

The revised two-factor Study Process Questionnaire: R-SPQ-2F

John Biggs*

University of Hong Kong

David Kember and Doris Y.P. Leung

Hong Kong Polytechnic University

Aim. To produce a revised two-factor version of the Study Process Questionnaire (R-SPQ-2F) suitable for use by teachers in evaluating the learning approaches of their students. The revised instrument assesses deep and surface approaches only, using fewer items.

Method. A set of 43 items was drawn up for the initial tests. These were derived from: the original version of the SPQ, modified items from the SPQ, and new items. A process of testing and refinement eventuated in deep and surface motive and strategy scales each with 5 items, 10 items per approach score. The final version was tested using reliability procedures and confirmatory factor analysis.

Sample. The sample for the testing and refinement process consisted of 229 students from the health sciences faculty of a university in Hong Kong. A fresh sample of 495 undergraduate students from a variety of departments of the same university was used for the test of the final version.

Results. The final version of the questionnaire had acceptable Cronbach alpha values for scale reliability. Confirmatory factor analysis indicated a good fit to the intended two-factor structure. Both deep and surface approach scales had well identified motive and strategy subscales.

Conclusion. The revision process has resulted in a simple questionnaire which teachers can use to evaluate their own teaching and the learning approaches of their students.

The Study Process Questionnaire (SPQ) (Biggs, 1987a, 1987b), and its school-level companion, the Learning Process Questionnaire (LPQ) (Biggs, 1987c), were developed in the late 1970s. Since that time, the nature of the tertiary sector has changed dramatically, with respect to such factors as the heterogeneity of the student population, the structure and administration of institutions, the range and depth of curricula, methods of delivery and assessment, and so on. However, as is indicated by the ever expanding demand for such instruments as the SPQ and the similar Approaches to

* Requests for reprints should be addressed to Professor J.B. Biggs, PO Box 8227, Tumbi Umbi, NSW 2261, Australia.

Study Inventory (ASI) (Entwistle & Ramsden, 1983) for research and development, the utility of the constructs being measured is just as high as ever. It is therefore timely that the factor structure of the constructs might be re-examined and the items defining the constructs reviewed and possibly updated.

The norms themselves are another matter. Originally it was thought desirable and feasible to provide norms for different student populations, and so, as far as Australia was concerned, norms were provided in arts, science and education, for males and females, separately for college and university sectors (Biggs, 1987b). Now those two sectors have merged, and arts and science are no longer the modal faculties, in terms either of size or of academic priority. On the one hand, the student population is more heterogeneous than it was, and on the other hand, with the modularisation of teaching units, students' courses of study are now more programme-based than faculty-based. The basis on which norms might be provided is thus a much more complex issue now than it was. For the purposes we have in mind for the present revision, we suggest that norms are either unnecessary, or can be obtained intra-institutionally by users, as explained below.

But apart from the basic need simply to update the instruments, work and conditions in recent years have suggested the utility of providing a shortened version dealing only with surface and deep approaches, principally for work on teaching effectiveness and staff development. In these days of changing teaching contexts, accountability, and concerns with quality assurance and particularly with quality enhancement, instruments like the SPQ have an increasingly important role to play that was not envisaged fifteen or so years ago.

The development of the SPQ

Many inventories addressing learning processes are derived top-down from cognitive psychology, particularly information processing theories (Moreno & DiVesta, 1991; Schmeck, Geisler-Brenstein, & Cercy 1991; Weinstein, Schulte, & Palmer, 1987), with the deliberate intention that they address universal and 'culture-fair' mechanisms (Moreno & DiVesta, 1991). Such a framework, however, seems particularly inappropriate for such a context-dependent issue as student learning, where student strategy use is dependent upon a host of factors, such as students' values and motives, their perceptions of task demands, teaching and assessment methods, classroom climate, and so on.

By studying how students perceived a particular reading task and then went about learning it, Marton and Säljö (1976a, 1976b) came up with the powerful idea of 'approach to learning', which became the point of departure for the emerging conceptual framework known generically as 'student approaches to learning' (SAL) theory (Biggs, 1993a; Entwistle & Waterston, 1988). SAL theory has in fact become a meta-theory for conceptualising teaching and learning, which has gone in two major directions: phenomenography (Marton, 1981; Prosser & Trigwell, 1998) and constructivism and systems theory (Biggs, 1999; Dart & Boulton-Lewis, 1998). However, the notion that students' perceptions and learning-related activities are central to teaching and learning is common to all SAL sub-theories (Biggs, 1993a, 1999; Entwistle & Waterston, 1988).

The Study Process Questionnaire (SPQ) (Biggs, 1987a, 1987b) was developed from an earlier 10-scale Study Behaviour Questionnaire (SBQ), conceived within an information-processing framework (Biggs, 1976). Higher order factor analysis suggested that the 10 scales could be interpreted in terms of three higher order factors. The most suitable interpretation of these factors, however, was in terms of the SAL conceptual framework, not the original IP theory, because the three factors were found to be comprised of two kinds of items, those relating to a motive, and those relating to a congruent strategy. In this, the factor analysis recalled Marton and Säljö's original point that a student handled a reading task according to his or her intentions prior to engaging the task. However, whereas those authors were concerned with two intentions or motives, to remember significant facts and details or to try to understand what the author was trying to say, we are here dealing with three such motives: to keep out of trouble with minimal effort, to engage the task appropriately, and to maximise grades. Each such motive was associated with a congruent strategy: selective memorising, seeking for meaning, and optimal time and space management, respectively (see Table 1). Given the differing methodologies and contexts, the similarity between the

Table 1. The original Study Process Questionnaire: Dimensions, motives and strategies

	<i>Surface</i>	<i>Deep</i>	<i>Achieving</i>
<i>Motive</i>	fear of failure	intrinsic interest	achievement
<i>Strategy</i>	narrow target, rote learn	maximise meaning	effective use of space and time

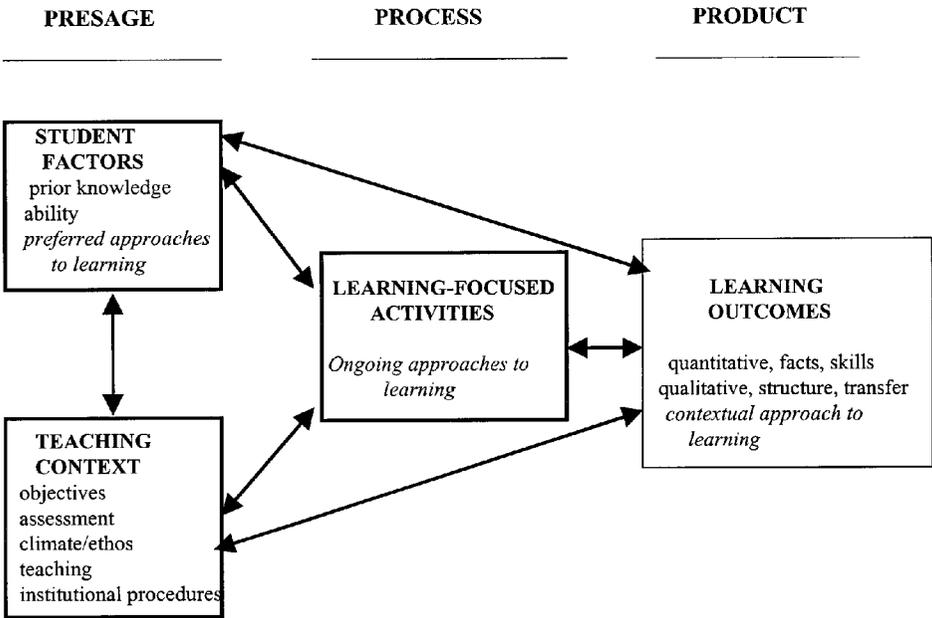
first two motives and strategies and the Swedish work on surface and deep approaches was remarkable, and to capture that similarity, the surface/deep terminology was adopted for the first two dimensions. Thus, the SPQ yielded three Approach scores, Surface, Deep, and Achieving respectively, and a component Motive and Strategy score for each Approach.

What do SPQ scores measure?

Students' approaches to learning are conceived as forming part of the total system in which an educational event is located, as schematised in the Presage-Process-Product (3P) model (Figure 1) (Biggs, 1987a, 1993a, 1993b). In the 3P model, student factors, teaching context, on-task approaches to learning, and the learning outcomes, mutually interact, forming a dynamic system (Figure 1).

Presage factors refer to what exists prior to engagement that affects learning. On the student side this includes such factors as prior knowledge, ability, and their preferred approaches to learning; and on the side of the teaching context, the nature of the content being taught, methods of teaching and assessment, the institutional climate and procedures, and so on. These factors interact to determine the on-going approach to a particular task, which in turn determines the outcome. However, as the reversible arrows show, each such factor affects every other factor, so that for instance the student's preferred approach will adjust to the particular context and course being taught, and to the success or otherwise of the outcome.

Figure 1. The ‘3P’ model of teaching and learning



The heart of the teaching/learning system is at the process level, where the learning-related activity produces or does not produce the desired outcomes. As Shuell puts it:

If students are to learn desired outcomes in a reasonably effective manner, then the teacher’s fundamental task is to get students to engage in learning activities that are likely to result in their achieving those outcomes. It is important to remember that what the student does is more important than what the teacher does. (Shuell, 1986, p. 429)

A generic way of describing ‘what the student does’ is precisely in terms of their ongoing approaches to learning. There are many possible interactions between student perceptions and teaching demands here. A student who typically picks out likely items for assessment and rote learns them, finds that strategy won’t work under portfolio assessment, so goes deep. Another student, who normally interacts deeply, may decide to go surface in a module that is overloaded with content and assessed by a poorly constructed MCQ. Indeed the generic aim of good teaching is precisely to encourage students to adopt a deep approach and to discourage the use of a surface approach (Biggs, 1999). Thus, the mean of the approaches of the students in a class gives an index of the quality of the teaching in that class, so we may then refer to one outcome of teaching as a ‘contextual approach to learning’.

It is therefore quite inappropriate to categorise students as ‘surface’ or ‘deep’

learners on the basis of SPQ responses, as if an approach score measured a stable trait of the individual. SPQ responses are a function of *both* individual characteristics *and* the teaching context. Both teacher and student are jointly responsible for the outcome, the teacher for structuring the enabling conditions, the learner for engaging them. Thus, an approach to learning describes the nature of the relationship between student, context, and task.

Approach scores on the SPQ are thus in marked contrast both to scores on learning or cognitive style instruments, which are designed specifically to be insensitive to context (Biggs, 1993a, in press), and to the constructs accessed by questionnaires deriving from information processing theory (Biggs, 1993a; Moreno & DiVesta, 1991). Given that, it is astonishing to read that ‘the SPQ appears . . . as if it were a learning styles instrument, measuring some characteristic of the person rather than their relation with the object of learning’ (Bowden & Marton, 1999, p. 60). This statement either reveals a profound misunderstanding of systems theory, or a cavalier disregard for the published work on the SPQ (Biggs, 1987a, 1993a), particularly that relating to its extensive use in a before-after mode to assess the impact of innovations (e.g., Kember, Charlesworth, Davies, McKay, & Stott, 1997). Be that as it may, the fact that it has been made at all suggests we should be careful in clarifying how the SPQ can be used to characterise teaching contexts.

In sum, SPQ scores can be quality indicators at presage, process and product levels, as referring to *preferred*, *ongoing*, and *contextual* approaches to learning (see Figure 1):

- at the presage level, they may describe how individuals differ within a given teaching context (preferred approach)
- at the process level, they may describe how specific tasks are handled (ongoing approach)
- at the product level, they may describe how teaching contexts differ from each other (contextual approach).

In the first case, the preferred approach tells us the extent to which an individual differs from other students in a similar context. This is the case where norms are appropriate, so that a student’s motive, strategy and/or approach scores may be compared to the scores of others in the same cohort. That is, we are interested in variability between individuals in a given context.

In the second case, the ongoing approach would be obtained by requiring individuals to respond to items reworded to suit a specific task, as did Tang (1991) in connection with different assessment tasks. In this way, ongoing approach scores tell us how a particular task was handled.

In the last case, the contextual approach is assessed by calculating class or sub-group means, so that differences between means tell us how different classes or teaching contexts differ. We might compare different classes, different institutions even, or before-after mean scores after the introduction of an intervention in the same class. It is contextual approaches on which we would like to concentrate here. Contextual approach scores can tell us when the system is working (when motives, strategies and approaches are predominantly deep), and when it is not working (when motives, strategies and approaches are predominantly surface).

In an ideal system, all students would be expected to engage the highest level learning activities and thus to handle the task, or to solve the problem, appropriately. This is in fact the generic definition of a deep approach, while a student using a surface approach would use lower order verbs *in lieu* of the higher order. The following illustrates this clearly:

I hate to say it, but what you have got to do is to have a list of 'facts'; you write down ten important points and memorise those, then you'll do all right in the test . . . If you can give a bit of factual information – so and so did that, and concluded that – for two sides of writing, then you'll get a good mark. (A psychology undergraduate, quoted in Ramsden, 1984, p. 144)

It is unlikely that the teacher of this student thought that an adequate understanding of psychology could be manifested by selectively memorising. Rather, an inappropriate assessment task *allowed* the students to get a good mark on the basis of memorising facts. As it happened, this particular student wrote brilliant essays, and later graduated with first class honours. The problem is therefore not that this student is irredeemably cursed with a surface 'style', but that under current conditions of teaching and assessment he made a strategic decision that a surface approach would see him through this task. As indeed it did.

Teaching and assessment methods often encourage a surface approach when they are not aligned to the aims of teaching the subject, as in the above case. The presence of a surface approach signals that something is out of kilter in our teaching or in our assessment methods, but that it is something we can hope to address. The approaches that prevail tell us something about the quality of the teaching environment. Thus questionnaires like the SPQ can be useful for evaluating teaching environments (Biggs, 1993b; Kember *et al.*, 1997), and are often more sensitive when reworded for a particular subject (Eley, 1992), or assessment tasks (Tang, 1991; Thomas & Bain, 1984).

A particularly depressing finding is that most students in most undergraduate courses become increasingly surface and decreasingly deep in their orientation to learning (Biggs, 1987a; Gow & Kember 1990; Watkins & Hattie, 1985). There are however exceptions; students with aspirations for graduate study do not show this pattern in their chosen area of study (Biggs, 1987a), nor do students taught using problem-based learning, who become increasingly deep, and less surface, in their orientations (Newble & Clarke, 1986). For most undergraduate students, however, something is happening as they progress that is increasingly supporting the use of lower cognitive level activities, which is of course the opposite of what is intended by a university education (Gow & Kember, 1990). One might call it the 'institutionalisation' of learning, whereby students tend to pick up the tricks that get you by, such as 'memorising ten important points' (see above).

The role of the achieving-related scales

In using the SPQ as a means of monitoring teaching/learning environments, the role of the achieving-related scales is not as evident as those of deep and surface scales. In fact, the achieving motive and strategy had a different relationship with the deep and surface motives and strategies from the outset (Biggs, 1978). Whereas deep and surface

strategies describe the way students engage the task itself, the achieving strategy refers to how the student organises when and where the task will be engaged, and for how long. Higher order factor analyses usually associate the achieving motive and strategy with the deep approach (Biggs, 1987a), but depending on the subjects and teaching conditions, sometimes achieving-related scores load on the surface approach (Biggs & Kirby, 1984). Indeed, Kember and Leung (1998) have shown that, using confirmatory factor analysis, the SPQ can most conveniently be described in terms of two factors: deep and surface, with achieving motive and strategy subscales aligning themselves on both factors. The confirmatory factor analysis of LPQ data by Wong, Lin, and Watkins (1996) could also be interpreted as consistent with this finding.

To summarise, then, there appears to be a need for a shorter two-factor version of the SPQ, addressing deep and surface approaches only, that can be administered quickly and easily by a regular teacher, for use in monitoring teaching contexts. Such uses might include:

1. Teachers monitoring their teaching from class to class, or following some innovation in teaching or assessment in an action research design.
2. An outcome measure of teaching in more formally structured research.
3. Suggesting to staff developers where teachers or departments may need help.
4. Diagnosis of students with study problems, by comparing individuals' deep and surface scores and comparing individuals to others in the same cohort.
5. Examining the relationship of approaches to learning with other curriculum variables with a view to fine-tuning curricula based on the insights obtained.
6. Quality assurance exercises in much the same way as the Course Experience Questionnaire is used in Australia to monitor students' perceptions of courses. In this last case institutions would keep their own norms but they would be used on a class or departmental basis, not on the basis of an individual student.

The need for shorter instruments also seems to have influenced the development of the ASI. The original version (Ramsden & Entwistle, 1981) had 64 items and 16 subscales. Various shortened forms have been produced, including an 18-item version measuring meaning, reproducing and achieving orientations (Gibbs, Habeshaw, & Habeshaw, 1989). A revised version (RASI) (Entwistle & Tait, 1994), though, has 38 items in 14 subscales, measuring five major dimensions. Richardson's review (2000) concluded that the 18-item version of the ASI was 'not adequate from a psychometric point of view' (p. 123) and reported that 'the RASI does not appear to represent an improvement on earlier versions of the ASI' (p. 122), which have themselves been criticised.

Developing the R-SPQ-2F

In developing a new version of the SPQ, the strategy was to start with a reasonably large pool of items which would be reduced through testing to a smaller set which had the best fit to the projected two-factor model. In devising the pool of items, the original items from the deep and surface scales of the SPQ were examined in the light of the insights below. Some were included in their original form and others were reworded.

Guidelines for revising items

Firstly some items needed re-wording to update the terminology. Higher education has undergone a major transformation since the original questionnaire was developed so it was inevitable that some items needed adapting.

The questionnaire was also developed before the insights into approaches to learning gained from the intensive study of the approaches of Asian students (Kember, 1996; Watkins & Biggs, 1996). For this simple two-factor version of the SPQ the intention was not to develop scales which fully characterised the possible combinations of understanding and memorising. The work, though, was utilised to ensure that the deep and surface approach items were consistent with the clearer descriptions which had emerged from this body of work.

The other important insight was concerned with a better understanding of extrinsic motivation, which had contributed to the original surface motive scale. Kember, Wong, and Leung (1999) argued that there was evidence that courses which provided a good career preparation provided very positive motivation, which was entirely compatible with intrinsic motivation. Wording of items intended to characterise surface motivation needed to reflect a tendency to minimise the cognitive level of the task rather than this career motivation. It was also clear that the original surface motivation subscale consisted of sub-components measuring fear of failure and the desire for a qualification for the sake of obtaining a well-paid job.

Reduction of items

The revision of existing items and the development of new ones ultimately resulted in 43 items for testing. These were combined in random order into a single questionnaire. Students were asked to respond to the questions on a 5-point Likert scale range from 'always true of me' to 'only rarely true of me'. A sample of health science students from a university in Hong Kong were asked to complete the questionnaire. A total of 229 usable questionnaires were returned, with a high return rate since the questionnaires were handed out for completion in class.

Two statistical tests were used to determine which items to delete and which to retain. The Reliability procedure of SPSS (Norusis, 1986) produces useful statistics following a test of the reliability of items specified as forming a hypothesised scale. The procedure calculates a Cronbach alpha coefficient for the scale and, more importantly for our purposes, indicates the alpha for the scale if an item were deleted. The inter-item correlation matrix also provides useful information about the degree to which an item can form part of a coherent scale.

The more powerful test was through using the EQS program (Bentler, 1995) in a confirmatory factor analysis mode. The initial test was of the original 43 items fitting to a model with deep and surface approaches, each with strategy and motive subscales. The test of the model produces a regression coefficient and an error term showing the degree of relationship between each item and its appropriate latent variable or factor. Items which make the most useful contribution to a scale have relatively high regression coefficients and low error terms. Determination of misfitting parameters in the model was assessed by means of multivariate Lagrange Multiplier (LM) and Wald Tests accomplished in EQS. The LM tests provide information to identify those parameters (both paths and covariances) which when added to the hypothesised model

result in a significant drop in the model χ^2 value. The Wald tests help in assessing the statistical significance of the parameter estimates. Hence, the LM tests tell us when to add new paths, and the Wald tests when to delete existing paths, with the proviso that additions and deletions need to be theoretically plausible. As items are removed from the model the goodness of fit of the new overall model can also be estimated by a number of goodness of fit indicators (see discussion below).

An encouraging indication of the robustness and appropriateness of these procedures was that there was broad concurrence between the two quite different approaches. The process of trial and revision through reduction of items was repeated for two cycles. At each stage the questionnaire was further revised by deleting items which did not contribute to a component. The outcome of this exercise in reducing items was two deep and surface factors each with 10 items. Within each of these two factors it was possible to distinguish strategy and motive subscales. Each of the subscales consisted of five items. The final version of the questionnaire therefore has two main scales, Deep Approach (DA) and Surface Approach, (SA) with four subscales, Deep Motive (DM), Deep Strategy (DS), Surface Motive (SM), and Surface Strategy (SS) (see Appendix)

Testing the new version of the SPQ

The final version of the revised questionnaire was then tested with a sample of 495 undergraduate students from various disciplines across each year of study from one university in Hong Kong. The dimensionalities of the four components were examined by confirmatory factor analysis to check whether items contributed to the intended component. The Cronbach alpha values for each component were then computed to determine the scale and subscale reliabilities. The results from the final test of the questionnaire are given in detail.

Reliability and unidimensionality of subscales

The unidimensionality of each of the subscales was separately tested by fitting a single factor model to the corresponding five items by the EQS program (Bentler, 1995). The goodness of fit of the model to the data can be assessed by many fit indexes with conventionally accepted cut-off criteria (see, for example, Bentler, 1990; Hoyle & Panter, 1995; Marsh & Hau, 1996). However, Hu and Bentler (1999) recently found that, in practice, the 'rule of thumb' conventions for cut-off criteria were inadequate in evaluating model fit, suggesting instead the use of a two-index presentation strategy, using the standardised root mean squared residual (SRMR) supplemented with one other fit index. From their simulations, the new strategy can better control for both Type I and Type II errors. Here, following the suggestions recommended by Hu and Bentler (1999), the comparative fit index (CFI), and the SRMR were chosen for this study. A CFI value greater than 0.95, and SRMR less than .08 can be used as an indication of a relatively good fit between the hypothesised model and the observed data.

The results of separately testing each of the subscales are shown in Table 2. Good fits of the single factor models for the four subscales to the observed data were supported and hence we can conclude that the items are unidimensional for each of the four

subscales. Once the homogeneity of the items has been established, we can use the Cronbach alpha to determine the subscales' reliability (Schmitt, 1996). Cronbach alpha values for each subscale in the instrument were computed and are given in Table 2. The values all reach acceptable levels indicating that the subscales can be interpreted as internally consistent.

Table 2. Unidimensionality and reliability check for the four subscales

Subscales	CFI	SRMR	Alpha
Deep Motive (DM)	0.997	0.01	0.62
Deep Strategy (DS)	0.998	0.02	0.63
Surface Motive (SM)	0.988	0.02	0.72
Surface Strategy (SS)	0.998	0.02	0.57

Note: CFI = comparative fit index, SRMR = standardised root mean squared residual, Alpha = Cronbach alpha.

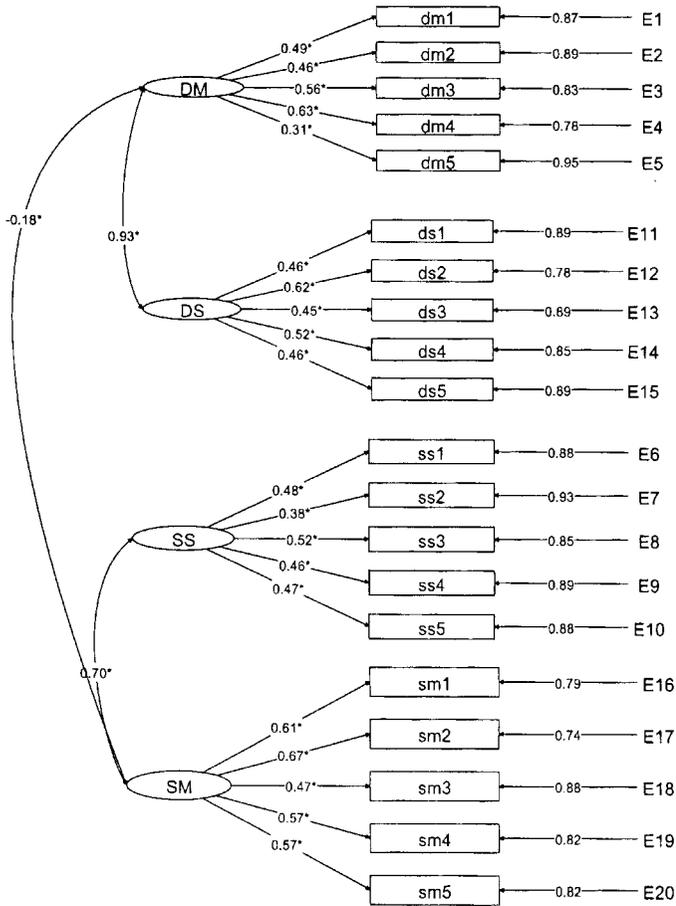
It is expected that most of the routine users will compute the scores for both Deep and Surface Approaches by summing up the corresponding 10 items. Thus, it would be useful to provide the reliabilities of the two latent constructs for our sample. The Cronbach alpha values are 0.73 for DA and 0.64 for SA in the sample, which are considered as acceptable.

Hypothesised models

Two models were tested to show different aspects of the questionnaire. The first (Model 1) looks at the structure of the complete instrument from the items level. The model consists of the four subscales formulated as latent constructs with their corresponding five items as indicators. The relationship between the motive and strategy subscale is shown as a correlation, which in structural equation modelling terms is a more general case than combining them into a single higher order factor (Rindskopf & Rose, 1988). These two higher order factors are then hypothesised as being negatively correlated since deep and surface approaches are envisaged as not commonly occurring in conjunction. The hypothesised model is shown in Figure 2, though to avoid duplication, the diagram includes the standardised path estimates and error terms resulting from the testing of the model.

Model 2, shown in Figure 3, concentrates upon testing the dimensionality of the whole instrument so treats the subscales as indicators of two latent factors, namely Deep Approach (DA), and Surface Approach (SA). DA has two indicators, dm and ds, while SA has sm and ss as indicators. The four indicators, dm, ds, sm and ss, were created by summing the corresponding five items. Note that the four indicators are now observed variables, instead of latent variables, and hence they are labelled with lower case letters to make them distinguishable from the latent constructs used in Model 1. As with Model 1 the relationship between DA and SA was hypothesised as a negative correlation.

The two models are complementary, in that they examine alternative aspects of the same relationship. The first should show whether the individual items conform to the expected pattern. The second more clearly tests the anticipated dimensionality.

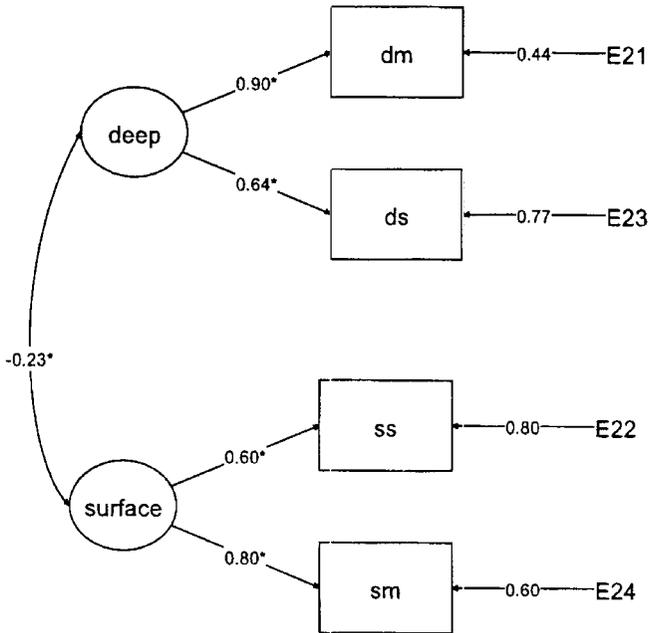
Figure 2. Latent structure of R-SPQ-2F at item level (Model 1)

Note: Variables in circles are latent constructs and variables in square are observed variables. DM = Deep Motive, DS = Deep Strategy, SM = Surface Motive, SS = Surface Strategy, Deep = Deep Approach, Surface = Surface Approach.

The goodness of fits of the two hypothesised models were tested with confirmatory factor analysis using the EQS program (Bentler, 1995). Table 3 gives the corresponding covariance matrix used in the analysis for Model 2 (The matrix used for Model 1 is omitted to save space; however, is available on request). The two indexes, CFI and SRMR, were reported for both Models 1 and 2, based on the robust estimation method provided by EQS for model evaluation.

Model 1

The result with standardised paths for Model 1 is illustrated in Figure 2. For Model 1, CFI = 0.904 and SRMR = 0.058 which indicate quite a reasonable fit to the data; given the complexity of the model, however, there is a possibility of a Type II error (Hu & Bentler, 1999).

Figure 3. Latent structure of R-SPQ-2F at subscales level (Model 2)

Note: Variables in circles are latent constructs and variables in square are observed variables. DM = Deep Motive, DS = Deep Strategy, SM = Surface Motive, SS = Surface Strategy, Deep = Deep Approach, Surface = Surface Approach.

Table 3. Covariance matrices used in the analysis for Model 2

	DM	DS	SM	SS
DM	8.567			
DS	4.963	8.669		
SM	-1.740	-1.033	12.376	
SS	-1.001	-1.159	5.090	9.004

All the paths from the constructs to the items were statistically significant at the 5% level. The standardised path coefficients range from 0.31 to 0.63 suggesting that the items are good indicators of the four constructs. The latent constructs DM and DS are positively correlated as expected. The correlation of 0.93 suggests that the two constructs are similar, but the motive and strategy components of an approach have always been envisaged as intimately related. The high correlations between both strategy-motive subscales is also reassuring in view of the anticipated use of the questionnaire in its simplest form as just two deep and surface approach scales.

Model 2

The results for Model 2 are presented in Figure 3 and an adequate fit to the data is suggested by the values of the indexes, CFI = 0.992 and SRMR = 0.015. Note that two

cases were considered as outliers and were deleted in the analysis for the following three reasons. First, the two cases had extremely large multivariate kurtosis values (1097 and 607) relative to the other cases (400) as given by EQS (Byrne, 1994). Second, by looking at their raw scores, these two cases were deviant from the entire sample in they were the only cases with extremely low scores for all four measures (Bentler, 1995). Finally, after deleting the two cases, both the CFI and SRMR values remained nearly unchanged while the χ^2 value and the path estimates changed substantially.

The statistical significance of all the paths from latent constructs to indicators was observed. The two higher order constructs, DA and SA, were negatively related as expected.

Conclusion

This article has presented an argument for re-developing the SPQ into a simple two-factor version which teachers can use in a number of ways to evaluate the learning environment in their own classrooms. The development process commenced with testing 43 items taken from the original SPQ, taken from the SPQ in modified form, or new items. The process of drawing up this pool of items was guided by insights into approaches to learning established since the original version was devised.

A process of testing and refinement resulted in a final version with deep and surface approach scales. Each of these scales consists of 10 items so the questionnaire is short and simple enough for use by teachers. At the same time, the rigorous testing described in this article shows that the final version of the questionnaire has very good psychometric properties.

We would envisage most routine users of the questionnaire would use it in a two-factor form, deep and surface approaches, as these are the indicators which are most pertinent to its intended use by teachers in their classrooms. The two main factors, though, do have clearly identified motive and strategy sub-components which may be of interest to some researchers. From a theoretical viewpoint it is also reassuring to see that the development and testing of the questionnaire confirmed the vision of an approach as consisting of congruent motive and strategy components.

The principal motivation for the re-development of the instrument was our commitment to teachers researching the learning environment in their own classrooms (Biggs, 1999; Kember, 2000). We believe that the most effective way of ensuring high quality teaching and learning is for teachers to take responsibility for ensuring that assessment and other contextual elements in the teaching and learning system are constructively aligned to promote deep approaches to learning. We believe that this revised two-factor version of the SPQ will be an ideal tool for teachers to use in evaluating and researching their own classrooms. In this case, it is useful to indicate in the preliminary instructions (see Appendix) that you want your students to reply in connection with the particular course, module, or programme in question, rather than to studying generally.

The Revised-SPQ-2F is printed in full in the Appendix. Readers are invited to use it for evaluating their teaching and for genuine research purposes. The conditions are that they acknowledge the source as the present paper and accept that the copyright on the questionnaire is owned by John Biggs and David Kember. Users of the questionnaire are

invited to send a copy of their data to David Kember at etkember@polyu.edu.hk for purposes of comparison and establishing cultural validity.

References

- Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*, 238–246.
- Bentler, P.M. (1995). *EQS Structural equations program manual*. Encino, CA: Multivariate Software.
- Biggs, J.B. (1976). Dimensions of study behaviour: Another look at ATI. *British Journal of Educational Psychology*, *46*, 68–80.
- Biggs, J.B. (1978). Individual and group differences in study processes. *British Journal of Educational Psychology*, *48*, 266–279.
- Biggs, J.B. (1987a). *Student approaches to learning and studying*. Camberwell, Vic.: Australian Council for Educational Research.
- Biggs, J.B. (1987b). *The Study Process Questionnaire (SPQ): Manual*. Hawthorn, Vic.: Australian Council for Educational Research.
- Biggs, J.B. (1987c). *The Learning Process Questionnaire (LPQ): Manual*. Hawthorn, Vic.: Australian Council for Educational Research.
- Biggs, J.B. (1989). Approaches to the enhancement of tertiary teaching. *Higher Education Research and Development*, *8*, 7–25.
- Biggs, J.B. (1993a). What do inventories of students' learning processes really measure? A theoretical review and clarification. *British Journal of Educational Psychology*, *63*, 1–17.
- Biggs, J. (1993b). From theory to practice: A cognitive systems approach. *Higher Education Research and Development*, *12*, 73–86.
- Biggs, J.B. (1999). *Teaching for quality learning at university*. Buckingham: Open University Press.
- Biggs, J.B. (in press). Enhancing learning: A matter of style or approach? In R.J. Sternberg & L.F. Zhang (Eds.), *Perspectives on thinking, learning, and cognitive styles*. Mahwah, NJ: Lawrence Erlbaum.
- Biggs, J.B., & Kirby, J. (1984). Differentiation of learning processes within ability groups. *Educational Psychology*, *4*, 21–39.
- Bowden, J., & Marton, F. (1999). *The university of learning: Beyond quality and competence*. London: Kogan Page.
- Byrne, B.M. (1994). *Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming*. Thousand Oaks, CA: Sage.
- Dart, B., & Boulton-Lewis, G. (Eds.) (1998). *Teaching and learning in higher education*. Camberwell: Australian Council for Educational Research.
- Eley, M.G. (1992). Differential adoption of study approaches within individual students. *Higher Education* *23*, 231–254.
- Entwistle, N., & Ramsden, P. (1983). *Understanding student learning*. London: Croom Helm.
- Entwistle, N.J., & Tait, H. (1994). *The revised Approaches to Studying Inventory*. Edinburgh: Centre for Research into Learning and Instruction, University of Edinburgh.
- Entwistle, N., & Waterston, S. (1988). Approaches to studying and levels of processing in university students. *British Journal of Educational Psychology*, *58*, 258–265.
- Gibbs, G., Habeshaw, S., & Habeshaw, T. (1989). *53 Interesting ways to appraise your teaching*. Bristol: Technical and Educational Services.
- Gow, L., & Kember, D. (1990). Does higher education promote independent learning? *Higher Education*, *19*, 307–322.
- Hoyle, R.H., & Panter, A.T. (1995). Writing about structural equation models. In R. Hoyle (Ed.), *Structural equation modeling*. Thousand Oaks, CA: Sage.
- Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternations. *Structural Equation Modeling*, *6*, 1–55.
- Kember, D. (1996). The intention to both memorise and understand: Another approach to learning? *Higher Education*, *31*, 341–351.

- Kember, D. (2000). *Action learning and action research: Improving the quality of teaching and learning*. London: Kogan Page.
- Kember, D., & Leung, D.Y.P. (1998). The dimensionality of approaches to learning: An investigation with confirmatory factor analysis on the structure of the SPQ and LPQ. *British Journal of Educational Psychology*, 68, 395–407.
- Kember, D., Wong, A., & Leung, D.Y.P. (1999). Reconsidering the dimensions of approaches to learning. *British Journal of Educational Psychology*, 69, 323–343.
- Kember, D., Charlesworth, M., Davies, H., McKay, J., & Stott, V. (1997). Evaluating the effectiveness of educational innovations: Using the Study Process Questionnaire to show that meaningful learning occurs. *Studies in Educational Evaluation*, 23(2), 141–157.
- Marsh, H.W., & Hau, K.T. (1996). Assessing goodness-of-fit: Is parsimony always desirable? *Journal of Experimental Education*, 64, 364–390.
- Marton, F. (1981). Phenomenography – Describing conceptions of the world around us. *Instructional Science*, 10, 177–200.
- Marton, F., & Säljö, R. (1976a). On qualitative differences in learning – I: Outcome and process. *British Journal of Educational Psychology*, 46, 4–11.
- Marton, F., & Säljö, R. (1976b). On qualitative differences in learning – II: Outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology*, 46, 115–127.
- Moreno, V., & DiVesta F. (1991). Cross-cultural comparisons of study habits. *Journal of Educational Psychology*, 83, 231–239.
- Newble, D., & Clarke, R.M. (1986). The approaches to learning of students in a traditional and in a problem-based medical school. *Medical Education*, 20, 267–273.
- Norusis, M. (1986). *SPSS guide to data analysis for SPSS-X with additional instructions for SPSS/PC+*. Chicago, IL: SPSS Inc.
- Prosser, M., & Trigwell, K. (1998). *Teaching for learning in higher education*. Buckingham: Open University Press.
- Ramsden, P. (1984). The context of learning. In F. Marton, D. Hounsell, & N. Entwistle (Eds.), *The experience of learning* (pp. 144–164). Edinburgh: Scottish Academic Press.
- Ramsden, P., & Entwistle, N.J. (1981). Effects of academic departments on students' approaches to studying. *British Journal of Educational Psychology*, 51, 368–383.
- Richardson, J.T.E. (2000). *Researching student learning: Approaches to studying in campus-based and distance education*. Buckingham: SRHE & Open University Press.
- Rindskopf, D., & Rose, T. (1988). Some theory and applications of confirmatory second-order factor analysis. *Multivariate Behavioral Research*, 23, 51–67.
- Schmeck R., Geisler-Brenstein E., & Cercy, S. (1991). The Revised Inventory of Learning Processes. *Educational Psychology*, 11, 343–362.
- Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological Assessment*, 8, 350–353.
- Shuell, T.J. (1986). Cognitive conceptions of learning. *Review of Educational Research*, 56, 411–436.
- Tang, C. (1991). *Effects of different assessment methods on tertiary students' approaches to studying*. Unpublished Ph.D. Dissertation, University of Hong Kong.
- Thomas, P.R., & Bain, J.D. (1984). Contextual dependence of learning approaches: The effects of assessments. *Human Learning*, 3, 227–240.
- Watkins, D., & Biggs, J.B. (Eds.) (1996). *The Chinese learner: Cultural, psychological and contextual influences*. Melbourne and Hong Kong: Australian Council for Educational Research and the Comparative Education Research Centre, University of Hong Kong.
- Watkins, D.A., & Hattie, J. (1985). A longitudinal study of the approach to learning of Australian tertiary students. *Human Learning*, 4(2), 127–142.
- Weinstein, C., Schulte, A., & Palmer, D. (1987). *Learning and Study Strategies Inventory (LASSI)*. Clearwater, FL: H&H Publications.
- Wong, N.Y., Lin, W.Y., & Watkins, D. (1996). Cross-cultural validation of models of approaches to learning: An application of confirmatory factor analysis. *Educational Psychology*, 16, 317–327.

Appendix

Revised Study Process Questionnaire (R-SPQ-2F)

This questionnaire has a number of questions about your attitudes towards your studies and your usual way of studying.

There is no *right* way of studying. It depends on what suits your own style and the course you are studying. It is accordingly important that you answer each question as honestly as you can. If you think your answer to a question would depend on the subject being studied, give the answer that would apply to the subject(s) most important to you.

Please fill in the appropriate circle alongside the question number on the 'General Purpose Survey/Answer Sheet'. The letters alongside each number stand for the following response.

A—this item is *never* or *only rarely* true of me

B—this item is *sometimes* true of me

C—this item is true of me about *half the time*

D—this item is *frequently* true of me

E—this item is *always* or *almost always* true of me

Please choose the *one* most appropriate response to each question. Fill the oval on the Answer Sheet that best fits your immediate reaction. Do not spend a long time on each item: your first reaction is probably the best one. Please answer each item.

Do not worry about projecting a good image. Your answers are CONFIDENTIAL.

Thank you for your cooperation.

1. I find that at times studying gives me a feeling of deep personal satisfaction.
2. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
3. My aim is to pass the course while doing as little work as possible.
4. I only study seriously what's given out in class or in the course outlines.
5. I feel that virtually any topic can be highly interesting once I get into it.
6. I find most new topics interesting and often spend extra time trying to obtain more information about them.
7. I do not find my course very interesting so I keep my work to the minimum.
8. I learn some things by rote, going over and over them until I know them by heart even if I do not understand them.
9. I find that studying academic topics can at times be as exciting as a good novel or movie.
10. I test myself on important topics until I understand them completely.
11. I find I can get by in most assessments by memorising key sections rather than trying to understand them.
12. I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
13. I work hard at my studies because I find the material interesting.
14. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
15. I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.
16. I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
17. I come to most classes with questions in mind that I want answering.
18. I make a point of looking at most of the suggested readings that go with the lectures.
19. I see no point in learning material which is not likely to be in the examination.
20. I find the best way to pass examinations is to try to remember answers to likely questions.

The responses to items are scored as follows:

$$A = 1, B = 2, C = 3, D = 4, E = 5$$

To obtain main scale scores add item scores as follows:

$$DA = 1 + 2 + 5 + 6 + 9 + 10 + 13 + 14 + 17 + 18$$

$$SA = 3 + 4 + 7 + 8 + 11 + 12 + 15 + 16 + 19 + 20$$

Subscale scores can be calculated as follows:

$$DM = 1 + 5 + 9 + 13 + 17$$

$$DS = 2 + 6 + 10 + 14 + 18$$

$$SM = 3 + 7 + 11 + 15 + 19$$

$$SS = 4 + 8 + 12 + 16 + 20$$

