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The Cross-Over phenomenon: Unexpected patterns of change of Students' Approaches to Learning

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Abstract

A key aim of educational course design is to encourage students to adopt deeper approaches to learning. This article reports the findings of three studies that explored how medical students responded to three carefully designed educational course units. The findings suggest that while a subgroup of the students responded by adopting deeper approaches (as intended by the designers of the course units), another subgroup responded by adopting more surface approaches. Two further subgroups displayed minimal changes in their approaches despite significant changes in their learning contexts. The finding (in all three studies) of a notable proportion of students adopting more surface approaches is of particular concern, as this could adversely affect the impact of even the most carefully designed educational program. These findings suggest that the context-dependent nature of approaches to learning merits further investigation as it may be more complex than previously described in the literature.

Keywords: medical students, medical education, deep and surface approaches to learning, context-dependent nature, cross-over phenomenon

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Introduction

This article critiques some beliefs and assumptions related to students' approaches to learning. In particular, aspects related to the context-dependent nature of approaches are explored through three studies which examined the way individual students responded to educational contexts designed to encourage deeper approaches to learning. The findings highlight the complexity of the interaction between student factors and context factors, and raise concerns about how even the best designed educational context could lead to unexpected and undesired outcomes.

Background

'Students' approaches to learning' refer to the manner in which students engage with their learning. The concept of approaches to learning arose from the early work of Marton and Saljo (1976). A key finding of their work was that different students adopted different approaches when faced with the same learning task, and that these different approaches related to different learning outcomes. Approaches that were characterised as deep, related to higher quality learning outcomes, while those that were characterised as surface, related to poorer quality learning outcomes. These concepts gained wider recognition as similar results were yielded by relatively independent work commenced by Biggs (1979) and Entwistle and Ramsden (1983). This subsequent work differed from that of Marton and Saljo (1976), by being predominantly survey based, and by focusing on the approaches usually used by students. A finding common to the work of all three research groups was that different students used different approaches within any given context.

The findings of further research suggested another important feature of approaches: the same student could use a surface approach in some contexts and a deep approach in others. This was termed the ‘context-dependent nature’ of approaches (Ramsden 1992). The implication was that some educational contexts were more likely to encourage deep approaches in students, while some were more likely to encourage surface approaches (Newble & Clarke 1986). Work along these lines resulted in the identification of features of educational contexts that were likely to relate to deep or surface approaches (Biggs 2003, Gibbs 1992, Trigwell & Prosser 1991). These features will be referred to as ‘deep-enhancing features’.

The relationship between ‘deep-enhancing features’, students’ approaches to learning and learning outcomes, has been illustrated by the 3P-Model of learning (Biggs 2003). This model describes three stages in the process of learning, termed *Presage*, *Process* and *Product*. “Presage factors refer to what exists prior to engagement that affects learning” (Biggs, Kember & Leung 2001, p. 135). These include student factors and teaching context factors. Examples of student factors are motivation, conceptions of learning, prior knowledge, abilities and preferred approaches to learning. Examples of teaching context factors are the nature of the content, instructional method, assessment method, and institutional climate and procedures. These contextual factors are the realm of the deep enhancing features recommended in the literature. *Process* refers to the stage during which learning takes place and is characterised by students’ approaches to learning. The model depicts how presage factors influence the process (approach to learning) used by students in particular situations. The Process (approach to learning) has been shown to relate to the outcome of learning (Hegarty-Hazel & Prosser 1991, Marton & Saljo 1976, Trigwell & Prosser 1991, van Rossum & Schenk 1984), which is depicted in the model as the *Product*. The 3-P model is useful to depict the interactive system in which learning takes place.

The theoretical framework developed through the above work led to the recommendation that designing educational contexts based on ‘deep-enhancing features’ could lead to deep approaches and higher quality learning outcomes in all or most students (Ramsden 2003). This recommendation is reflected in the work of Prosser and Trigwell (1999) and Biggs (2003), where the authors use examples of pairs of students who use different approaches in one educational context, but suggest that both students would use deep approaches when exposed to a ‘deep-enhancing’ context. This is then extrapolated to suggest that ‘deep-enhancing’ contexts’ could be expected to encourage deep approaches in all or most students. This expectation appears reasonable even though it may appear to run counter to the original findings by Martin and Saljo. However, it should be remembered that the contexts that they investigated were not chosen for their deep enhancing features: hence in the range of contexts they explored, they found a range of approaches to learning. The recommendation that arose from the developments in the approaches to learning literature is that if contexts are designed to embody deep enhancing features, the approaches of students engaged in them will tend to be ‘deeper’. The expectation that the manipulation of educational contexts could direct most students towards deeper approaches deserves further exploration. The three studies reported in this article explored this issue by examining how individual students’ approaches to learning changed when they were exposed to ‘deep-enhancing’ contexts.

Methods

The research project utilised surveys before and after exposure to three different course units in medical education, each designed to encourage deep approaches to learning. This involved the administration of the original version of the Study Process Questionnaire (SPQ-R-2F,

Biggs, Kember & Leung 2001), to students prior to their exposure to the course unit, followed by the administration of a modified version of the same instrument (modified to focus the questions on the approach adopted in the just completed course unit) after the course unit.

Setting of First study – the Pilot program

The First study was set within an educational program that was carefully planned according to currently accepted principles of sound educational design. This was designed by the Faculty of Medicine, University of New South Wales (UNSW) to pilot components of a new undergraduate program in medicine that was under development. (This will be referred to as the Pilot program). The Pilot program, an inquiry-based program, placed a high emphasis on collaborative learning, self-directed learning and integration of disciplinary content within a student-centred environment. These are features of educational design that have been associated in the literature with increasing the likelihood that students will take a deeper approach to learning (Biggs 2003, Gibbs 1992, McCune & Entwistle 2000, Prosser & Trigwell 1999, Trigwell & Prosser 1991).

The Pilot program differed from the program in which the students were previously enrolled, in the following ways :

1. There was scope for students to follow individual interests and students had to identify which content areas to study and how much depth was required.
2. Identification of resources, authentication of information, critiquing and evaluating information was the learner's responsibility.
3. Collaborative learning and teamwork was a high priority.

4. Disciplinary content was presented in an integrated manner, around relevant health scenarios. Disciplinary structures were present, but to a lesser degree.
5. The lecture load was reduced and students were encouraged to follow up information as they felt necessary.
6. The social and cultural aspects of health were given as much emphasis as the medical sciences.
7. Assessment was integrated and used methods beyond the conventional Multiple Choice Question (MCQ) formats, including essay, short answer, group and peer assessments.

While 44 students participated in the Pilot program, complete paired data from the two surveys was finally available for only 34 of these students. All of these students were invited for interviews, and 18 students consented.

The Clinical setting

The second study was set in a medical school in Sri Lanka. The target group comprised final year medical students who were about to commence study in a new clinical attachment. (This setting will hereafter be referred to as the Clinical setting.) Clinical attachments have been found to be successful in promoting deep approaches (Newble & Clark 1986) as they include authentic learning activities that relate closely to medical practice. This setting was relevant to the research questions that were being explored as it represented a discrete educational setting which had its own features designed to encourage effective learning of clinical skills: these included a special emphasis on exposure to emergency surgical situations, and a period of extra responsibility as a ‘shadow house officer’, where students had a period of supervised training in the (simulated) role of an intern medical officer.

The choice of the Sri Lankan medical school was influenced by practical issues related to access to medical students, due to one researcher's affiliation with the medical school. But it was also chosen because it offered a very different setting from the first study (which targeted first year medical students in an Australian medical school who were undertaking mainly campus based learning activities). The curriculum in use in Sri Lanka was structured in the conventional way as 'pre-clinical', 'para-clinical' and 'clinical' stages. No assumptions were made regarding comparability of the program to the program in place at the Australian medical school. The Sri Lankan setting provided us with the opportunity to explore this research question with final year students involved in hospital-based learning, within a very different cultural milieu.

In Sri Lanka, the first survey was conducted before the students were exposed to any aspects of the new clinical attachment, and the second survey was conducted after the students had experienced two-thirds of the attachment. When the two sets of data were matched by the identifier provided by the student, paired data was available for 27 students.

The New program

The third study was conducted at the same medical school in which the first study (on the Pilot program) had been conducted. (We will refer to this as the New program). This study took place eighteen months after the First study. The target group was commencing medical students of the new medicine program of this school. These students were commencing study in the program that had evolved from the Pilot program used in the first study. The setting was therefore similar to the one in which the first study was conducted, was designed on the same principles as the Pilot program, but provided more structure and guidance for the students. The pilot program had been extensively evaluated by staff, students and an independent evaluator (BrowneWright Consulting Pvt Ltd 2002) and the identified issues had

been addressed as part of its evolution into the New Program. The New Program laid special emphasis on eight graduate capabilities, which included development in the areas of self-directed learning, reflective practice, and critical evaluation of information. Content was integrated, and was presented in clinically relevant ways through the use of scenarios that mirrored situations likely to be encountered by learners in future medical practice. These were all features that the literature suggests as likely to encourage deeper approaches. This program is described further in McNeil et al (2006).

The first survey was done before students commenced study in the new program. When completing the survey, students were asked to think about the way they usually studied within their previous study experiences (in high school). 183 students responded to this survey. The second survey was conducted after the students had experienced six months of the New program. 194 students responded to this survey. When the two sets of data were matched by the identifier provided by the student, paired data was available for 129 students.

When compared to the first study, the settings for the second and third studies can be considered as (i) a very different setting in medical education with a similar sample size (Clinical Setting) and (ii) a very similar setting in medical education with a larger sample size (New Program).

Ethics approval was obtained for each of the three studies from the relevant Australian and Sri Lankan universities.

Data Analysis

The surveys of the three studies yielded a deep approach scale score (DA) and a surface approach scale score (SA) for each student. The DA score was deemed the most useful score when measuring changes in approaches to learning (Kember *et al.* 1997). This was based on the findings by Kember et al (1997) that the DA score is the more relevant and representative indicator, as it relates well to meaningful learning. The authors of the above work opine that an increase in DA scores suggests an educational program that encourages higher quality learning.

A k-means cluster analysis was performed based on scores on the DA scale, before and upon completion of the relevant educational context of each study.

Results

The cluster analysis categorised students based on the before and after DA scores as well as the direction of change. The change of cluster centre indicated only the general pattern displayed by cluster members, and individual members' change of scores was either greater or smaller than the change indicated by the change in cluster centre.

Results of cluster analysis from First study (Pilot program)

In the First study, cluster analysis was possible for 34 (of the 44) participants for whom paired data were available. A four cluster solution was sought. The data was also explored through an eight cluster solution, but this added no further value, so the four cluster solution was retained. Exploration of the data in this manner through cluster analysis is supported by the literature (Anderberg 1973, Stockburger 2005). The results of the cluster analysis are summarised in table 1.

Table 1: Summary of cluster analysis – Pilot program

Cluster No	Nature of change of cluster centre	No. of cluster members	Interpretation	Subgroup name
1	34 → 26	10	This subgroup responded with a more surface approach	Surface responding (SR)
2	25 → 20	7	This subgroup maintained their usual surface approach	Persistent Surface (PS)
3	25 → 35	14	This subgroup adopted a deeper approach than before	Deep responding (DR)
4	39 → 43	3	This subgroup maintained their usual deep approach	Persistent Deep (PD)

The four clusters displayed four different patterns of change in DA scores, and the clusters were named according to these patterns of change. Clusters of students who made a change of approach in response to the Pilot program equal to at least one Standard Deviation (6.1) were named ‘context responsive clusters’, and clusters that demonstrated a change less than one SD were named ‘persistent approaches clusters’.

The context-responsive clusters

The two context-responsive clusters (Cluster 1 & 3) displayed patterns of change that were opposite to each other.

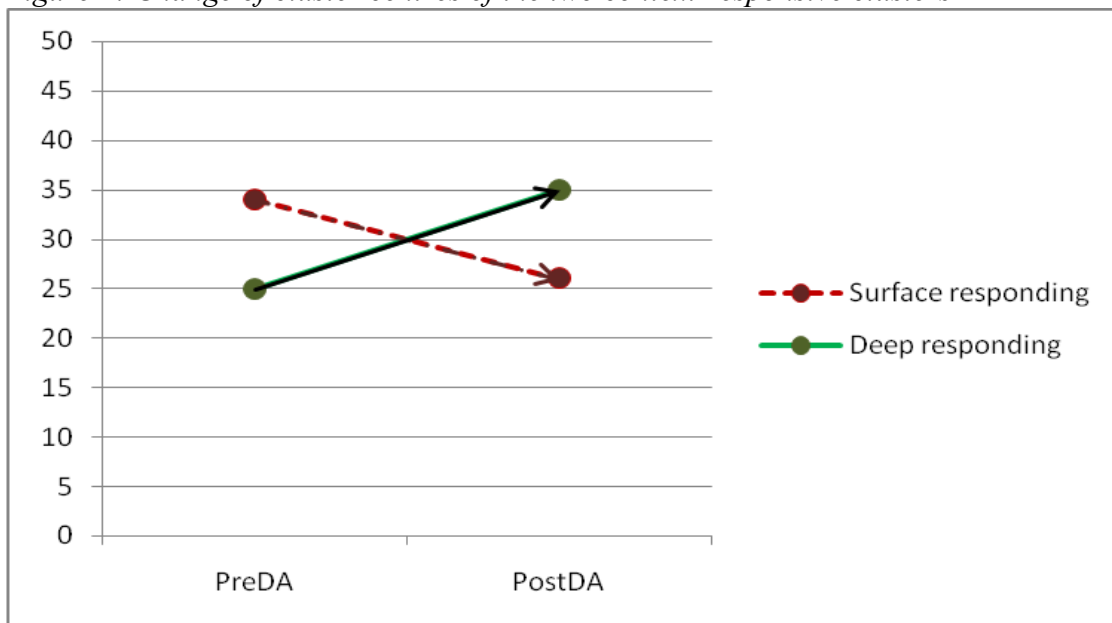
- **Cluster 1** depicts a 23% decrease in DA score (34→26), suggesting a change towards a more surface approach. This pattern of change of approaches is contrary to the expectation of the designers of the Pilot program. We named this cluster the Surface Responding Cluster, and it consisted of 10 students. The student interviews illuminated the concerns of the students who belong to this category. We have selected Rick (pseudonym) whose DA score changed from 39→24, to represent this subgroup in the discussion of the findings below.

• **Cluster 3** depicts a 40% increase in DA score (25→35), suggesting a change towards a deeper approach. This was the pattern of change expected by the curriculum designers. We named this cluster the Deep Responding Cluster, and it consisted of 14 students. Brett (pseudonym) is representative of this subgroup and his DA score changed from 22→31.

Graphical representation of the change of cluster centres of the two context-responsive clusters

The patterns of change of cluster centres (DA scores) of the two context-responsive clusters are depicted in the figure below. The X axis represents the two points in time before exposure to the relevant educational program and upon completion of the educational program. The Y axis represents the cluster centers (corresponding to the DA scores). A higher score indicates a deeper approach.

Figure 1: Change of cluster centres of the two context-responsive clusters



The pattern of change of the two clusters depicted above is almost opposite. The manner in which the same context can stimulate some students to change from surface to

deep approaches and others to change from deep to surface approaches, is a key finding of this research project. The interesting feature is the way students ‘cross-over’ from surface to deep and deep to surface approaches. We will refer to this as the ‘**Cross-over Phenomenon**’. The subgroup that changed from deep to surface (the surface responding subgroup) is of particular concern from an educational design perspective.

The Persistent approaches clusters

Clusters 2 and 4 consisted of students whose DA scores remained relatively unchanged (change of less than one SD) in response to the Pilot program. We named these the Persistent Approaches Clusters, and they include 10 of the 34 students.

- **Cluster 2** represents students whose typical deep approach scores were already low and during the Pilot program these scores showed a minimal decrease. We refer to this group as the Persistent Surface Cluster. Jo (pseudonym) is a typical student from this group and her DA score dropped from 20→17.

- **Cluster 4** represents students with a minimal increase in DA scores which were already high. We named this group the Persistent Deep Cluster. Mark (pseudonym) is typical of this group and his DA score increased from 40→41.

Survey findings from New Program

A cluster analysis was conducted on the paired survey data, which was available for 129 students. A four cluster solution indicated a change towards more surface approaches in two of the clusters, and minimal change in the other two. The literature (Anderberg 1973, Stockburger 2005) suggested that it was appropriate to use cluster analysis for further exploration of data and further details of the patterns of change were sought through an eight cluster solution. This provided more detail about the various patterns of change of approaches scores that was present within the group.

As was done in analysis of the First study, the clusters were named according to the pattern of change in the DA scores, qualified by the magnitude of the change when compared to the mean (30.5) and SD (6.1), of the DA scale. The clusters that demonstrated a change equal to or more than one SD were named ‘context-responsive’ clusters, and those that demonstrated a change less than one SD were named ‘persistent approaches’ clusters.

The table below summarises the patterns of change of approaches displayed by students in the New program. Three of the four patterns observed during the First study were observed during this study. A clear Deep responding subgroup could not be identified, as changes towards deep were minimal, suggesting that these clusters better aligned with the Persistent Deep subgroup (based on the criteria that were used in all three studies).

Table 2: Summary of eight cluster solution – New Program

Cluster No	Nature of change	Number of cases	Subgroup
8	34 → 36	14	Persistent Deep (n=24)
7	41 → 37	10	
5	29 → 22	29	Surface responding (n=43)
1	38 → 30	14	
2	18 → 16	4	Persistent Surface (n=20)
3	23 → 24	16	
6	26 → 29	14	Persistent intermediate (n=42)
4	31 → 28	28	

The patterns observed in the clusters with minimal change of scores differed slightly from the patterns of the previous study: there were minor decreases in scores which were already high, and minor increases in scores which were already low. This was slightly different from the patterns displayed by the Persistent Deep and Persistent Surface subgroups respectively, in the First study.

Clusters 7 and 8 demonstrated a pattern of marginal change (less than 1SD) of DA scores which were high in both contexts. Cluster 7 displayed a marginal drop in DA scores which continue to be high in both contexts. Cluster 8 demonstrated a slight increase (less than 1SD) of DA scores which were moderately high. These patterns of change correspond to the pattern of change displayed by the 'Persistent Deep approach' cluster of the first study. These two clusters together consisted of 24 students.

Clusters 1 and 5 display a clear pattern of decrease in DA scores (greater than 1SD). The pattern of these clusters corresponds to the pattern displayed by the Surface responding subgroup of the First study. These two clusters included 43 students.

Clusters 2 and 3 displayed a pattern of decrease of DA scores (less than 1SD) which were low in both contexts. This corresponded to the pattern of change displayed by the Persistent Surface cluster of the first study - 20 students belonged to these clusters.

Two clusters displayed only minimal change of DA scores, and their absolute scores remained close to the mean, making it difficult to classify them as favouring either deep or surface approaches. These clusters were named Persistent Intermediate.

Survey findings from the Clinical setting

A cluster analysis was conducted on paired survey data (n=27) from the Clinical setting. A four cluster solution revealed two clusters with minimal changes in approach, one cluster with a decrease of 40% in DA score, and another cluster with a 9% increase in DA score. An eight cluster solution was then examined and was found to be useful in identifying further detail of the patterns of change.

Clinical Setting - Eight cluster solution

All four patterns observed during the First study were observed during this study. Once again, the observed pattern was the basis for naming of the clusters, but was supported by consideration of the mean (27.5) and SD (4.7). The clusters that demonstrated a change equal to or more than one SD were considered to be ‘context-responsive’, and clusters that demonstrated a change less than one SD were named ‘persistent approaches clusters’.

The eight clusters that were identified, the number of students who belong to these clusters, and how the clusters were categorised based on the corresponding subgroup pattern of the First study, are summarised below.

Table 3: Summary of eight cluster solution – Clinical setting

Cluster	Nature of change	Number of cases	Subgroup
2	33→35	4	Persistent Deep (n=4)
6	31→42	1	Deep responding (n=9)
8	24→30	8	
3	30→25	5	Surface responding (n=10)
1	28→22	4	
4	32→13	1	
7	22→22	3	Persistent Surface (n=4)
5	17→16	1	

Cluster 2 demonstrated a pattern of minimal change (less than one SD) towards deep approaches, of DA scores which are moderately high. This pattern corresponds to that seen in the Persistent Deep subgroup of the First study. Four students belonged to this cluster.

Clusters 6 and 8 demonstrated a pattern of change (greater than one SD) towards a deeper approach. This pattern of changes corresponds to the pattern demonstrated by the Deep responding cluster of the First study. Nine students belong to these two clusters.

Clusters 1, 3 and 4 demonstrated a change (greater than one SD) towards more surface approaches. This pattern corresponds to that observed in the Surface responding cluster of the First study. Ten students belong to these clusters.

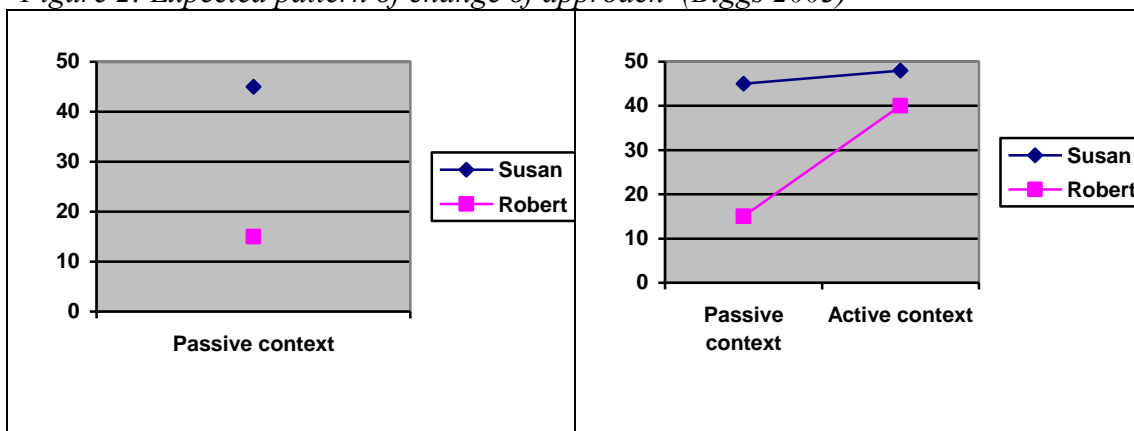
Clusters 5 and 7 demonstrated no change or minimal change (less than one SD) towards surface approaches, of DA scores which were already low. This pattern corresponds to the pattern observed in the Persistent Surface cluster of the first study. Four students belonged to these clusters.

It is important to emphasise that the above interpretation is based on the degree of change of the approaches scores, rather than on absolute values. The findings presented above suggest that student groups within the clinical setting also consisted of subgroups whose approaches to learning changed in a variety of ways in response to a new context. The patterns of change observed in these subgroups correspond to the patterns of change observed in the First study, and therefore support the findings of the First study.

Discussion and conclusion

The findings presented above suggest that the context dependent nature of approaches to learning may be more complex than described in the literature. In particular, the findings challenge the notion that the hitherto identified deep-enhancing contextual features will encourage deep approaches in all or most students. The findings suggest that the hypothetical examples used by Prosser & Trigwell (1999) and Biggs (2003) to demonstrate the context dependent nature of approaches, may not represent the full complexity that can be expected in everyday educational contexts. The hypothetical examples of Biggs (2003, p.4) are represented in figure 2, but the depiction differs in that it compares approaches in two points in time only (as opposed to Biggs's examples which depict how approaches scores change over a continuum).

Figure 2: Expected pattern of change of approach (Biggs 2003)

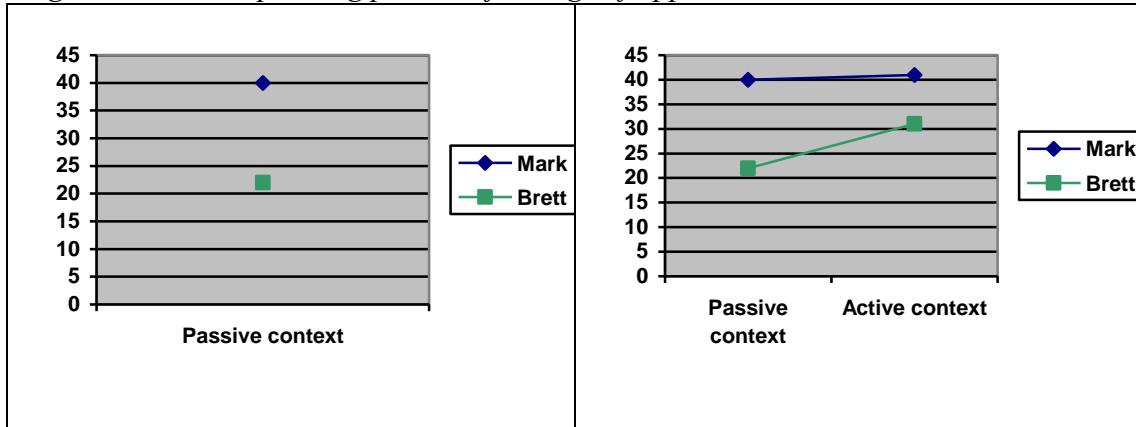


passive context = example: lecture based teaching (Biggs, 2003, p.4)

active context = example: problem based learning (Biggs, 2003, p.4)

Within the first (passive) context, Susan adopts a deep approach while Robert adopts a surface approach. Biggs suggests that if the context was changed to an appropriate 'active context', Robert would approximate the deep approach being used by Susan, and that Susan would continue to use a deep approach. The findings of the **First study** suggest that there are students who do respond in the above manner. Mark (Persistent Deep subgroup) responded as Susan would, and Brett (Deep responding subgroup) responded as Robert would.

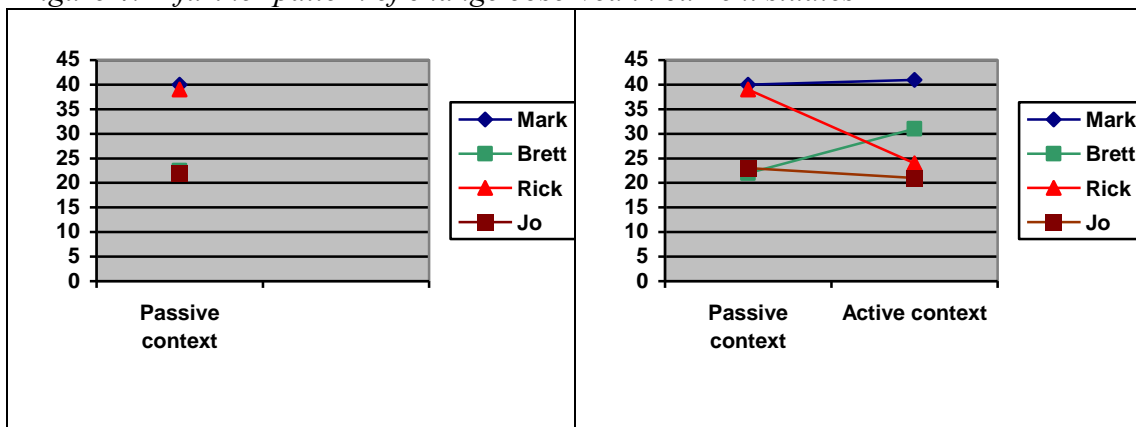
Figure 3: A corresponding pattern of change of approach in current studies



passive context = example: lecture based teaching (Traditional program)
 active context = example: inquiry based learning (Pilot program)

However, while Mark and Brett responded in this way, other students (represented by Rick and Jo) responded in contrary ways.

Figure 4: A further pattern of change observed in current studies



passive context = example: lecture based teaching (Traditional program)
 active context = example: inquiry based learning (Pilot program)

Rick belongs to the Surface responding subgroup and Jo belongs to the Persistent Surface subgroup. The responses of Rick and Jo are contrary to what was intended by the designers of the 'active' educational context. Responses such as these are not reported in the literature, possibly because they are considered 'outliers'. The findings of this study suggest that a substantial proportion of students may respond in this unintended manner, and that this phenomenon could influence the outcomes achieved by an educational program. This

phenomenon thus deserves further exploration which could result in further development of the theory of approaches to learning.

The unintended responses observed may arise from complex interactions between context factors and student factors. This is illustrated by the table below, which summarises the presage factors identified through the student interviews, and the possible interactions with different educational contexts that seem to lead to different approaches in different students.

Table 4: Interaction between presage factors and resultant approaches

Presage		Process
Student factors Identified during interviews	Context factors	
Passion for learning with a focus on development of capabilities needed for future practice Example: Mark	passive context → DA active context → DA	
Preference for active, inquiry based contexts with flexibility and opportunity to explore areas of interest Examples: Brett, Ben	passive context → SA active context → DA	
Preference for contexts with relatively high levels of structure and guidance and disciplinary basis Examples: Julia, Belinda	passive context → DA active context → SA	
Extrinsic motivation combined with negative attitudes towards learning OR Limited academic skills and low self esteem combined with fear of failure Examples: Mary, Jo	passive context → SA active context → SA	

passive context = highly structured, delivery focused (lecture based, teacher focused, eg: traditional program)

active context = inquiry based (student autonomy, integration, eg: Pilot program)

DA=Deep approach, SA=Surface approach

Eight possible combinations of interaction between presage factors are depicted. Only four of these eight combinations may give rise to the approach that is expected, based on the previously cited theories suggested by Prosser & Trigwell (1999) and Biggs (2003). The other four combinations may give rise to approaches not predicted by the above theories: two of these combinations are completely opposite to the effect predicted by the theories.

The approaches that arise from students with a 'Preference for active, inquiry based contexts ...' are as predicted by theory. However, the response from students with a 'Preference for contexts with high level structure and guidance ...' are the opposite of what may be predicted by the theory. This is the response demonstrated by the Surface responding subgroup.

The combinations at the top and bottom extremes of table 4 suggest relatively **context-independent (persistent) approaches**. This is also a notable finding, as it suggests that not all students' approaches to learning are context dependent. The relative stability of approaches displayed by some students is an area that deserves further research. The findings suggest that the proportion of students in the 'Persistent approaches' subgroups (both persistent deep and persistent surface) may be substantial: these students included 10 of the 34 students in the First study, 44 of the 129 students in the New program, and 8 of 27 students in the Clinical setting.

The theoretical implications presented above can be summarised by the following questions related to the context dependent nature of approaches:

1. Is the context-dependent nature of approaches more complex than suggested by current research findings? Is the interaction between (student and learning environment) presage factors so complex as to make the impact of context features such as educational design less predictable?

2. Is the characterisation of context features as deep or surface dependent on student preferences?
3. Are the approaches of all students context-dependent, or is this true of only a proportion of students?

While the above questions are important from a theoretical perspective, how might these findings contribute to actual practice? The findings are likely to be useful for small-group teachers who experience this variation in response amongst students in their everyday practice. Features that may help to identify categories of students have been identified by the use of qualitative methods (Balasooriya 2005). It can be argued that educators who work closely with groups of students are likely to recognise these patterns in their students. Educators may recognise those students who effectively engage with learning activities, almost independently of the teaching/learning methods (Persistent Deep), and conversely those who minimally engage with learning activities in spite of all possible efforts (Persistent surface). Some may also recognise those students who are frustrated by didactic methods and enthusiastically embrace more active and student-centred methods (Deep responding). Finally, some educators may have come across those students who have formed such a strong attachment to didactic methods and thus refuse to recognise the benefits of more active methods – these students are likely to be the ones who persistently complain about self-directed or integrated activities and believe that collaborative learning or discussion of wider issues are a ‘waste of time’ (Surface Responding).

It is possible that many educators recognise these categories of students, but are not adequately equipped to deal with some of them, especially the Surface responding subgroup. This is likely to lead to a situation where only a proportion of students benefit from the deep

enhancing features of a curriculum design, as the Surface responding subgroup could include a substantial proportion of students.

The findings also suggest that both inquiry-based as well as conventional curricula are able to promote deep approaches in some students. However, it is important to recognise that while the promotion of deeper approaches is one aim of inquiry-based curricula it is not the only aim: in fact, inquiry-based curricula aim to develop a wide range of skills including higher level communication and collaborative skills, critical analysis skills and an appreciation of the social and cultural context of health. It is therefore important to consider the present findings within this context. We believe that inquiry-based curricula have considerable potential for achieving a wide range of outcomes, but the observed variation in student response may hinder their achievement. A better understanding of the nature of the variation in student response may help us to develop more effective teaching strategies and curriculum designs, and may help to maximise the benefits of existing inquiry-based curricula.

The first step in this process would be to recognise the magnitude of the variation present in student groups. The second step would be to identify the different subgroups within wider real-world small-group settings. The final step would be to develop teaching strategies and curriculum features to address each subgroup in a way that, in total, engages the majority of students. Further research is required to confirm these findings and to explore how this new understanding can help to optimise the benefits of deep-enhancing educational design.

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