Results show that instructors score significantly higher than students (t = –2.11; df = 697; p = 0.03). Students have more traditional conceptions of assessment than instructors.

We also examined whether any systematic differences in conception of assessment exist between men and women, Dutch and non-Dutch students and junior versus senior students.

Results indicate that female students score significantly higher than male students (t = –2.48; df = 371.6; p = 0.025), a gender difference which cannot be detected amongst the instructors.

Senior students score significantly higher on the CAS than their junior counterparts (t = –4.63; df = 612; p = 0.00).

Finally, the Dutch students score significantly more constructivist than the non-Dutch students (t = 2.35; df = 612; p = 0.019).

Conceptions of knowledge

First, we examined the factor structure of the 30-item EBQ administered to the sample of students (n = 617). A principle component analysis with Oblimin rotation was run and did not replicate the four factors as hypothesised by Chan and Elliott (2004). Since our primary focus is on the dichotomy between a traditional versus a constructivist conception of education, we decided to run a two-factor solution (Eigenvalues of 3.11 and 2.61 respectively; together explaining 19% of variance). Inspection of the items with loadings > 0.30 in each factor clearly shows a traditional conception of knowledge versus a more constructivist conception of knowledge. The traditional factor contains 12 items reflecting a focus on innate ability,

Table 2. CAS scores by students (n = 617) and instructors (n = 85)

	Students	Instructors
Mean	4.74	5.95
Male	4.09	6.11
Female	5.08	5.67
Junior	3.91	–
Senior	5.75	–
Dutch	4.94	–
Non-Dutch	3.60	–

expert authority, and certainty of knowledge. The constructivist factor contains 11 items on learning effort and the learning process. The mean score on the 12 items in the traditional factor and the 11 items in the constructivist factor were used to classify subjects into four different groups: (1) traditionalists (scoring above the mean on the first factor and below the mean on the second factor), (2) constructivists (scoring above the mean on the second factor and below the mean on the first factor), and two mixed groups: (3) above average on both factors, and (4) below average on both factors. The two-factor solution of the EBQ is shown in Table 3.

Students scored significantly higher (2.81) than instructors (2.43) on the traditional scale (t = 7.13; df = 700; $p < 0.001$) while their scores on the constructivist scale are similar (students = 3.51, instructors = 3.56).

For further analyses of differences in EBQ scores between males and females, Dutch and non-Dutch students and junior versus senior students, we refer to Otting and Zwaal (2006).

Conceptions of teaching and learning

A principle component analysis with Oblimin rotation on the 30-item TLCQ yielded a two-factor solution (Eigenvalues of 5.42 and 3.46; together explaining 29.6% of the variance). The two factors, one indicating a constructivist conception of teaching and learning, the other a traditional conception of teaching and learning, exactly replicated the two factors identified by Chan and Elliott (2004) except for two items. The item 'I have really learned something when I can remember it later' in this study is transferred to the constructivist factor, while the item 'The major role of a teacher is to transmit knowledge to students' is considered to be misplaced and was rejected from further analyses. The two-factor solution of the TLCQ is shown in Table 4.

The mean score on the 16 items in the traditional factor and the 12 items in the constructivist factor were used to classify subjects into four different groups: (1) traditionalists (scoring above the mean on the first factor and below the mean on the second factor), (2) constructivists (scoring above the mean on the second factor and below the mean on the first factor), (3) above average on both factors, and (4) below average on both factors.

Students scored significantly higher (2.74) than instructors (2.05) on the traditional scale of the TLCQ (t = 11.57; df = 700; p = 0.001) and significantly lower (3.77) than instructors (4.11) on the constructivist scale (t = –6.11; df = 700; $p < 0.001$).

For further analyses on differences in EBQ scores between males and females, Dutch and non-Dutch students and junior versus senior students we refer to Otting and Zwaal (2006).

The relationship between conceptions of knowledge, conceptions of teaching and learning and conceptions of assessment

To assess the relationship between the conceptions of knowledge, the conceptions of teaching and learning, and the conceptions of assessment, we calculated the correlation between the scores on the different scales used to measure the several conceptions. The results of the correlation analysis are shown in Table 5.

The score on the scale measuring the traditional conception of knowledge (EBQ-TRAD) has a significant positive correlation with the score on the traditional conception of teaching and learning (TLCQ-TRAD) (r = 0.545). The traditional conception of knowledge is not correlated with the constructivist conception of knowledge (r = 0.011, ns) but significantly negatively correlated with a constructivist conception of teaching and learning (r = –0.263).

The score on the scale measuring the constructivist conception of knowledge (EBQ-CONSTR) is significantly correlated with the score on the constructivist conception of teaching and learning (TLCQ-CONSTR) (r = 0.384). A traditional conception of teaching and learning is negatively correlated with a constructivist conception of teaching and learning (r = –0.30), while no relation with a constructivist conception of knowledge was detected.

Higher CAS scores are significantly related to lower scores on the traditional scales of both theEBQ (r = –0.336) and TLCQ (r = –0.381). The CAS score is positively and significantly correlated with the constructivist conception of knowledge (r = 0.112) and teaching and learning (r = 0.377).

Since the correlationpattern described above holds true for both groups of students and instructors when examined separately, they are not included here.

Congruency in conceptions of education

The second research issue was aimed at the question of whether students' and instructors' conceptions of education are congruent, that is: do they show a consistent traditional or constructivist orientation toward all three sets of conceptions? To address this question, we classified subjects into groups, based on their position on the two factors on the EBQ and TLCQ and their score on the CAS. For the EBQ and TLCQ, subjects were assigned to one of four different groups according to their position on the two scales. Subjects scoring above average on the traditional scale AND scoring below average on the constructivist scale were classified as 'traditional'. Subjects were labelled 'constructivist' if they scored above average on the constructivist scale AND below average on the traditional scale. All other subjects formed two 'mixed' categories, with either low scores on both scales or high scores on both scales. For the CAS, all subjects scoring above the mean were classified as constructivist, all others as traditional.

Results of the categorisation on all three instruments (EBQ, TLCQ and CAS) are shown in Table 6.

Chi-square analysis shows a significant relationship between conception of knowledge and conceptions of teaching and learning among students (χ^2 = 124.6; df = 9; p = <0.001). For instructors, the association is non-significant.

Table 3. Pattern matrix of the two-factor solution for the EBQ (n = 617)

	Component	
	1	2
There isn't much you can do to make yourself smarter as your ability is fixed at birth.	0.636	
I still believe in what the experts say even though it differs from what I know.	0.583	
Scientific knowledge is certain and does not change.	0.572	
Students who begin school with 'average' ability remain 'average' throughout school.	0.560	
Our abilities to learn are fixed at birth.	0.513	
The really smart students don't have to work hard to do well in school.	0.466	
I am very aware that teachers know more than I do and so I agree with what they say rather than rely on my own judgment.	0.433	
I have no doubts about the experts' opinions.	0.421	
One's innate ability limits what one can do.	0.410	
The ability to learn is innate/inborn.	0.378	
Some students are born incapable of learning well in certain subjects.	0.362	
Scientists will ultimately get to the truth if they keep searching for it.	0.305	
How much you get from your learning depends on your effort.		0.565
People will learn better if they focus more on the process of understanding rather than on the facts to be acquired.		0.543
Everyone needs to learn how to learn.		0.523
If people can't understand something right away, they should keep on trying.		0.499
If one tries hard enough, then one will understand the course material.		0.494
Wisdom is not knowing the answers, but knowing how to find the answers.		0.479
Learning something really well takes a long time or much effort.		0.383
One learns little if one does not work hard.		0.372
Knowing how to learn is more important than the acquired facts.		0.360
Anyone can figure out difficult concepts if one works hard enough.		0.345
Getting ahead takes a lot of work.		0.306

Note 1: Extraction method: Principal component analysis. Rotation method: Oblimin with Kaiser normalisation. Rotation converged in 6 iterations.
Note 2: Traditional scale (12 items) with a mean of 2.81 and alpha of 0.695. The constructivist scale (11 items) has a mean of 3.51and alpha of 0.620.

Congruency or consistency in conceptions of education can also be calculated as the number of subjects in the diagonal cells, in particular the two shaded cells. Inspection of Table 6 shows that 77 (11%) subjects have a consistently traditional-conception of knowledge, teaching and learning, and assessment, while 62 (9%) are consistently constructivist in their conception of knowledge, teaching and learning, and assessment. Separate analyses for students and instructors provide similar figures (Students: 11% TRAD (69), 9% CONSTR (56); Instructors: 9% TRAD (8) and 7% CONSTR (6)). With respect to the congruency of conceptions of education, students seem to be just as inconsistent as instructors.

Discussion

Do students and instructors hold similar conceptions of education?

With regard to all three sets of conceptions, students show a more traditional orientation than instructors do. There could be different explanations for this result. First, it could be a matter of age – instructors being older on average than students. Why would people become more constructivist with age? Maybe because age is correlated with more experience, different formal and informal teaching and learning contexts, more time to reflect on own and others' learning processes and a growing awareness of the relative nature of knowledge. Particularly instructors who have received explicit training in educational sciences might have a more elaborated and sophisticated set of conceptions of education. A third determinant of the difference in orientation could be the different perspectives of students and instructors, as consumers and providers of education, respectively. In a constructivist context, students are expected to become actively engaged in the educational process as co-producers of the programme. If prior education has not prepared students to take up that role, they might resume to a consumer role.

With respect to conceptions of knowledge, the conceptions of teaching and learning, and conceptions of assessment, senior students prove to be significantly more constructivist than first-year students. To what extent this is caused by participating in a constructivist context (PBL) or by maturation, would require a longitudinal design and a comparison of a constructivist with a more traditional institutional setting.

The maximum acceptable level of discrepancy between conceptions of instructors and students and between institutional and individual conceptions of education are important issues which would warrant further research. More behavioural output measures need to be incorporated into such studies too, like the impact of conceptions of education on study results, time on task, teacher performance, satisfaction scores, and academic achievement.

Do gender, nationality and seniority make a difference?

When examining the CAS scores to see whether any systematic differences in conception of assessment exist between men and women, Dutch and non-Dutch students and junior versus senior students, it turns out that female students score significantly higher than male students, Dutch students

Table 4. Pattern matrix of the two factor solution for the TLCQ (n = 617)

	Component	
	1	2
Good students keep quiet and follow the teacher's instruction in class.	0.607	
It is best if the teachers exercise as much authority as possible in the classroom.	0.581	
Teaching is to provide students with accurate and complete knowledge rather than encourage them to discover it themselves.	0.576	
Good teaching occurs when there is mostly teacher talk in the classroom.	0.545	
The traditional/lecture method for teaching is best because it covers more information/knowledge.	0.542	
Learning mainly involves absorbing as much information as possible.	0.540	
Learning means remembering what the teacher has taught.	0.540	
Learning to teach simply means practicing the ideas from lecturers without questioning them.	0.530	
Students have to be called on all the time to keep them under control.	0.527	
A teacher's task is to correct learning misconceptions of students right away instead of allowing them to verify them for themselves.	0.522	
Teachers should have control over what students do all the time.	0.517	
A teacher's major task is to give students knowledge, assign them drill and practice, and test their recall.	0.512	
No learning can take place unless students are controlled.	0.480	
Teaching is simply telling, presenting or explaining the subject matter.	0.458	
During the lesson, it is important to focus on the textbook.	0.412	
Learning occurs primarily from drilling and practice.	0.409	
Students should be given many opportunities to express their ideas.		0.669
It is important that a teacher understands the feelings of the students.		0.620
The ideas of students are important and should be carefully considered.		0.597
In good classrooms there is a democratic and free atmosphere, which stimulates students to think and interact.		0.585
Good teachers always encourage students to think for answers themselves.		0.570
Learning means students have ample opportunities to explore, discuss and express their ideas.		0.551
I have really learned something when I can remember it later.		0.524
Instruction should be flexible enough to accommodate individual differences among students.		0.518
Effective teaching encourages more discussion and hands-on activities for students.		0.509
Good teachers always make their students feel important.		0.496
Every student is unique or special and deserves an education tailored to his or her particular needs.		0.432
The focus of teaching is to help students construct knowledge from their learning experience instead of knowledge transmission.		0.423
Different objectives and expectations in learning should be applied to different students.		0.313

Note 1: Extraction method: Principal component analysis. Rotation method: Oblimin with Kaiser normalisation. Rotation converged in 7 iterations.
Note 2: Traditional scale (16 items) with a mean 2.73 and alpha of 0.822. The constructivist scale (13 items) has a mean of 3.77 and alpha of 0.801.

Table 5. Correlation between conception of knowledge, teaching and learning, and assessment (n = 702)

	EBQ-TRAD	EBQ-CONSTR	TLCQ-TRAD	TLCQ-CONSTR
EBQ-TRAD				
EBQ-CONSTR	0.011			
TLCQ-TRAD	0.545**	0.011		
TLCQ-CONSTR	–0.263**	0.384**	–0.300**	
CAS	–0.336**	0.112**	–0.381**	0.377**

**Correlation is significant at the 0.01 level (2-tailed).

significantly higher than non-Dutch students, and senior students significantly higher than their junior counterparts. These findings raise several new issues for further research. One would be the issue about the relationship between the well-established outcome that female students generally outperform their male counterparts with regard to academic achievement and their respective conceptions of education. A second topic for further study would be the analysis of cultural differences in prior educational systems and their impact on students' conceptions of education.

Are conceptions of education congruent?

A traditional conception of knowledge is significantly correlated with a traditional conception of teaching and learning, while a constructivist conception of knowledge is significantly correlated with a constructivist conception of teaching and learning. Similarly, the CAS scores are significantly negatively correlated with the traditional conception of knowledge and teaching and learning and show a significant positive correlation with the constructivist conceptions of knowledge and teaching and learning.

Table 6: Cross-tabulation of 'conceptions of knowledge' and 'conceptions of teaching and learning'. Shaded cells indicate congruency between conceptions of knowledge and teaching and learning

			EBQ				
			Both low	Traditional	Constructivist	Both high	Total
CAS Traditional	TLCQ	Both low	15	20	11	14	60
		Traditional	19	77	14	34	144
		Constructivist	5	5	11	9	30
		Both high	11	17	8	27	63
		Total	50	119	44	84	297
CAS Constructivist	TLCQ	Both low	39	17	16	11	83
		Traditional	18	25	12	20	75
		Constructivist	54	14	62	36	166
		Both high	8	11	28	34	81
		Total	119	67	118	101	405

These results suggest a rather consistent profile within the conceptions of education. A constructivist orientation toward knowledge is correlated with a similar orientation toward teaching and learning and toward assessment, and vice versa for a traditional orientation.

If we classify subjects as constructivist or traditional using the mean on the different scales as a cut-off point, a significant relationship occurs between conceptions of knowledge and conceptions of teaching and learningfor the students in our sample. For instructors, the association is non-significant. If congruency or consistency in conceptions of education is expressed as the number of subjects having a consistently traditional conception of knowledge, teaching and learning and assessment, then 11% have a consistently traditional conception of education, and 9% are consistently constructivist in their conception of education. Although these figures are hard to interpret, they suggest that students are just as consistent as instructors. Further research is needed to validate the statement that a subjects' conception of education can be accurately predicted based on their EBQ, TLCQ or CAS scores. Further research should also test whether a dichotomy (constructivist vs. traditional) as applied in the present study is sufficient to classify the different conceptions of education.

Implications for education

An important implication of the present study is to monitor the alignment between the educational philosophy of an institute and the conceptions of education held by its students and instructors. Discrepancies in conceptions between the different stakeholders might cause an educational philosophy to fail, because its principles are misunderstood, misapplied or even rejected by students and instructors. It seems like a good idea to regularly check their conceptions of education, using the tools applied and developed in this study.

Although the results of the study seem to substantiate the idea that the constructivist principles of PBL are supported by instructors and students, further research is needed to compare traditional and constructivist educational systems, and their respective pay-offs. A related issue is to demonstrate in what way constructivism is better than traditional education.

PBL and assessment

Matching learning and assessment in problem-based learning requires the introduction of innovative methods of assessment that are in line with the constructivist framework behind problem-based learning. Students' experiences with the attempt to align learning and assessment are not always perceived as positive. A study of Winning et al. (2005) on students' experiences of assessment in problem-based curricula shows that the majority of students had negative experiences. Especially, the amount of clarity and feedback, the consistency of grading, and the clarity of expectations were mentioned as major shortcomings. Clear explanations of the assessment concepts and goals combined with support for students to improve their (self- and peer-) assessment skills are needed for a better understanding of a broader range of assessment methods.

References

Biggs JB. 2003.*Teaching for quality at university.* Buckingham: SRHE and Open University.

Birenhaum M, Dochy E. (eds). 1996. *Alternatives in assessment of advancements, Learning and prior knowledge*. Boston: Kluwer.

Bloxham S, West A. 2004. Understanding the rules of the game: marking peer assessment as a medium for developing students' conceptions of assessment. *Assessment and Evaluation in Higher Education* 29(6): 721–733.

Boud D. 1995. Assessment and learning: contradictory or complementary? In: Knight P (ed.), *Assessment for learning in higher education*. London: Kogan Page. pp 35–48.

Boud D, Falchikov N. 2006.Aligning assessment with long-term learning.*Assessment and Evaluation in Higher Education* 31(4): 399–413.

Brown GTL. 2004. Teachers' conceptions of assessment: implications for policy and professional development. *Assessment in Education* 11(3): 301–318.

Brownlee J, Purdie N, Boulton-Lewis G. 2003. An investigation of student teachers' knowledge about their own learning. *Higher Education* 45:109–125.

Chan K-W, Elliott RG. 2002. Exploratory study of Hong Kong teacher education students' epistemological beliefs: cultural perspectives and implications on beliefs research. *Contemporary Educational Psychology* 27: 392–414.

Chan K-W, Elliott RG. 2004. Relational analysis of personal epistemology and conceptions about teaching and learning. *Teaching and Teacher Education* 20: 817–831.

Chan K-W. 2004. Pre-service teachers' epistemological beliefs and conceptions about teaching and learning: cultural implications for research in teacher education. Paper presented at the NZARE AARE Conference, Auckland. *Australian Journal of Teacher Education* 29(1): 1–13.

Dolmans DHJM, De Grave W, Wolfhagen IHAP, Van de Vleuten CPM. 2005. Problem-based learning: future challenges for educational practice and research. *Medical Education* 39: 732–741.

Ebel RL. 1972. *Essentials of educational measurement*. London: Prentice-Hall International.

Entwistle N. 2000. *Promoting deep learning though teaching and assessment: conceptual frameworks and educational contexts.* Paper presented at the TLRP Conference, Leicester. November 2000.

Gijbels D, Dochy F, van den Bossche P, Segers M. 2005. Effects of problem-based learning: a meta-analysis from the angle of assessment. *Review of Educational Research* Spring 2005, 75(1): 27–61.

Hofer BK. 2000. Dimensionality and disciplinary differences in personal epistemology. *Contemporary Educational Psychology* 25: 378–405.

Hofer BK. 2004. Exploring the dimensions of personal epistemology in differing classroom contexts: student interpretations during the first year of college. *Contemporary Educational Psychology* 29:129–163.

Hofer BK, Pintrich PR. 1997. The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research* 67(1): 88–140.

Howard BC, McGee S, Schwartz N, Purcell S. 2000. The experience of constructivism: transforming teacher epistemology. *Journal of Research on Computing in Education* 32(4):455–466.

Maclellan E. 2001. Assessment for learning: the differing perceptions of tutors and students. *Assessment and Evaluation in Higher Education* 26(4): 307–318.

Nijhuis JFH, Segers MSR, Gijselears WH. 2005. Influence of redesigning a learning environment on student perceptions and learning strategies. *Learning Environments Research* 8: 67–93.

Otting H, Zwaal W. 2006. The identification of constructivist pedagogy in different learning environments. In: McCuddy MK (ed.), *Thechallenge of educating people to lead in a challenging world*. Dordrecht: Springer. pp 171–196.

Perry WG.1981. Cognitive and ethical growth: the making of meaning. In: ChickeringA (ed.)*, The Modern American College.* San Francisco: Jossey-Bass. pp 76–116.

Samuelowicz K, Bain JD. 2001. Revisiting academics' beliefs about teaching and learning. *Higher Education* 41: 299–325.

Samuelowicz K, Bain JD. 2002. Identifying academics' orientations to assessment practice. *Higher Education* 43: 173–201.

Schommer M.1990. Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology* 82: 98–504.

Schommer M. 1994. Synthesizing epistemological belief research: tentative understandings and provocative confusions. *Educational Psychology Review* 6(4): 293–319.

Schommer-Aikins M, Easter M. 2006. Ways of knowing and epistemological beliefs: combined effect on academic performance. *Educational Psychology* 26(3): 411–423.

Schraw G, Bendixen LD, Dunkle ME. 2002. Development and validation of the epistemic beliefs inventory (EBI). In: Hofer BK, Pintrich PR(eds), *Personal epistemology: the psychology of beliefs about knowledge and knowing*. Mahwah, NJ: Lawrence Erlbaum Associates. pp 261–275.

Segers M. 2004. Assessment en leren als twee-eenheid: onderzoek naar de impact van assessment op leren. *Tijdschrift voor Hoger Onderwijs* 22(4): 188–219.

Segers M, Dochy F, De Corte E. 1999. Assessment practices and students'knowledge profiles in a problem-based curriculum. *Learning Environments Research* 2: 191–213.

Segers M, Dochy F. 2001. New assessment forms in problem-based learning: the value-added of the students' perspective. *Studies in Higher Education* 26(3): 327–343.

Struyven K, Dochy F, Janssens S, Schelfhout W, Gielen S. 2006. De effecten van de evaluatie-ervaring op de percepties van studenten over assessment. *Pedagogische Studiën* 83: 35–54.

Taylor, C. 1994. Assessment for measurement or standards: the peril and promise large-scale assessment reform. *American Educational Research Journal* 31(2): 231–262.

Tickle EM, Brownlee J, Nailon D. 2005. Personal epistemological beliefs and transformational leadership behaviours. *Journal of Management Development* 24(8): 706–719.

Trigwell K, Prosser M, Waterhouse F. 1999. Relations between teachers' approaches to teaching. *Higher Education* 37: 57–70.

Van der Vleuten CPM, Dolmans DHJM, Scherpbier AJJA. 2000.The need for evidence in education. *Medical Teacher* 22(3): 246–250.

Winning T, Lim E, Townsend G. 2005. Student experiences of assessment in two problem-based dental curricula: Adelaide and Dublin. *Assessment and Evaluation in Higher Education* 30(5): 489–505.