Title	The learning and studying approach of NIE students: A longitudinal study (1)
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Abstract
The learning and studying approach of NIE students was studied using the Bigg's Study Process Questionnaire (SPQ). Results showed that the SPQ is a good instrument with good psychometric properties for studying the three approaches to learning namely: surface, deep and achieving approaches.

Students in NIE generally adopt deep approaches more than surface approaches to their learning. Focused interviews were used as follow-up procedures to further probe into their learning and studying behaviour. Students indicated that the teaching and learning process, the assessment mode and the learning environment all contributed to their approaches to learning and studying.

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Introduction

Learning approaches have a motivation and strategy element which are intimately linked (Biggs, 1979; Watkins, 1983). Students attempt to understand a topic if it is of real interest to them or they can see some relevance to their current or future roles. Students normally have a predisposition to either surface or deep approaches to learning in general. A surface approach normally is associated with limited interest in a task. The motive here is extrinsic, it is to carry out the task because of either positively or negatively reinforcing consequences. The student is willing to engage the task and pass minimally either because life will be even more unpleasant if he/she does not, or because he/she wishes to gain a paper qualification with minimal effort or trouble. A typical surface strategy is rote learning. Surface motivated students focus on what appear to be the most important topics or elements, and reproduce them. Because of this focus, they do not see interconnections between elements or meanings and implications of what is learned. The surface approach is basically used to simply get the task out of the way; to get by without failing. Surface learners normally would reproduce and regurgitate material learned.

A deep approach normally is associated with intrinsic motivational factors and curiosity; the strategy here flows from the curiosity to seek meaning. Deep motivation corresponds to the felt need one experiences in everyday problem solving contexts that are personally significant. In the deep approach, there is personal commitment to learning which means that the student relates the content to meaningful contexts or to existing prior knowledge, depending on the subject concerned. Deep processing involves processes of a higher cognitive level than rote learning. Study behaviour here is usually marked by wide reading, discussion with teachers and other students, playing with the task, thinking about it constantly; there is in-depth involvement with the problem, worrying about it and not letting it go. Deep learners are more likely to study material more critically, reflecting creativity and tend to produce and expand knowledge.

Many studies characterised surface and deep approaches (e.g. Marton & Saljo, 1976) by using qualitative research methods. Biggs (1987) added an achieving approach and developed the Study Process Questionnaire (SPQ). The achieving motive is like the surface approach in that it is focused on the product, in this case the ego trip that comes with obtaining high marks and winning prizes. The general strategy is to maximise the chances of obtaining high marks, the nature of engagement in tasks really depends on what earns the most marks. The achieving strategy concentrates on cost-effective use of time and effort; being self-disciplined, neat and systematic, planning ahead, allocating time to tasks. The element of competition may also prompt such behaviours. While at any given time surface and deep approaches are mutually exclusive, an achieving approach may be linked to either surface or deep. Surface-achievers, for instance, systematically learned selected details by rote to obtain high grades. Deep-achievers, who are often the better students, are organised and they search for both meaning and high grades. Biggs' conceptualisation of the three approaches is summarised in Table 1 below:

Table 1: Biggs' Conceptualisation of Approaches to Learning and Studying

APPROACH	MOTIVE	STRATEGY
Surface Approach (SA)	Surface Motive (SM) is instrumental: main purpose is to meet requirements minimally: a balance between working too hard and failing.	Surface Strategy (SS) is reproductive: limit target to bare essentials and produce through rote learning.
Deep Approach (DA)	Deep Motive (DM) is intrinsic: study to actualise interest and competence in particular academic subject.	Deep Strategy (DS) is meaningful: read widely, inter-relate with previous relevant knowledge.
Achieving Approach (AA)	Achieving Motive (AM) is based upon competition and ego-enhancement: obtain highest grades, whether or not material is interesting.	Achieving Strategy (AS) is based on organising one's time and working space: behave as 'model student'.

Learning approaches are not stable psychological traits but depend upon the student's motivation and the strategy he/she adopts in meeting the tasks prevailing. It is reasonably common for students to adopt a surface approach in one course/module and a deep approach in another (eg. Laurillard, 1984; Ramsden, 1984) Many other variables such as intrinsic and extrinsic motivation, assessment procedures, teaching approaches, workload and the teaching environment were shown to have an impact on the learning approaches (See for example, Gow & Kember, 1990; Entwistle & Ramsden, 1983; Kember & Gow, 1994). Measures of approaches to learning are therefore sensitive to various contextual variables which constitute the learning and teaching environment.

Although a lot of work on the studying and learning approaches of tertiary students have been carried out elsewhere (Biggs, 1987; Ramsden & Entwhistle, 1981) and also in Asia (Biggs, 1991, 1992, 1993; Kember & Gow, 1990; Stokes, Balla & Stafford, 1989), very little research of this nature has been conducted in Singapore. This longitudinal study follows from the first study reported in the last ERA (1997) conference, investigating Biggs' Study Process Questionnaire (SPQ) and investigating the studying and learning approaches of tertiary students in Singapore. This report concentrated on NIE students.

The Study

This study is part of a longitudinal study of validating the SPQ for use in tertiary institutions in Singapore, investigating the different studying and learning approaches that the students here adopt towards satisfying educational goals and factors affecting the studying and learning approaches.

The SPQ consists of 42 items, seven for each of six sub-scales: surface motive (SM) and surface strategy (SS); deep motive (DM) and deep strategy (DS); achieving motive (AM) and achieving strategy (AS). Each item is in the form of a statement. Students respond to each item on a 5-point scale; whether the item is never or only rarely true (1), sometimes true (2), true about half the time (3), frequently true (4), always or almost always true (5). Essentially, this is a self-report scale. Main approach scales are calculated by summing scores on the respective motive-strategy sub-scales, i.e. surface approach (SA) is the sum of surface motive and surface strategy (SA=SM+SS); deep approach (DA) is the sum of deep motive and deep strategy (DA=DM+DS) and achieving approach (AA) is the sum of achieving motive and achieving strategy (AA=AM+AS). Norms have been established for the SPQ for the Hong Kong and Australian tertiary students. Here the results from the Singaporean sample will be compared to the established norms.

The Sample

The sample for this study consists of the Post-Graduate Diploma in Education (PGDE) students, the Diploma in Education (Dip Ed) students and the BA/BSc with Education students in the National Institute of Education (NIE), Bukit Timah Campus, Singapore. Students in the PGDE Programme normally are graduates from universities, possessing basic undergraduate degrees in the Arts and the Sciences mainly and this is a one-year programme. Students in the Dip Ed and BA/BSc Programmes are those who graduated from the schools after obtaining their General Certificate of Education 'Advanced' Level (GCE 'A') qualification. Generally, these students are younger in age. The Dip Ed is a two-year programme where at the end, the students are awarded a Diploma in Education. The BA/BSc programme is a 4-year programme where at the end, the students are awarded Degrees in Bachelor of Arts with Education or Bachelor of Science with Education, with an additional honours year.

The SPQ was administered to 378 PGDE students and 269 Dip Ed students in March, 1997. These were the graduating PGDE students who were attending the one-year pre-service PGDE programme and the graduating Dip Ed second year students who were attending the pre-service 2-year Dip Ed programme. Background data like age, sex, race, stream (Science or Arts) and some socio-economic status information were also collected from the respondents for this study which is part of the longitudinal study. The SPQ was later administered to 352 PGDE students in August, 1997 and to 349 first year Dip Ed students in October, 1997 and to 106 BA/BSc students in October, 1997. The PGDE students were followed up to the second semester and the same group took the SPQ again in February, 1998. The Dip Ed students were followed up to their second year and the same group of students took the SPQ again in August, 1998. We were unable to follow up the BA/BSc students, instead a different group of 83 BA/BSc year two students took the SPQ in March, 1998.

Reliability estimates of the sub-scales of the SPQ for the NIE samples

Table 2 showed the reliability estimates of the sub-scales of the SPQ from studies overseas. Generally the figures showed reasonably acceptable values.

Table 2: Reliability Estimates of Sub-scales of SPQ (Alpha Coefficients) -- Overseas Studies

	N	SM	SS	DM	DS	AM	AS
All Hong Kong	2338	.53	.65	.60	.75	.74	.69
Australian Unis.	823	.61	.66	.65	.75	.72	.77

Note: SM=Surface Motive, SS=Surface Strategy, DM=Deep Motive, DS=Deep Strategy, AM=Achieving Motive, AS=Achieving Strategy.

The reliability estimates in terms of coefficient Alpha for the samples of NIE students in the study are shown in Table 3 below.

Table 3: Reliability Estimates of Sub-scales of SPQ (Alpha Coefficients) – NIE Students

	n	SM	SS	DM	DS	AM	AS
PGDE (Mar, 1997)	378	.64	.60	.78	.69	.77	.72
PGDE (Aug, 1997)	352	.64	.69	.61	.78	.79	.73
PGDE (Feb, 1998)	387	.63	.71	.69	.78	.83	.75
Dip Ed (Mar, 1997)	269	.60	.68	.74	.60	.79	.79
Dip Ed (Oct, 1997)	349	.56	.58	.65	.81	.77	.80
Dip Ed (Aug, 1998)	161	.57	.59	.69	.81	.72	.75
BA/BSc (Oct, 1997, Y1)	106	.71	.69	.70	.78	.78	.75
BA/BSc (Mar, 1998, Y2)	83	.52	.70	.69	.81	.77	.82

When compared to studies in Hong Kong and Australia (Table 2), the reliability estimates were reasonably high and generally higher than the overseas cases. The reliability estimates showed that all the sub-scales of the SPQ for the NIE samples have reasonably high reliability, with the surface motive and surface strategy sub-scales figures lower than the rest of the other sub-scales.

Factor Structure of the SPQ

Data from these two groups, the PGDE and the Dip Ed students were subjected to exploratory and confirmatory factor analysis to determine the factor structure of the SPQ. In both the samples the six-factor, varimax rotated, factor structure were not well-defined. The four-factor, varimax rotated, factor structure seemed to provide more parsimonious solutions to the factor structure of the SPQ.

Data from the PGDE and the Dip Ed samples were subjected to confirmatory factor analyses specifying a priori a six-factor model followed by a four-factor model. Both the six and four factor models were identified. The PGDE six-factor model resulted in a chi-square value of 1721.77 with 804 degrees of freedom; the four-factor model resulted in a chi-square value of 1804.21 with 813 degrees of freedom. For the Dip Ed sample corresponding figures were 1605.83 with 804 degrees of freedom and 1668.45 with 813 degrees of freedom. The other goodness of fit statistics are shown in Tables 4 and 5.

Table 4: Goodness of Fit Statistics – PGDE Students

Model	GFI	AGFI	RMR	PGFI
6-Factor Model (PGDE, n=378; Mar, 1997)	.82	.80	.069	.73
6- Factor Model (PGDE, n=352; Aug, 1997)	.81	.79	.072	.72
4-Factor Model (PGDE, n=378; Mar, 1997)	.81	.79	.071	.73
4-Factor Model (PGDE, n=352; Aug, 1997)	.81	.79	.074	.73

Table 5: Goodness of Fit Statistics – Dip Ed Students

Model	GFI	AGFI	RMR	PGFI
6-Factor Model (Dip Ed, n=269; Mar, 1997)	.78	.75	.078	.69
6-Factor Model (Dip Ed, n=349; Oct 1997)	.81	.79	.071	.72
4-Factor Model (Dip Ed, n=269; Mar, 1997)	.77	.74	.081	.69
4-Factor Model (Dip Ed, n=349; Oct, 1997)	.80	.78	.072	.72

GFI=Goodness of Fit Index, AGFI=Adjusted Goodness of Fit Index,
RMR=Root Mean Square Residual, PGFI=Parsimony Goodness of Fit Index.

It can be seen from the confirmatory factor analyses that in both the cases, the six- factor as well as the four-factor models produced almost similar results. The results from the PGDE and the Dip Ed students compared very well with the previous graduating groups. These analyses lend support to consider the six dimensions of the SPQ. Indeed the four-factor models again proved to be more parsimonious solutions, having comparatively similar goodness of fit statistics as the six factor models.

Summary Statistics of the Sub-scales of the SPQ

Summary statistics in terms of means and standard deviations of the SPQ sub-scales and also the surface, deep and achieving approaches are shown in Tables 6, 7, 8 and 9. In both the PGDE and the Dip Ed samples, the deep approach had the highest mean followed by surface approach and then the achieving approach. Similarly, the trend was the same in the case of the Hong Kong universities' sample. Of particular interest in all the cases, the PGDE and Dip Ed samples have higher means for all the three approaches.

Table 6: Means and Standard Deviations of Sub-scales of SPQ – Hong Kong University (N=473)

	Mean	Std. Deviation
SM	20.45	4.57
SS	19.57	4.16
SA	40.06	7.67

DM	22.59	4.74
DS	22.06	4.65
DA	44.64	8.42
AM	22.60	4.94
AS	20.48	4.86
AA	39.79	8.02

Source: Biggs, J. (1992). Why and how do Hong Kong Students Learn? p.108

In particular, the means for the deep approach were the highest for the PGDE sample, with the Dip Ed sample also higher than the Hong Kong study. Dip Ed students for the Oct, 1997 sample have higher deep approach means than those of the PGDE counter parts for the Aug, 1997 sample. But during the following semester, the PGDE students have higher means than the Dip Ed students in their second year of the Dip Ed programme. It is interesting to note that for the PGDE students, there is a gain in the deep approach means from the first to the second semester however, for the Dip Ed students, the corresponding deep approach means dropped a little from first year to the second year of the programme.

Table 7: Means and Standard Deviations (SD) of Sub-scales of SPQ – PGDE Students

	Mean (SD) Mar, 1997 n=378	Mean (SD) Aug, 1997 n=352	Mean (SD) Feb, 1998 n=387
SM	21.26 (4.82)	21.43 (4.72)	21.84 (4.49)
SS	20.20 (4.42)	20.36 (4.34)	20.81 (4.26)
SA	41.46 (8.02)	41.79 (7.85)	42.64 (7.69)
DM	24.51 (4.31)	24.73 (4.24)	25.39 (4.24)
DS	22.77 (4.52)	22.98 (4.48)	23.79 (4.41)
DA	47.28 (7.84)	47.71 (7.72)	49.18 (7.82)
AM	19.86 (5.34)	19.94 (5.36)	20.80 (5.66)
AS	21.16 (4.91)	21.46 (4.83)	20.81 (4.93)
AA	41.03 (8.67)	41.40 (8.60)	41.61 (9.03)

Table 8: Means and Standard Deviations (SD) of Sub-scales of SPQ – Dip Ed Students

	Mean (SD) Mar, 1997 n=269	Mean (SD) Oct, 1997 n=349	Mean (SD) Aug, 1998 n=161
SM	23.09 (4.91)	23.45 (4.47)	22.60 (4.24)
SS	21.63 (4.17)	22.11 (3.96)	21.55 (3.73)
SA	44.72 (7.99)	45.59 (7.32)	44.14 (7.05)
DM	24.00 (4.73)	24.63 (4.49)	24.23 (4.41)
DS	22.52 (4.76)	23.60 (4.82)	22.81 (4.60)
DA	46.53 (8.55)	48.26 (8.46)	47.01 (8.21)
AM	20.75 (5.28)	21.97 (5.43)	21.17 (4.78)
AS	22.05 (5.22)	22.66 (5.28)	22.11 (4.62)
AA	42.80 (8.94)	44.57 (9.27)	43.30 (8.14)

Table 9: Means and Standard Deviations (SD) of Sub-scales of SPQ – BA/BSc Students

	Mean (SD) Oct. 1997 Y1 n=106	Mean (SD) Mar. 1998 Y2 n=83
SM	23.30 (5.24)	23.17 (4.31)
SS	21.84 (4.27)	20.29 (4.78)
SA	45.14 (8.61)	43.46 (7.92)
DM	23.35 (4.77)	24.07 (4.94)
DS	22.37 (4.64)	23.27 (5.02)
DA	45.73 (8.60)	47.30 (9.12)
AM	21.36 (5.75)	20.66 (5.43)
AS	20.98 (5.01)	19.44 (5.52)
AA	42.39 (8.90)	39.92 (9.13)

SM=Surface Motive, SS=Surface Strategy, SA=Surface Approach,
DM=Deep Motive, DS=Deep Strategy, DA=Deep Approach,
AM=Achieving Motive, AS=Achieving Strategy, AA=Achieving Approach

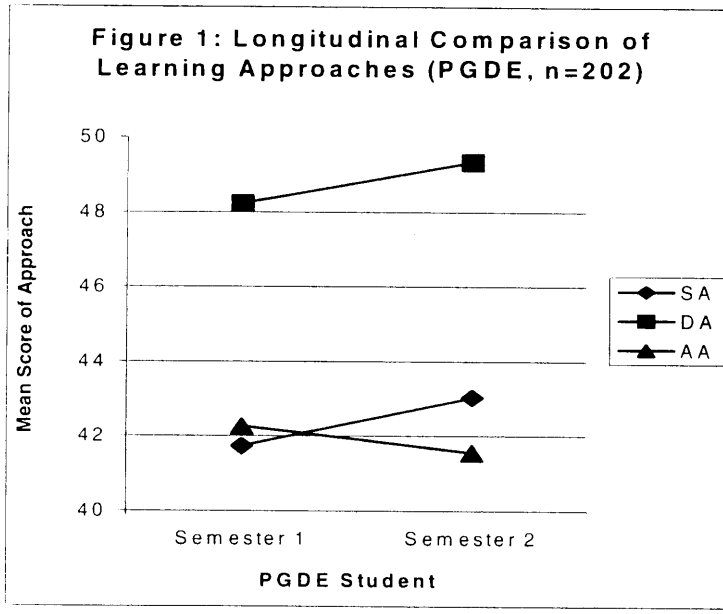
For the BA/BSc samples surface approach means were relatively high but in both cases, deep approach means were again higher than surface and achieving means. These two groups of BA/BSc students were not the same groups of students. A cross sectional comparison showed that surface approach means and achieving approach means fell while deep approach means showed a marked increase.

Longitudinal Comparison of Learning Approaches

Data from the PGDE students taken on August, 1997 when they were in the first semester was followed up and matched with the same students when they were in the second semester in February, 1998. Owing to missing information only about 202 pairs of results were reported.

Figure 1 below shows the longitudinal comparison of the approaches to learning for the PGDE students over the two semesters. It can be seen from Figure 1 that there was an increase in deep approach and also surface approach while the achieving approach showed a decrease. The surface approach showed an increase that was statistically significant ($t=2.29$, $p<.023$) and the deep approach showed an increase that was marginally significant ($t=1.94$, $p<.053$) while the difference for the achieving approach was not statistically significant.

Similarly, data from the Dip Ed students taken in October, 1997 when they were in the first year of the Diploma programme was followed up and matched with the same students when they were in the second year taken in August, 1998. Owing to missing data, only 129 pairs were reported.



SA=Surface Approach, DA=Deep Approach, AA=Achieving Approach.
To investigate further regarding the reasons for adopting the different approaches to studying and learning, focused interviews of different groups of the PGDE students were carried out.

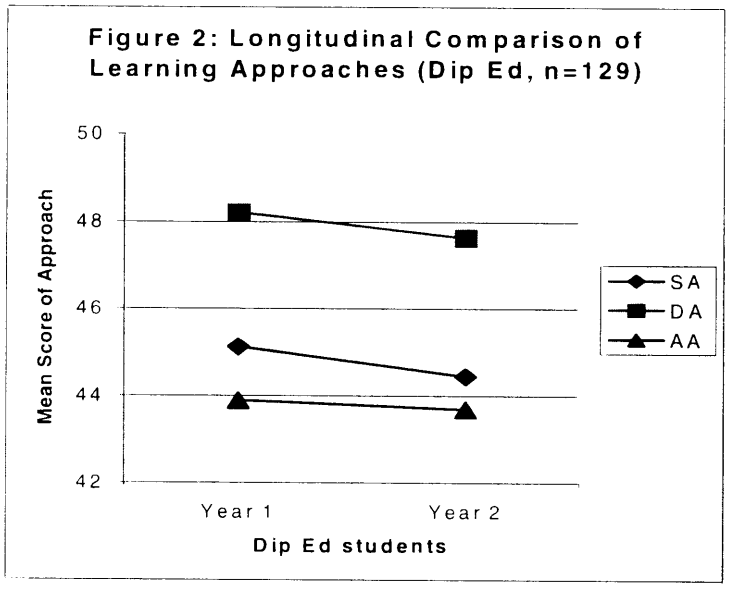


Figure 2 shows the longitudinal comparison of the approaches to learning for the Dip Ed students over the two years. It can be seen from Figure 2 that for all the three approaches, the mean values showed some decrease. However, the drop in value of all the cases were not statistically significant. Again, in all cases, the deep approach means were higher than surface means and achieving means.

Focused Interview Results

Three different groups of PGDE students were assembled for the focused interview sessions.

According to Stewart and Shamdasani (1990), a focused group is a group of individuals assembled together to discuss a topic of research from their personal experience. The purpose of using focused groups is to draw upon the students' feelings, experiences and reactions that are revealed through an interactive gathering.

A moderator facilitates the interaction within the group based on questions supplied by the researchers. The focus group provides a larger amount of information in a shorter period of time than individual interviews. Compared to individual interviews, focused group interviews elicit several views within a group context. The interaction among individuals spurs discussion and triggers other ideas from members of the group. The group interaction also enables members to ask questions of each other as well as reconsider their own views.

One limitation of using the focused group interview method is the researcher cannot clearly identify an individual view, but rather a group view in a specific context and culture. Another limitation is that one member of the group may dominate the discussion and that particular view is recorded. To overcome these limitations, the moderator is critical in three ways: first, by explaining the purpose of the group interview, second by facilitating interaction among all group members and third by assisting the group to feel at ease to discuss the topic openly.

Responses from three focused groups were summarised under the questions raised of students in the PGDE Programme. The focused group interviews complemented and elaborated on the findings obtained from surveys completed by the PGDE students.

The first question raised by the moderator was, "Do you have the same or different way of learning and studying for each subject/module?" The initial discussion focused on the assessments required in the module as illustrated in the following comments:

> *Not really, depends also on the assessment mode.*
>
> *We use different ways of learning based on the assessment of the course.*
>
> *With exams, we study differently.*
>
> *Based on the nature of the subject whether it is concept-based or more factual, theoretical or practical.*

The facilitator prompted the groups to consider the teaching style and expectations of the lecturers and tutors. The general comment was that although PGDE courses aim to equip students with new teaching approaches and methods, the courses themselves were usually taught and assessed in traditional ways.

With regards to the reasons students preferred particular learning styles, some admitted that they studied according to their own interest. Others commented that they study alone except if there was a group project. The influence of peer groups on studying and learning styles was not factored in as important. Some of the other responses suggested that students were interested in reading a lot and learning by themselves. Other students mentioned that cramming was a common way to study for exams in all subjects.

The second question raised by the moderator was, "Has your motive for learning and studying changed during the programme?". In one group the discussion started with some students saying that they entered the PGDE programme "to learn how to teach" and "to get a certificate." As the discussion continued, most of the students said that their motivation decreased during the programme. This same group said they were most motivated by how to get good marks or just to pass. Others said they learned a lot during class interaction.

Another group said that the teaching practice component of the PGDE programme provided real situational experience and made an impact on them.

> *After teaching practice, we became more interested in practical aspects such as how applicable or feasible a particular teaching method is in a real classroom situation.*

One student in this group said that curiosity is still there, "I'm still interested in finding out all possible approaches to teaching." Another student however admitted,

> *I'm frustrated by the fact that many of the things I learned in NIE cannot be applied in the school due to constraints within the school system.*

The third question raised by the moderator was, "What feature(s) of the programme affect changes to your learning and studying?" Many responses centred around the idea that they did not change their learning strategies because they have no time to change their strategies although they would like to experiment. However, some said,

> *Small-class teaching makes a difference – learn a lot there from practitioners.*
>
> *For interest, we read more widely.*

Near the end of the focused group interview, the following chart was shown:

Approach	**Motive**	**Strategy**
A	instrumental, meet minimal requirements	reproductive, rote learning
B	study to actualise interest & competence in subject	meaningful, read widely, interrelate with previous knowledge
C	competition, obtain highest grade regardless of material	behave as "model student"

The students were not informed explicitly that A is a surface approach, B is a deep approach and C is an achieving approach. The moderator asked, "Before the PGDE programme, which approach (A, B or C) did you use most and why?"

> *Mainly A type of approach, just want to pass.*
>
> *Mainly Approach A but a little towards Approach B.*

After some discussion, the moderator asked the last question, "After joining the PGDE programme, which approach did you use most and why?"

Several students in one of the groups agreed that they do not adhere to one approach rather they use approaches A, B and C in combination. Their choice depends on the modules, the instructional process and assessment mode. Although they would like to use Approach B (deep approach) at NIE, they have no time to do so.

In one group, several students agreed that the undergraduate studies at the National University of Singapore and Nanyang Technological University were more rigorous and assignments required more reading. In the PGDE programme, there was a constraint of time so they admitted to doing little reading since the assignments were less demanding.

In the third group of 15 students, two chose Approach A because of time constraints. Eight chose Approach B because they can afford to spend time on higher-order skills and to explore topics. Two chose Approach C and three did not respond. Most of the students said they use a combination of Approaches A and B.

Conclusion

The SPQ has been shown to have good psychometric properties. Generally, reliability estimates in terms of alpha coefficient have consistently shown high, acceptable values across samples and over time. It is also of interest to note that generally reliability figures were higher in values when compared to studies overseas. The factor structure of the SPQ has also been shown to be consistent across samples and over time. Generally, there is a six-factor model although the four factor-model is more parsimonious. These results showed that the SPQ indeed has good psychometric properties thus giving more credibility to conclusions derived from the use of this instrument in the local situation.

Summary statistics in terms of the six sub-scales and the three approaches consistently showed that the figures were comparable to those research done in Hong Kong. For the PGDE, the Dip Ed and the BA/BSc samples students were higher for the deep approach, followed by the surface approach then the achieving approach. This trend was consistent across the samples taken over time. Contrary to popular beliefs that Singapore students are, good for regurgitating and are generally surface learners only, results from this longitudinal study for the NIE students have shown that the students here do practice and employ deep approaches and also achieving approaches in their studying and learning behaviour.

The longitudinal comparison of approaches, following the same PGDE students from semester 1 to semester 2 (Fig. 1), showed that they generally maintained the deep approach higher than achieving and surface approaches. In this case, there were increases in the deep approach and the surface approach but the achieving approach declined a little. Following the same Dip Ed students from year 1 to year 2 (Fig. 2), generally all the three approaches declined. This could be due to the fact that the students nearing the end of the programme were now more interested in passing their exams. However, they still maintained deep approach higher than surface and achieving approaches. This further lend support to the fact that NIE students generally demonstrate learning and studying approaches beyond the surface and superficial kind.

The focused interview results showed that the PGDE students' learning and studying approaches were influenced by the assessment mode mainly. This could be due to the fact that when the data was collected, they were towards the end of the programme and much of their attention was directed to the coming exams. Their motives and strategies fluctuated from the surface to the deep kind and hence the approaches revolved from the surface to the

deep approaches, depending on the situations at hand. They also indicated that the teaching and learning process, the curriculum and environment too have effects on their learning.

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