*Australian Journal of Educational & Developmental Psychology***.** Vol 2, 2002, pp 17-32

Assessing Students' Conceptions of Learning

Nola Purdie & John Hattie
Queensland University of Technology University of Auckland

Abstract

This study describes the development of an instrument designed to assess student's conceptions of learning. The Conceptions of Learning Inventory (COLI) was developed from qualitative data obtained from Australian and Japanese high school students. Six conceptions of learning were identified. The COLI was used to compare the conceptions of learning of groups of students from Australia (Indigenous and non-Indigenous), Malaysia, and America (Caucasian and African American). The self-rated academic achievement of students who endorsed all six conceptions of learning was higher than that of students who endorsed fewer conceptions of learning. There was little support for the existence of the two qualitatively different conceptions that are commonly identified (a surface conception involving the acquisition, storage, reproduction, and use of knowledge; and a deep conception involving the construction of meaning and personal change).

Introduction

For several decades, research into students' conceptions of learning has indicated that students conceive of learning in qualitatively different ways. There has been a consistent and persistent message that these conceptions can be categorized in such a way as to reflect two predominant positions: (1) some students have a surface understanding of learning that involves the acquisition, storing, reproduction, and using of knowledge; (2) some students have a deep understanding of learning that involves the construction of meaning (understanding) and personal change.

Within these two broad categories of conception, subcategories have also been identified. For instance, following analysis of participant responses to several open-ended questions about learning (e.g., "What do you actually mean by learning?"; "How do you usually set about learning?"), Säljö (1979) concluded that people thought about learning in five distinctly different ways. He described these different conceptions as: (a) the increase of knowledge; (b) memorizing; (c) the acquisition of facts, procedures etc., which can be retained and/or utilized in practice; (d) the abstraction of meaning; and (e) an interpretative process aimed at the understanding of reality. The first three of these conceptions represented a surface understanding of learning; the fourth and fifth conceptions represented a deep understanding of learning.

Following Säljö's study, over two decades of research has led to the now commonly accepted view that there exists a hierarchical set of conceptions of learning that show a developmental trend (in the sense that conceptions at the upper levels reflect an interpretative/constructivist view of learning as opposed to one in which learning is acquired and reproduced). Conceptions of learning researchers have proposed that 'better' learning outcomes are attained by those students who hold conceptions of learning at the upper end of the hierarchy.

Although there is remarkable similarity in the conceptions identified and described across a number of studies for several decades and involving people of varying ages in a number of different learning contexts, these findings cannot be taken to imply a universality of meaning with reference to learning. Indeed, Säljö (1987) concluded that "... learning does not exist as a general phenomenon. To learn is to act within man-made institutions and to adapt to the particular definitions of learning that are valid in the educational environment in which one finds oneself" (p. 106). Different educational environments will define learning according to "different socially and culturally established conventions with respect to what counts as learning" with the result that "the meaning of the concept of learning is highly ambiguous and not susceptible to any analytically satisfactory definition" (p. 104).

Accordingly, there have been several studies that have approached the task of identifying people's conceptions of learning from a cross-cultural perspective. One of these studies (Marton, Dall'Alba, & Tse, 1993) involved investigations with teacher educators from mainland China. The findings from this study revealed both similarities and differences with previously identified Western interpretations of the phenomenon of learning. One of the major differences concerned the relationship that people perceive between learning, memorizing, and understanding. Participants in studies conducted in Western educational contexts have generally equated rote learning with memorization, and these processes have been clearly distinguished from the process of understanding. Memorization and understanding are viewed as separate entities that occur at different points in time. However, several different ways of thinking about the relationship between memorization and understanding were identified in the study with the Chinese teacher educators. For some participants, understanding was taken to be the sum of "all the pieces of knowledge that are remembered or memorized" (Marton, Dall'Alba, & Tse, 1993, p. 4). In other words, understanding was interpreted as the sum of the first three of the six conceptions described by Marton and his colleagues (1993). Other participants considered the relationship between memorizing and understanding to be one in which there was a confluence of memorizing and understanding rather than a separation of the processes. Each process was seen to contribute to the other. Distinctions that were made concerned differences within memorization rather than between memorization and understanding. Mechanical memorization was distinguished from memorization with understanding. Furthermore, within the notion of memorization with understanding were two different views about the relationship: (a) it is easier to memorize or remember what is already understood, and (b) understanding can be developed through memorization.

Understanding, also, was interpreted in several different ways. For some, understanding implied that at some point in time there was a revelation about the meaning of something, as indicated in the expression "I get it!". Marton, Dall'Alba and Tse (1993) refer to this as the S-O form; that is, a subject (S) understands an object (O). Other people described understanding as a gradual process rather than as a distinct or abrupt change at a particular moment in time.

Two other studies in which participants came from Asian educational settings also provided intriguing results with respect to the concept of memorization (see Watkins & Regmi, 1992; Watkins, Regmi, & Astilla, 1991). Nepalese students, both at secondary and tertiary levels of study, gave no evidence of thinking about learning as involving the memorization of subject matter content. Moreover, it was only within the group of students studying at the tertiary level that there was mention of the conception of 'learning as understanding'.

These three studies with students from non-Western learning environments draw attention to the different interpretations of what it means to memorize. In Western educational contexts, memorization is frequently equated with rote learning or the repetition (sometimes mindless) of facts and discrete pieces of information. Invariably, it is frowned upon as being an indicator of shallowness in learning. What is suggested by the findings from these three studies, however, is another way of thinking about the relationship between the two processes of memorizing and understanding that does not place one process in juxtaposition to the other. Instead, the effectiveness of one process may be enhanced or augmented by the other.

There is a commonly held view that students' conceptions of learning have explanatory power in terms of the quality of learning outcomes (Van Rossum & Schenk, 1984), although this view has not gone unchallenged. For instance, Fuller (1999) found little evidence of a relationship between university students' conceptions of learning and their academic achievement, arguing that the learning context exerts a stronger influence on learning than the conceptions of learning that students bring to the context. Furthermore, Fuller questioned the practice of categorising students as holding just a single conception because conceptions of learning are complex constructs incorporating a number of components, not least of which are contextual constraints such as amount of subject matter to be learned, assessment requirements, and approach to teaching.

Studies of students' conceptions of learning have generally used a phenomenographic approach in which the emphasis is on trying to understand how people view the world around them. Attention is directed not so much at reality as it is, but more at the various interpretations people have of it—what is sometimes referred to as "a second order perspective". Typically in phenomenographic research people are asked open-ended questions about the particular phenomenon being studied. Their responses are sorted into conceptual categories on the basis of similarities and differences. Phenomenography is not concerned with evaluations of conceptions—their 'rightness' or 'wrongness'; it is just as interested in mistaken conceptions of reality.

Phenomenographic researchers derive conceptions of learning data from interviews with students or from their written responses to open-ended questions about learning. Collection and analysis of such data are lengthy processes, and as a result researchers have tended to use small sample sizes from which it is difficult to establish and test theory. The purpose of the current study was to develop an instrument that could be used with larger groups of students to test empirically a model of learning conceptions. We aimed to test the dimensionality of this instrument across several cultural groups, with particular attention to the relationship between memorising and understanding. In addition, we sought to explore the relationship between conceptions of learning and academic achievement.

Part 1: Instrument Development

Background

In a previous study in which we explored the conceptions of learning of Japanese and Australian students (Purdie, Hattie, & Douglas, 1996), we identified nine categories of conception of learning. These categories are described in detail in the original study but can be summarized in this way. Learning is (a) increasing one's knowledge; (b) memorizing and reproducing information; (c) using information as a means to an end; (d) understanding; (e) seeing something in a different way; (f) personal fulfillment; (g) a duty; (h) a process not bound by time or context; and (i) developing social competence. The first six of these conceptions are similar to those identified in previous studies (e.g., Marton, Dall'Alba, & Beaty, 1993). Learning as a duty is similar to the moral dimension identified by Cliff (1995). The final two conceptions have features in common with two process conceptions identified by Tynjälä (1997)—learning as a process not bound by time or context is somewhat akin to her conception of learning as a developmental process which is both unintentional and inevitable; the final conception, learning as developing social competence, is similar to Tynjälä's sixth process conception, learning as an interactive process that occurs between people. These nine conceptions were the starting point for the development of our conceptions of learning instrument.

Procedure

Using the written and oral responses made by students to questions about their conceptions of learning in our original study (Purdie, Hattie, & Douglas, 1996), we constructed from10 to 20 items for each of the nine categories of conception. The resulting 112 item instrument required respondents to indicate on a 6-point scale the extent to which they agreed (or disagreed) with statements about learning. This instrument was completed by 250 students (51% female) in two high schools in the metropolitan area of one Australian city. A variety of factor analytic procedures was used to reduce this set of items to the best four, five, or six items per category. In all, 45 items remained.

This 45 item instrument was completed by another group of Australian high school students (n=331, 49% female) to further reduce the number of items, and to develop a substantive model of students' conceptions of learning. Analysis of these data resulted in a 32 item instrument representing six factors. To validate this model of conceptions of learning, the 32 item instrument was completed by yet another group of Australian high school students (n=356, 48% female).

Analytic approach

Exploratory factor analyses (a maximum likelihood method of factor extraction, with oblimin rotation) were conducted with SPSS 10. The purpose of these analyses was to eliminate items with unacceptably high levels of measurement error, and to provide an indication of possible models for more rigorous investigation. AMOS, a program for performing structural equation modeling, was used to conduct confirmatory factor analyses of the conceptions of learning items.

Following the suggestion of Hoyle and Paynter (1995), several goodness-of-fit indexes were used to test models. Values close to 1 (over .90) on the Normed Fit Index (NFI), the Tucker Lewis Index (TLI) and the Comparative Fit Index (CFI) indicate a good model. The Root Mean Square Error of Approximation (RMSEA) is acceptable when it is not higher than .08. Values of .05 or less indicate a close fit to the model (Browne & Cudeck, 1993). In theory, the χ^2 fit index indicates a good model fit if the χ^2 is not significant. In practice, the statistic is sensitive to sample size such that "If the sample is small then the χ^2 test will show that the data are not significantly different from quite a wide range of different theories, while if the sample is large, the χ^2 test will show that the data are significantly different from those expected on a given theory…" (Gulliksen & Tukey, 1958). In place of the χ^2 test, a relative χ^2 (χ^2/df) is more often used. Ratios as low as 2 or as high as 5 have been used by different researchers to indicate a reasonable fit (Marsh & Hocevar, 1985), with figures closer to 2 being more acceptable.

Results

Examination of a number of alternative models, developed from various combinations of items selected from the bank of 45 items, indicated that a nine-factor model (as originally proposed) did not fit the data well. Several alternative models were proposed and tested, using the usual procedures for evaluating structural equation models (see, for instance, Bollen & Long, 1993; Hayduk, 1987). When evaluating models, the concern was not only with deriving the best fit statistics; the aim also was to estimate a model that could be interpreted theoretically. The model that was both conceptually meaningful and provided a good fit to the sample data contained six factors, derived from 32 items.

The six factors that were identified were interpreted in the following ways. Factor I consisted of five items related to a conception of learning as Gaining Information (INFO); Factor II consisted of nine items representing a conception of learning as Remembering, Using, and Understanding information (RUU); Factor III consisted of three items representing a conception of learning as a Duty (DUTY); Factor IV consisted of eight items representing a conception of learning as Personal Change (PERS); Factor V consisted of three items representing a conception of learning as a Process not bound by time or place (PROC); and Factor VI consisted of four items representing a conception of learning as the development of Social Competence (SOC). Factor loadings for the six factors, and model fit statistics for both the exploratory and validation samples of Australian students are reported in Table 1.

The biggest difference between the final six factor model and the nine factor model that was initially proposed lies in the clustering together of the items concerning the remembering, using and understanding of information. Also clustering as a single factor were those items concerned with seeing things in a different way, and personal change.

Table 1: Factor Loadings and Goodness of Fit Indexes from Confirmatory Factor Analyses of Conceptions of Learning Items for Two Samples of Australian Students

Factor/ Item	Exploratory Sample (n=331) Factor Loading	Validation Sample (n=356) Factor Loading
Factor I		
Gaining information (INFO)		
INFO1	.61	.42
INFO2	.55	.51
INFO3	.61	.44
INFO4	.62	.59
INFO5	.58	.50
Factor II		
Remembering, using, and understanding (RUU)		
RUU1	.54	.47
RUU2	.62	.48
RUU3	.63	.49
RUU4	.58	.53
RUU5	.68	.54
RUU6	.47	.60
RUU7	.63	.56
RUU8	.55	.48
RUU9	.56	.58
Factor III		
Duty (DUTY)		
DUTY1	.38	.31
DUTY2	.68	.63
DUTY3	.45	.55
Factor IV		
Personal change (PERS)		
PERS1	.64	.54
PERS2	.65	.53
PERS3	.75	.70
PERS4	.73	.60
PERS5	.56	.57
PERS6	.70	.65
PERS7	.61	.56
PERS8	.68	.72
Factor V		
Process (PROC)		
PROC1	.55	.56
PROC2	.47	.41
PROC3	.73	.64
Factor VI		
SOCIAL (SOC)		
SOC1	.70	.63
SOC2	.64	.60
SOC3	.68	.60
SOC4	.76	.71

Goodness-of-fit Indexes [a]		
χ^2/df	1.89	2.04
NFI	.97	.97
TLI	.98	.98
CFI	.98	.98
RMSEA	.05	.05

[a] NFI (Normed Fit Index); RFI(Relative Fit Index); TLI (Tucker Lewis Index); CFI (Comparative Fit Index); RMSEA (Root Mean Square Error of Approximation).

Intercorrelations between the factors was high, ranging from .42 (between INFO and PROC) to .88 (between INFO and RUU), suggesting the existence of a single higher order conceptions of learning factor. We unsuccessfully attempted to extract two higher order factors (surface and deep), in which INFO, RUU, AND DUTY were constrained to load on one higher order factor and PERS, PROC, and SOC on another. Reliabilities for the six conceptions ranged from .65 to .83 in the exploratory sample and from .50 to .86 in the validation sample. The 32 item instrument was subsequently referred to as the Conceptions of Learning Inventory (COLI) (see Appendix).

Part 2: Exploring Conceptions of Learning Across Cultures

Participants

The stability of the structure of the COLI across groups of students from different ethnic backgrounds was examined. The following groups of school students were recruited: Non-Aboriginal Australian (n=222, 57 % female); Aboriginal Australian (n=125, 47% female); Malaysian (n=219, 50% female); Caucasian American (n=616, 54% female); and African American (n=512, 58% female).

The non-Aboriginal Australian students came from two Queensland coeducational high schools located in middle-class suburban areas. One school was a large government school, the other was an independent, church-affiliated school. The Aboriginal Australian students came from two rural coeducational high schools in Queensland. In one of the schools, students were drawn from a nearby Aboriginal community in which there was a high unemployment rate and high rates of school absenteeism. Aboriginal students from the second rural school did not live in a separate Aboriginal community, but there were similar rates of Aboriginal unemployment in the town, and school absenteeism rates were also high. The Malaysian sample was drawn from five coeducational government high schools whose students were described as coming from middle-class backgrounds. The American sample was drawn from 69 Guilford County Schools, North Carolina. There were 277 high school students and 896 elementary school students. Fifty-six percent of the students were female. Fifty-three percent were Caucasian students and 44 percent were minority students (primarily African American).

Procedure

The non-Aboriginal Australian students, Malaysian students, and American students completed the written version of the COLI in class groups under the supervision of a teacher. Although the students from Malaysia were competent users of English, the wording on several of the items of COLI was changed slightly to reflect local idiomatic use of English. Because of low levels of literacy amongst the Aboriginal Australian students, these students completed the COLI in small groups (3 to 5) under the supervision of one of the researchers and a trained Aboriginal research assistant, who read each item to the students and checked that it had been understood.

Results

Factor loadings and fit statistics on the COLI for students from Australia, Malaysia, and America are shown in Table 2. Similar to the results obtained for the two Australian groups of students in Stage 3, lower factor coefficients were obtained for the Duty conception for all groups

Table 2: Factor Loadings and Goodness of Fit Indexes from Confirmatory Factor Analyses of Coli Items for Seven Samples of Students

Scale/Item	Aust (n=222)	Aborig (n=125)	Malay (n=219)	CAm (n=158)	AfAm (n=78)	CAm (E) (n=434)	AfAm (E) (n=376)
Gaining information							
INFO1	.55	.59	.63	.67	.65	.60	.64
INFO2	.42	.47	.48	.32	.45	.56	.58
INFO3	.62	.73	.59	.61	.70	.69	.74
INFO4	.62	.77	.57	.70	.65	.59	.69
INFO5	.63	.63	.32	.65	.61	.55	.51
Remembering, using, and understanding							
RUU1	.45	.44	.51	.64	.75	.59	.61
RUU2	.67	.68	.46	.50	.55	.50	.44
RUU3	.54	.57	.42	.60	.57	.63	.49
RUU4	.67	.65	.51	.64	.73	.61	.59
RUU5	.58	.70	.43	.68	.76	.60	.53
RUU6	.60	.58	.51	.75	.72	.62	.53
RUU7	.61	.62	.52	.72	.76	.68	.61
RUU8	.58	.62	.60	.66	.76	.55	.67
RUU9	.61	.54	.59	.68	.70	.61	.60
Duty							
DUTY1	.48	.46	.39	.55	.74	.53	.59
DUTY2	.59	.58	.83	.75	.86	.76	.78
DUTY3	.44	.51	.53	.67	.82	.66	.70
Personal change							
PERS1	.61	.71	.69	.75	.80	.66	.62
PERS2	.50	.68	.63	.79	.81	.65	.61
PERS3	.58	.62	.67	.78	.78	.69	.62
PERS4	.68	.64	.65	.77	.80	.73	.59
PERS5	.52	.60	.53	.79	.69	.64	.63
PERS6	.64	.77	.60	.81	.77	.72	.61
PERS7	.59	.61	.54	.81	.70	.68	.55
PERS8	.61	.70	.64	.81	.73	.67	.67
A process not bound by time or place							
PROC1	.62	.66	.51	.80	.74	.62	.65
PROC2	.51	.55	.53	.85	.65	.62	.58
PROC3	.76	.58	.63	.82	.66	.79	.65
Social competence							
SOC1	.68	.70	.61	.86	.79	.72	.59
SOC 2	.68	.81	.57	.83	.82	.69	.71
SOC 3	.58	.69	.57	.83	.66	.65	.52
SOC 4	.76	.65	.74	.82	.75	.71	.57
Goodness-of-fit Indexes [a]							
$\chi^2/\underline{df}$	2.00	1.87	2.10	1.78	1.59	2.58	2.03
NFI	.96	.94	.95	.95	.97	.97	.97
TLI	.98	.96	.97	.97	.96	.98	.98
CFI	.98	.97	.97	.98	.97	.98	.98
RMSEA	.06	.08	.07	.07	.09	.06	.05

Aust = Australian
Aborig = Aboriginal
CAm = Caucasian American
AfAm= African American
CAm (E) = Caucasian American (Elementary)
AfAm (E) = African American (Elementary)

[a] NFI (Normed Fit Index); TLI (Tucker Lewis Index); CFI (Compa Fit Index); RMSEA (Root Mean Square Error of Approximation).
[b] E = Elementary school

of students. Although fit statistics for each of the groups indicate that the model can confidently be applied across these cultural groups, in the Australian Aboriginal group there were particularly high interscale correlations (all above .80) suggesting some caution in applying the model with these students. Somewhat lower, interscale correlations were found in the data from the other samples, although they too were generally high, ranging from .31 to .92, and with both mean and median correlations of .69. Across all groups, internal consistency reliability indexes (Cronbach's alpha) ranged from .45 to .92, with a mean of .74 and a median of .76.

Table 3: Conception Means and Standard Deviations for Seven Cultural Groups

Conception	Group	Mean	SD
Gaining information	Australian	4.05	.85
	Aboriginal	4.70	.95
	Malay	4.29	.84
	Cauc. American	4.42	.79
	African American	4.58	.90
	Cauc American (E[a])	4.80	.82
	African American (E)	4.65	.91
Remembering, using, and understanding	Australian	4.65	.70
	Aboriginal	4.76	.75
	Malay	4.42	.70
	Cauc. American	4.77	.69
	African American	4.74	.87
	Cauc American (E)	4.97	.70
	African American (E)	4.64	.79
Duty	Australian	4.54	.85
	Aboriginal	4.94	.86
	Malay	4.75	.92
	Cauc. American	4.62	.87
	African American	4.91	1.09
	Cauc American (E)	5.16	.83
	African American (E)	4.89	.97
Personal change	Australian	4.20	.77
	Aboriginal	4.63	.93
	Malay	4.61	.82
	Cauc. American	4.31	.99
	African American	4.46	.98
	Cauc American (E)	4.66	.87
	African American (E)	4.54	.85
A process not bound by time or place	Australian	4.98	.74
	Aboriginal	4.63	.99
	Malay	4.73	.84
	Cauc. American	4.97	.95
	African American	4.91	.94
	Cauc American (E)	5.00	.89
	African American (E)	4.63	.96
Social development	Australian	4.21	.95
	Aboriginal	4.60	1.06
	Malay	4.45	.90
	Cauc. American	4.51	1.06
	African American	4.29	1.06
	Cauc American (E)	4.58	.94
	African American (E)	4.45	.91

[a] E = Elementary

To investigate differences between the groups on the six conceptions of learning, a 7 (group) x 2 (gender) MANOVA was performed. Means and standard deviations for each of the conceptions for the seven groups are shown in Table 3. All conception means were highest for the Aboriginal students and the Caucasian American elementary school students except for the Process conception for Aboriginal students, which was the lowest. Results of the MANOVA are shown in Table 4. The means for males and females were not significantly different across the groups for Information, F (6, 1401), = .93, $p > .05$; Remembering, Using and Understanding, F (6, 1401) = 1.74, $p > .05$; and Personal Change, F (6, 1401) = 1.18, $p > .05$. There were significant gender by group interactions for Social Competence, F (6, 1401), = 2.12, $p < .05$; and Process, F (6, 1401), = 2.84, $p < .01$; with females obtaining significantly higher means in the two American high school groups. There was a gender main effect for the Duty conception, F (1, 1401), = 6.10, $p > .05$; with females achieving a significantly higher mean overall.

Table 4: Group and Gender Effects for the Six Conceptions of Learning

Source	Conception	MS	F	df
Group	INFO	17.34	24.29***	6, 1401
(df = 6, 1401	RUU	7.93	15.14***	
	DUTY	13.42	17.48***	
	PERS	7.17	9.62***	
	PROC	5.19	6.61***	
	SOC	4.50	4.90***	
Gender	INFO	.52	.73	1, 1401
(df = (1, 1401)	RUU	.23	.45	
	DUTY	4.43	5.78*	
	PERS	1.46	1.96	
	PROC	5.60	7.13**	
	SOC	8.23	8.95**	
Group *Gender	INFO	.73	1.02	6, 1401
(df = (6, 1401)	RUU	.93	1.77	
	DUTY	.90	1.17	
	PERS	.86	1.15	
	PROC	1.69	2.15*	
	SOC	2.61	2.84**	

*$p<.05$, **$p<.01$, ***$p<.001$.

Conceptions of learning and academic achievement

We were unable to access formal achievement data for any of the groups of students. However, self-assessment of achievement data was available for the American sample of students and this was used to examine the relationship between conceptions of learning and academic achievement (there is evidence that student self-assessment provides a reliable estimate of actual academic achievement; e.g., Barnett & Hixon, 1997; Klein, 1998). Students were asked to rate their performance in Math, English, and in all their school work. For example, students were asked to rate (on a 6-point scale, with 6 indicating higher agreement) the extent to which they agreed with the statement "Compared to other students in my grade, I score high grades in (a) my Math class (b) my English class, and (c) in all my school work." In addition, students were asked to rate themselves on a 6-point scale on the statement "Overall in most of my school subjects I am at the "top of my class" (6) down to "near the bottom (1)."

We based our examination of the relationship between conceptions and achievement on the assumption that students held multiple conceptions of learning rather than one single or predominant one. This view is in keeping with Fuller's (1999) contention that "categorising students as holding just a single conception involves the loss of potentially important information" (p. 2). Thus, students were classified as endorsing a conception or not, according to whether they were above or below the overall mean for that conception. A total conceptions score was calculated for each student by summing the number of conceptions they endorsed. For example, a student who had six conception scores above the mean for each conception had a total conception score of 6. A student who had no conception scores above the mean for each conception had a total conception score of zero. The MANOVA that was performed to examine the relationship between the four achievement measures and the total number of conceptions produced a significant multivariate result, F (4, 24) = 6.21, p < .001. Univariate results were significant for each of the achievement measures. A linear increase in all achievement scores was associated with an increase in the number of conceptions (Table 5). This strong linear association is shown graphically in Figure 1. Thus, the higher achieving students were those who held multiple conceptions of learning rather than one single or predominant one

Table 5: Achievement by Number of Conceptions (Above the Mean)

	Number of Conceptions	Achievement Mean Score	SD	MS	F
Math	0	3.61	1.30	22.35	13.47*
	1	3.95	1.40		
	2	4.39	1.28		
	3	4.38	1.38		
	4	4.47	1.22		
	5	4.71	1.36		
	6	4.82	1.20		
English	0	3.85	1.16	18.10	13.39*
	1	4.33	1.31		
	2	4.49	1.09		
	3	4.40	1.26		
	4	4.56	1.16		
	5	4.69	1.28		
	6	5.01	1.03		
All Work	0	3.49	1.13	23.25	16.33*
	1	4.00	1.24		
	2	4.14	1.17		
	3	4.28	1.48		
	4	4.29	1.24		
	5	4.62	1.19		
	6	4.77	1.07		
Overall	0	3.49	1.23	14.67	13.09*
	1	3.88	1.22		
	2	4.11	1.03		
	3	4.19	1.18		
	4	4.27	.95		
	5	4.45	.95		
	6	4.48	.98		

df = 6, 796; * p <.001

Discussion

It is clear from the findings of phenomenographic studies over the last two decades that students conceive of learning in different ways. In our own research, we initially identified nine qualitatively different conceptions of learning held by groups of Australian and Japanese high school students (Purdie, Hattie, & Douglas, 1996). The first six of these (learning as increasing knowledge; memorizing and reproducing; a means to an end; understanding; seeing something in a different way; and personal fulfillment) were remarkably similar to those that have been identified in previous phenomenographic research in European contexts (e.g., Marton, Dall'Alba, & Beaty, 1993; Säljö, 1979; Van Rossum & Schenk, 1984). In that study, we also identified three

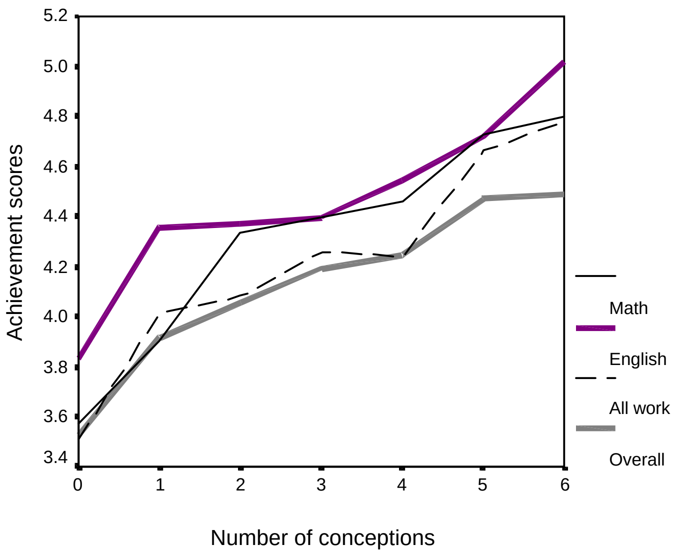

Figure 1. Achievement scores by the number of conceptions (above the mean)

conceptions that previously have not been mentioned in the research literature: learning as a duty; learning as a process not bound by time or context; and learning as developing social competence.

An important aim of the current study was to move beyond identification of the range of categories of conceptions of learning to test empirically the dimensionality of those categories. Results obtained from the structural equation modeling of items that had been developed from students' statements about the meaning of learning lend support to the contention that students conceive of learning in qualitatively different ways. However, the findings of our study do not support as great a differentiation between students' conceptions of learning as has generally been proposed. The model that provided the best interpretation of conceptions of learning data from groups of students from several cultural groups was one in which there are six general categories of conception: learning as (a) gaining information; (b) remembering, using, and understanding information; (c) a duty; (d) personal change; (e) a process not bound by time or place; and (f) social competence. The biggest difference between this model and that proposed by phenomenographic conception of learning researchers concerns the remembering, using, and understanding conception. To date, these have been presented in the literature as three distinct conceptions of learning. The remembering and using information conceptions have being interpreted as reflecting an overall surface conception of learning, and the understanding conception has been interpreted as reflecting an overall deep conception of learning.

The alignment of the understanding items with those that focused on remembering and using information adds weight to the findings of a growing body of research into the relationship between memorizing and understanding, particularly amongst students in some Asian educational contexts (see for instance, Dahlin & Watkins, 1997). Western educators have tended to dichotomize the processes of memorization and understanding, but the dividing line for Asian students appears not to fall between memorization and understanding, but between mechanical memorization and memorization in order to assist the development of meaning (Marton, Dall'Alba, & Tse, 1993). The findings from the current study suggest that the same also may apply for students in Western educational settings.

The effect of context on conceptions of learning has been a focus of attention in much of the phenomenographic research (e.g., Johansson, Marton, & Svensson, 1985; Marton, Carlsson, & Halász, 1992; Van Rossum, Deijkers, & Hamer, 1985). However, phenomenographic studies also have investigated conceptions of learning 'in general', and have arrived at similar conclusions with respect to the existence of a general set of qualitatively different ways in which people conceive of learning when learning is not directly allied to a specific learning activity (Marton, Dall'Alba, & Beaty, 1993; Säljö, 1979; Watkins & Regmi, 1992; Watkins et al., 1991). Our research did not address this issue; thus, one direction for work with the COLI might be to adapt it for use in specific contexts. For instance, instead of the general statement "Learning has helped me widen my views about life," students could be presented with the statement "Learning in science has helped me widen my views about life."

Another fruitful line of research is one in which motivational aspects of learning are explored in conjunction with students' conceptions of learning. Contemporary models of learning recognize the complexity of learning. Rather than focusing on one aspect in isolation, many of the instruments currently used to provide information about students and their learning assess a range of attitudinal, motivational and strategic aspects of learning (e.g., Biggs, 1987; Entwistle, Tait, & McCune, 2000; Pintrich, Smith, Garcia, & McKeachie, 1993; Zimmerman & Martinez-Pons, 1988). For instance, what is important is not that a student may conceive of learning as the memorization of information, but the motivation or purpose behind the memorizing behavior. This avenue is particularly worth exploring with respect to how Western students view the relationship between memorizing and understanding. Perhaps too little credit has been given to these students in terms of their ability to conceive of learning as memorizing in order to understand, rather than merely memorizing in rote fashion.

There is a growing body of literature on the importance of versatility or flexibility in learning (e.g., Cantwell & Beamish, 1994; Purdie & Hattie, 1999). The results of the current study add weight to this notion. The self-rated academic achievement of students who endorsed all six conceptions of learning was higher than that of students who endorsed fewer conceptions of learning. In this respect, one practical use of the COLI is for classroom teachers to assess the breadth of students' conceptions of learning. Students who are found to have a limited conception of learning should be helped to see that learning is a multifaceted construct that is best understood from multiple perspectives and achieved in a variety of ways.

Authors' note:

1. This study was supported by a grant from the Queensland University of Technology.

2. Correspondence concerning this article should be addressed to Nola Purdie, School of Learning and Professional Studies, Faculty of Education, Queensland University of Technology, Victoria Park Road, Kelvin Grove, QLD 4059, Australia.
Phone: (07) 3864 3787
Fax: (07) 3864 3987
Email: n.purdie@qut.edu.au

References

Barnett, J. E., & Hixon, J. E. (1997). Effects of grade level and subject on student test score predictions. *Journal of Educational Research, 90,* 170-175.

Biggs, J. B. (1987). *Student approaches to learning and studying.* Hawthorn, Victoria: Australian Council for Educational Research.

Bollen, K. A., & Long, J. S. (Eds.). (1993). *Testing structural equation models.* Newbury Park, CA: Sage.

Browne, & Cudeck, (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136 162). Newbury Park, CA: Sage.

Cantwell, R., & Beamish, P. (1994, November). *Executive strategy control in secondary and tertiary populations: Contrasting understandings of self-regulation.* Paper presented at the annual national conference of the Australian Association for Research in Education, University of Newcastle, New South Wales.

Cliff, A. F. (1995, August). *Postgraduate students' conceptions of learning: Implications for course teaching*. Paper presented at the 6th European Conference for Research on Learning and Instruction, University of Nijmegen, the Netherlands.

Dahlin, B., & Watkins, D. (1997, August). *The role of repetition in the process of memorising and understanding: A comparison of the views of Western and Chinese school students in Hong Kong.* Paper presented at the 7th Conference of the European Association for Research on Learning and Instruction, Athens, Greece.

Entwistle, N., Tait, H. & McCune, V. (2000). Patterns of response to an approach to studying inventory across contrasting groups and contexts. *European Journal of Psychology of Education, 15,* 33-48.

Fuller, R (1999). Do university students' conceptions of learning really influence their learning? *In Cornerstones: What do we value in higher education?* Proceedings, July 12-15, Melbourne, Australia: Higher Education Research and Development Society of Australasia. http://www.herdsa.org.au/vic/cornerstones/pdf/Fuller.PDF

Gullikson, H., & Tukey, J. W. (1958). Reliability for the law of comparative judgment. *Psychometrika, 23,* 95-110.

Hayduk, L. A. (1987). *Structural equation modeling with LISREL: Essentials and advances.* Baltimore, MD: John Hopkins University Press.

Hoyle, R. H., & Paynter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 158-176). Thousand Oaks, CA: Sage.

Johansson, B., Marton, F., & Svensson, L. (1985). An approach to describing learning as change between qualitatively different conceptions. In A. L. Pines & L. H. T. West (Eds.), *Cognitive structure and conceptual change* (pp. 233-257). New York: Academic Press.

Klein, P. A. (1998). Self-assessment in mathematics as a placement /advising tool. *Research and Teaching in Developmental Education*, *15*, 117-128.

Marsh, H. W., & Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self-concept: First- and higher-order factor models and their invariance across groups. *Psychological Bulletin, 97,* 562-582.

Marton, F., Carlsson, M. A., & Halasz, L. (1992). Differences in understanding and the use of reflective variation in reading. *British Journal of Educational Psychology, 62,* 1-16.

Marton, F., Dall'Alba, G., & Beaty, E. (1993). Conceptions of learning. International Journal of Educational Research, 19, 227-300.

Marton, F., Dall'Alba, G., & Tse, L. K. (1993, September). *The paradox of the Chinese learner.* Paper presented at the 5th Conference of the European Association for Research on Learning and Instruction, Aix en Provence, France.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53,* 801-813.

Purdie, N., & Hattie, J. (1999). The relationship between study skills and learning outcomes: A meta-analysis. *Australian Journal of Education, 43*, 72-86.

Purdie, N., Hattie, J., & Douglas, G. (1996). Student conceptions of learning and their use of self-regulated learning strategies: A cross-cultural comparison. *Journal of Educational Psychology, 88*, 87-100.

Säljö, R. (1979). *Learning in the learner's perspective. 1: Some common sense conceptions* (Report No.76), Institute of Education, University of Göteborg.

Säljö, R. (1987). The educational construction of learning. In J. T. E. Richardson, M. W. Eysenk, & D. W. Piper (Eds.), *Student learning*. Milton Keynes: Open University Press.

Tynjälä, P. (1997). Developing education students' conceptions of the learning process in different learning environments. *Learning and Instruction, 7*, 277-92.

Van Rossum, E. J., & Schenk, S. M. (1984). The relationship between learning conception, study strategy and learning outcome. *British Journal of Educational Psychology, 54*, 73-83.

Van Rossum, E. J., Deijkers, R., & Hamer, R. (1985). Students' learning conceptions and their interpretation of significant educational concepts. *Higher Education, 14*, 617-641.

Watkins, D., & Regmi, M. (1992). How universal are student conceptions of learning? A Nepalese investigation. *Psychologia, 25*, 101-110.

Watkins, D., Regmi, M., & Astilla, E. (1991). The-Asian-as-a-rote-learner stereotype: Myth or reality. *Educational Psychology, 11*, 21-34.

Zimmerman, B. J., & Martinez-Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology, 80*, 284-290.

Appendix

Subscales and Items of the Conceptions of Learning Inventory (COLI)

Learning as gaining information (INFO)

INFO1	Learning is when I'm taught something that I didn't know about before.
INFO2	Learning is taking in as many facts as possible.
INFO3	When someone gives me new information, I feel that I am learning.
INFO4	Learning helps me to become clever.
INFO5	Learning means I can talk about something in different ways.

Learning as remembering, using, and understanding information (RUU)

RUU1	When something stays in my head, I know I have really learned it.
RUU2	If I have learned something it means that I can remember that information whenever I want to.
RUU3	I should be able to remember what I have learned at a later date.
RUU4	I have really learned something when I can remember it later.
RUU5	When I have learned something, I know how to use it in other situations
RUU6	If I know something well I can use the information if the need arises.
RUU7	Learning is making sense out of new information and ways of doing things.
RUU8	I know I have learned something when I can explain it to someone else.
RUU9	Learning is finding out what things really mean.

Learning as a duty (DUTY)

DUTY1	Learning is difficult but important
DUTY2	Even when a learning task is difficult, I must concentrate and keep trying.
DUTY3	Learning and studying must be done whether I like it or not.

Learning as personal change (PERS)

PERS1	Learning has helped me to widen my views about life.
PERS2	Learning changes my way of thinking.
PERS3	By learning, I look at life in new ways.
PERS4	Learning means I have found new ways to look at things.
PERS5	Increased knowledge helps me become a better person.
PERS6	I use learning to develop myself as a person.
PERS7	When I learn, I think I change as a person.
PERS8	Learning is necessary to help me improve as a person.

Learning as a process not bound by time or place (PROC)

PROC1	I don't think that I will ever stop learning.
PROC2	I learn a lot from talking to other people.
PROC3	Learning is gaining knowledge through daily experiences.

Learning as the development of social competence (SOC)

SOC1	Learning is knowing how to get on with different kinds of people.
SOC2	Learning is not only studying at school but knowing how to be considerate to others.
SOC3	Learning is the development of common sense in order to become a member of society.
SOC4	Learning is developing good relationships.

Biographical Note

Nola Purdie is Senior Lecturer and Director of the Centre for Cognitive Processes in Learning, Faculty of Education, Queensland University of Technology, Victoria Park Rd, Kelvin Grove, Q, 4059 Australia. n.purdie@qut.edu.au. She specializes in models of learning; cross-cultural issues in learning, self-regulation of learning and behaviour, and identity.

John Hattie is Professor and Head of the School of Education at the University of Auckland, Private Bag 92019, Auckland, New Zealand, 274122-5001. hattie@auckland.ac.nz. He specializes in measurement models and their applications to educational problems, structural models, self-concept, and models of teaching and learning.