E-LEARNER PROFILES

Diversity in Learning

REPORT

Report on research findings of

TeLRF Project

e – Learning profiles
Diversity in Learning

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EXECUTIVE SUMMARY

Three significant trends have caused tertiary education organisations (TEO's) to rethink how they prepare graduates for their place in the community. These trends include: the changing face of the student body, rapid technology developments and new educational goals. Educational organisations must find appropriate ways of meeting the diverse needs of their diverse students; integrate new technology into the teaching process and up-date curriculum goals to address societal expectations of tertiary graduates.

The composition of the student body has altered dramatically in the last twenty years, largely as a result of Government policy to achieve greater open access to higher learning. Only about half the student body is in fulltime study, the average age is higher than in the past, there are more women than men and a wide range of ethnicities are represented in large numbers (NZ Ministry of Education, 2004). However, the retention statistics are not so encouraging, with many of the non-traditional students being the most vulnerable to failure or non-completion (Benseman, Coxon, Anderson, & Anae, 2006; McKenzie, 2005; Scott, 2005). Technology offers the promise of extending the role of lecturers and improving learning outcomes for these diverse students, but little work has been done to date on how this might be accomplished. While some students have welcomed technology into their learning experience, others have resisted its introduction. Finally, TEO's are moving from merely transmitting bodies of knowledge to developing independent knowledge workers who are able to think for themselves. These trends imply the need to understand and accommodate the diverse learning needs in teaching practice. Like Canute's tide, technology rolls relentlessly on and TEO's must harness its benefits to assist in meeting the varied needs of tertiary students whilst preparing them to take more responsibility for their own learning, become critical thinkers and life long learners.

This study took the first step in the process by specifying important learning related orientations and identifying differences in these orientations between groups of students. These differences may provide the basis for designing learning experiences that more closely match the diverse needs and preferences of students rather than the one-style-fits all approach

that is the hallmark of traditional teaching. Implicit in this is the notion that traditional teaching modes may need to change. Consequently the study also looked at student attitudes to a range of teaching modes and the relationship between preferred teaching modes and learning orientations. Additionally, where students sourced most of their information for study, and what skills and knowledge they believe to be important were examined.

The sample size was 1811 and came from six universities, five polytechnics or institutes and six private training organisations. A combination of printed questionnaires and online questionnaires were used. The questions were identical in both formats.

The results produced eleven learning orientations. These included: a preference for learning by listening (18.2% of students were high on this and 4.3% low); learning visually rather than by text (14.3% high and 33.4% low); working collaboratively rather than alone (14.8% high, 38.9% low); time poorness (13.8% high, 7.4% low); achievement motivation (29.1% high, 1.3% low); intrinsic rather than extrinsic motivation (39.9% high, 10.3% low); effort (18.2% high, 4.3% low); goal focus (46% high, 0.2% low); relativistic reasoning rather than factual (8.8% high, 28.7% low); dependent rather than independent learning (21.1% high, 22.8% low); and global rather than sequential learning (15.2% high, 24.4% low). These orientations were subjected to further principal components analysis which produced three super components, called here learner profiles: they are cognitive voyagers, strategic competitors and multimedia collaborators.

Strategic competitors characterise the largest group of students with about 34% of the student body being high on this learning profile. They have a driving ambition to succeed, are hard-working and disciplined in their study and approach learning strategically. Only about 12% of the tertiary population were high on the cognitive voyagers learning profile. These students understand learning to be a personal journey during which they engage in reflection and debate to socially construct knowledge that has meaning for them. About 20% of students are high on multimedia collaboration. These students prefer learning by listening to explanations, visually and in small text-bites. They have a dislike of reading long, academic passages. They also prefer to work collaboratively with other students.

Anovas and t-tests were used to measure differences between students. Students from the millennial generation (born after 1982) were different from older students on a range of characteristics including higher preferences for learning by listening, using visuals and working collaboratively. They were lower than older students on intrinsic motivation, independent learning and goal focus. Post graduate students were higher than others on relativistic reasoning, intrinsic motivation, independence and global learning. Maori and Polynesian students tended to be higher than other ethnic groups on a preference for listening and achievement motivation. European students were higher than others on independence, intrinsic motivation and a preference for working alone. Chinese students were higher than others on working collaboratively, a preference for learning visually and extrinsic motivation.

Of all the major subject areas fine arts students were the most different to others. They were highest on relativistic reasoning (abstract thinking), learning visually, intrinsic motivation and global learning. They were lowest on effort. Medicine and science students were the lowest on relativistic reasoning, and technology and engineering students were highest on working collaboratively. IT, information systems and library students were highest on effort.

Two large differences were found between international and domestic students. Domestic students were much higher than international on intrinsic motivation and a preference for working alone. They were also higher on independent learning and a preference for text (rather than visual) learning. Internationals students were higher on relativistic reasoning. A few moderate differences were found between the genders. Females were higher on intrinsic motivation and a preference for working collaboratively. Males had a stronger preference for visual learning.

While traditional modes of teaching (lectures, tutorials and printed study materials) were preferred above online learning modes, differences in age were apparent. Only 60% of students 23 years old or less liked traditional teaching modes, compared to 69% of students aged 24 – 41 and 72.3% of students 42 and above. Traditional modes were disliked by 10.7% of students under 23, 7% of students between 24-41 and 6.7% of older students. Lectures and tutorials were mainly associated with the learning orientations of listening, intrinsic motivation, effort, goal focus and visual learning in descending order of importance. Printed

study materials were mainly associated with effort, listening (negatively), working alone and text.

Student-based modes such as group work and student presentations were the most disliked. Students 23 and under had slightly higher levels of liking (33.3%) and lower levels of dislike (29.9%) than other groups. Of the 24-41 age group 34.3% dislike this mode and 32% liked it. The trend continued with older students of whom 36% disliked it and only 29.5 liked it. Student-based teaching modes were associated with a preference for working collaboratively and relativistic reasoning (abstract thinking). Student presentations were also associated with listening, achievement motivation and effort.

Purely online courses were disliked by 28.2% of under 23 year olds, 20% of 24-41 years olds and 29.5% of older students. They were liked by 34.9% of younger students, 40.4% of 24-41 year olds and 39.4% of older students. Blended courses (a mixture of online and traditional modes) fared better: 13.9% of those under 23 disliked them but 51% liked them; 10.8% of 24-41 year olds disliked them but 51.8% liked them; and 17.1% of older students disliked them but 47.4% liked them.

Textbooks and study guides (used 'often' by 82.4% of students) were the most important source of information for study, but only marginally more so than the internet (used 'often' by 77.4%). Library resources, both printed materials, used 'often' by 54.2% and online resources, used 'often' by 44.9% were considerably less used. Students rated 'knowing how to get information' (rated important by 93.8% of students) and 'being able to evaluate the worth of information' (rated important by 88.7%) as the most important skills to have. Having a large body of knowledge was rated the least important (rated important by 76.7%). Word processing (used 'often' by 79.3 of students), email (used 'often' by 77%) and finding information (used 'often' by 66.8%) were the three most frequent uses of the computer by students.

This study identified differences in learning orientations and learner profiles between students along demographic lines which raises the question of how such differences should be addressed. Nobody yet has reached a definitive answer to that question. The main debate

centres around whether student preferences should be accommodated (matched) or deliberately not accommodated (mismatched). The results of this study suggest that a judicious mix of both approaches is appropriate.

Students continue to show a strong preference for traditional teaching formats such as lectures. However, these are strongly associated with a dependency style in students. As TEO's move to other teaching formats, particularly online, students will make this transition more readily if teachers can find ways of restructuring the traditional format and give students a greater role to play.

A range of new educational goals have been articulated. Many of these include the need for students to be able to work independently and collaboratively, and to be life long learners (Candy, 2000; McCombs & Vakili, 2005). An integration of technology-based modes with student-based modes would seem to offer the best opportunity to develop these qualities. However, student attitudes to these approaches need to be improved. The evidence suggests that students dislike online learning because of inexperience on their part, an inability to cope with self directed learning, having a learning orientation that does not easily adjust to hypermedia, a lack of robustness in the technology systems causing frustration and a poor use of the technology to create truly interesting interactive learning. Addressing these issues is likely to bring about greater acceptance of technology-based learning.

Endnote: Website CD

The online questionnaire that was used for the survey has been modified and extended. It still is able to provide tertiary students with their own individual learning profiles and advice on improving their learning, but it now also has extra facilities for teachers and administrators. Teachers can use the website to generate reports on the predominant learning styles of students in their classes and administrators or managers can generate summary reports of the learning styles of all students in the institution. These can be cumulative or for specific periods of time. This website is available on CD for New Zealand tertiary institutions from the project leader Dr Lynn Jeffrey (phone: 09 4140800 ext 9282 or email: l.m.jeffrey@massey.ac.nz).

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LITERATURE REVIEW

Introduction

The increasing complexity and diversity of modern society places new demands on the process of preparing students to be independent thinkers, productive members of the community and future leaders. In particular, three emerging trends have substantial implications for the manner in which tertiary institutions go about their business. These are: the changing face of the student body, rapid technology developments and new educational goals. Educational institutions must find appropriate ways of meeting the diverse needs of their new students; integrating new technology into the teaching process and up-dating curriculum goals to address societal expectations of tertiary graduates.

The New Student Body

In the last twenty years the proportion of the population studying at tertiary level has expanded from 3.8% (1981) to 8.1% (2004) (Abbott, 2006). The composition of the student body has been profoundly changed during this growth by the influx of non-traditional students, creating great diversity in ethnicity, age, gender, socio-economic status and physical ability. Ministry of Education figures for New Zealand (2004) show that about half of all tertiary students in New Zealand are studying part time, Maori students make up 20%, Pasifika students 6%, and domestic Asian students 16%.

This growing diversity was largely triggered by Government policy changes in the late 1980's to encourage greater numbers of New Zealanders to undertake tertiary study (Abbott, 2006). As part of this initiative student loans made higher learning accessible to students who would not otherwise have been able to fund their study from their own resources. However, much of

this increase has been at the lower qualification levels – over half of tertiary students are studying at sub-degree level (Scott, 2005).

These changes reflect similar trends in Australia and the USA (King, 1999; McKenzie & Schweitzer, 2001). The National Centre for Education Statistics in the US (2002) reported that 75% of undergraduates were non-traditional. They defined non-traditional as:

- Delayed enrolments: students who did not enter tertiary education immediately after high school.
- Part-time students
- Full-time workers (work 35 hours or more per week)
- Financially independent
- Have dependents other than a spouse, such as children
- Single parents with one or more dependent children
- Having no high school qualification

The open-access policy has been effective, as witnessed by the large numbers of non-traditional students in the tertiary system (Abbott, 2006). However, in the last few years the student body has begun to change even more as a new group of students find their way to tertiary study. Different from their predecessors, the most recent generation of tertiary students, dubbed the "millennials", may present the biggest challenge to academia yet. These are students, born on or after 1982, who have grown up with technology. A number of writers claim this exposure has had a profound impact on how these students process information, interact with their peers and on their expectations of life (Oblinger, 2003; Oblinger & Oblinger, 2005; Prensky, 2001a; Prensky, 2001b; Wellner, 1999).

Prensky (2001) calls these students 'digital natives' as they are 'native speakers' of the digital language of electronic technology. Those born before 1982 he calls 'digital immigrants' who will always speak the digital language with an accent. Characteristics of the millennials have been described as: parallel processes and multi-taskers (Prensky, 2001a); preferring graphics before text (Prensky, 2001a); networked and connectedness (Prensky, 2001a; Strange, 2004); preferring random access (like hypertext) (Prensky, 2001a); wanting instant gratification and rewards (Prensky, 2001a) and preferring games to real work (Prensky, 2001a); a preference for teamwork (DeBard, 2004; Howe & Strauss, 2003; Murray, 1997; 2003; Wellner, 1999); structured rule followers (DeBard, 2004; Howe & Strauss, 2003; Murray, 1997; Oblinger,

2003; Zemke, Raines, & Filpczak, 2000); users of technology (Oblinger, 2003; Wellner, 1999); academically successful with little effort (Sax, 2003); achievement orientated (DeBard, 2004; Howe & Strauss, 2003); willing to work hard (Murray, 1997); have high expectations (DeBard, 2004; Wilson, 2004); accepting of authority (Strange, 2004); goal oriented (Murray, 1997) and pressured (DeBard, 2004; Murray, 1997; Rooney, 2003). In addition to these personal attributes, millennial students are the most diverse generation to enrol for higher learning (DeBard, 2004). Many of these characteristics have implications for the way millennials approach study and learning.

While this great diversity of students brings new perspectives and vitality to campus life, it also increases the demands on tertiary institutions and teaching staff to change their educational practices. Traditional approaches, suitable to a small cadre of elite students, are increasingly inappropriate to the needs of current students. Both internationally and in New Zealand, concern has shifted from providing access to preparation for tertiary study and a concern with student retention and success rates in higher learning (Benseman et al., 2006; McKenzie, 2005; Scott, 2005). A report by the Association of American colleges and Universities (2002) found that 53% of all students had to take remedial classes. Those who took the most remedial classes were the least likely to persist and pass their courses. In New Zealand many students who have entered tertiary education on the basis of being 20 years or older, rather than via a secondary school qualification, are unused to academic study (Scott, 2005). Students responsible for children, older students, those working excessive hours and those achieving low grades are the most likely to drop out of study (Hoyt & Lundell, 2003). Large numbers of international and permanent residents find the English language and cultural differences a barrier to successful study (Hart & Holton, 2001; Holmes, 2005). Maori students have good completion rates on qualifications below degree level, but have low rates at degree level and above (McKenzie, 2005; Scott, 2005). Pasifika students have the lowest completion rates in New Zealand (Benseman et al., 2006; Scott, 2005). Many students find themselves unable to spend as much time on their studies as teaching staff expect as they juggle student loans, part-time or even full time work and family commitments (Hoyt & Lundell, 2003). Kuh (2003) found that university students spent only about 12 hours per week studying outside class time, roughly half the recommended time. All of these factors work against non-traditional students succeeding. While technology holds the promise of helping to

address the varied needs presented by tertiary students those needs must first be identified and articulated. One way forward is to map the learning characteristics these students bring to tertiary study, particularly those characteristics that impinge on their learning performance. If these new students have different attitudes, perceptions and styles to learning than traditional students then tertiary institutes must understand and accommodate these differences to enhance the likelihood of academic success.

Implementing Technology in Education

In the last twenty years the on-line revolution and entrance of new competitors into the distance education market have created pressure on tertiary providers to move away from more traditional modes of teaching (Cuban, 1993; Hanna, 1998). Cuban (1993) identified three additional drivers in this move towards technology-based teaching: a need to keep students' technological skills current with those expected in the work force and education; a push to increase productivity in learning and teaching; and a goal of fostering self-directed learning. Several writers add to these four, a fifth driver; changes in student demographics (Concannon, Flynn, & Campbell, 2005; Gerbic, 2004). Increasing numbers of students find the traditional provision of internal classes during business hours to be unsatisfactory. These are the students, for example, who are combining part-time study and work or adults returning to tertiary study to up-date their skills. Technology offers these students the promise of 'any-time, anywhere' learning. Additionally, younger students who have grown up with technology, expect to find it an integral part of their learning environment (Levin & Arafeh, 2002). These drivers collectively create strong pressure on tertiary institutions to provide online access to course materials.

The pressure to adopt more technology throws up a number of challenges for tertiary institutions. What technologies should be adopted? How can technologies be matched with pedagogy to maximise learning outcomes? This study does not address the first question but aims to provide some answers to the second. Technology can be viewed as another teaching mode along side others such as traditional (lectures, tutorials) and student-based modes (group projects, student presentations). This raises a number of issues. What are student attitudes to technology as a teaching mode? Not all students are 'digital natives' and if students resist the introduction of technology its effectiveness will be reduced (Akerlind &

Trevitt, 1999). How might the technologically delivered instruction be presented to accommodate the individual and diverse needs of the student body? How do students use technology and what experience do they have in using it?

Changing Goals of Education

The impact of technological change on socio-economic structures is apparent in the changing goals of education. The new focus is on producing flexible graduates with "life-long learning" skills (Candy, Crebert, & O'Leary, 1994; Concannon et al., 2005). Tertiary institutions are moving from merely transmitting knowledge, to fostering the management and development of cognitive skills that enable the learner to build, modify and manipulate his or her own knowledge bases in less formal learning environments. Traditional education and training methods are appropriate for teaching people what to think. However, even in conventional industries, workers are becoming "knowledge" workers who need to be able to think for themselves. In knowledge-intensive organisations, original, independent problem-solving is even more critical. Sveiby states that the four main features of production in such industries are:

- Non-standardisation
- Creativity
- High dependence on individuals; and
- Complex problem solving (Sveiby, 1992, p. 170).

Candy argues that universities should be providing a leadership role in developing graduates who:

- Are capable of finding things out for themselves through disciplined inquiry;
- Can apply what they know to the solution of non-recurrent problems and the betterment of society;
- Are able to bring to bear insights and methods derived from various fields of study and practice; and
- Can explain what they know to patients, clients, colleagues and members of the public. (Candy, 2000, p.275).

In 1983, Knowles noted that for the first time in history the rate of social and technological change was so rapid that knowledge can be out-dated within ten years and obsolete in twenty. This rate of change has continued to increase. Shimizu (1999) found that the half-life of knowledge varies from field to field. Half-life is defined as the time it takes for knowledge to half its usefulness. In engineering the half-life period is estimated to be 6.3 years, in information technology it's 4.8 years. In a person's lifetime most of his or her learning will take place outside traditional, formal educational institutions. The adult who is dependent on a teacher to direct and facilitate learning will be severely disadvantaged in this environment. Without the props of a formal education system such an adult may have difficulty defining problems, seeking resources, selecting and processing information. The response has been a call to provide students with skills that will allow them to seek, access, evaluate and use information as-and-when its needed, rather than stock-piling knowledge of depreciating value (Candy, 2000).

Collectively these trends have implications for the way in which tertiary organizations structure their learning environments and support students. The adoption of technology for teaching is one important change in this direction. Implementation is more likely to be successful if tertiary organisations have a clear picture of student attitudes to both new and traditional teaching modes rather than assuming that technology will be accepted;

Finally, the new knowledge society is less interested in large bodies of knowledge but does need self directed, life-long learners who are techno-savvy and able to find, evaluate and use information to solve problems. The literature on each of these issues is discussed in more depth in the following section.

Teaching Modes Preferences

Much of the research on student preferences for teaching modes has focused on the benefits or disadvantages of matching students with their preferred mode (Davidman, 1981; Dunn, 2000; Fraser & Rentoul, 1980; Hayes & Allinson, 1996; Kirby, 1988; Pask, 1988; Shipman & Shipman, 1985). More recently, the focus has shifted to understanding student preferences in light of new e-learning technologies. While many have assumed or claimed student satisfaction with online learning, others have sounded a cautionary note (see for example,

Hara & Kling, 2000; Noble, 1997). A number of studies have shown that students have a strong preference for traditional modes of teaching, though explanations for this preference differ (Hunt, Eagle, Thomas, & Shergill, 2002; Hunt, Eagle, & Thomas, 2002; Sadler-Smith & Riding, 1999; Smith, 2001).

The incursion of technology into the educational sector has been met with both resistance and acceptance. Institutions see the potential for cost reduction and the ability to penetrate new markets, particularly in distance education (Collis & Moonen, 2001; Feenberg, 1999). Staff are attracted to the potential for creating collaborative learning through learning communities, using authentic tasks and developing cognitive apprenticeships (Hung & Chen, 2000; Shaffer & Resnick, 1999). Many students who have grown up with technology expect to find it extensively used in their tertiary learning environment (Levin & Arafeh, 2002). However, successful implementation of new technologies in education also depends on acceptance by all students. Such acceptance may depend on a range of factors such as managing the change process (Akerlind & Trevitt, 1999); student characteristics such as learning styles (Shaw & Marlow, 1999); previous experience and demographic factors (Spennemann, 1996). The evidence until recently pointed to a greater enthusiasm by staff than students (Hara & Kling, 1999).

Not all teaching staff are convinced by the arguments. Some, concerned by the wholesale adoption of new technology, claim the literature is dominated by: overly enthusiastic supporters who minimize the problems experienced by students; studies that are more anecdotal than systematically empirical and research that has an uncritical acceptance of assumptions about the educational benefits of technology (Armstrong, 2000; Attewell, 2001; Hara & Kling, 2000; Oppenheimer, 1997; Windschitl, 1998). These studies often find high levels of student dissatisfaction with technology, emphasising the frustration of learning in a technology-based environment, high levels of anxiety and confusion associated with ambiguous instructions (Burge, 1994; Hara & Kling, 2000; Wegerif, 1998).

Others have tried to explain student attitudes to educationally-based technology by examining the relationship between student characteristics such as learning styles and preference for teaching modes (Sadler-Smith & Riding, 1999; Shaw & Marlow, 1999; Smith, 2001). Shaw

and Marlow (1999), for example found that students with a "theorist" learning style held negative views of ICT delivery. Smith (2001) found that technology students with a high preference for structure preferred collaborative learning modes. Smith (2001) also found preference variations based on age and gender. An earlier study by Sadler-Smith and Riding (1999) found an overall preference for traditional teaching modes such as lecturers, but students with a holist-analyst style preferred a collaborative mode. They too, found gender effects. In a variation on this theme, Owen and Straton (1980) were able to show similar preferences to Sadler-Smith and Riding (1999), which they called co-operative (students working together to achieve a learning goal), competitive (student works alone to compete with other students), and individualistic (students work to achieve their own goals) modes.

Differences in attitudes to teaching modes based on demographic variables can also be found. Shaw and Marlow (1999) reported no gender differences in attitudes to the use of information and communications technology (ICT), but marked differences in age, with younger, first-year students displaying a more positive attitude than second and third year students. Overall, however, students in the study preferred traditional, teacher-led learning modes. Hart (1995), using hypertext documents, reported a generally favourable attitude to the use of computers for teaching but found a large number of students also printed the materials to create their own print-based workbook, partially negating the intent of using computers. The students most likely to do this were female, had less experience of computers and were full-time rather than part-time students.

The current study examined students' preferences for different types of teaching modes (for example, on-line, lectures, student presentations), their most important sources of information (for example, internet, textbooks), their main use of computer technology (for example, word processing, email) and the interaction between student characteristics and teaching modes.

Student Characteristics

For the last 35 years researchers have tried to identify the role of individual differences in the learning process. It has been quite clear for some time that what the student does is more important to learning outcome than what the lecturer does (Schuell, 1986), but how might this contribution be quantified and understood so that lecturers can enhance the student's role?

The results for the last three decades have been inconsistent and often disappointing (Lawless & Kulikowich, 1998). Research on these issues has followed three avenues. The first was aptitude-treatment interaction (ATI). This involved matching a student characteristic, such as anxiety, with a treatment designed to accommodate it. ATI was popular in the late 1960's and 1970's and continued to be periodically revisited into the 1990's (Snow, 1992).

Interest in the second avenue, learning styles, began about the same time as ATI research, and continues today. It is based on the notion that each person has a predisposition to go about learning in a particular way. These predispositions are defined differently by different groups. At one end of the spectrum, they are seen as being related to cognitive styles, but with a learning orientation. In this guise they are relatively stable characteristics, for example, visual-verbal learning styles (Riding & Rayner, 1999). At the other end of the spectrum, a style is viewed as any preferred way of undertaking learning activity and may include such diverse elements as lighting levels, preference for working collaboratively and motivation (Dunn, 2000). The literature on learning styles is fragmentary and isolated in specific domains, and this has mitigated against a coherent and cohesive advance in the field (Bonham, 1988). However, since the 1980's there has been renewed interest in learning styles in higher education (Bedford, 2006; Coffield, Moseley, Hall, & Ecclestone, 2004). Bedford (2006) argues that recent research show signs of a reconceptualisation of the theory of learning styles to link learning styles and the self-regulation of learning.

The third approach to individual differences began later, in the 1970's. It started almost simultaneously in three locations: Australia (Biggs, 1976); England (Entwistle, 1977) and Sweden (Marton & Saljo, 1976a, 1976b). Unlike ATI and learning style research there was a high level of agreement and cohesion between the terminology, research and results. Collectively this area has come to be known as student approaches to learning (SAL). Briefly, the researchers found that students had three possible motives for studying; surface (interested only in getting the qualification); deep (intrinsically interested in the subject) and achieving (wanting to "do well"). Further, these motives influenced the kind of strategies students use for learning. A surface motive was related to a surface strategy (memorizing); a deep motive triggered a deep strategy (understanding) and an achieving motive was associated with organizational strategies (achieving). A motive-strategy combination formed

an approach. A number of studies have confirmed a relationship between the type of approach and quality of learning outcome (Hunt, 1995; Sadler-Smith, 1996a; Trigwell & Prosser, 1991).

In common with all three streams of research is the underlying belief that differences in individual students should be dealt with differentially to maximize learning. In the literature this has come to be known as the "matching hypothesis". The characteristic is identified and measured, then matched with a treatment, learning activity, teaching mode or situation that accommodates, enhances or ameliorates the effects of the student characteristic. For example, students who are high in anxiety benefit from highly structured courses with ample opportunity for reviews (Tobias, 1985). However, there is debate about the evidence supporting this hypothesis. Some writers have found that matched conditions produce better learning (see for example, Durling, Cross, & Johnson, 1996; Ford, 1989; Ford & Chen, 2001; Graff, 2003; Riding & Grimley, 1999). Others take the view that deliberately mismatching styles and methods will strengthen student weaknesses and enable them to learn in a greater variety of ways (Felder, 1993).

Not all studies have found support for the matching hypothesis. Hayes and Allinson (1996) analysed 19 studies that measured the interactive effect of learning style and learning activity. They found that while 12 of the studies provided support for the notion that matching style with a learning activity or teaching method improved learning performance, eight others did not. Kratzig and Arbuthnott (2006) did not find evidence of the matching hypothesis, however this may reflect a small sample size (n = 65).

Several writers have noted the lack of integration in the area of individual differences (Curry, 1990; Jones, 1997; Sadler-Smith & Smith, 2004). Song (2002) defines the problem as a need to identify different types of learners and learning environments. There have been a number of attempts to impose a framework on this diverse area. Four that are particularly helpful are Curry's onion model (1983); Miller's model of cognitive processing and styles (1987); Riding and Cheema's model of style dimensions and learning strategies (1991), and Sternberg's cognition, personality and activity centredness (1997). Each of these frameworks uses a broad definition of individual differences as encompassing one or more of the

following: styles, strategies, attitudes, approaches, predispositions and preferences. Given the lack of agreement on what a definitive learner and/or learning environment typology might finally look like this seems to be a sensible and cautious approach.

Individual difference studies have taken a number of different approaches. Some have examined the relationship between individual differences and learning outcomes (see for example, Lemire & Gray, 2003) curriculum design and learning – teaching practices (for example, Claxton & Murrell, 1987; Wooldridge, 1995), and learning approaches (for example, Biggs, 1978; Biggs & Moore, 1993). This study took a pragmatic approach, focusing on identifying and measuring a wide range of tertiary student characteristics and how student groups differed on those characteristics.

The framework found to be most useful in making these decisions was the onion-like structure developed by Curry (1983). Curry classified a large number of individual difference-type instruments into three layers, rather like an onion. Inner layers represented measures of stable trait-like characteristics, while the outer layers comprised instruments measuring more flexible and modifiable characteristics. This study chose a "slice of onion" approach, taking from each layer those learning characteristics that could be accommodated by lecturers or modified by students, and had been shown to have some impact on learning outcomes. Following the advice of Snow (1992) the selected characteristics included cognitive, conative and affective measures. Bedford (2006), in an overview of learning styles, noted that researchers in the field accommodated the multidimensional nature of learning styles by incorporating four components: preference for particular features of the learning environment; psychological constructs relating to information processing or to perception; learner-behaviour patterns, and metcognitive regulation strategies. Characteristics from the first three of these dimensions were also used in the study. The identified characteristics become significant at different stages in the learning process, starting with learning drivers (for example motivation), the perceptive process (the preferred modality, for example visual), cognitive (including information processing approaches, for example sequential or global) and learning behaviours (for example collaborative). A range of eleven characteristics was selected and these were thought to provide a more comprehensive approach to understanding the role of the individual student in the learning process. The criteria for inclusion were

pragmatic; characteristics had to be associated with learning outcome and be able to be modified or accommodated by either teachers or students so that learning could be improved. These characteristics are discussed in greater depth on the following section.

Learning Drivers

Learning drivers are those characteristics that affect a student's ability to persist at working to achieve a goal, particularly over extended periods of time. The driving forces measured here are extrinsic, intrinsic and achievement motivation, effort and time poorness.

Motivation

Motivation can be thought of as the needs, wants, interests and desires that propel individuals in a particular direction. Student motivation relates to the student's desire to participate in the learning process and is directly related to academic achievement. The relationship between learning performance and motivation was established in the 1970's by the work of Biggs (1976; 1978; 1979) and Marton and Saljo (1976a; 1976b). They identified two motives; deep and surface. These two motives are closely related to intrinsic and extrinsic motivation. The work of these writers established that *why* students studied (motive) influenced *how* they studied. Consequently, those who had a surface (extrinsic) motive engaged in surface learning which primarily involved rote learning. Students with a deep (intrinsic) motive studied to understand the meaning of the material. Both teams of researchers found that students with a deep motive and strategy were more likely to have a higher quality of learning outcome.

Students who are intrinsically motivated engage in learning for the enjoyment they get from learning particular content. However, students who are extrinsically motivated study for a reason that is external to the activity of learning. It might be a means of getting a qualification that will improve their job opportunities or to please their parents. These students get no satisfaction from learning and consequently minimise the time and effort they put into study and thinking about the ideas raised in class (Lepper, 1988). Not only do extrinsically motivated students make less effort, they are less likely to persist with study, particularly when faced with obstacles or difficulties (Kohn, 1996).

In addition to deep and surface motives, Biggs (1976; 1978; 1979) suggested a third motive called achieving. Biggs' students with an achieving motive were driven by competitiveness and a need to win and would use whichever approach they deemed likely to be most successful. This construct is closely related to McClelland's (1985) 'achievement motivation'. People high in achievement motivation set moderately difficult, but achievable goals. They are not gamblers, preferring to work hard on problems if they know they can influence the outcome. Their motivation comes from winning or solving the problem rather than rewards such as money. They seek and value specific feedback on how they are doing so that they can improve their performance.

Other studies have looked at self efficacy (Anderman & Midgley, 1992; Bandura, 1993), expectancy (Al-Ansari, 2005) and task value (Al-Ansari, 2005). Although measuring motivation in different ways, these studies agree that students high in motivation show higher levels of persistence and more directed effort. If students lack the necessary cognitive skills then those efforts may not always be well directed, but all things being equal, higher levels of motivation are associated with higher learning outcomes (Al-Ansari, 2005).

Effort

Closely related to motivation is the amount of effort that students generate to persist in and complete a learning task. Few would dispute this relationship, however it's an area that hasn't been extensively studied. One of the first to draw attention to it was Eisenberger (1992) who used the term 'industrious' and found that rather than being an innate condition, effort was learned behaviour. In a series of experiments he found that reinforced high effort resulted in greater persistence and that this high effort was carried through to subsequent tasks. He called this behaviour 'learned industriousness'. Students who have a history of studying extremely hard and have then been rewarded for this effort will try harder and for longer when faced with subsequent tasks. High effort drives greater persistence which results in better learning outcomes (Hickman, 1998). Teachers who provide encouragement and then reward high effort will produce more persistent students than those who are more permissive.

Two conflicting views are given of millennial students and effort. Sax (2003) claims that they have experienced high academic success at high school without significant effort and

that this may work against them in tertiary study. Murray (1997) however, argues that this generation is hard working. When matched with a strong achievement motivation that several writers attribute to these students, it seems more probable that they are hard working (DeBard, 2004; Habermas, 1972; Howe & Strauss, 2003).

Time – Poorness

Traditionally, time on task has been associated with better learning performance. Perhaps the best known proponents of this influence are Chickering and Ehrmann (1996) who claim it to be, along with effort, essential to effective learning. Shea, Swan, Frederickson and Pickett (2001) also found a relationship between time on task and student learning performance and satisfaction. However, the relationship is not linear. Kelly and Loving (2004) found mild amounts of time pressure to be beneficial. They argue that under time pressure students restrict their attention to salient information by filtering out less important information, thereby enhancing performance. However, beyond an optimal point time pressure, particularly when the learning task is challenging, hinders performance (Anderson, 2000; Veenman & Beishuizen, 2004). Academic learning places high cognitive and metacognitive demands on students and these are hampered by time constraints. Better learning ensues when studying is spaced over time to allow both cognitive and metacognitive processes to be effectively deployed (Veenman & Beishuizen, 2004). When students feel constrained by time they tend to compensate by engaging in surface rather than deep learning as studies on exam cramming, often brought on by procrastination, have demonstrated (Anderson, 2000; Hunt, 1995; Rothblum, 1986). A study in 2002 found that many tertiary students felt time poor due to family, work and life style commitments and this time pressure adversely affected their study (Hunt, Eagle, Thomas et al., 2002). Support for the notion that tertiary students have trouble finding adequate time for study was provided by Kuh (2003) who found that university students spent only about half the recommended time on study outside of the classroom. More recently Jeffrey, Hide and Legg (2006) found that 32% of small business managers felt that time pressure severely reduced their ability to fully engage in training activities. Silverthorne (2002) reports progress on research being undertaken by Harvard Professor Amabile looking at the relationship between time pressure and creativity. Results to date indicate that there is an increasing ‘time famine’ in the modern workplace and the time pressure this produces mitigates against creativity.

Perceptual Preferences

Visual Verbal and Text Modes

Information is received via the five senses; sight, sound, smell, touch and taste and is then processed for meaning in the working memory (Moreno & Mayer, 2000). An individual's ability to make sense of incoming information is thought to be better when it is received in the individual's preferred modality (Cassidy & Eachus, 2000). In a learning context sight, sound and touch are considered to be particularly important. Most research of adolescents and adults has focused on sight and sound, though some researchers include touch (Kratzig & Arbuthnott, 2006). Auditory learners understand best when they hear information or explanations. Kinesthetic learners perform best when they can touch and manipulate materials. Learners who have a high visual preference are more proficient at decoding information that is imaged-based, for example pictures, diagrams and charts.

A problem arises in the consideration of students who learn better from text than images. Text is a visual image, but the decoding of text is very different from the skills required for interpreting graphic material. Some writers have made a verbal-visual distinction (see for example, Riding, 1997) in which 'verbalisers' have a preference for words whether they are written or spoken. The basis for making the verbal-visual split is that verbal and visual information are processed in different parts of the working memory (Baddeley, 1986; Pavio, 1986). Building on this notion, Moreno and Mayer (2000) were able to demonstrate that students who were given images with a corresponding narration performed better than students who were given simultaneous images and text. When the images were being processed in the visual working memory, the narration was able to be independently processed in the auditory part of the working memory; neither process interfered with the other. However, students who had to read text whilst watching images did less well because both processes were being conducted in the limited capacity of the visual working memory, creating a cognitive overload. According to the rationale put forward by Moreno and Mayer (2000) verbal and visual information is processed in different parts of the working memory. However, their results suggest that text is processed via the visual memory, not the auditory working memory where oral input is processed. Text is either processed in the visual mode or

the verbal mode, but presumably not both. This muddies their argument for making a distinction between the verbal and visual on the basis of location. Using the label 'verbal' to cover processing done in two different parts of the working memory, that is in the auditory part for spoken words and the visual part for written words, seems unhelpful as each requires different skills and abilities.

Three recent studies found that students made clear distinctions between written text and the spoken word and so proposed three modes of processing; visual, auditory and text (Hunt, Eagle, & Kitchen, 2004; Jeffrey, Hide, & Legg, 2006a; Lincoln & Rademacher, 2006). Images and text are both to be decoded in the visual working memory but require different processing strategies. Differences in the ability of students to use these strategies may account for different preferences for text or images. Bazerman (1985) argues that people with highly developed reading skills are able to extract information from written material with great flexibility; reading selectively and scanning over irrelevant content. Poor readers struggle to extract meaning and must plod laboriously through mountains of words. A powerful discriminator between good and poor readers is the use of decoding strategies that promote understanding (Spring, 1985). Poor readers may have more effective visual or auditory decoding strategies making learning through these modalities more effective and enjoyable.

Visual learning can be defined as the ability to conceptualise ideas and thoughts as graphical images rather than in language (Wileman, 1993). Baldwin and Kabry (2003) found a stronger preference for visual learning (82%) than verbal (18%) amongst students, a finding supported by Smith (2000) who surveyed Australian trainees. Marx and Frost (1998) explain a similar finding as resulting from exposure to multimedia messages on computers, TV, videos and other electronic media. Of course this presupposes that learning styles are shaped by use and exposure rather than inherent and fixed as argued by some researchers (Carroll, 1983; Pask, 1976). Others go further and claim that students, and teaching staff, need to be proficient in these skills because the future learning and working environment will be increasingly dominated by visually-driven communication (Cyrs, 1997; van Dam, 2005). They assume the students of the 'net-generation' are already masters of the icon-world.

Cognitive Processing

After information has been received via one or more of the perceptual modes it is processed in the working memory. Chen (2002) found that cognitive styles are related to the manner in which information is acquired and processed. Three styles or approaches for processing information are examined. The first, sequential and global processing, looks at whether students work through information in a linear or hypermode fashion. Goal focus is a relatively new construct: Murray (1997) was one of the first to associate it with the millennial generation. Hunt et al (2004) found it to be a strong characteristic of business students. The third processing approach is dependent-independent learning. This identifies a student's propensity to uncritically and passively accept information from teachers versus actively testing and challenging new information presented by teachers.

Sequential and Global Processing

A sequential or global style of processing information is thought to be a cognitive style that describes the student's preference for the type of learning sequence (linear or non-linear), size of information chunks (small or large) and level of detail (specific and narrow or broad and large-scale). According to Felder (1993) sequential learners take small incremental steps to understanding, following a linear path and focusing on specific details. On the other hand he describes global learners as taking large jumps, being fuzzy about details, following non-linear paths and building the big picture. The concepts of global and sequential have considerable overlap with Riding's (1993) wholist-analyst styles; Pask's (1988) serialists and holists; and Witkin's (1977) field dependence and field independence.

Concern with sequential and global styles has come into particular prominence because of the rising importance of technology as a medium for teaching (Kim, 2001; Montgomery, 1995). Whereas traditional teaching, as found in lectures and books, follows a linear sequence, many e-learning environments use hypertext facilities and present information in a non-linear format that allows students to choose their own path through the material (Lawless & Brown, 1997). These multiple pathways increase the flexibility for students but also impose greater skill demands on them. Successful e-learning requires students to be self directed learners who can make appropriate learning decisions about the sequencing, timing and level of instruction (Ford & Chen, 2000).

An important aspect of the skills needed by e-learners to find their way around electronic learning environments is the ability to navigate in a non-linear manner. While this may suit global learners, who have a preference for jumping about a topic to follow an individualised associative trail, it might be that sequential learners, whose preference is for highly structured linear pathways, find the presentation of multiple options and the constant need to make decisions about what to do next increases their cognitive workload, therefore hindering their ability to learn (Sweller, 1994). The additional task of navigating reduces the students' capacity to focus on the instructional material.

Global learners tend to build the build picture first, then fill in the details. Sequential learners, on the other hand, progressively accumulate detailed information which is then used to create the big picture or domain framework. The non-linear organisation of instructional material in e-learning increases the need for students to understand the overall structure of the learning environment, particularly the location of specific information to aid their navigational decision-making. Clearly, global learners who are adept at creating information structures early in the learning endeavour will be more advantaged in this environment then sequential learners (Bajraktarevic, Hall, & Fullick, 2003; Graff, 2003).

The tendency of sequential learners (Rider's 'analysts') to view instruction material in small units is exacerbated by the manner in which e-learning material is segmented into small components. Riding and Grimley (1999) found that these students did not learn as well as holists (global learners) in an e-learning environment with highly segmented information. Segmentation increased the tendency of analysts (sequential learners) to see information as discrete units, thereby increasing the difficulty of integrating them into a meaningful whole.

Given the disadvantage at which sequential learners appear to be in a hypertext e-learning context, it is concerning that several studies have suggested sequential learners form a larger portion of the student population than global learners. According to Baldwin and Sabry (2003) between 64 and 71% of students in their sample had a preference for sequential learning. A similar figure of 72% sequential and 28% global learners was found by Montgomery and Groat (2000). In true ATI tradition a number of writers have developed

structural aids to improve the performance of sequential learners and thereby minimising their disadvantage (Bajraktarevic et al., 2003; Dunser & Jirasko, 2005).

Goal Focus

Two previous studies found that some students used a strategy called goal focus (Hunt, Eagle, Thomas et al., 2002; Jeffrey, Hide, & Legg, 2006b). Students high on this strategy paid very close attention to assessment requirements, seeking out information early in a course and ensuring that they fully understood what they needed to do to pass the course. This also entailed an awareness that good marks came from 'giving the lecturer what they wanted'. These students take their cues from the lecturer as to what is important and what views are 'right'. High goal focus students are not the same as dependent learners. These students are simply street-smart and recognise that in the game of learning the lecturer holds the key to good grades. Millennial student are believed to be high on this characteristic (Murray, 1997). It may be that these students who have grown up playing computer games are applying game strategies to their study. To win a computer game you must uncover the rules of the game then focus closely on applying them to reach the goal or target. As Prensky (2001a) has pointed out, these students prefer game-playing to reality. It's a small step to suggest that successful game strategies are being used to deal with real-life tasks.

Independent Learning

Independent learning is a dimension of self directed learning in which students are willing to challenge or disagree with their teachers. Self directed learners are students who are willing to assume more responsibility for their own learning process. Self directed learning originally gained prominence in the late 1970's, early 1980's when it was closely associated with adult education (Cross, 1982). Since then there has been a dawning recognition that more self direction is a worthwhile goal for all students, particularly in the context of new online learning modes. Martinez (2001) found that self directedness was associated with greater success in completing online courses. However, fostering self directedness through online learning has been problematic. Akerlind and Trevitt (1999) argue that traditional education fosters dependency on the teacher and consequently students who find themselves in online learning environments that require greater independence are discomforted. Saddler-Smith & Riding (1999) also found that traditional teaching modes do little to prepare students for such independence, and most students have shown a preference for traditional teaching modes. They explain this preference by reference to Knowles' distinction between pedagogy and

andragogy. Students were seen as teacher-dependent (pedagogical), rather than self-directed and motivated (andragogical), and thus were more comfortable with a teacher-controlled learning environment. As Akerlind and Trevitt (1999) point out, faculty need to prepare students for the more independent thinking that is inherent in online learning.

Learning Behaviours

In addition to attitudinal and cognitive preferences, students also show preferences for behaving in consistent ways when studying.

Collaborative Learning

Collaborative learning involves the development of skills and knowledge of individuals as a result of interaction in a group. A number of benefits are advanced for collaboration including improved learning (Gokhale, 1995), higher motivation (Moller, Huett, Holder, & Young, 2005) and better preparation for the workplace (Horsburgh, Lamdin, & Williamson, 2001). The evolution of the internet with its numerous tools for synchronous and asynchronous communication has opened the way for a much wider application of collaborative learning.

The case for improved learning rests largely on the notion of a constructivist view of learning. Constructivists believe that learning is an active process in which students take input from the outside world and construct understanding and meaning that is personal to them (Duffy & Jonassen, 1991). By discussing their understanding with others through a process of articulation and challenge, students may come to a shared understanding (Cognition and Technology Group at Vanderbilt, 1991). Further, the views put forward by other students provide alternative perspectives and thinking patterns which enhance the development of meta-cognitive skills (Sharan, 1980). Koschmann (1996) believes that learning results from discourse and interaction. He believes that the process of articulating, defending and refining ideas enhances the quality of learning. This view is supported by Jones et al (2000) who emphasise the importance of the conflict and collision of opposing views in fostering cognitive growth and problem-solving skills.

Collaborative skills research shows that undergraduate students strongly dislike working in groups (Hunt et al., 2004). It may be that the quality of the outcome is strongly mediated by the quality of the group processes and teachers neither understand nor apply these principles

(Gerbic, 2004; Shaw, 1981). However, when students believe that collaboration has real benefits, then they are much more positive about engaging in collaborative learning (Horsburgh et al., 2001).

Conclusion

Most learning style-type inventories and research have focused on a narrow range of characteristics, usually cognitively based. It seems unlikely that attending to a few such characteristics will make a substantial difference to learning effectiveness. This study takes a more holistic or whole-person perspective of learning. Motives, intentions, strategies and cognitive factors spanning the entire learning process are examined. Collectively they are referred to as learning orientations. All of these orientations have been associated with successful learning outcomes and are able to be manipulated by either students or lecturers.

Chapter

2

METHODOLOGY

Research Problem

In the first chapter the case was made for identifying and describing learning characteristics of tertiary students to provide an overview of the diverse approaches to learning taken by students. Additionally, their attitudes to teaching modes, sources of information, consideration of what is important to know and how they use computers will enrich this understanding. The specific research questions to be answered are:

1. Can a set of learning orientations be identified that describe the major learning characteristics of tertiary students?
2. Can these learning orientations be clustered to produce a small set of learner profiles that describe some 'typical' tertiary students?
3. Do students differ in their learning orientations on the basis of the demographic variables of ethnicity, gender, age, place of study, qualifications being studied, major subjects being taken, domestic or international status.
4. Which teaching modes do students prefer?
5. Where do students get most of their information from?
6. What do students believe is important to learn?
7. Do learning orientations influence teaching mode preference?
8. What do students mostly use computers/internet for?

Sample

Demographics

The sample size was 1811 tertiary students, although another 100 more questionnaires arrived after the data analysis had begun. These students came from 19 tertiary education

organisations (TEOs). These included 6 universities, 5 polytechnics or institutes and 6 private educational providers. As can be seen from figure 2.1 most of the students came from universities, these proving easier to get access to. The sample approached representativeness in most areas. The two areas of under-representation were: the number of students studying at sub-degree level (20%), however over half of all tertiary students are studying at this level (Scott, 2005); the number of Maori students at 4.6% when they make up 20% of all tertiary students. Of the 1811 respondents 1287 (65.3%) were female and 524 (34.5%) were male and 1412 (78%) were domestic students and 399 (22%) international. Just over 30% (549) were born overseas and 69.7% (1262) were born in New Zealand.

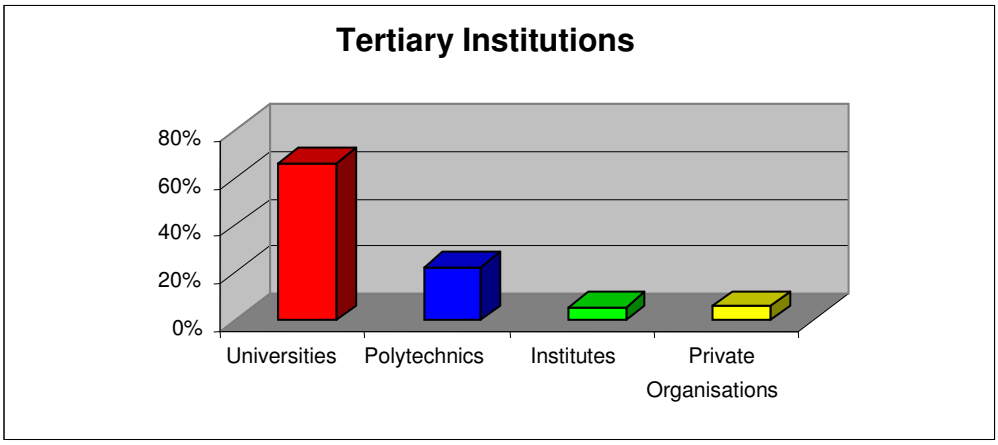


Figure 2.1: Universities (12.01), Polytechnics (402), Institutes (101), Private organisations (107)

Figure 2.2 shows the qualifications being sought by the students in the sample. Degrees were the most popular qualification, reflecting the preponderance of universities and to a lesser extent, polytechnics in the study.

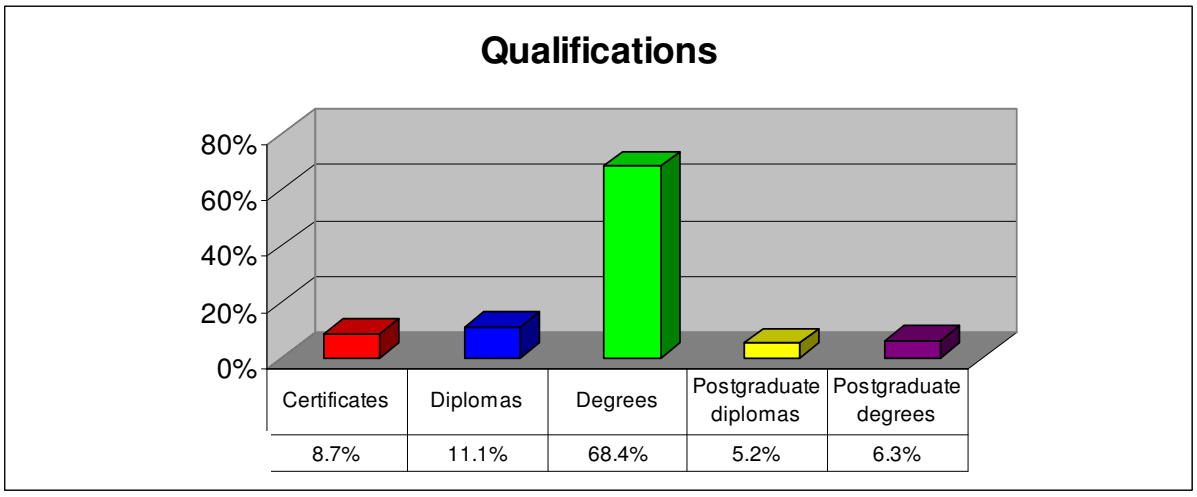


Figure 2.2: Qualifications being undertaken by sample.

The majors being taken by students ran to 14 pages so these were grouped along traditional discipline lines (see figure 2.3). Humanities includes: humanities 10.9%; education 3.3%; human resource management, marketing, management and communication 18.2%; law 0.9%; and sport 1.7. Medicine includes: medicine 12.4%, science 2.5%. Finance-based includes: finance, accounting and economics. IT includes: all computer-related disciplines, information systems and management, and library studies[1].

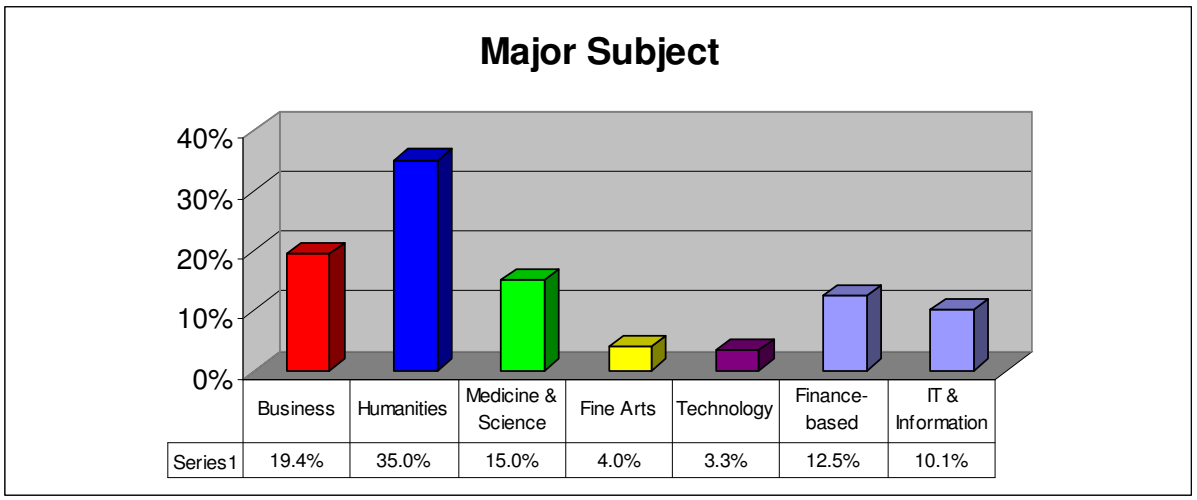


Figure 2.3: Major subjects taken by sample.

A wide range of ethnic groups were identified and these were classified into major groups (see figure 2.4). The number of Maori students (4.6%) was disappointing as Maori make up 20% of all tertiary students. This reflects an inability to access wanangas despite repeated attempts. On the other hand the proportion of Polynesians is close to the national average.

[1] It may seem strange to include library studies with IT, however almost all of library study courses that were given by respondents included a major computer component.

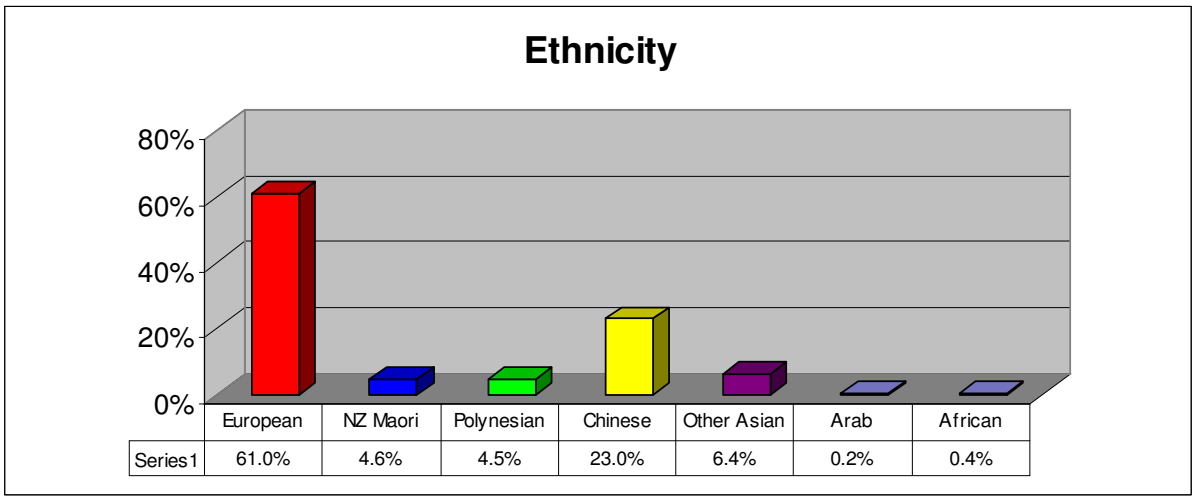


Figure 2.4: Ethnics groups in the sample

Ninety-four point nine percent of the sample had access to a computer at home and 89.4% had access at work. Most of the sample had access to broadband and only 3.1% had no internet access (see figure 2.5).

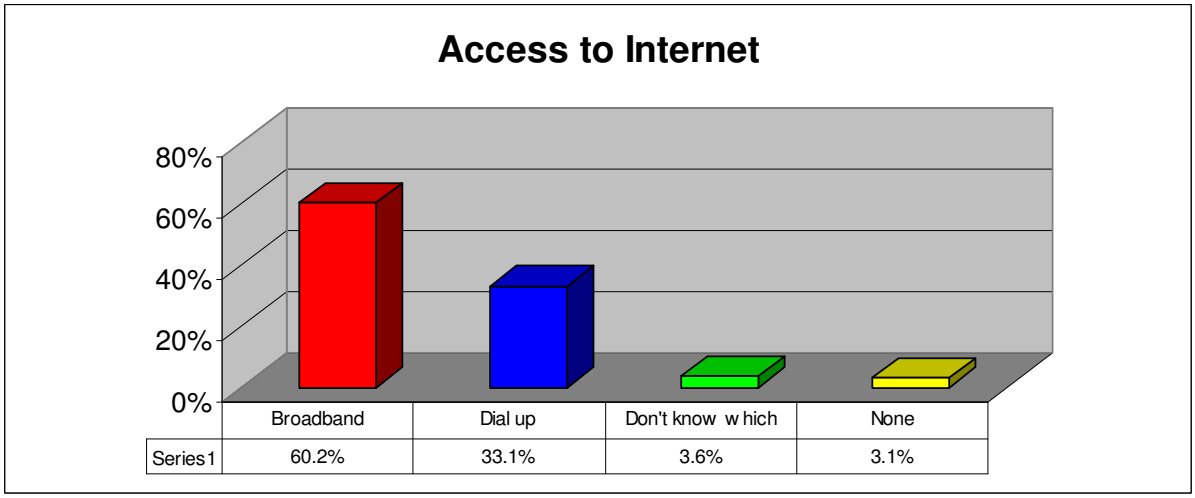


Figure 2.5: Proportion of sample with access to the internet

Approximately 60% of the sample has used a computer for 11 years or more, with 10.9% having used them for more than twenty years (see figure 2.6). Only 8.6% have less than five years experience.

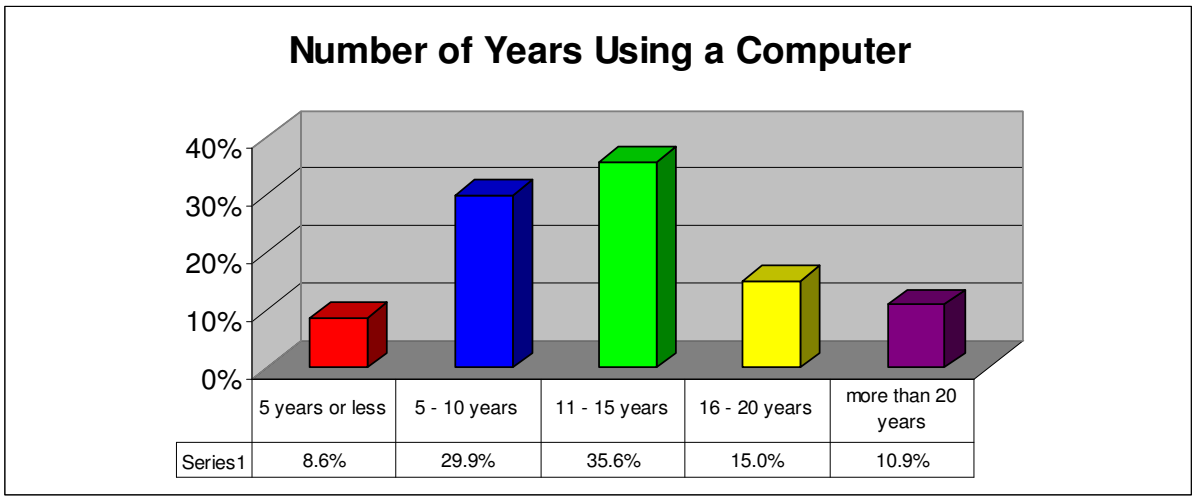


Figure 2.6: Number of years respondents have used a computer for

Recruiting Procedures

The aim was to get a large sample size so a variety of recruiting techniques were used. In the first instance appropriate individuals in the higher levels of management with a responsibility for learning were contacted and asked to help with recruitment. The response was mixed. Some organisations were very helpful and assisted in a number of ways. For example, one university put a link to the online questionnaire on their main online learning homepage. Others ignored the requests or said they didn't want researchers from outside their organisation to conduct research on their students. The second step was contact heads of departments or teachers with a responsibility for, or interest in, learning and teaching and seek their assistance. This was quite fruitful as many of these people announced the study at staff meetings and distributed printed questionnaires and information regarding the online questionnaire URL. The third step was to advertise in 11 students magazines. Most of these were accompanied by a short article on the study.

Two incentives were offered. Students who took part were provided with their personal learning profile based on their responses. For students who did the questionnaire online this was generated instantly and could be printed, sent to their email address or posted by mail. Students who filled in printed copies of the questionnaires were a little slower to receive their feedback as these had to be input by the researcher. The second incentive was for lecturers who encouraged their classes to take part. Students were asked to use a code on their questionnaire and these were used to generate summaries of the main learning styles for each

class which were sent to the lecturer. It should be pointed out that no students could be identified from the summaries.

Data Collection Methods

About 800 of the questionnaires were distributed to students in class by their teachers. Some were given time in class to filled out the questionnaire and others took it home to complete in their own time. Most of these were returned to their teachers and returned in bundles. Some students used the FREEPOST option and returned the questionnaire directly. Four hundred questionnaires were posted to distance learning students and 130 were returned via the FREEPOST option. About 1,291 students registered on the online questionnaire website and 1,100 completed the questionnaire online. Some of those who registered, however, were lecturers checking the questionnaire to see if it was suitable for their students. It is difficult to establish an accurate response rate as bundles of questionnaires were sent to various institutions and many may never have been distributed.

Description of the Questionnaire

A total of seven measures were administered: Preference for teaching modes, sources of information that students use, knowledge and skills students think are important, learning orientations part 1 (single dimension constructs), learning orientations part 2 (bi-polar constructs), how students use computers and biographical information. The learning orientations part 1 and 2 and the teaching modes were developed from a previous study (Hunt, Eagle, Thomas et al., 2002). Their development for this study is described next.

Teaching Modes

In the earlier study (Hunt, Eagle, Thomas et al., 2002) nineteen modes of teaching were presented to students who rated their preference for each mode on a five-point Likert-type scale. A factor analysis reduced these to four main types: traditional (lecture, study guide, textbooks), small group/class (tutorials, one-to one tutoring), student-based (groupwork, student presentations) and technology based (several online formats). The main representatives from each of these four types were used producing eight items (see questionnaire in Appendix B).

Learning Orientations Part1

The 26 Likert-type items that made up this section measured five learning orientations developed for the 2002 study by Hunt, Eagle and Thomas. The contribution of each item in the scale was reviewed, weak items strengthened and new items added. The details of the scales from the first study are produced in Table 2.1 below.

Table 2.1: Components from (Hunt, Eagle, Thomas et al., 2002)

Components	Loading Range	Eigen Values	Percent of Variance	Reliability Coefficient	Mean	S.D.
Effort.	.46 to .69	2.19	3.12	0.78	3.77	.69
Listening mode preference	.51 to .74	1.69	2.42	0.73	3.10	.74
Achievement motivation	.52 to .70	1.40	2.01	0.53	3.52	.81
Goal focus	.46 to .73	1.38	1.96	0.51	3.81	.71
Time poorness	.42 to .57	1.05	1.50	0.55	2.96	.73

Learning Orientations Part 2

The forty items in part 2 were also developed from the 2002 study by Hunt, Eagle and Thomas, but these were changed from Likert-type items to a bi-polar format. Inspection of the original components that emerged in the 2002 suggested that a number of them could be reconstructed into bi-polar items. It was thought this might increase reliability as the two opposing statements gave more information and clarity about the construct than a single statement. The original scales are presented in Table 2.2 below.

Table 2.2: Components from (Hunt, Eagle, Thomas et al., 2002)

Components	Loading Range	Eigen Values	Percent of Variance	Reliability Coefficient	Mean	S.D.
Visual mode preference.	.41 to .77	3.93	5.61	0.81	2.74	.71
Collaborative learning mode.	.63 to .85	2.62	3.74	0.85	2.67	.90
Intrinsic motive.	.60 to .76	2.47	3.53	0.78	2.82	.77
Extrinsic motive	.66 to .69	2.082	2.97	0.69	2.67	1.00
Dependent learner	.77 to .84	1.29	1.84	0.71	3.18	.90
Factual course preference	.77 to .81	1.03	1.47	0.65	2.76	.98
Independent learner	.73 to .75	1.01	1.44	0.54	3.29	.89

The visual scale had an implication of an anti-reading bias. This was elaborated into a full bi-polar construct with a preference for text at one end, and for visual learning at the other. Similarly the items related to collaborative learning were contrasted with working alone, and factual course preference with relativistic reasoning. The motivation and dependency scales were merged. The

same process of item review, strengthening and new item creation, where appropriate, were carried out. In the original study items were developed to measure global-sequential learning but these failed to cohere with adequate reliability. A further attempt was made in this study to develop the scale. Items that had been reviewed were examined and other inventories measuring this construct were explored (for example, Felder & Spurlin, 2005). Some items were modified from the original study and new items were developed from the literature.

Pilot Study

A pilot of the questionnaire was trialled on 87 tertiary students. All of the scales showed good reliability, but one item was modified and a further item was added to the global-sequential scale. Based on these results the final questionnaire was printed and the online website developed.

Online Questionnaire

The items on the online questionnaire were identical to the printed version. However, students needed to register for the online version. They could use any user name and password they wanted. Registering allowed them to complete the questionnaire at a later time if they were interrupted or ran out of time.

The first four hundred printed copies of the questionnaire were used to develop feedback to the students in the form of their personal learning profile. Once the questionnaire had been completed a learning profile was generated for the student. This could be printed off, viewed it online or posted to a physical address. Registration also allowed them to revisit their results.

Chapter

3

RESULTS

Introduction

The results are presented in three sections. In section one, principal components analysis (PCA) was used to identify typical characteristics of learning styles, attitudes and dispositions, collectively referred to as learning orientations. A second order principal components analysis was conducted on the learning orientations to produce three learner profiles which describe three main types of student. In section two, differences between groups of students in relation to learning orientations and learner profiles were explored using ANOVAS and t-tests. Groups were created according to gender, ethnicity, subject majors, type of tertiary institution, qualification and age.

In section three, student attitudes to teaching modes, their sources of information, beliefs about what's important to know and computer activity were examined. The influence that learning orientations had on these attitudes to teaching modes was examined using standard multiple regression.

Section One: Identifying Styles, Attitudes and Dispositions

In this section, characteristics that might usefully describe the tertiary student population were identified and measured. In stage one eleven such characteristics were established. These learning orientations were then subjected to further principal components analysis to see if they would group together in ways that would describe typical students. This procedure produced three learner profiles from the eleven learning orientations.

Learning Orientations

Learning orientations describe the learning characteristics of the tertiary student body. Students rated the items that comprised the components according to how well the item described them. The individual items that made up the questionnaires were analysed using principal components analysis (PCA), to determine the nature and extent of these orientations. The choice of principal components analysis to reduce the number of items to a smaller number of components was influenced by the large number of items, the need for uncorrelated components to be used in later regression analysis and to determine the presence of underlying relationships between the learning orientations.

The learning orientation measure had two parts. The first part comprised 26 Likert-type questions that measured single constructs. The second part comprised 40 bi-polar questions measured along a 7-point continuum. The two parts were each subjected to a principal components analysis. The analysis was carried out in four steps. First the appropriateness of the data for factor analytical techniques was evaluated. A correlational matrix was computed for all variables and the presence of correlations greater than 0.3 in both of the PCA's determined the likelihood of some underlying processes. The size of the sample needed for the number of variables has been widely debated (O'Neil & Child, 1984), however the ratio of sample size to items for both part 1 (69.6:1) and part 2 (45.2:1) meets the more stringent guide-lines (Tabachnick & Fidell, 1989). The Kaiser-Meyer-Oklin of 0.825 (part 1) as a measure of sampling adequacy is described by Kaiser (1974) as "very good" and 0.90 (part 2) as "marvellous". The KMO together with Barlett's test of sphericity (11662.361; $p \leq 0.0000$: part 1) and (23649.912; $p < 0.0000$; part 2) established the appropriateness of the data for principal component analysis.

In the second step, components were extracted. A scree test supported the retention of five components (Part 1) and six (Part 2) (Cattell, 1966; Tabachnick & Fidell, 1989). While a scree test is not always very exact, the large sample size, generally high communality values and the high loading of variables on each component favoured the use of a scree test for determining the number of components (Gorush, 1983). To avoid overspecification, component loadings were set at .40. Variables that cross-loaded were assumed to load on the component for which they had the highest loading. To minimise errors in interpretation,

components were described by considering loadings in descending order. The five-factor solution extracted 52.9% of the variance and the six-factor solution, 58.35%. Information on the components is set out in Tables 3.1 and 3.2.

In the third step, orthogonal rotation with varimax was chosen for simplicity of reporting and because it was intended to use component scores for further analysis (Tabachnick & Fidell, 1989). Adequacy of the rotation was determined by the presence of a simple structure (Thurstone, 1947). Several variables correlated highly with each component, and generally only one component correlated highly with each variable. In Part 1 three questions cross loaded on another component. These were items 20, 9 and 3, which all had secondary loadings of .4 on component 2. The differences in the loading on the components were sufficiently large to justify retaining the three variables.

Finally component scores were computed for each case using the regression method.

Table 3.1: Principal Components Analysis for Part 1 of Learning Orientations

Component 1: Listening	**1**	**2**	**3**	**4**	**5**
I remember best what I hear.	**.81**	.17	.02	-.02	-.08
I remember best things that are spoken.	**.78**	.25	.01	-.05	-.07
I prefer listening to reading.	**.78**	-.119	.05	.11	.07
I prefer listening to the lecturer than reading textbooks.	**.75**	-.14	.00	.07	.17
I understand better if the lecturer explains things rather than reading about them.	**.54**	-.22	.11	.15	.29
Component 2: Effort					
I look at most of the additional readings suggested by the lecturer.	.02	**.65**	.04	-.09	-.05
I usually set out to understand thoroughly the meaning of what I am asked to read.	.01	**.62**	.19	-.05	.10
I usually put a lot of effort into trying to understand things that at first seem difficult.	.06	**.57**	.13	.06	.06
I try to be strict with myself in my study habits, so that I can do the very best I can.	-.05	**.57**	.32	.05	.16
I make sure I clearly understand the assessment requirements early in the course.	.01	**.55**	.05	-.08	.36

Component 3: Achievement motivation					
I want top grades in my studies so that I will be able to select from among the best jobs available.	.00	.04	**.76**	.01	.04
I am very competitive in my studies.	.05	.19	**.68**	-.09	.09
I see myself as an ambitious person	.14	.07	**.66**	.04	.10
I set out to get full marks for an assignment, and try as hard as I can to achieve them	-.04	.41	**.59**	-.1	.18
It is important to me to do really well in my studies so I make study a top priority	-.00	.41	**.54**	-.09	.22
Component 4: Time poorness					
I don't have enough time to do as much study as I need to for my course	.03	.05	.02	**.81**	.03
Other things such as work and family do not leave me enough time to think about the ideas from my studies	.00	.07	-.04	**.77**	-.05
I usually don't have time to think about the implications of what I have read	.12	-.18	-.01	**.67**	.057
Often I don't have enough time to really understand the ideas I read about	.031	-.08	-.02	**.65**	.00
Component 5: Goal focus					
I pay close attention to information the lecturer gives about exams	.13	.07	.20	-.00	**.75**
Lecturers sometimes indicate what is likely to be in the exams, so I look out for hints	.09	-.00	.08	.06	**.73**
I take care to find as much information as possible on what will be in an exam	-.03	.31	.16	-.03	**.53**
When working on an assignment, I try to keep in mind exactly what the particular lecturer seems to want	-.00	.41	.02	-.01	**.50**
Eigenvalues	4.56	3.14	2.10	1.44	1.40
% of variance	17.6	12.1	8.1	5.5	5.4
Reliability Coefficient	.80	.67	75	.72	.65
Mean	3.43	3.55	3.70	3.30	4.04
Standard deviation	.74	.61	.68	.76	.59

Interpretation of Learning Orientations Components Part 1

The five components that emerged confirmed the results of an earlier study (Hunt et al., 2004) in which 1279 business students were surveyed about their learning orientations.
The first component, 'Listening', describes a preference for learning by listening to explanations rather than reading them. The mean of 3.43 suggests that this preference is slightly more common than not amongst tertiary students.

Tertiary students also tend to work hard, put effort into understanding and try to be disciplined in their work habits. These characteristics combined to make the component 'Effort'.

'Achievement motivation', component 3, is also an important defining characteristic of tertiary students. These students are highly competitive and driven by a need to achieve academically in order to further their future professional careers.

A mean of 3.30 for the component 'time poorness', suggests that while this describes some students, there is also a substantial portion to whom it doesn't apply. Time poor students have such busy lifestyles they don't feel they have sufficient time to reflect on the new ideas presented in class or in reading material. Once they leave the lecture theatre they "switch off" the lecture and move on to the next item on their agendas. The pressure of time is a constant companion.

The fifth component, 'Goal Focus' describes students who want to know from their lecturers very clearly and specifically what is required for them to pass the course. Students deem that success will come from focusing intently on cues and other information given by the lecturer as to what counts, what is important and what will be in the examination. Their ability to interpret or identify what the lecturer wants is regarded as an important strategy for success.
In the second principal components analysis 40 bi-polar items were examined (see Table 3.2). Six components emerged accounting for 53.3% of the variance. Students indicated their position along a seven-point scale with opposing statements at each end.

The six components that emerged again confirmed an earlier exploratory principal component analysis, including one component 'sequential-global, that failed to emerge previously (Hunt et al., 2004). The items from the initial study had been improved and this was demonstrated by the strong loadings and good reliabilities.

Table 3.2: Principal Components Analysis for Part 2 of Learning Orientations

Component 1: Factual Content v's Relativistic Reasoning	**1**	**2**	**3**	**4**	**5**	**6**
I prefer courses where the answers are factually right or wrong ←→ I prefer courses in which the answers are based on my own argument and reasoning	**.72**	-.04	.01	-.12	.15	-.11
I find courses with no clear right and wrong answers frustrating ←→ I enjoy developing my own interpretation of the ideas presented in the course	**.69**	-.04	.03	-.18	.15	-.08
For most questions there is one best answer ←→ For most questions there is rarely a single best answer.	**.64**	.05	.13	-.09	.11	.08
I believe a lecturer's job is to explain the way things are ←→ I believe a lecturer's job is to help us discover our own knowledge	**.64**	.02	-.08	.08	.09	.18
I like to stay focused on the facts and hard data ←→ I like to explore ideas from a number of different viewpoints before making up my own mind	**.64**	.06	-.03	-.13	.17	.17
I prefer courses that specify in detail what I must do to pass ←→ I prefer courses that allow me a lot of freedom to choose which aspects I want to focus on.	**.59**	.08	-.00	.03	.12	.06
I prefer courses that emphasis practical, concrete material (facts, data) ←→ I prefer courses that emphasis abstract material (concepts, theories).	**.58**	-.07	-.07	.10	.02	.13
I prefer classes to focus on the ideas being presented by the lecturer ←→ I prefer lecturers who allow me to share my experience and knowledge with the class.	**.57**	.12	.07	-.03	.21	.07
I like courses that are structured and organized ←→ I enjoy classes that are flexible and spontaneous.	**.56**	.13	.13	-.18	.02	.26
I get frustrated with classes that get side-tracked into other topics ←→ I get frustrated with classes that do not explore interesting ideas that might come up in class	**.52**	.08	.09	.05	.08	.28

I prefer my lecturer to present the material in systematic steps ←→ I prefer my lecturer to give me an overview of the subject, and relate it to other subjects and ideas.	**.52**	.05	.04	-.05	.03	.28
I think it's up to the lecturer to decide what should be taught ←→ I like courses that allow me to pursue my personal goals and interests.	**.50**	.10	-.06	.03	.30	.16
I prefer lecturers to tell me exactly how they want the assignment done ←→ I like projects that let me decide what I want to do and how to do it.	**.48**	.07	-.02	.05	.23	.31
Component 2: Text v's Visual						
I understand written explanations more easily ←→ I understand diagrams more easily.	.06	**.84**	-.06	.07	-.01	.08
I remember best what I what read ←→ I remember best what I see in pictures or graphs.	.06	**.82**	-.12	.13	.00	.06
In a book with lots of pictures and diagrams, I prefer to focus on the written text ←→ In a book with lots of pictures and diagrams, I prefer to focus on the pictures and diagrams.	.09	**.79**	-.09	.07	-.02	.00
I prefer to get new information in written form ←→ I prefer to get new information in pictures, diagrams, or graphs.	.05	**.78**	-.12	.09	-.00	.00
When studying I prefer to summarise information as notes ←→ When studying I prefer to summarise information as diagrams.	.02	**.66**	-.07	.07	.10	.10
I make notes to summarise material in my courses ←→ I make simple charts, diagrams or tables to summarise material in my courses.	.05	**.59**	-.05	.10	.10	.16
Component 3: Working Alone v's Collaborative						
I prefer to work on my own ←→ I prefer to work in a group.	.00	-.10	**.90**	-.06	.02	.03
I find working on my own more stimulating and productive ←→ I find working in a group more stimulating and productive.	-.03	-.12	**.83**	.01	.01	-.02
The idea of working alone appeals to me ←→ The idea of group projects, with one grade for the entire group, appeals to me.	.04	-.06	**.83**	-.09	.07	.04

I can get better grades working on my own ←→ I can get better grades working in a group	.05	.07	**.81**	-.15	.10	-.00
Working with other people slows down my learning ←→ Working with other people helps me in my studies.	-.02	-.10	**.65**	.03	.08	.00
Component 4: Extrinsic v's Intrinsic Motivation						
I am studying because I feel its expected of me, not because I really want to ←→ I am studying because I enjoy it.	-.05	.08	-.08	**.80**	-.07	.05
I am more interested in the qualifications I'll get than in the courses I'm taking ←→ The course I'm taking is so interesting, I would like to continue learning about the subject after I finish this course.	-.16	.02	-.00	**.72**	.05	-.05
I chose my present courses because I felt I had to, more than because I'm interested in the subject ←→ I chose my present course because it is an area I know I will enjoy working in.	-.00	-.00	.02	**.71**	.05	.05
I don't find academic study interesting ←→ I find that studying academic topics can often be really exciting and gripping.	-.03	.16	-.11	**.68**	-.12	.00
I find assignments boring and stressful ←→ I enjoy my studies so much I often become absorbed in an assignment.	-.06	.16	-.10	**.66**	-.15	.02
I spend a good deal of my spare time finding out more about interesting topics that have been discussed in classes ←→ I do not spend much time thinking about lectures outside of class.	-.11	.09	.00	**.59**	-.17	-.19
Component 5: Dependent v's Independent Learners						
Lecturers know the right answers so I don't argue with them ←→ Lecturers are not always right so I am prepared to argue with them.	.28	.01	.08	-.11	**.80**	.08
I don't disagree with my lecturers because they are the experts ←→ I sometimes disagree with my lecturers because they are not always right.	.26	.02	.06	-.05	**.77**	.07
I don't feel confident enough to challenge the opinions of lecturers ←→ I feel confident challenging	.14	-.02	.06	-.18	**.71**	.04

the opinions of my lecturers.						
I prefer to accept the lecturer's ideas as being right ←→ I prefer to check for myself before I accept my lecturer's ideas.	.27	.01	.09	-.01	**.65**	.07
Component 6: Sequential v's Global Learning						
When working on assignments or solving problems I keep focused on the topic ←→ When working on assignments or solving problems I often find connections between what I'm working on and other subjects or problems.	.36	.09	.04	-.01	.15	**.68**
When studying I focus only on the topic I'm working on ←→ When studying a topic I am often reminded of ideas from other courses.	.34	.05	.12	-.07	.17	**.60**
When studying for a test, I like to systematically summarise the material ←→ When studying for a test, I often add extra notes or diagrams to my notes at a later stage as new ideas come to me.	.20	.20	-.07	-.02	.00	**.53**
When reading a textbook I prefer to work through it logically from beginning to end ←→ When reading a textbook I prefer to skip about and dip in to the relevant parts.	.119	.14	.01	.08	.07	**.52**
I like to learn new content in straightforward logical steps ←→ I usually jump around a topic a lot, then find it suddenly falls into place.	.31	.02	-.04	.08	-.01	**.50**
Eigenvalues	7.86	5.23	2.91	2.31	1.69	1.30
% of variance	19.65	13.10	7.30	5.80	4.22	3.23
Reliability Coefficient	.86	.86	.89	.81	.79	.62
Mean	3.61	3.7	3.51	4.67	4.06	3.88
Standard deviation	1.05	1.31	1.46	1.25	1.28	1/18

Interpretation of Learning Orientations Components Part 2

The components from this analysis each have a double-barrelled name which describes the two polar ends of a continuum on a 7-point scale. Means above the central value of 4 indicate a leaning towards the second half of the characteristic and means lower than 4 indicate a

leaning towards the first characteristic. The components are described in descending order of distance from a mean of 4 as the greater the distance the more strongly the component describes the student body. However, it should be noted that overall none of these characteristics have a mean that is very far from 4.

Component 4, 'extrinsic-intrinsic motivation' had the greatest distance from 4 (0.67), indicating that overall tertiary students are higher on intrinsic motivation. Students who are intrinsically motivated tend to take courses that they find interesting and so enjoy studying. They are more likely to spend time reflecting on the ideas raised in their courses and seeking out additional information about the topics that they have covered in class. Students who are high on extrinsic motivation are generally not interested in the courses that they are taking and are likely to be taking the course because of some external pressure. This may be parents, employers or because the particular course is a gate keeper to another opportunity.

'Working alone-collaborative' was the third component to emerge. A mean of 3.51 suggests that overall the student body is more inclined to working alone than collaboratively. Students who are high on a preference for collaboration find working in groups stimulating and helpful to their studies. They believe that they will get higher grades from group work than by working on their own. By contrast students who prefer to work alone believe that group works slows their learning. They find that they do their best work on their own.

Component 1, 'factual-relativistic reasoning', also has a mean below 4, indicating a stronger preference for factually-based courses. Students who are high on a preference for factual courses prefer learning to be black and white, answers clearly right or wrong. They like learning practical concrete information rather than theories or abstract ideas. They like their courses to be highly structured and driven by the lecturer. At the opposite end of the spectrum, students high on relativistic reasoning enjoy spontaneity in their courses. They like to learn through argument and debate and will consider other perspectives before deciding their own position. These students recognise that things are rarely black or white and are able to tolerate ambiguity. They prefer courses that are flexible and able to follow interesting issues that arise in the course of a lesson. They also want to have input into decisions about the course content.

With a mean of 3.7, tertiary students are more inclined to a preference for reading information rather than having it visually presented. A high preference for reading indicates students who feel they understand written information better than visual and are more likely to summarise information in note form. Visual learners feel they are better at decoding visual information. They find graphical information easier to remember and are themselves more likely to use pictures and diagrams when studying.

The sixth component, 'sequential-global' has a mean only slightly below 4 suggesting more students are sequentially oriented than global. Those who are high on sequential learning like to stay focused on a topic and work systematically, step-by-step through their study material. Global learners, however, often find that learning one topic triggers associations with ideas from other areas. They move through material in more of a hyperlink mode to follow connections, rather than moving in a more structured way. While their pathways may seem random at first, at a particular point they find the big picture suddenly falls into place.

Tertiary students seem to be evenly balanced across 'dependent and independent learning'. Dependent learners accept without question the ideas and information given to them by lecturers. They have neither the confidence nor the inclination to challenge their lecturers. Independent learners however, believe that lecturers are not always right and feel comfortable disagreeing with them. These students will get independent verification of information before accepting it as true.

For each learning orientations students were categorised as being high, moderate or low (see Table 3.3). Generally the main group of students are 'moderate', but there are some interesting variations. For example, a large group of students are high on achievement motivation (46%), intrinsic motivation (39.9%), learning via text (33.4%), factual learning (28.7%), independent learning (22.1%), dependent learning (22.8%), sequential learning (24.4%) and working alone (38.9%). While these present a global picture of tertiary students' learning orientations, more striking differences emerge when learning orientations are examined in relation to specific groups of students.

Table 3.3: Proportions of students who are high, moderate or low on learning orientations as percentages

Learning Orientation	High	Moderate	Low
Effort	18.1	80.8	1.1
Listening	18.2	77.5	4.3
Time poorness	13.8	78.8	7.4
Goal Focus	46	53.8	0.2
Achievement Motivation	29.1	69.6	1.3
Relativistic Reasoning (rather than Factual)	8.8	62.5	28.7
Intrinsic (rather than Extrinsic) Motivation	39.9	49.8	10.3
Dependent (rather than Independent) Learning	21.1	56.1	22.8
Global Learning (rather than Sequential)	15.2	60.4	24.4
Text (rather than Visual) learning	33.4	52.3	14.3
Working Collaborative (rather than Alone)	14.8	46.3	38.9

Collectively the results of these two principal components analyses provide eleven useful components for describing student characteristics related to learning behaviour, attitudes and dispositions. The components from these two PCA's where then subjected to a second order principal components analysis. Second order PCA's have been widely used in measuring student characteristic (Biggs, 1987; Entwistle, 1991) as a way of exploring relationships between the first set of components.

Learner Profiles

The eleven learning orientations were expected to cluster together in a way that described students in a more holistic manner. These clusters of components have been called 'Learner Profiles' as they describe characteristics that are commonly found together in particular students.

The same procedure described earlier for the first order PCA was followed. The Kaiser-Meyer-Oklin was .68 The KMO together with Barlett's test of sphericity (2961.608; $p \leq 0.0000$) established the appropriateness of the data for principal component analysis. Three components emerged, accounting for 54% of the variance. The results are presented in Table 3.4.

Table 3.4: Second Order Principal Components Analysis using Learning Orientation Components

Component 1: Cognitive Voyager	**1**	**2**	**3**
Relativistic reasoning	**.87**	-.00	-.05
Global learning	**.79**	-.11	.19
Independent learning	**.69**	.07	-.29
Component 2: Strategic Competitor			
Achievement motivation	.00	**.80**	-.00
Effort	.04	**.78**	-.22
Goal focused	-.16	**.74**	.09
Component 3: Multimedia Collaborators			
Listening	.06	.24	**.68**
Visual	.37	-.07	**.61**
Collaborative	-.05	-.09	**.57**
Extrinsic motivation	-.22	-.43	**.49**
Time poorness	-.19	-.09	**.44**
Eigenvalues	2.3	2.1	1.6
% of variance	20.99	19.34	14.15
Reliability Coefficient	.73	.71	.51
Mean	3.87	3.76	4.31
Standard deviation	.97	.50	.82

Cognitive Voyagers

Three learning orientations came together to describe a learning profile called 'cognitive voyager'. These students are interested in exploring abstract ideas, theories and concepts. Through reflection, debate and discussion they are actively engaged in socially constructing knowledge that has personal meaning for themselves. Learning for them is a personal journey and they expect to be involved in charting the course. To some extent this profile represents a kind of intellectual maturing. Because they are interested in making meaningful connections, their learning pathways are more likely to follow hyper-jumps rather than structured linear

steps. They like to create the 'big picture' and identify the relationships that link ideas together.

These students accept nothing at face value, even when it comes from their teachers. Every idea is critically examined and independently tested. Teachers who don't substantiate their views are challenged.

As can be seen from figure 3.1, only about 12% of tertiary students might be considered moderately high to high on this profile. About 18% are low on this profile.

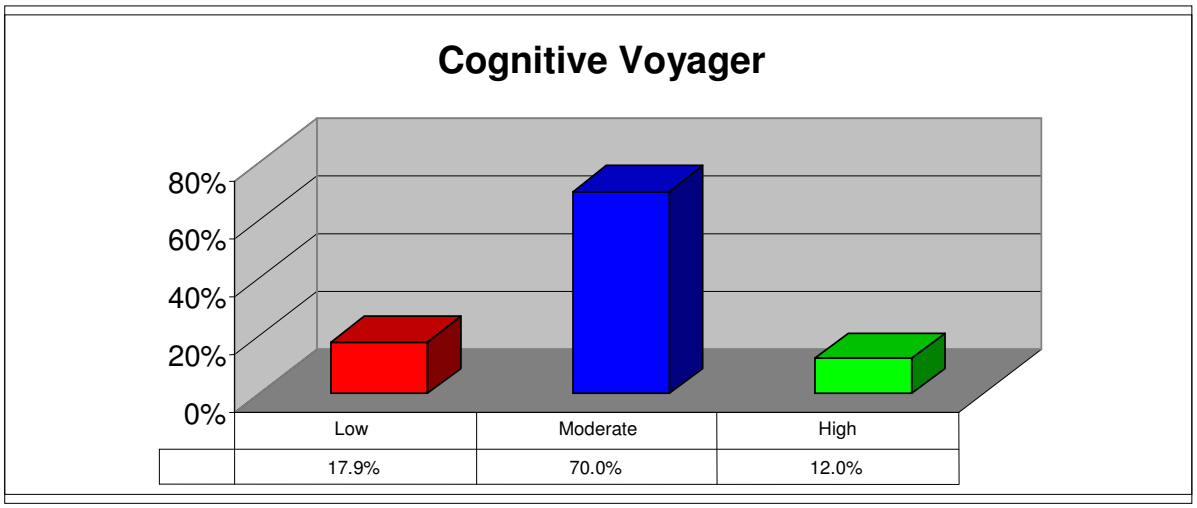


Figure 3.1: Distribution of a cognitive voyager profile in tertiary students

Strategic Competitors

The strategic competitor is also comprised of three learning orientations: achievement motivation, effort and goal focus. These students have a driving ambition to achieve academically and make study a top priority to achieve this end. Often they will place academic success above getting on with their classmates. One of the defining characteristics of these students is their willingness to put a lot of effort into their studies. They recognise the importance of understanding information rather than rote learning and are willing to do additional work to enhance their level of learning. Their willingness to work hard and go the extra mile is fostered by an enjoyment of studying.

Strategic competitors give themselves a good chance of achieving their goals by being highly disciplined in their study behaviour and focused in their attention to success factors. In many ways they see education as a game and believe that winning depends on understanding the rules and focusing tightly on the intended outcome. For them the key is assessment, and they pay close attention to cues from their lecturer about exams and tests. They make sure they are clear about assessment requirements and write to satisfy the expectations of their lecturer. Unlike the cognitive voyager they are likely to stay within the framework of the course and are not interested in pursuing interesting but tangential issues.

As can be seen in figure 3.2, about a third of tertiary students are high on this profile and only about 7% are low. About 60% of the tertiary population are moderate.

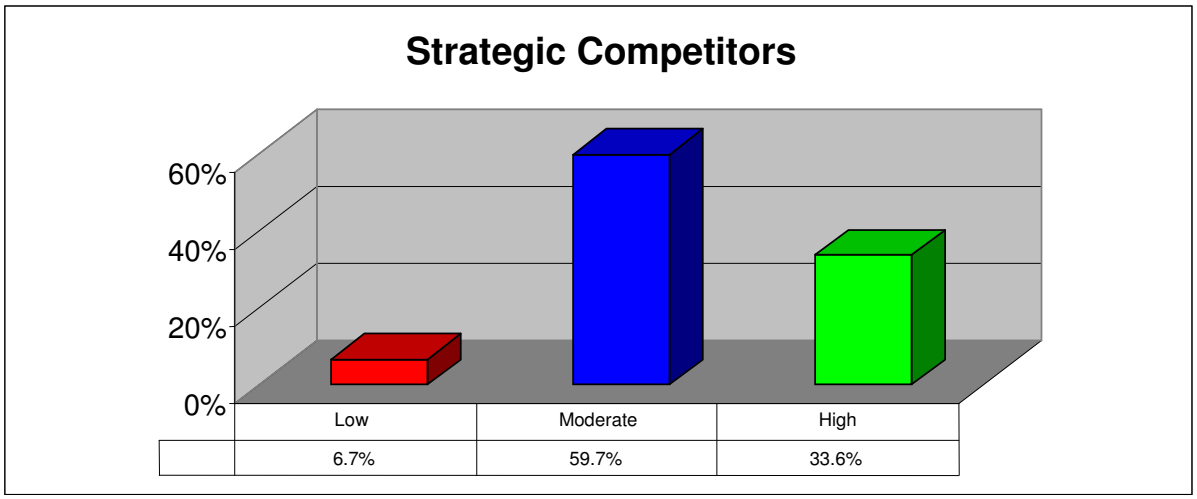


Figure 3.2: Distribution of a strategic competitor profile in tertiary students

Multimedia Collaborators

The third type of learner profile is the multimedia collaborator. This profile is comprised of five learning orientations: preferences for learning through listening, through visual modes, working collaboratively, extrinsic motivation and time-poorness.

These students had an aversion to reading long passages of text. They preferred to get their information from listening to explanations or in a diagrammatic format. They preferred working with other students in a group rather than studying alone. They were high on extrinsic motivation and studied for utilitarian reasons rather than being motivated by an

intrinsic interest in their courses. These students felt a great pressure of time. Other commitments crowded their lives, leaving little time for thoughtful reflection and consideration of ideas raised in class. Once a lecture was over this student immediately 'switches off'. About 20% of the student population were high on these characteristics (see figure 3.3).

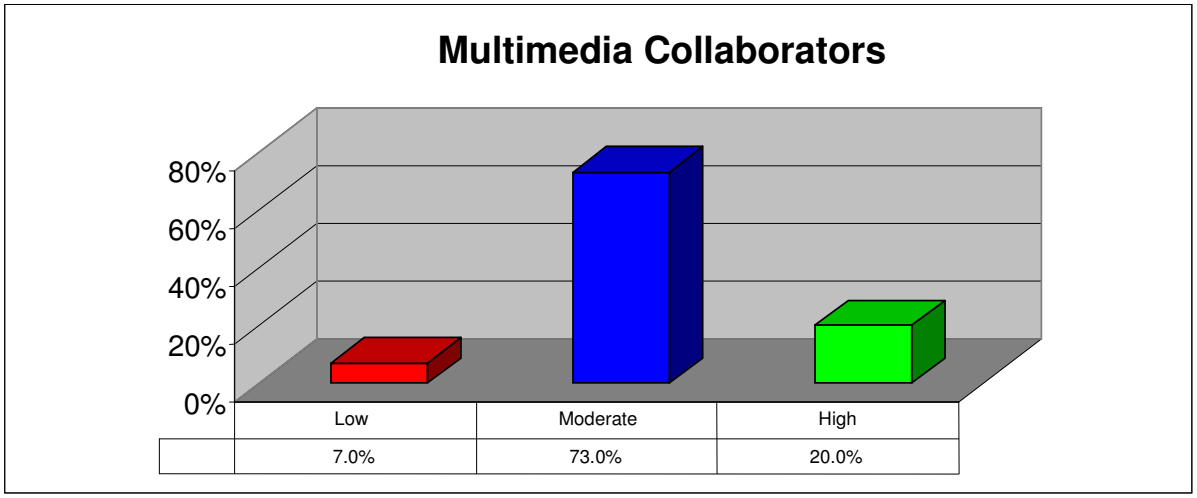


Figure 3.3: Distribution of a multimedia collaborative profile in tertiary students

Section Two: Differences between Groups

Differences in Learning Orientations

While the means and standard deviations of the principal components provided a global picture of tertiary students, ANOVA and t-tests were used to describe in greater detail the differences in learning orientations and learner profiles between groups of students. These results capture the diversity in approaches to learning by tertiary students. Students were grouped according to: generation (based on age), type of educational institution, type of qualification, ethnicity, and gender.

ANOVA is the appropriate procedure to use for testing for differences in means when there are more than 2 groups. A conservative post hoc test (Scheffe) was used to identify which groups differed from which. T-tests are appropriate for testing for different means when there are two groups such as gender (male and female). The full statistical results can be found in Appendix A, but for the sake of clarity and ease of understanding only the means of groups that were significantly different are presented here, together with an indication as to the direction of that difference.

Differences Between Generations

Age was used to divide the sample into generational groups as described by Oblinger (2003) (see Table 3.5). The full results for the ANOVA and the Scheffe Post Hoc can be found in Appendix A, Tables 1 and 2). A summary of the main features are presented in Table 3.5.

Table 3.5: Generational Groupings

Generation	Years Born	Age Group (years)	Group Size
Millennials	1983 – 2000	Under 23	887
Generation X	1965 – 1982	24 – 41	612
Baby Boomers	1947 – 1964	42 – 59	287
Matures*	1900 - 1946	60+	15

*Because the Mature group was so small it was deleted from further analysis.

Table 3.6: Means for the Three Generation Groups.

	Means		
	Millennials	Generation X	Baby Boomers
Listening All groups significantly different to each other	3.52	3.39	3.23
Effort All groups significantly different to each other	3.33	3.68	3.88
Text-Visual* All groups significantly different to each other	3.82	3.63	3.32
Working Alone -Collaborative* Only Gen X and Baby B's are not significantly different to each other	3.72	3.38	3.16
Extrinsic-Intrinsic Motivation* All groups significantly different to each other	4.34	4.81	5.38
Dependent-Independent Learning* All groups significantly different to each other	3.82	4.19	4.45
Goal Focus Only Gen X and Baby B's are not significantly different to each other	3.96	4.10	4.09

* For these components a mean lower than 4 tends more to the first side of the hyphen, higher than 4 tends closer to the other side. For example, millennials tend closer to a visual preference and Baby Boomers more to a text preference.

Looking at the results in Table 3.6 two clear patterns can be seen. Either there is a trend for a characteristic to increase progressively with age, or to decrease. Characteristics that become stronger as we get older are effort, intrinsic motivation and independent learning. Characteristics that are stronger in younger people are a preference for learning by listening and through visual formats rather than reading and working collaboratively. Goal focus increases very slightly with age, then seems to plateau.

Differences Between Educational Institutions

Four types of educational institution were surveyed: Universities, polytechnics, institutes and private training organisations. ANOVA was used to identify differences between students from different educational organisations (see table 3.7). For full results see tables 3 and 4 in Appendix A.

Table 3.7: Means for the Education Groups.

	Means			
	Universities	Polytechnics	Institutes	Private Organisations
Listening	3.48	3.17	3.52	3.74
Effort	3.47	3.69	3.45	3.89
Achievement Motivation	3.66	3.68	3.69	4.0
Text-Visual*	3.74	3.40	3.78	3.90
Working Alone - Collaborative *	3.59	3.12	3.72	3.90
Extrinsic-Intrinsic Motivation*	4.56	4.95	4.78	4.77

* For these components a mean lower than 4 tends more to the first side of the hyphen, higher than 4 tends closer to the other side.

There are no consistent patterns in Table 3.7 but there are some interesting observations. Students from private educational organisations have the highest preference for learning by listening and through visual means. They are also highest on effort, achievement motivation and a preference for working collaboratively. They are higher on intrinsic motivation than university students.

Polytechnics are lowest on listening and have the strongest preference for learning by text (reading). They are also highest on working alone and intrinsic motivation.
University students are highest on extrinsic motivation but in other respects are similar to institutes.

Differences Between Qualifications

Students were asked to specify which of fives types of educational qualification they were working towards: Certificate, diploma, degree, postgraduate diploma or postgraduate degree. ANOVA was used to identify differences between students studying for different qualifications (see table 3.8). For full results see tables 5 and 6 in Appendix A.

Table 3.8: Means for Qualifications

	Means				
	Certificates	Diplomas	Degrees	Postgraduate Diplomas	Postgraduate Degrees
Listening	3.60	3.37	3.41	3.41	3.45
Time-poorness	3.14	3.36	3.29	3.45	3.23
Effort	3.74	3.75	3.46	3.73	3.71
Achievement Motivation	3.86	3.70	3.66	3.62	3.74
Relativistic Reasoning	3.67	3.43	3.56	3.85	4.10
Working Alone - Collaborative *	3.87	3.37	3.53	3.15	3.40
Extrinsic-Intrinsic Motivation*	4.67	4.84	4.59	4.90	5.17
Dependent-Independent learning*	3.98	4.01	3.99	4.55	4.57
Sequential-Global*	3.78	3.62	3.90	4.03	4.28

Table 3.8 does not show clear trends or patterns but again a number of interesting observations are apparent. Certificate students are the least time-poor and postgraduate diploma students the highest. Degree students are significantly lower on effort than all other students. Achievement motivation is highest for certificate students and lowest for degree and postgraduate diploma students.

Postgraduate degree students are higher than others on relativistic reasoning and global learning than others. Postgraduate diploma students show the strongest tendency to working alone, while Certificate students are the lowest. However, all groups show an overall preference for working alone. Generally, the higher the level of qualification, the higher the level of intrinsic motivation. The stand out exception to this is degree students who have the lowest intrinsic motivation. Post graduate students are higher on independent learning than undergraduates.

Differences Between Ethnicities

In the questionnaire students identified themselves into 35 different ethnicities. These were reorganised into five major categories: Europeans, NZ Maori, Polynesians, Chinese and other Asians. The Chinese were kept as a separate group because they formed a significant sized

group in the sample (approximately 400). Analysis found this group to be quite distinct from the group of other Asian students on several learning orientations, confirming the decision to keep them separate. 'Other Asians' included students from: India, Burma, Korea, Cambodia, Indonesia, Sri Lanka, Pakistan, Malaysia, Vietnam, Japan, Singapore, Bangladesh, Hong Kong and Thailand. NZ Maori were also kept as a distinct category because of their unique status as indigenous people in New Zealand.

Table 3.9: Means for the Ethnic Groups

	Means				
	Europeans	NZ Maori	Polynesians	Chinese	Asian (excluding Chinese)
Listening	3.31	3.71	3.68	3.56	3.59
Achievement Motivation	3.67	3.81	4.12	3.58	3.79
Relativistic Reasoning	3.56	3.64	3.63	3.76	3.44
Text-Visual	3.55	3.93	3.66	3.95	3.52
Working Alone - Collaborative*	3.18	3.71	3.85	4.17	3.77
Extrinsic-Intrinsic Motivation*	4.97	4.55	4.62	3.92	4.62
Dependent-Independent learning*	4.18	4.12	3.90	3.84	3.65

Most differences are between European students and Chinese, though sometimes also other Asian students. Europeans have the lowest preference for learning by listening. Polynesians are higher than other groups on achievement motivation. Chinese students are slightly higher than others on relativistic reasoning, but this difference is small. Chinese and NZ Maori students have the highest preference for learning through visual methods. Europeans prefer text (reading). Europeans are also highest on working alone, independent learning and intrinsic motivation. Chinese students are highest on extrinsic motivation. Chinese and other Asian students have the highest means on dependent learning.

Differences Between Major Subjects

Students were asked to specify their major subject areas. Some did this very specifically, for example marketing, while others identified more general categories such as business. Initially these were categorised into 17 major groups and then re-categorised into 7 groups on the basis of similarity of content area. Business as a general category was kept but those business

students who gave a more specific answer were grouped according to the type of content. Library studies were included with IT because a large portion of the library courses identified seemed to indicate an emphasis on computer and knowledge management.

Table3.10: Means for the Majors

	Means						
	Business	Humanities, Education, marketing, HRM, Law	Medicine & Science	Fine Arts	Technology & Engineering	Finance, Accounting, Economics	IT, Information Systems & Library Studies
Effort	3.54	3.57	3.52	3.30	3.49	3.56	3.61
Relativistic Reasoning	3.75	3.76	3.10	4.67	3.25	3.26	3.64
Text-Visual	3.83	3.49	3.72	4.28	4.02	3.61	3.67
Working Alone -Collaborative*	3.82	3.33	3.24	3.42	4.05	3.64	3.60
Extrinsic-Intrinsic Motivation*	4.17	4.92	4.91	5.43	4.54	4.25	4.71
Sequential-Global*	3.76	4.00	3.72	4.61	3.81	3.56	3.83
Goal focus	4.00	4.07	4.12	3.64	3.95	4.05	4.01

Some interesting patterns emerge based on majors (see Table 3.10). Fine arts students are the most distinctly different to other students. They are lowest on effort (IT & library students are highest) and lowest on goal focus. They are highest on relativistic reasoning, though business and humanities are higher than other students. Fine arts students are also highest on global learning, and again humanities are second highest. The size of the difference between fine arts students and others is quite high. Fine arts students are also highest in preferring visual learning, while humanities and finance students are the lowest.

Technology students have the strongest preference for working collaboratively, followed by business students. Both of these groups are significant higher than humanities and medical groups. Business and finance students have the highest levels of extrinsic motivation.

Differences Between Domestic or International Student Status

T-tests were used to identify differences between domestic and international students (see Table 3.11). Full results can be found in Appendix A, Tables 11.

Table 3.11: Differences between Domestic and International Students

	Domestic Means	International Means	Mean Difference
Listening	3.39	3.54	-.14191
Effort	3.57	3.46	.10700
Achievement Motivation	3.71	3.60	.11851
Factual - Relativistic Reasoning	3.56	3.76	-.20492
Text-Visual	3.61	3.88	-.26629
Working Alone -Collaborative	3.33	4.11	-.78037
Extrinsic-Intrinsic Motivation	4.87	4.00	.86441
Dependent-Independent Learning	4.13	3.80	.33465
Sequential-Global	3.90	3.75	.15176
Goal Focus	4.05	3.98	.06737

* All means significant at either 0.05 or 0.01 levels.

While there were statistically significant differences in all of the means shown above, many of them were very small in size and therefore of little importance. The largest difference was in intrinsic motivation, with domestic students being much higher. There was also a large difference in collaborativeness, with domestic students having a preference for working alone and internationals preferring to collaboratively. International students were also higher on dependent learning, visual learning and relativistic reasoning.

Differences Between Genders

T-tests were used to identify differences in learning orientations based on gender (see Table 3.12 below and Table 12 in Appendix A for full results).

Table 3.12: Gender Differences

	Male Means	Female Means	Mean Difference
Listening	3.48	3.40	.08545
Effort	3.42	3.61	-.19331
Achievement Motivation	3.62	3.72	-.10092
Time -poorness	3.22	3.32	-.10349
Relativistic Reasoning	3.69	3.56	.13074
Text-Visual	3.89	3.56	.32564
Working Alone -Collaborative	3.73	3.39	.33878
Extrinsic-Intrinsic Motivation	4.38	4.83	-.44458
Dependent-Independent Learning	4.21	3.98	.23243
Sequential-Global	3.99	3.84	.15009
Goal Focus	3.95	4.08	-.12642

Most of the differences found were very small. Some moderate differences are: females are higher on intrinsic motivation, a preference for learning by reading (text) and working alone. Males are slightly lower on dependent learning.

Differences in Learner Profiles

ANOVAS and t-tests were also used to identify differences in learner profiles. Again the full results can be found in Appendix A.

Differences Between Generations

The patterns that appeared in the learning orientations analysis are also apparent here. As people age they are likely to grow stronger as cognitive voyagers or strategic competitors. Multimedia collaborators are more strongly associated with younger students (see Table 3.13 below and Tables 13 and 14 in Appendix A).

Table 3.13 Means for Generations

	Means		
	Millennials	**Generation X**	**Baby Boomers**
Cognitive Voyagers Millennials are different to Baby B's, but no other differences	3.77	3.88	4.01
Strategic Competitors Millennials different to Gen X and Baby B's	3.66	3.85	3.87
Multimedia Collaborators All groups significantly different to each other	4.49	4.23	3.90

Differences between Educational Institutions

As can be seen in Table 3.14 Polytechnics have fewer multimedia loners and private organisations have slightly more strategic competitors. See also Appendix A Tables 15 and 16.

Table 3.14: Means for Institutions

	Means			
	Universities	**Polytechnics**	**Institutes**	**Private Organisations**
Strategic Competitors	3.72	3.81	3.71	3.98
Multimedia Collaborators	4.38	4.01	4.39	4.47

Differences Between Qualifications

Students studying at a postgraduate level are more likely to be cognitive voyagers than undergraduates. Degree students are the least likely to be strategic competitors (see Table 3.15 below and Tables 17 and 18 in Appendix A).

Table 3.15: Means for Qualifications

	Means				
	Certificates	**Diplomas**	**Degrees**	**Postgraduate diplomas**	**Postgraduate degrees**
Cognitive Voyager	3.81	3.69	3.82	4.17	4.37
Strategic Competitors	3.86	3.83	3.72	3.78	3.81

Differences Between Ethnicities

The major ethnic difference is that Chinese students are the least likely to be strategic competitors: they are significantly lower than New Zealand Maori or Polynesian. The strongest strategic competitors are Polynesian students. Chinese students are the highest group of multimedia collaborators and Europeans are the lowest (see Table 3.16 and Tables 19 and 20 in Appendix A).

Table 3.16: Means for Ethnicities

	Means				
	European	**NZ Maori**	**Polynesian**	**Chinese**	**Other Asians**
Strategic Competitors	3.75	3.87	4.04	3.68	3.79
Multimedia Collaborators	4.09	4.55	4.47	4.76	4.38

Differences Between Majors

Fine arts students are much more inclined to be cognitive voyagers than other students though humanities students are also higher than others. Conversely, fine arts students are much lower than other students on strategic competition. Humanities students are the least likely to be multimedia loners and business and technology students the most likely (see Table 3.17 below and Tables 21 and 22 in Appendix A).

Table 3.17: Majors and Learner Profiles

	Means						
	Business	Humanities, Education, marketing, HRM, Law	Medicine & Science	Fine Arts	Technology & Engineering	Finance, Accounting, Economics	IT, Information Systems & Library Studies
Cognitive Voyagers	3.84	4.01	3.56	4.55	3.67	3.51	3.90
Strategic Competitors	3.74	3.78	3.79	3.52	3.72	3.79	3.73
Multimedia Collaborators	4.57	4.12	4.22	4.25	4.53	4.45	4.29

Differences between Domestic and International students

International students are much more likely than domestic students to be multimedia loners. The difference between the two groups on strategic competition is statistically significance but very small in real terms (see Table 3.18 and Table 23 in Appendix A).

Table 3.18: Mean Differences between Domestic and International Students

	Domestic Means	International Means	Mean Difference
Strategic Competitor	3.78	3.68	.09778
Multimedia Collaborator	4.19	4.70	-.50926

Differences in Gender

Males are slightly more likely to be cognitive voyagers or multimedia collaborators than females (see Table 3.19 below and Table 24 in Appendix A).

Table 3.19: Mean Differences in Gender

	Male Means	Female Means	Mean Differences
Cognitive Voyager	4.01	3.80	.21118
Strategic Competitor	3.66	3.80	-.13957
Multimedia Collaborator	4.48	4.21	.26767

Section Three: Perceptions of Teaching, Information Sources and Knowledge

Teaching Modes

Students were asked to rate eight teaching modes according to how well they liked them. The results are presented in Table 3.20 in descending order from the most to the least popular. These results confirmed previous findings (Hunt, Eagle, & Thomas, 2002) that students mostly prefer traditional teaching modes (1, 2 and 3 in Table 3.20). All forms of online learning rate just above neutral, though it should be noted that blended learning (a mixture of online and traditional) rate the highest of online formats. Least liked are student teaching modes.

Table 3.20: Students Preference for Teaching Modes

	Mean	Std. Error	Std Deviation
1. Printed study materials such as study guides, textbooks	3.9486	.02186	.92955
2. Tutorials	3.7197	.02102	.89396
3. Lectures	3.6147	.02129	.90550
4. Mixture of online and lectures	3.4801	.02199	.93487
5. Online discussions, chat-rooms developed by teachers	3.2315	.02356	1.00118
6. Fully online courses	3.0543	.02633	1.11913
7. Group projects	3.0443	.02563	1.08855
8. Student presentations	2.9296	.02499	1.06185

Students' preference for teaching modes was further investigated by categorising students into groups who either like or dislike particular modes (see Table 3.21). Students who were relatively neutral were omitted. For all teaching modes the majority of cases were accounted for by these two groups, suggesting that students feel strongly about which teaching modes they like or dislike.

Table 3.21: Proportions of Students who Like or Dislike Teaching Modes as Percentages

Teaching Modes	Millennials		Generation X		Baby Boomers	
	Like	Dislike	Like	Dislike	Like	Dislike
Printed study materials such as study guides, textbooks	64.8	11.4	79.6	4.9	86.7	3.5
Tutorials	57.9	9.9	66.2	6.8	70.3	6.6
Lectures	57.5	10.8	61.5	9.3	60	10.1
Mixture of online and lectures	50.9	13.6	51.8	10.8	47.4	17.1
Online discussions, chat-rooms developed by teachers	39.2	22.1	42	14.1	40.1	27.9
Fully online courses	30.6	34.4	38.9	26	38.7	31
Group projects	37.2	24.9	35.1	33.9	27.5	40.4
Student presentations	29.5	34.9	30.6	34.8	31.4	31.7

Influences on Preference for Teaching Modes

Standard multiple regression was performed to determine the influence of a range of learning orientations on preference for teaching modes. Multiple regression was chosen as an appropriate measure for predicting the influence of several independent variables on a dependent variable. Standard multiple regression in which all of the independent variables were entered in a single block was used as there was no strong theoretical basis for ordering their entry into the equation (Tabachnick & Fidell, 1989).

While some significant influence on all teaching modes was found, only five were large enough to be of interest. These are reported in Tables 3.22 to 3.26. Results are presented in descending order of influence. The size of the beta value indicates the level of influence a learning orientation has on how well students like a particular mode of teaching, however, it

is not appropriate to compare beta variables across teaching modes. The value has meaning only within each specific regression. Learning orientations accounted for between 11% and 35.5% of the variance.

It can be seen from Table 3.22 that a preference for learning by listening has the strongest influence on a liking for lectures. Intrinsic motivation and a goal focus have a moderate influence and small contributions are made by effort, working alone and a preference for reading rather than visual learning. These account for 23% of the variance.

Table 3.22: Multiple regression showing influence of learning orientations on preference for lectures

Lecture	**Beta**	**T ratio**
Listening	.402**	15.8
Extrinsic - Intrinsic Motivation	.163**	5.94
Goal focus	.123**	4.67
Effort	.096**	3.19
Working alone -Collaborative	-.085*	-3.3
Text-Visual	-.084**	-3.1
R^2 = .23		
Adjusted R^2 = .23		
F = 38.3		
F Sign =.0000		

** ρ<.01 * ρ<.05

In Table 3.23 the strongest predictor of a liking for tutorials is again listening followed quite closely by intrinsic motivation. Moderate predictors are effort, a preference for collaboration and independent learning. A preference for visual learning makes a small contribution. These learning orientations account for 11% of the variance.

Table 3.23: Multiple regression showing influence of learning orientations on preference for tutorials

Tutorials	**Beta**	**T ratio**
Listening	.185**	6.80
Extrinsic - Intrinsic motivation	.151**	5.17
Effort	.105**	3.27
Working alone- Collaborative	.097**	3.59
Independent	0.84**	2.81
Text-Visual	.060*	2.11
R^2 = .12		
Adjusted R^2 = .113		
F = 17.13		
F Sign = .0000		

** ρ<.01 * ρ<.05

The most important predictor of a preference for printed study materials is effort. Students who are low on listening are more likely to prefer this mode of teaching as are students who enjoy working alone and learning by reading (text). Small contributions are made by students who tend to factual learning, are low on achievement motivation and high in intrinsic motivation. These collectively account for 23% of the variance (see Table 3.24).

Table 3.24: Multiple regression showing influence of learning orientations on preference for printed study materials

Printed Study Materials	**Beta**	**T ratio**
Effort	.280**	9.34
Listening	-.191**	-7.53
Working alone -Collaborative	-.125**	-4.94
Text-Visual	-.123**	-4.64
Factual learning – relativistic reasoning	-.07*	-2.33
Achievement motivation	-.064*	-2.22
Extrinsic - Intrinsic motivation	.062*	2.28
R^2 = .24		
Adjusted R^2 =.23		
F = 38.7		
F Sign = .0000		

** ρ<.01 * ρ<.05

Enjoyment of group work is very strongly predicted by a liking for working collaboratively. A moderate contribution is made by relativistic reasoning and minor contributions come from achievement motivation, visual learning and effort (see table 3.25). These influences account for 35% of the variance.

Table 3.25: Multiple regression showing influence of learning orientations on preference for group projects

Group Projects	**Beta**	**T ratio**
Working alone -Collaborative	.567**	24.5
Factual - Relativistic reasoning	.114**	3.78
Achievement motivation	.076**	2.9
Text-Visual	.062*	2.55
Effort	.062*	2.27
R^2 =.36		
Adjusted R^2 =.355		
F = 71.0		
F Sign = .0000		

** $\rho<.01$ * $\rho<.05$

As with group work, student presentations are strongly predicted by a preference for working collaboratively and relativistic reasoning. Moderate contributions are made by achievement motivation, listening and effort. Generally, the type of student who likes group work will also like student presentations (see Table 3.26).

Table 3.26: Multiple regression showing influence of learning orientations on preference for student presentations

Student Presentations	**Beta**	**T ratio**
Working alone -Collaborative	.234**	8.88
Factual - Relativistic reasoning	.201**	5.83
Listening	.121**	4.58
Achievement motivation	.121**	4.06
Effort	.112*	3.57
Dependent-Independent Learning	.083**	2.85
R^2 =.170		
Adjusted R^2 =.163		
F = 25.77		
F Sign = .0000		

** ρ<.01 * ρ<.05

Fully online courses were weakly predicted by effort and extrinsic motivation (see Table 3.27).

Table 3.27: Multiple regression showing influence of learning orientations on preference for fully online courses

Fully Online Courses	**Beta**	**T ratio**
Effort	.177**	5.258
Extrinsic-Intrinsic motivation	-.199**	-3.86
R^2 =.031		
Adjusted R^2 =.023		
F = 4.03		
F Sign = .0000		

** ρ<.01 * ρ<.05

A liking for online discussion or chatrooms was weakly predicted by effort, relativistic-reasoning and extrinsic motivation (see Table 3.28).

Table 3.28: Multiple regression showing influence of learning orientations on preference for online discussions, chatrooms developed by teachers

Online Discussions, chatrooms developed by teachers	**Beta**	**T ratio**
Effort	.098**	2.89
Factual-Relativistic-reasoning	.09**	2.41
Extrinsic-Intrinsic motivation	-.05*	-1.61
R^2 =.026		
Adjusted R^2 =.019		
F = 3.4		
F Sign = .0000		

** ρ<.01 * ρ<.05

A liking of blended courses was predicted by a listening orientation (see Table 3.29).

Table 3.29: Multiple regression showing influence of learning orientations on preference for a Mixture of Online and Traditional Courses

Blended Online and Traditional	Beta	T ratio
Listening	.088**	3.09
R^2 =.031		
Adjusted R^2 =.024		
F = 4.09		
F Sign = .0000		

** ρ<.01

Sources of Information

Students were asked to rate how often they used a range of information sources when studying for tests, exams or working on assignments. Tables 3.30 and 3.31 show that traditional textbooks are marginally ahead of the internet as the main source of information. Online library resources are less popular than library books and journals. Other students are also a useful source of information.

Table 3.30: Sources of Information for Learning

	Mean	Std. Error	Std Deviation
Set textbooks, study guides	4.2136	.02012	.85543
Internet	4.1249	.02385	1.01421
Library – printed books and journals	3.5266	.02844	1.20815
Library – online resources	3.2432	.02965	1.25960
Other students	2.4250	.03220	1.20463

Table 3.31: Sources of Information and High Usage

Sources of Information	Percentage of students who use source often or very often
Set textbooks, study guides	82.4
Internet	77.4
Library – printed books and journals	55.2
Library – online resources	44.9
Other students	18.7

When these figures are broken down by qualification and generation some interesting differences emerged. Across the board Certificate students make less use of all resources than

any other students. Graduate students make greater use of library online resources than other students (see Table 3.32).

Table 3.32: Means By Qualifications

	Means				
	Certificates	Diplomas	Degrees	Postgraduate Diplomas	Postgraduate Degrees
Set textbooks, study guides	3.87	4.40	4.21	4.37	4.15
Internet	3.78	4.12	4.15	4.26	4.21
Library – printed books and journals	3.03	3.44	3.56	3.83	3.68
Library – online resources	2.68	3.02	3.26	3.72	2.78
Other students	2.71	2.11	2.47	2.14	2.31

Table 3.33 Show that the older the student, the more likely they are to use printed materials. No significant differences would found between the age groups in their use of the internet. Older students are more likely than younger students to use the library's online resources. Younger students rely more heavily on other students to provide them with information than older students. See Appendix A, Tables 27-30 for Anova results

Table 3.33 Means By Generations

	Means		
	Millennials	**Generation X**	**Baby Boomers**
Set textbooks, study guides	4.03	4.30	4.56
Internet	4.15	4.13	4.07
Library – printed books and journals	3.35	3.60	3.89
Library – online resources	3.13	3.31	3.45
Other students	2.70	2.30	2.06

Knowledge and Skills

Students were asked to rate the importance of a range of skills and knowledge in terms of their careers. While all knowledge and skills were rated as quite important or higher, 'knowing how to get information you need' was rated as the most important (see Table 3.34). Having a large body of knowledge, traditionally considered important, was rated as the least important.

Table 3.34: What's Important to Know

	Mean	**Std. Error**	**Std Deviation**
Knowing how to get information you need	4.6036	.01482	.63054
Being able to evaluate the worth of information	4.4035	.01764	.75015

Knowing how to learn effectively	4.3858	.01753	.74544
Being able to use a computer	4.2653	.02017	.85789
Having a large amount of knowledge about the subjects you are studying.	4.1163	.01973	.83867

Using the Computer

Students were asked how often they used the computer for a range of activities. As can be seen from Table 3.35 email, finding information and word processing are the most common uses.

Table 3.35: Computer Uses

	Mean	Std. Error	Std Deviation
Email	4.39	.024	1.00
Finding information	4.37	.022	.929
Word processing	4.23	.024	.99
Entertainment	3.03	.036	1.49
Spreadsheets	2.78	.033	1.39
Communications (chatrooms, MSN etc)	2.60	.038	1.58
Design tools	2.37	.031	1.31
Shopping	2.05	.024	1.21

Chapter

4

DISCUSSION

This study had two main aims. First, it sought to describe the important learning characteristics of tertiary students in ways that would be helpful to educational institutions, teachers and students in improving the learning experience of diverse students. The second aim was to examine the relationship between students' characteristics and modes of teaching. This was considered to be a useful approach to understanding student attitudes to new technologies in learning, particularly given findings of student resistance to the introduction of online learning.

A Framework for Learning Orientations?

For the past 35 years researchers have struggled to realise the benefits of accommodating individual differences in teaching practices. Cronbach (1967) recognised that students' learning characteristics varied and so teaching needed to provide alternatives to match those differences. However, efforts to create effective interactions between students and the learning environment have produced contradictory and disappointing results (Lawless & Kulikowich, 1998). Despite this failure, the area has attracted a huge amount of attention from researchers and practitioners, generating a profusion of definitions, measures, theoretical orientations and perspectives and models (Cassidy, 2004; Roodenburg, 2003; Song, 2002) A number of researchers have tried to bring order and structure to this chaos by imposing upon it frameworks or models that seek to classify, unify and identify the relationships between the various approaches (Curry, 1983; Miller, 1987; Riding & Cheema, 1991; Sternberg, 1997). While these attempts at order help to clarify the nature and diversity of instruments used in the area they do little to advance the central problem. How can we improve learning by matching student learning characteristics to appropriate teaching or learning contexts?

One of the issues that it apparent from the work of the unifiers is that most instruments have focused on a small number of cognitively-based styles or preferences (see for example, Felder & Spurlin, 2005; Witkin et al., 1977). In the late 1980's Snow (1987) expressed the need to expand the range of characteristics considered for individual differences research to include conative and affective factors in addition to the more commonly studied cognitive variables. Subsequent research lends weight to his advice (Jackson III, 1998; Snow & Jackson III, 1997).

The structure of the instrument used in the current study was developed pragmatically rather than theoretically. Given the lack of a unified theoretical framework it was felt that taking a more inductive approach might at least provide insight into understanding the diversity of student characteristics and at most provide pointers for the future development of theoretical perspectives. The scales were not, however, developed in a vacuum. Notice was taken of the advice of Snow (1987) to include conative, affective and cognitive aspects. The work of Curry (1983) influenced the decision to take a whole-person approach and look at a range of characteristics spanning the learning process. Finally, characteristics were only included if an argument could be made for their impact on learning outcomes or the quality of the learning experience, and their modifiability to the needs of students.

The replication of the eleven characteristics from a previous study as predicted, their good reliability and their subsequent formation into three larger learner profiles lends encouragement to this approach. Further, differences in learning orientations and learning profiles between students on the basis of ethnicity, age and other demographic variables lends further support to the notion that these characteristics may be useful for identifying diverse approaches and preferences in the tertiary student body. All of the orientation and profiles have face and theoretical validity, though further research is needed to establish their usefulness in responding to differential teaching/learning activities.

Learner Profiles

Three learner profiles emerged from the second order principal components analysis, which describe alternative pathways to learning. The profiles are comprised of a range of

conative/affective, cognitive, perceptual and behavioural factors which present a detailed, but holistic view of the student's approach to learning.

Strategic Competitors

The most common pathway is that of the strategic competitor. About a third of tertiary students are high on this profile and only about 7% are low. The strongest characteristic of this group of students is their driving ambition to achieve academically. Often they will place academic success above friendship with their classmates.

These students use two main approaches to achieve their goals. First, they put a great deal of effort into their study. They willingly undertake set tasks but also seek out additional readings and information to enhance their understanding. Their effort is underpinned by an enjoyment of studying, but they are also highly disciplined in their work habits. The second strategy they use is to focus very clearly on the goal, which they define as successfully passing the paper. Early in the course they clarify the lecturer's expectations and requirements with regard to assessment then carefully monitor interactions with the lecturer for hints and cues that might advantage them when undertaking assessment activities.

A number of studies show these same characteristics coalescing. Dweck and Elliot (1983) found that focusing on goals, a characteristic associated with achievement motivation, guides the student's approach to the task. Further, students high on these factors are likely to make a greater effort, be more persistent and achieve better learning outcomes (Al-Ansari, 2005). Anderman and Midgley (1992) found that learning goal oriented students are more likely to use self-regulatory strategies, similar to the disciplined strategies of the strategic competitor, and deep-level comprehension strategies when studying.

Glimpses of strategic competitors can be found in other studies. Some of the terms used by Riding and Cheema (1991) to describe a dimension they call 'analytic' are reminiscent of the strategic competitor: deductive, rigorous, constrained, convergent, formal. Similarities can also be found with Entwistle and Ramsden's Approaches to Studying (ASI) (1983) and Bigg's Study Process Questionnaire (SPQ) (1987). Strategic competitors work hard to understand the course content: the ASI's 'meaning orientation' and the SPQ's "deep strategy"

describe this as an intention to understand the material and to construct meaning from it. The SPQ also has a factor called "achieving" which describes a competitive approach, similar to the 'strategic approach' in the ASI. Both of these dimensions are very similar to the 'achievement motivation' of the strategic competitor. Just as the strategic competitor is associated with a very disciplined approach, Entwistles and Ramsden's (1983) 'strategic approach' is negatively correlated with 'disorganised studying'.

Although the evidence suggests that these students tend to be academically successful (Al-Ansari, 2005), there are some issues that need consideration. These students are careful to stay within the square. They are not gamblers or risk-takers. They accept the rules and the objectives given by their lecturers and do not challenge these nor present alternatives. The strategic competitor profile suggests that these students learn the rules of the game then play to win. It would seem that they see the lecturer's views and opinion on what is important and worth learning as one of the main rules. An explanation of this characteristic may be found in McClelland's concept of achievement motivation (McClelland, 1985). McClelland says students high in achievement motivation are likely to set moderately difficult tasks that stretch their ability – but not too much. They will engage in this behaviour only as long as they can influence the outcome. By carefully identifying and meeting all of the requirements to pass the course assessment, including factoring in the lecturer's influence, strategic competitors can exert a great deal of influence on the outcomes. Should they challenge the objectives set by the lecturer, or even set learning objectives that are at odds with those of the lecturer, they begin to lose this control. Given the new educational goals to produce flexible, independent thinkers (Candy, 2000), this tendency to play safe rather than challenging their teachers or push boundaries may be an issue worth addressing. Perhaps part of the problem is related to the dominance of traditional modes of teaching in which the lecturer holds centre stage and is the primary voice in presenting information. Other modes of teaching may provide the opportunity for a greater variety of voices, including the student's own.

While strategic competitors are more prevalent than either cognitive voyagers or multimedia collaborators, they are more predominant in some groups of students than others. They are more likely to be older students and are found in higher proportions in private educational organisations than in other tertiary institutions. Polynesian students are significantly higher on

strategic competition than all other groups, though they are closely followed by New Zealand Maori. Chinese students are lower than other groups on this profile.

Strategic competitors are fairly evenly distributed among subject majors except for fine arts students who were much lower on this profile. Very small differences between domestic and international students, and males and females were found, but these were not big enough to be of any importance.

Cognitive Voyagers

Cognitive voyagers are found less commonly than strategic competitors. Only about 12% of tertiary students are high on this profile, but nearly 20% are low. The strongest characteristic of these students is their interest in exploring ideas, theories and abstract concepts. They understand learning to be a personal journey during which they engage in reflection, debate and discussion to socially construct knowledge that also has personal meaning for them. This profile seems to represent a kind of intellectual maturing in which the students become aware that learning is not about finding the 'right' answer because most things are relative and the world is too complex to be reduced to simple black and white solutions.

Cognitive voyagers are high on global learning and independence and these two attributes make hypermedia learning particularly suitable for them. Global learners quickly create a 'big picture' and then move freely through that domain in a non-linear manner, following associations and connections. These independent students like to take control of their own learning process and to determine their own goals and approaches. Such students are thought to benefit from the hypermedia format of online learning in a number of ways. The big picture that globalists develop aids their navigation through the branching format of hypermedia, making it less likely they will lost or disorientated (Graff, 2003). Hypermedia formats also allow students to structure and sequence their learning in a manner that makes personal sense to them and meets their own learning goals (Barua, 2001). Using hypermedia formats they can take charge of their learning experience, shaping it to their needs, not those of the lecturer.

This is not the case for dependent learners who may feel lost and confused in this unstructured environment. Dependent students prefer the security and structure of a teacher in a traditional role directing their learning (Sadler-Smith, 1996b), and have difficulty determining how to sequence and structure their learning in a hypermedia environment (Ford & Chen, 2000). This inability to take control of their own learning results in unsatisfactory learning pathways that may miss out significant parts of the information (Chen & Angelides, 2003). Dependent learners, unused to controlling their own learning, feel overwhelmed by the constant choices and decisions they must make (Neilsen, 2000).

By contrast global learners prefer to be free from the restraints of linear sequencing and pacing that dominates traditional teaching such as lectures. Global learners study and think in jumps that follow a network of conceptually related associations rather than in a linear sequence which they find restrictive and frustrating. A hypermedia learning environment allows them to use the hypermedia environment to reflect the natural bent of their global style.

Unfortunately, most students are sequential rather than global. Just as global learners are likely to be more comfortable in a hypermedia environment, sequential learners may be disadvantaged. The flexibility that liberates the global learner can leave the sequential learner feeling disorientated and overwhelmed by the need to determine their own pathways (Neilsen, 2000). Learning in a hypermedia environment requires the student to perform two simultaneous tasks: learn the content and navigate through the system. Students who lack these navigational skills have a dramatically increased workload because now more of their attention and processing capacity must be devoted to navigating and less is available for learning (Graff, 2003; Sweller, 1994).

A second consideration is the way in which sequential learners tend to view information as a series of separate parts, making it difficult for them to structure these discrete units into a meaningful whole (Riding & Grimley, 1999). Information is presented in a fragmentary way in hypermedia formats, exacerbating the natural tendency of the sequential learner to see the parts not the whole and increasing their difficulty in learning in a meaningful way (Graff, 2003). The combined effect of navigational difficulties and fragmentation of information has

a detrimental effect on learning performance for sequential learners (Graff, 2003; Riding & Grimley, 1999). Gygi (1990) suggests that these students can be helped in a hypermedia environment by the provision of 'discourse cues' which act as signposts to the structure and organisation of material within the website. Graff (2003) proposes two aids for the sequential learner: the incorporation of a website overview function that acts a map, and the de-segregation of information to help sequential learners see information in a more holistic way. Mitchell, Chen and Macreadie (2005) offer a third solution. They found that prior knowledge of the content domain and system expertise influenced student performance in hypermedia learning and suggested that a tutorial on the hypermedia system reduced difficulties with navigation and disorientation.

Cognitive voyagers accept nothing at face value, even when it comes from their teachers. Every idea is critically examined and independently tested. Teachers who don't substantiate their views are challenged. While lecturers may claim to be actively fostering such students it is possible that these students do not always do as well as might be expected. Some teachers find constant challenge from such students a distracting irritant or even a threat to their authority. This attitude tends not to translate into good grades for students. This notion finds resonance in styles of convergence and divergence. Convergers seek the one accepted correct answer while divergers tend to generate a number of potentially acceptable solutions to the problem (Cassidy, 2004). According to Getzels and Jackson (1982) divergent thinking is incompatible with the inherent structure and routine of formal education and is therefore unpopular with teachers and discouraged.

Cognitive voyagers want to set their own learning objectives and take control of the learning process. However, most educational courses tend to be highly structured with many of the main decisions made before they start. There is rarely room for student input into the content or format. Cognitive voyagers are more likely to take what they need or are interested in from the course and may ignore assessment requirements and/or deadlines (Roberts, 2006).

Cognitive voyagers also show a similarity to a number of other 'learner-types'. Honey and Mumford's 'reflectors' (1992) for instance like to observe experiences from many different perspectives and like to collect data from several sources before making decisions.

Unsurprisingly then, cognitive voyagers are also similar to the Kolb's (1985) 'assimilators' as Honey and Mumford (1992) derived their model from Kolb's work. Assimilators like reflecting on means and situations, applying logic, ideas and concepts, and analysing and building theories (Kolb, 1985).

Felder and Spurlin (2005) developed a bi-polar dimension which they called sensing at one end and intuitive at the other. Sensing students prefer data and facts, characteristics very similar to students who are high on the 'factual' content preference side of the factual-relativistic reasoning scale used in the current study. Intuitive students, on the other hand, prefer abstract theories and interpretations of factual content, similar to students high on relativistic reasoning. Sensing (factual) students seem to be more common than intuitive students, a reflection of the finding in this study (Felder & Silverman, 1988; Montgomery, 1995). The results of this study that global (intuitive) learners are a minority in the student body confirms the findings of Felder and Silverman (1988) and Montgomery (1995).

Accommodating cognitive voyagers in the classroom is problematic. The central issue is who owns and controls the course. These students want more control over the direction and nature of their courses and flexibility in structuring them. Lecturers may be uncomfortable in surrendering "their" ownership and control. Unstructured courses have a greater risk element, depending as they do on unknowns such as the group dynamics or the level of autonomy and self directedness of any particular intake. At a time when good student evaluations results are essential to promotion, lecturers may be unwilling to risk their own advancement for uncertain gains in learning for their students.

As with strategic competitors, cognitive voyagers are more commonly associated with older students, but they are also very strongly associated with post graduates. This probably reflects the intellectual maturation process that is evident in their high rating on the relativistic reasoning scale.

Of all the subject majors, fine arts students are much higher than any other subject area on this profile. While artistic endeavours are often thought of as visual skills, in fact, they also require a substantial ability to think in the abstract, to think outside the square and the work

these students produce is a very personal interpretation of their learning. These students are more likely to set personal learning goals and to have a strong inclination to pursue their study in the manner they believe is consistent with their work style.

Males are slightly higher on this profile than females, but no other differences between students were found.

Multimedia Collaborators

About 20% of students were high on this profile and about 7% low. The strongest characteristic of these students is their preference for learning by listening or through imagery. A strong sub-text is a dislike of reading, particularly long passages. They like their text in sound-bites. There are two groups of students particularly prevalent in this profile: international students and millennial students. International students are much higher than domestic students on listening and visual preferences rather than text. It may be that all non-New Zealanders happen to be high on these characteristics, however a more reasonable explanation is that the biggest barrier faced by international students is that of language. Despite most TEO's having language entry requirements, many international students struggle with academic English (Holmes, 2005). This raises the possibility that their natural learning style is being distorted as they seek ways to circumnavigate this large obstacle in their path. Listening to explanations in less formal spoken language, and interpreting graphics, is easier than wading through dense, abstractly written textbooks or journal articles. Of course, if using preferred learning styles benefits performance, these students are doubly disadvantaged in that they may need to forego their natural style to adopt an approach that minimises the impact of the language barrier.

The second group is the millennial generation who have been characterised as visually-savvy, but less proficient and less interested in the written word (McCarthy & Kuh, 2006; van Dam, 2005). A number of commentators attribute this trend to the pervasive influence of media on their socialisation process (Oblinger, 2003; Oblinger & Oblinger, 2005; Prensky, 2001a; Prensky, 2001b; Wellner, 1999). This trend is particularly evident in computer technology. Certainly since Macintosh introduced icon-based menus, the use of icons has pervaded

computer screen design. Further evidence of a social trend towards the use of images is apparent in the emergence of the graphic novel; a cross between a comic and a novel, with the story told in a sophisticated combination of text and pictures. The target market for these novels is the adolescent and young adult market, that is, the millennial generation.

In a hypermedia online learning environment visualisers are likely to be more comfortable with the structure of the website than those who prefer text. Those who prefer text may feel more comfortable reading and understanding the written content of a hypermedia website, but they are less able to maintain a spatial orientation within the hypermedia environment and are therefore more likely to become disorientated (McDonald & Stevenson, 1999). On the other hand, most hypermedia environments also include a lot of text material in the content and this has the potential to increase difficulty for visualisers who are less adept at reading. Graf (2003) found that text preferers performed less well than visualisers on hypermedia tasks that required significant navigating, a finding supporting the notion that visualisers can handle hypermedia navigation more easier than text preferers. He also found that text preferers (his 'verbalisers') out-performed visualisers on text-intensive tasks such as essays. In this context an overview map did not aid the performance of the text preferers.

Multimedia collaborators also like working with others in groups rather than studying alone. Again, international students and millennial students were found to be higher than other groups on this preference. Europeans were significantly lower than other ethnicities on collaboration. This finding is supported by other studies that found Caucasians had a lower preference for working collaboratively and cooperatively in a group than other ethnic groups. For example, Mexican-Americans and African-Americans were found to be more group-oriented than white students (Remirez, 1982 cited in Swanson, 1995). These findings also agree with those of Anderson and Adams (1992) who concluded that women and non-Caucasian males had a higher preference for peer cooperation than Caucasian males. Sonnenwald and Li (2003) found that students with a highly individualistic style held negative attitudes to collaborative learning. Holfstedes (2001) identified European cultures as being high in individualism and many Eastern cultures high on collectivism.

Others have also found millennial students to be high in a preference for collaborative working (DeBard, 2004; DiGilio & Lynn-Nelson, 2004; Howe & Strauss, 2003; Murray, 1997; 2003; Wellner, 1999). The explanation for their collaborative tendencies seems to relate to their use of technology. As Grunwald (2004) points out 13-17 year olds spent more time using home digital media (computer, games, internet) than they do TV. Most of them will be using more than one technology at a time so they can be online while watching TV or maybe talking on the phone. Large portions of this media time is spent connected to their peers, socialising, playing games or studying. Instant messaging (IM) has become the communication and socialising mechanism of the millennial generation. In the US, 70% of teenagers use IM as a major communication tool as opposed to 44% of online adults (Lenhart, Simon, & Graziano, 2001). One of the advantages of IM is that it is able to support multiple, simultaneous conversations. While at high school these students developed the practice of connecting electronically with their friends to share ideas on school work (Lenhart et al., 2001). It seems probable that they have brought these study practices with them to tertiary study.

Multimedia collaborators are also more likely to be higher on extrinsic motivation than other students, this is more so for international students than millennial students. Students who are extrinsically motivated study for utilitarian reasons and get little pleasure out of the experience. Several studies have also found that extrinsic motivation is associated with poor learning strategies and outcomes (see for example, Al-Ansari, 2005; Biggs, 1987). For international students the language barrier increases the difficulty of the learning task (Burns, 1991). At the same time that they are struggling to understand new concepts, they are trying to translate English into their own language to make sense of the information. The cognitive load involved in doing this is very high until the students are extremely proficient and able to think in English. It's not difficult to understand why there may be little pleasure in study and their main driver is achieving a qualification that has market value when getting a job.

Finally, multimedia collaborators are time poor. While time poorness was strongly associated with this learner profile it is not associated with any other particular demographic group. All students seem to feel a degree of time poorness. Students with a multimedia profile may feel a higher level of time poorness than others because they are more likely to be using less

efficient learning strategies, may have more languages problems and their negative experiences with study may increase the pressure they feel in relation to study.

Time poorness seems to be a common feature of everyday life. A Harvard study found that time was increasingly scarce in the workplace and this had a negative effect on creativity (Silverthorne, 2002). Students generally spend much less time than expected on study as they tried to balance student loans, part-time or even full time work and family commitments (Hoyt & Lundell, 2003; Kuh, 2003).

All learning takes time, and the more complex and abstract the knowledge being learnt, the more time to reflect and process the information becomes important. Tertiary institutions expect that students will spend substantially more time studying than they spend in class. For example, at Massey University undergraduate students are expected to put in about 50 hours study a week (NK, 2006). About one third of this is made up of scheduled classes. Research suggests that students fall well short of the expected studying time (Hoyt & Lundell, 2003). Perhaps reflecting the time famine that afflicts other parts of society, millennial students in particular have been characterised as time pressured (DeBard, 2004; Murray, 1997; Rooney, 2003).

Most learning occurs when students actively process information, reflect on what it means to them, how it fits with other knowledge they have and how they might use it (Biggs, 1998). This is a kind of deep processing which results in robust and flexible knowledge structures, and little of it takes place in noisy classrooms that are mainly concerned with transmitting a body of information from the teacher to the student. Unfortunately, it is the unstructured study time that is encroached upon when students rush from class to their part time jobs, to fulfil family obligations or to social commitments.

Teaching Modes

The three most popular teaching modes were all traditional (printed study material, tutorials and lectures). This was followed by a blend of online and lectures, then other online formats. Least popular are group projects and student presentations. These findings replicate a similar finding by Hunt, Eagle and Thomas (2002). Saddler-Smith and Riding (1999) also identified

two of these modes: their 'dependent learner' they define as 'teacher-led' which is similar to traditional modes, and their 'collaborative learner' is similar to student-based modes. They did not use an online preference.

That students prefer traditional modes of teaching at a time when TEO's are trying to introduce new technology based modes on a large scale is concerning. Saddler-Smith & Riding (1999) found similar results and explained them in terms of Knowles' distinction between pedagogy and andragogy (Knowles, 1990). The subjects of Saddler-Smith and Riding (1999) study were viewed as teacher-dependent (pedagogical), rather than self-directed and motivated (andragogical), and thus were more comfortable with a teacher-controlled learning environment. If traditional modes foster or sustain learning dependency then this may support the case for weaning students off comfortable preferences to give them the opportunity to learn to cope with alternative modes (Hayes & Allinson, 1988; Smith, 2001).

The online teaching modes were rated quite low. This finding is consistent with Hunt, Eagle and Thomas's (2002) study of New Zealand business students who commented on the frequent and frustrating failings of the technology. Other studies have found high levels of student dissatisfaction with technology, emphasizing the frustration of learning in a technology-based environment, high levels of anxiety and confusion associated with ambiguous instructions (Burge, 1994; Hara & Kling, 2000; Wegerif, 1998). As the millennials surge further into the student body they may tip the balance to a more positive view of online learning, but meantime TEO's need to find ways of increasing student acceptance of new technology. Akerlind and Trevitt (1999) argue that moving to online learning environments involves much more than simply requiring students to move from teacher-dependency to taking a greater responsibility for their own learning. They suggest that the process involves an entire paradigm shift in which students must re-orientate their assumptions and expectations about learning and teaching. They found that resistance to change is most apparent when it conflicts with the students' past traditional educational experiences. Their advice is to manage the change process gradually and carefully with students and they present a series of strategies to assist that process.

Student-based modes, overall, were the most disliked. The implications of this for online learning are problematic. Educational research has long identified interaction between students as a key variable in learning (Brookfield, 1986; Keppell, Au, Ma, & Chan, 2006; Kezar, 2006; Slavin, 1983). Much of the current interest in on-line learning has been driven by its potential to harvest the benefits of collaborative learning through the establishment of online learning communities. Group work is thought to facilitate learning in a number of ways. Several studies have found that working with others reduced uncertainty and anxiety when faced with new, complex tasks and increased engagement with the task (Auster, 2000; Cohen, 1984; Perkins & Saris, 2001). Others have shown how the nature of the interaction between students provides alternative models of thinking and clarification of concepts as they are forced to defend or explain their own views (Colbeck, Campbell, & Bjorklund, 2000; Dudley, David, & McGrady, 2001; Sharan, 1980; Slavin, 1980; Webb, 1980). Delucchi (2006) however, found inconsistent results for the learning benefits of collaborative groups.

Why do students dislike group work? Payne et al (2006) put forward the suggestion that this non-traditional form of learning is uncomfortable for students who haven't developed appropriate strategies to deal with it. However, they also reported that students who disliked group work expressed reservations about working with other students who were unreliable and unwilling to make an adequate commitment to the group effort. This theme is echoed in Delucchi's (2006) study where students commented on the unfairness of having to work with 'free riders'. If large groups of students feel uncomfortable with collaborative learning modes then this may provide a significant obstacle to implementing some of the most beneficial aspects of online learning. Such resistance to this form of learning might be reduced if assessment of group work takes more account of individual contributions (Delucchi, 2006; McKinney & Graham-Buxton, 1993); if students are given appropriate strategies for managing and behaving in groups, clear goals are developed and staff maintain oversight of the work (Payne et al., 2006).

Influences on Preference for Teaching Modes

Learning orientations were found to be associated with preferences for teaching modes, mostly in the direction expected. Intrinsic motivation and effort tend to predict a high level of

liking for all modes of teaching so students who enjoy study and work hard are able to move comfortably and confidently between different modes.

Lecture preference is most strongly predicted by a preference for listening. It is also associated with intrinsic motivation, goal focus and effort. Students high in goal focus probably enjoy the structure and organisation that's found with the lecture format. Students who favour lectures also have a slight preference for working alone and learning from text. These characteristics cut across learning profiles with elements of both strategic competitors and multi-media collaborators showing a preference for lectures. Clearly cognitive voyagers find the strictures of the lecture format too restrictive. These results emphasise the important role that listening plays in the lecture, the most common teaching mode. For many students, however, listening isn't their dominant perceptual mode (Baldwin & Sabry, 2003).

The results for tutorials were similar to lectures in terms of listening, intrinsic motivation and effort. However there was here also a slight preference for working collaboratively, independence and visual learning. It may be that the tutorial is perceived as more of a group exercise than the lecture and so collaborators enjoy the opportunity to work in this context. The independence predictor is also interesting and suggests that students may feel more comfortable challenging teachers in smaller groups. The flip side of this notion is that large lecture groups stifle independent thinking in students. This suggestion fits with the finding that lecturing is associated with student dependency and emphasises again the need to introduce students to alternative modes of learning and teaching even if that initially causes them some discomfort.

Not surprisingly, a preference for working collaboratively strongly predicted a preference for group work. The next largest predictor was relativistic reasoning. Students high on this orientation enjoy the discussion and debate of ideas and may feel that group work gives them the opportunity to engage in this activity.

Student presentations showed many similarities to group modes. Collaboration was the strongest predictor and relativistic reasoning was second. The opportunity to control and direct the learning activity no doubt appeals to relativistic reasoners. This was the only mode

to be associated with achievement motivation, albeit not very strongly. It may be that for some students the competitive element of being compared to fellow students is appealing.

Sources of Information

Alarmingly textbooks are only marginally more popular than the internet as a source of information for study and assignments. Printed library books are quite a lot less popular and library online resources even less popular. Online library sources have full text access to a huge range of databases, providing at a touch of the button the latest studies on any given topic, but students will turn first to using the world wide web. At least part of this may be habit. Millennial students have become used to using the internet for school work at high school so it is likely they have simply slipped into this easy option at tertiary level as navigating library databases requires more effort, and skill (Grunwald, 2004).

The pattern of resource use is interesting when looked at in terms of the qualifications being taken. Certificate students make less use of all resources, than all other groups. Post graduate students use all sources of information more than other groups, except for slightly less use of textbooks by post graduate degree students. Preference for the internet is very close to the preference for textbooks for all groups. While post graduate students use the internet in preference to library online resources, they do use library online resources much more than other students.

Unfortunately there is evidence that this reliance on the internet as a source of information may have detrimental effect on the quality of learning. According to Bell (1998), easy access to the internet has reduced the use of more sophisticated online search skills needed by business students for searching serious, traditional online databases such as LEXIS-NEXIS, Dialog and the Dow Jones Index. The internet produces masses of instant information: Unfortunately most of it is superficial and of little real value for study. According to Bell (1998), this drawback had not dented the enthusiasm of his students for taking the path of least resistance. An important part of a tertiary education is recognizing that all information is not equally valuable. ‘Facts’ quoted in magazines are likely to be much less reliable than facts given in an academic journal. Realising that information or interpretation of information needs to be grounded in empirical evidence or logical deduction is important to student learning. However, the seductive quality of easy information may tempt students to lower their

evaluative criteria and it increases the attractiveness of information that has not been rigorously evaluated. If students are prepared to trade off quality for quantity, then education will be degraded rather than enhanced by technology.

Knowledge and Skills

What students rated as 'important to know' is encouraging and matches some of the new educational goals. They rated 'knowing how to get information' most highly and this was followed by 'being able to evaluate the worth of information'. The traditional product of an education, 'having a large body of knowledge about the subjects being studied' was rated as the least important. In a knowledge-rich society where information has a limited shelf-life (Shimizu, 1999), expending effort on building personal stores is less important than being able to rapidly access information as and when its needed (Candy, 2000). Former US Secretary of Labour, Bob Reich, suggests that the term 'knowledge worker' refers to the abilities a person has acquired for problem-identification, problem-solving and strategic brokering competencies (Reich, 1991). A defining characteristic of knowledge workers, apart from tertiary education, is the peripheral importance of facts to their skills profile because whatever data are required will be available to them at the touch of a computer key.

Conclusions

The Government's open-access policy of the late 1980's, early 1990's dramatically increased the size and the diversity of the student body (Abbott, 2006; Scott, 2005). While the success of the policy was gratifying, it has become apparent that many of the new non-traditional students have not been as successful in tertiary education as hoped (Abbott, 2006; Benseman et al., 2006; Holmes, 2005; McKenzie & Gow, 2004; Scott, 2005). Understanding the extent and nature of learning differences between tertiary students may begin to pinpoint areas that institutions and teachers can address to improve the quality of the learning experience and outcomes for students.

The literature on preferences, styles and approaches suggests that learning behaviour is influenced by, and expressed through relatively stable patterns that characterise how

individuals deal with learning tasks. These theories point to the importance of differences between students and how such differences are evident in the consistent ways they engage with learning tasks. For example, some students may take a sequential or linear approach to interacting with course material, while others will take seemingly random hyper-jumps (Felder & Spurlin, 2005). This study identified differences in learning orientations between students along demographic lines, for example, millennial students are different from the older generation x or baby boomers, international students are different from domestic students. This raises the question of how such differences should be addressed. Nobody yet has reached a definitive answer to that question. The main debate centres around whether student preferences should be accommodated (matched) or deliberately not accommodated (mismatched). The results of this study suggest that a judicious mix of both approaches may appropriate.

In the current transition from traditional to newer modes of teaching, consideration needs to be given to the interaction between students and mode preference. Students continue to show a strong preference for traditional teaching formats such as lectures. However, these are strongly associated with a dependency style in students. The structure of the lecture with the lecturer playing the central role probably fosters this dependency. As organisations move to other teaching formats, particularly online, students will make this transition more readily if teachers can find ways of decentralising lectures and giving students a greater role to play. It is important to emphasis that students need to be taught how to play these new roles, they won't simply find their feet by being thrown into an uncomfortable situation.

A range of new educational goals have been articulated. Many of these include the need for students to be able to work independently and collaboratively, and to be life long learners (independent learning) (Candy, 2000; McCombs & Vakili, 2005). An integration of technology-based modes with student-based modes would seem to offer the best opportunity to develop these qualities. Learning in an online environment can encourage self directed learning and its 'connected' nature provides the opportunity for collaborative learning. However, student attitudes to these approaches need to be changed. The evidence suggests that students dislike online learning because of inexperience on their part, an inability to cope with self directed learning, having a learning orientation that does not easily adjust to

hypermedia, a lack of robustness in the technology systems causing frustration and a poor use of the technology to create truly interesting interactive learning. Addressing these issues is likely to bring about greater acceptance of technology-based learning.

The two main objections to working collaboratively arise from a lack of skill and understanding on the part of students about how to work successfully in groups and because many students believe that all group members don't contribute equally; some are social loafers. It would seem that many lecturers are not skilled in group-work and are thereby fail to teach their students how to get the maximum benefit from this learning mode. Group dynamics, roles and responsibilities must be an integral part of encouraging students to work collaboratively. The perceived unfairness of social loafing can be addressed with the development of balanced assessment procedures that take account of individual contribution as well as group performance.

Multimedia collaborators are high on extrinsic motivation and have an anti-reading bias. Extrinsic motivation results from and is maintained by negative learning experiences. Students high on extrinsic motivation tend to use surface or rote learning strategies which result in poor learning outcomes, reinforcing a negative attitude to learning. If these students can be encouraged to make more effort then the negative cycle can be broken. While lecturers can't 'motivate' students, they can create a learning environment in which students can develop a more intrinsic approach. A range of strategies can be used to this end but any set of strategies must include giving the students the opportunity to experience success early in the course.

The anti-reading bias is more difficult to address. Trying to force students to read longer, denser and more abstract material is likely to result in subversive behaviours such as forays into the internet for alternative interpretations or summaries of the required reading. Reducing the amount of reading seems to simply reinforce the loss of reading skills. Perhaps at tertiary level teachers must face the prospect of teaching students to read, at least in terms of academic reading and writing.

Other areas suggest a matching approach to accommodate student learning orientations. For example, sequential students and those who have a preference for text rather than imaging will be disadvantaged in a hypermedia, online learning environment. These students are more likely to become disorientated and have their cognitive workload increased by the effort required for navigating the nonlinear format of hypermedia. Additionally, sequential students will find it harder to fully understand the interrelationships between information that is the hallmark of learning, in an environment that exacerbates their tendency to fragment information.

Cognitive voyagers are a group of students who are not well served by the rigidity of traditional modes of learning. Accommodating their need for independence and the ability to chart their own learning course, including determining their own learning goals, is a challenge for teachers. Certainly these students seem to epitomise many of the new educational goals commonly espoused such as critical thinking, but the evidence suggests that such students are not welcome in many classrooms.

International students, particularly those for whom English is a second language, have the biggest workload of any students. Their learning is constantly mediated by the language barrier. This is most apparent in the reading of abstract textbooks and journal articles. International students must be encouraged to improve their writing and reading skills but, once they have been accepted into the New Zealand educational system then provision must be made to assist them to develop these skills, and teaching should, as far as possible, off-set the disadvantage of language. This does not require difficult or obscure strategies, for example: minimising jargon and idioms, using diagrams and images, providing opportunities for reviewing lecture material (for example, making lecture notes available online), providing note-taking supports such as powerpoint print-outs or partially complete notes. International students who fully participate in the classroom or online add valuable diversity to the learning experience of the class as a whole.

In the past the homogeneous nature of the small elite group of students who undertook higher learning was well established and catered for. The non-traditional students who now fill our tertiary institutions, and this includes students from the millennial generation, are different

from their lecturers in experience, expectations and perceptions. The implication of these differences is that the consistent and stable styles and orientations that students have developed over time should be taken into consideration when designing learning experiences. Online learning holds the promise of providing the mechanisms to accommodate individual differences and improve learning, provide networked learning communities that promote collaborative skills and facilitate the fulfilment of educational goals that will see tertiary graduates characterised by self directed, life long learners. However, the dream has yet to be realised.

Limitations and Further Research

The major limitation of this study was the failure to get greater representation of students engaged in sub-degree programmes (they make up approximately half the tertiary population) and the consequent under-representation of Maori. These students are found in their greatest numbers in wanangas and, despite repeated efforts, getting access proved extraordinarily difficult.

The study identified learning orientations and learner profiles which were useful for describing differences between groups of students. However, further research is needed to identify appropriate treatments, either as matches or mismatches, to learning orientations. Treatments would be considered effective if they were able to improve learning outcomes for students who were high or low on a particular orientation; or if the quality of the learning experience was enhanced. This may not directly result in improved learning, but may have the conative/affective outcomes of improving motivation and therefore effort in learning.

Recommendations

1. **Encourage the development of blended courses which provide a range of teaching modes and experiences.**

Online courses are most acceptable to students when they are combined with more familiar teaching modes. These courses should de-emphasise lectures, which although popular amongst students seems to work against their best interests, fostering passivity, conformity and dependency, and reducing active student participation. The human face-to-face contact traditionally provided by lectures might be better served through tutorials. The smaller size of tutorial groups seems to be associated with greater learning independence and a more active engagement.

2. **Providing Appropriate Structure and Support in Online Environments**

Global and visual learners are likely to feel at ease in the hypermedia structure of online learning, but not so sequential, dependent or text learners. Sequential and dependent students need navigational support to negotiate their way around an online environment and assistance in integrating fragmentary information. The key for these students is the provision or explication of structure. This might take a number of forms, the simplest being a course overview or map, though the evidence suggests these are not always very helpful. A course structure that repeats the same patterns, for example definition, example, exercise, also give a sense of orientation. In addition to the provision of a structural framework, or perhaps even integrated into it, should be navigational signposts or guides which suggest or direct particular pathways. At one end of the spectrum these would present alternative routes through the course as a smorgasbord so that the cognitive voyager is able to set their own learning objectives and choose those pathways that have the most personal relevance and meaning, and at the other end of the spectrum choice would be restricted to a more highly structured pathway with fewer options to reduce cognitive workload and assist the dependent learner make better decisions. The highly structured format would help the sequential learner to build a more integrated framework, though thought should also be given to the addition of regular 'synthesisers' to show students how the specific ideas covered fit into the bigger picture (see for example Reiguluth's Elaboration Theory ,1999).

3. **Presenting Information in Appropriate Formats: Visually, Orally or in Text**

Millennial and international students, for different reasons, show a clear preference for multi-media learning, and a distinct aversion to reading long academic passages. Whether reading skills should be allowed to degrade even further by greater use of images, oral information and shorter text passages is ultimately a debate beyond the scope of this report. In the meantime a middle path is suggested. Substantial use of graphics and oral presentations is recommended for face-to-face teaching and in online presentations for a course's basic concepts and ideas. These should be supported by required reading of articles and book chapters. However, it is strongly recommended that these readings should be structured in ways that enable students to develop better reading skills. A very simple example might be to provide a list of questions that need to be answered from their reading.

4. **Teach Collaborative Skills**

Although millennial students generally show a stronger preference for collaborative work, overall this mode of learning was not favoured by students. However, there is ample evidence to suggest that collaborative learning is highly beneficial to learning and e-learning is a particularly rich environment for supporting communication. Collaborative learning may be more acceptable and effective if students are taught appropriate strategies for managing and behaving in groups, clear goals are developed, staff maintain an oversight of the work and evaluative procedures take into account both group success and individual contributions.

Endnote: Website CD

The online questionnaire that was used for the survey has been modified and extended. It still is able to provide tertiary students with their own individual learning profiles and advice on improving their learning, but it now also has extra facilities for teachers and administrators. Teachers can use the website to generate reports on the predominant learning styles of students in their classes and administrators or managers can generate summary reports of the learning styles of all students in the institution. These can be

cumulative or for specific periods of time. This website is available on CD for New Zealand tertiary institutions from the project leader Dr Lynn Jeffrey (phone: 09 4140800 ext 9282 or email: l.m.jeffrey@ massey.ac.nz).

REFERENCES

Abbott, M. (2006). Competition and reform of the New Zealand tertiary education sector. *Journal of Education Policy, 21*(3), 367-387.

Akerlind, G. S., & Trevitt, C. (1999). Enhancing self-directed learning through educational technology: When students resist the change. *Innovations in Education and Training International, 36*(2), 96-105.

Al-Ansari, E. M. (2005). The dynamic interplay of student motivation and cognition in the college of education students at Kuwait University. *Social Behaviour and Personality, 33*(4), 341-350.

Anderman, E. M., & Midgley, C. (1992). Student self efficacy as a function of classroom goal orientation. *(Educational Resources Information Center Document Reproduction Service No. ED 375-367).*

Anderson, J. (2000). *Cognitive psychology and its implications* (5 ed.). New York: WH Freeman.

Anderson, J. A., & Adams, M. (1992). Acknowledging the learning styles of diverse student populations: Implications for instructional design. In L. B. Border & N. V. Chism (Eds.), *Teaching for diversity* (pp. 19-34). San Francisco: Jossey-Bass Publishers.

Armstrong, P. (2000, 3-5 July). *Include me out: critique and contradiction in thinking about social exclusion and life long learning.* Paper presented at the SCRUTREA, 30th Annual Conference, University of Nottingham, UK.

Attewell, P. (2001). The first and second digital divide. *Sociology of Education, 74*(3), 252-259.

Auster, C. J. (2000). Probability sampling and inferential statisitcs: An interactive exercise using M7M's. *Teaching Sociology,*

28(379-385).

Baddeley, A. D. (1986). *Working Memory*. Oxford, England: Oxford University Press.

Bajraktarevic, N., Hall, W., & Fullick, P. (2003, May 20th 2003). *Incorporating learning styles in hypermedia environment: Empirical evaluation.* Paper presented at the AH2003: Workshop on Adaptive Hypermedia and Adaptive Web-Based Systems

Twelfth International World Wide Web Conference,, Budapest, Hungary.

Baldwin, L., & Sabry, K. (2003). Learning styles for interactive learning systems. *Innovations in Education and Training International, 40*(4), 325-340.

Bandura, A. (1993). Perceived self efficacy in cognitive functioning. *Educational Psychologist*(28), 117-148.

Barua, S. (2001). An interactive multimedia system on 'Computer Architecture, Organisation, and Design'. *IEEE Transactions on Education*(44), 41-46.

Bazerman, C. (1985). Physicists reading physics. *Written Communication, 2*(1), 3-22.

Bedford, T. A. (2006). Learning styles: A review of English-language literature. In R. R. Sims & S. J. Sims (Eds.), *Learning Styles and Learning: A Key to Meeting the Accountability Demands in Education*. DarwNew Yorkin: Nova Science Publishers, Inc.

Bell, S. J. (1998). Weaning them from the Web: teaching online to the MBA internet generation. *Database*(June/July), 67-70.

Benseman, J., Coxon, E., Anderson, H., & Anae, M. (2006). Retaining non-traditional students: lessons learnt from Pasifika students in New Zealand. *Higher Education Research and Development, 25*(2), 147-162.

Biggs, J. B. (1976). Dimensions of study behaviour: Another look at ATI. *British Journal of Educational Psychology, 46*, 68-80.

Biggs, J. B. (1978). Individual and group processes in study processes. *British Journal of Educational Psychology, 48*, 266-279.

Biggs, J. B. (1979). Individual differences in study processes and the quality of learning outcomes. *Higher Education, 8*, 381-394.

Biggs, J. B. (1987). *Student approaches to learning and studying*. Melbourne: Australian Council for Educational Research.
Biggs, J. B. (1998). *What the Student Does: Teaching for Enhanced Learning in the 90s*. Auckland, New Zealand: Unpublished Paper Presented at the HERDSA'98 conference.
Biggs, J. B., & Moore, P. J. (1993). *The Process of Learning* (3 ed.). New York, USA: Prentice Hall.
Bonham, L. A. (1988). Learning style use: In need of perspective. *Lifelong Learning: An Omnibus of Practice and Research, 11*(5), 14-17.
Brookfield, S. D. (1986). *Understanding and facilitating adult learning*. San Francisco: Jossey-Bass.
Burge, E. J. (1994). Learning in computer conferenced contexts: The learners' perspective. *Journal of distance Education, 9*(1), 19-43.
Burns, R. (1991). Study and stress among first year overseas students in an Australian university. *Higher Education Research and Development, 10*(1), 61-77.
Candy, P. C. (2000). Knowledge navigators and lifelong learners: Producing graduates for the information society. *Higher Education Research & Development, 19*(3), 261-277.
Candy, P. C., Crebert, G., & O'Leary, J. (1994). *Developing Lifelong Learners through Undergraduate Education*. AGPS, Canberra, Australia: National Board of Employment, Education and Training.
Carroll, J. B. (1983). Studying individual differences in cognitive abilities: Through and beyond factor analysis. In R. F. Dillon & R. R. Schmeck (Eds.), *Individual Differences in Cognition* (Vol. 1, pp. 1-33). New york: Academic Press.
Cassidy, S. (2004). Learning styles: An overview of theories, models, and measures. *Educational Psychology*(24), 419-444.
Cassidy, S., & Eachus, P. (2000). Learning style, academic belief systems, self-report student proficiency and academic achievement in higher education. *Educational Psychology*(20), 307-322.
Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioural Research*(1), 245-276.
Chen, S. (2002). A cognitive model for non-linear learning in hypermedia programmes. *British Journal of Educational Technology, 33*(4), 449-460.
Chen, S. Y., & Angelides, M. C. (2003). Customisation of internet multimedia information systems design through user modelling. In N. S. Shi & V. K. Murthy (Eds.), *Architectural Issues of Web-Enabled Electronic Business* (pp. 241-255). Hearshey, PA: Idea Group Publishing.
Chickering, A., & Ehrmann, S. (1996). Implementing the seven principles: Technology as lever. *AAHE Bulletin, 49*(2), 3–6.
Claxton, C., & Murrell, P. (1987). Learning styles: implications for improving educational practices. *Eric document ED 293478*.
Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning: A systematic and critical review*, from http://www.lsrc.ac.uk/publications/index.asp
Cognition and Technology Group at Vanderbilt. (1991). Some thoughts about constructivism and instructional design. In T. M. Duffy & D. H. Jonassen (Eds.), *Constructivism and the technology of instruction: A conversation*. Hillsdale, NJ: Lawrence Erlbaum Associates.
Cohen, E. G. (1984). Talking and working together: Status, interaction and learning. In P. L. Peterson, L. C. Wilkinson & M. Hallinan (Eds.), *The social context of instruction*. New York: Academic Press.
Colbeck, C. L., Campbell, S. E., & Bjorklund, S. A. (2000). Grouping in the Dark. What college studetns learn from group projects. *The Journal of Higher Education, 71*(1), 60 - 83.
Collis, B., & Moonen, J. (2001). *Flexible Learning in a Digital world*. London, UKKogan Page.
Concannon, F., Flynn, A., & Campbell, M. (2005). What campus-based students think about the quality and benefits of e-learning. *British Journal of Educational Technology, 36*(3), 501-512.
Cronbach, L. J. (1967). How can instruction be adapted to individual differences? In R. M. Gagne (Ed.), *Learning and Individual Differences*. Columbus, OH: C.E. Merrill Publishing Co.

Cross, K. P. (1982). *Adults as learners*. San Francisco: Joseey-Bass Publishers.
Cuban, L. (1993). Computers meet classroom: classroom wins. *Teachers College Record, 95*(2), 185-210.
Curry, L. (1983). An organisation of learning style theory and constructs. In L. Curry (Ed.), *Learning style in continuing education* (pp. 115-131). Halifax, Canada: Dalhousie University.
Curry, L. (1990). A critque of the research on learning styles. *Educational Leadership, 48*(2), 50-56.
Cyrs, T. E. (1997). Visual thinking: Let them see what you are saying. *New Directions for Teaching and Learning*(71), 27-32.
Davidman, L. (1981). Learning style: The myth, the panacea, the wisdom. *Phi Delta Kappan*, 641-646.
DeBard, R. (2004). Millennials coming to college. *New Directions for Student Services, Summer*(106), 33-45.
Delucchi, M. (2006). The efficacy of collaborative learning groups in an undergraduate statisitcs course. *College Teaching, 54*(2), 244-248.
DiGilio, J. J., & Lynn-Nelson, G. (2004). The Millennial Invasion: Are you ready? *Information Outlook, 8*(11), 15-19.
Dudley, L., David, H., & McGrady, D. (2001). Using an investment project to develop prefessional competencies in Introduction to Finance Accounting. *Journal of Education for Business, 76*(3), 125-131.
Duffy, A., & Jonassen, D. H. (1991). Constructivism: New implications for instructional technology? *Educational Technology, 31*(5), 7-12.
Dunn, R. (2000). Capitalising on college students' learning styles: Theory, practice and research. In R. Dunn & S. A. Griggs (Eds.), *Practical approaches to using learning styles in higher education*. Westport, CT: Bergin & Garvey.
Dunser, A., & Jirasko, M. (2005). Interaction of Hypertext Forms and Global Versus Sequential Learning Styles. *Journal of Educational Computing Research, 32*(1), 79-91.
Durling, D., Cross, N., & Johnson, J. (1996). *Personality and learning preferences of students in design and design-related disciplines*. Paper presented at the International Design and Technology Educational Research and Curriculum Development Conference, IDATER 96, Loughsborough University, Loughsborough. Retrieved 23 May 2006 from: http://www.lboro.ac.uk/idater96/downloads96/durling96.pdf.
Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. In P. H. Mussen (Ed.), *Handbook of child psycholoy* (Vol. 4, pp. 643-691). New York: J.Wiley and Sons.
Eisenberger, R. (1992). Learned industriousness. *Psychological Review, 99*(2), 248-267.
Entwistle, N. J. (1977). Strategies of learning and studying: recent research findings. *British Journal of Educational Studies, 3*, 225-238.
Entwistle, N. J. (1991). Approaches to learning and perceptions of the learning environment. *Higher Education, 22*, 201-204.
Entwistle, N. J., & Ramsden, P. (1983). *Understanding student learning*. Beckham, Kent: Croom Helm.
Feenberg, A. (1999). *Distance learning: Promise or threat?* Retrieved 25 April 2002, from http://www-rohan.sdsu.edu/faculty/feenberg/TELE3.HTM
Felder, R. (1993). Reaching the second tier: learning and teaching styles in college science education. *Journal of College Science Teaching, 23*(5), 286-290.
Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering Education, 78*(7), 674-681.
Felder, R. M., & Spurlin, J. (2005). Applications, reliability and validity of the Index of Learning Styles. *International Journal of Engineering Education, 21*(1), 103-112.
Ford, N. (1989). Learning styles and strategies of postgraduate students. *British Journal of Educational Technology, 16*(1), 65-79.
Ford, N., & Chen, S. Y. (2000). Individual differences, hypermedia navigation and learning: an emprical study. *Journal of Educational Multimedia and Hypermedia*(9), 281-311.

Ford, N., & Chen, S. Y. (2001). Matching/mismatching revisited: an empirical study of learning and teaching styles. *British Journal of Educational Technology, 32*(1), 5-22.
Fraser, B. J., & Rentoul, A. J. (1980). Person-environment fit in open classrooms. *Journal of Educational Research, 73*, 159-167.
Gerbic, P. (2004, July 2004). *What about flexible learning and Ict? - A review of technology based flexible learning in tertiary education*.
Getzel, S. J., & Jackson, P. W. (1982). *Creativity and intelligence*. New York: Wiley.
Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology Education, 7*(1), accessed 29 May 2006 from http://scholar.lib.vt.edu/ejournals/JTE/v2007n2001/gokhale.jte-v2007n2001.html.
Gorush, R. L. (1983). *Factor Analysis*. Hillsdale, NJ: Lawerence Erlbaum.
Graff, M. (2003). Learning from web-based instructional systems and cognitive style. *British Journal of Educational Technology, 34*(4), 407-418.
Greater Expectations National Panel. (2002). *Greater Expectations: A New Vision for Learning as a Nation goes to College*. Washington, DC: Association of American Colleges and Universities.
Grunwald, P. (2004). *Two million American children have their own web sites, broad new internet survey shows*. Retrieved 2 February, 2006, from http://www.schooldata.com/ssm-grunwald-internet.htm
Gygi, K. (1990). Recognising the symptoms of hypertext....and what to do about it. In B. Laurel (Ed.), *The Art of Human-computer Interface Design* (pp. 279-288). Reading: Addison-Wesley.
Habermas, J. (1972). *Knowledge and Human Interests*. London, UK: Heinemann.
Hanna, D. (1998). *Higher education in an era of digital competition: Emerging organisational models*. Retrieved 25/04/2002, 2002, from http://www.aln.org/alnweb/journal/vol2_issue1/hanna.htm
Hara, N., & Kling, R. (1999). Students' frustrations with a web-based distance education course. *First Monday, 4*(12).
Hara, N., & Kling, R. (2000). Students' distress with a web-based distance education course. *Information, Communication & Society, 3*(4), 557-579.
Hart, G. (1995). *Learning styles and hypertext: exploring user attitudes*, 2000
Hart, M., & Holton, D. (2001). *Bridging institutions: Bridging the class and race divide*. Paper presented at the Researching Widening Access: International Perspectives, Glasgow.
Hayes, J., & Allinson, C. W. (1988). Cognitive style and the theory and practice of individual and collective learning in organisations. *Human Relations*(51), 847-871.
Hayes, J., & Allinson, C. W. (1996). The implications of learning styles for training and development: A discussion of the matching hypothesis. *British Journal of Management, 7*(1), 63-73.
Hickman, K. L. (1998). *Learned industriousness: Replication in principle*. Retrieved 13 July, 2006, from http://www.findarticles.com/p/articles/mi_m2405/is_3_125/ai_53409845/print
Hofestede, G. H. (2001). *Culture's consequences: comparing values, behaviours, institutions, and organsiations across nations*. Thousand Oaks, Calif: Sage Publications.
Holmes, P. (2005). Ethnic Chinese students' communication with cultural others in a New Zealand university. *Communication Education, 54*(4), 289-311.
Honey, P., & Mumford, A. (1992). *The Manual of learning Styles: Revised Version*. Maidenhead: Peter Mumford.
Horsburgh, M., Lamdin, R., & Williamson, E. (2001). Multiprofessional learning: the attitudes of medical, nursing and pharmacy students to shared learning. *Medical Education, 1*(35), 876-883.
Howe, N., & Strauss, W. (2003). *Millennials go to College*. Great Falls, VA: LifeCourse Associates.
Hoyt, J., & Lundell, M. (2003). *The effect of risk factors and student service interventions on college retention*. Retrieved 3 July, 2006, from http://www.uvsc.edu/ir/research/Retentionwriteup.pdf
Hung, D. W. L., & Chen, D.-T. (2000). Appropriating and negotiating knowledge: Technologies for a community of learners. *Educational Technology, May-June*, 29-32.

Hunt, L. M. (1995). *Approaches to learning: The selection and use of learning strategies*. Massey University, Palmerston North.
Hunt, L. M., Eagle, L., Thomas, M. J. W., & Shergill, G. (2002). *Learning Profiles: Student styles, perceptions and obstacles to study*. Auckland, New Zealand: Massey University.
Hunt, L. M., Eagle, L. C., & Kitchen, P. J. (2004). Marketing education and information technology: Matching needs or needing a better match? *Journal of Marketing Education, 26*(1), 75-88.
Hunt, L. M., Eagle, L. C., & Thomas, M. J. W. (2002). *Student resistance to ICT in education*. Paper presented at the International Conference on Computers in Education, North Shore, New Zealand.
Jackson III, D. (1998). *An exploration of selected conative constructs and their relation to science learning* (No. CRESST CSE Technical Report 467). Palo Alto: Department of Education, Standford University.
Jeffrey, L. M., Hide, S., & Legg, S. (2006a). *Learning styles of workers in the road transport, residential and civil construction and motor trade sectors* (No. ACC Project No 58202). Auckland: Massey University Centre for Ergonomics, Occupational Safety and Health.
Jeffrey, L. M., Hide, S., & Legg, S. (2006b). *Learning styles of workers in the road transport, residential and civil construction and motor trade sectors* (No. ACC Project No 58202). Palmerston North: Centre for Ergonomics, Occupational Safety and Health, Massey University.
Jones, A., Scanlon, E., & Blake, R. (2000). conferencing in comminities of learners: Examples from scoial history and science communication. *Educational Technology & Society, 3*(3), 215-226.
Jones, A. E. (1997). Reflection-impulsivity and wholist-analytic: Teo fledglings or is R-I a cuckoo? *Educational Psychology, 17*(1&2), 65-77.
Kelly, J. R., & Loving, T. J. (2004). Time pressure and group performance: Exploring underlying processes in the Attentional Focus Model. *Journal of Experimental Social Psychology, 40*(2), 185-198.
Keppell, M., Au, E., Ma, A., & Chan, C. (2006). Peer learning and learning-oriented assessment in technology-enhanced environments. *Assessment & Evaluation in Higher Education, 31*(4), 453-464.
Kezar, A. (2006). Redesigning for collaboration in learning initiatives: An examination of four highly collaborative campuses. *Journal of Higher Education, 77*(5), 804-838.
Kim, K. (2001). Implications of User Characteristics in Information Seeking on the World Wide Web. *International Journal of Human-Computer Interaction, 13*(3), 232-340.
King, P. (1999). Improving access and educational success for diverse students: Steady progress but enduring problems. In C. S. Johnson & H. E. Cheatham (Eds.), *Higher Education Trends for the Next Century: A Research Agenda for Student Success*: American College Personnel Association.
Kirby, J. R. (1988). Style, strategy, and skill in reading. In R. R. Schmeck (Ed.), *Learning strategies and learning styles*. New york: Plenum Press.
Knowles, M. (1983). *Androgogy: An emerging technology for adult learning*. Kent: The Open University.
Knowles, M. (1990). *The adult learner: A neglected species*. Houston: Gulf.
Kohn, A. (1996). By all available means: Cameron and Pierce's defense of extrinsic motivators. *Review of Educational Research*(66), 1-4.
Kolb, D. A. (1985). *Learning style inventory: Self-scoring inventory and interpretation booklet*. Boston, MA: McBer and Company.
Koschmann, T. D. (1996). *Computer-supported problem based learning: Theory and practice of an emerging paradigm*. Mahwah, NJ: Lawerence Erlbaum Associates.
Kratzig, G. P., & Arbuthnott, K. D. (2006). Perceptual learning style and learning proficiency: A test of the hypothesis. *Journal of Educational Psychology, 98*(1), 238-246.
Kuh, G. D. (2003). What we are learning about student engagement from NSSE. *Change, 35*(2), 24-32.

Lawless, K., & Kulikowich, J. M. (1998). Domain knowledge, interest, and hypertext navigation: a study of individual differences. *Journal of Educational Multimedia and Hypermedia, 7*(1), 51-69.
Lawless, K. A., & Brown, S. W. (1997). Multimedia learning environments: Issues of learner control and navigation. *Instructional Science*(25), 117-131.
Lemire, D., & Gray, J. (2003). An introduction to learning styles for developmental educators. *Journal of college Reading and Learning, 33*(2), 231-239.
Lenhart, A., Simon, M., & Graziano, M. (2001). *The internet and education: findings of the Pew Internet and American Life Project*. Retrieved 1 July, 2006, from http://www.pewinternet.org/pdfs/PIPSchoolsReport.pdf
Lepper, M. R. (1988). Motivational considerations in the study of instruction. *Cogntion and Instruction, 5*(4), 289-309.
Levin, D., & Arafeh, S. (2002). *The Digital Disconnect: The Widening Gap Between Internet-Savvy Students and Their Schools*. Washington: Pew Trust.
Lincoln, F., & Rademacher, B. (2006). Learning styles of ESL students in comunnity colleges. *Community College Journal of Research and Practice, 30*(5-6), 485-500.
Martinez, M. (2001). Mass Customization: Designing for Successful Learning. *International Journal of Educational Technology, 2*(2), Accessed 20 July 2006 from http://smi.curtin.edu.au/ijet/v2002n2002/martinez/.
Marton, F., & Saljo, R. (1976a). On qualitative differences in learning I: Outcome and processes. *British Journal of Educational Psychology, 46*(1), 4-11.
Marton, F., & Saljo, R. (1976b). On qualitative differences in learning II: Outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology, 46*(2), 115-127.
Marton, F., & Saljo, R. (1976a). On qualitative differences in learning I: Outcome and processes. *British Journal of Educational Psychology, 46*, 4-11.
Marton, F., & Saljo, R. (1976b). On qualitative differences in learning II: Outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology, 46*, 115-127.
Marx, R. D., & Frost, P. J. (1998). Toward optimal use of video in management education: examining the evidence. *Journal of Manangement, 17*(4), 243-250.
McCarthy, M., & Kuh, G. D. (2006). Are students ready for college? What student engagement data say. *Phi Delta Kappan, 87*(9), 664-669.
McClelland, D. C. (1985). How motives, skills and values determine what people do. *American Psychologist*(40), 812-825.
McCombs, B. L., & Vakili, D. (2005). A learner-centred framework for e-learning. *Teachers College Record, 107*(8), 1582-1600.
McDonald, S., & Stevenson, R. J. (1999). Spatial versus conceptual maps as learning tools in hypertext. *Journal of Educational Multimedia and Hypermedia, 8*(1), 43-64.
McKenzie, D. F. (2005). Reducing attrition rates for Maori students. *Journal of Developmental Education, 28*(3), 12-18.
McKenzie, K., & Gow, K. (2004). Exploring the first year academic achievement of school leavers and mature-age students through structural equation modelling. *Learning and Individual Differences, 14*(2), 107-123.
McKenzie, K., & Schweitzer, R. (2001). Who succeeds at University? Factors predicting academic performance in first year Australian university students. *Higher Education Research & Development, 20*(1), 21-33.
McKinney, K., & Graham-Buxton, M. (1993). The use of collaborative learning groups in the large class: Is it possible? *Teaching Sociology*(21), 403-408.
Miller, A. (1987). Cognitive styles: An integration model. *Educational Psychology, 7*(4), 251-268.
Mitchell, T. J. F., Chen, S. Y., & Macredie, R. D. (2005). Hypermedia learning and prior knowledge: domain expertise vs. system expertise. *Journal of Computer Assisted Learning, 21*((1),), 53-64.

Moller, L., Huett, J., Holder, D., & Young, J. (2005). Examining the impact of learning communities on motivation. *The Quarterly Review of distance Education, 6*(2), 137-143.
Montgomery, S. M. (1995). *Addressing diverse learning styles through the use of multimedia: Material and energy balance.* Paper presented at the ASEE/IEEE Frontiers in Education, Atlanta. Retrieved 20 September, 2005 from http://fie.engrng.pitt.edu/fie95/3a2/3a2.htm.
Montgomery, S. M., & Groat, L. N. (2000). *Student learning styles and their implications for teaching.* Retrieved 20 October, 2005, from http:www.crlt.umich.edu/resmain.html
Moreno, R., & Mayer, R. E. (2000). A learner-centered approach to multimedia explanations: driving instructional design principles from cognitive theory. *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning, Retrieved 20 September 2005 from http://imej.wfu.edu/articles/2000/2/05index.asp*.
Murray, N. D. (1997). Welcome to the future: The Millennial Generation. *Journal of Career Planning & Employment, 57*(3), 36-41.
NCES. (2002). *The conditions of education 2002*. Retrieved 17 July, 2006, from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002025
Neilsen, J. (2000). *Designing web usability: The practice of simplicity*. Indianapolis, IN: New Riders.
NK. (2006). The Points System. In *Massey University 2006 Calendar*. Palmerston North: Massey University.
Noble, D. F. (1997). Digital diploma mills: The automation of higher education. *firstmonday*(3).
NZ Ministry of Education. (2004). *Retention, completion and progression in tertiary education 2003: technical documentation*. Retrieved 19 July, 2006, from www.minedu.govt.nz/goto/tertiary-analysis
Oblinger, D. G. (2003). Boomers, Gen-Xers, Millenials, Understanding the New Students. *EDUCAUSE Review*.
Oblinger, D. G., & Oblinger, J. L. (2005). Is It Age or IT: First Steps Toward Understanding the Net Generation. In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the Net Generation*. Boulder, CO: Educause. Accessed 7 September, 2005 from http://www.educause.edu/EducatingtheNetGeneration/5989.
O'Neil, M. J., & Child, D. (1984). Biggs' SPQ: A British study of its internal structure. *British Journal of Educational Psychology*(54), 228-234.
Oppenheimer, T. (1997, July). The computer delusion. *The Atlantic Monthly, 280,* 45-62.
Owens, L., & Straton, R. G. (1980). The development of a co-operative, competitive, and individualised learning preference scale for students. *British Journal of Educational Psychology, 50*, 147-161.
Pask, G. (1976). Styles and strategies of learning. *British Journal of Educational Psychology, 46*, 128-148.
Pask, G. (1988). Learning strategies, teaching strategies, and conceptual or learning style. In R. R. Schmeck (Ed.), *Learning strategies and learning styles* (pp. 83-100). New York: Plenum Press.
Pavio, A. (1986). *Mental representations: A dual coding approach*. Oxford, England: Oxford University Press.
Payne, B. K., Monk-Turner, E., Smith, D., & Sumter, M. (2006). Improving group work: Voices of students. *Education, 126*(3), 441-448.
Perkins, D. V., & Saris, R. N. (2001). A "jigsaw classroom" technique for undergraduate statistics courses. *Teaching of Psychology*(28), 111-113.
Prensky, M. (2001a). *Digital natives, digital immigrants*. Retrieved 17 November, 2004, from http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf
Prensky, M. (2001b). Digital natives, digital immigrants, Part II: Do they really think differently? *On the Horizon, 9*(6), 1-6. Accessed 7 September, 2005 from http://www.marcprensky.com/writing/Prensky-DigitalNatives,DigitalImmigrants-Part2002.pdf.
Reich, R. (1991). *The work of nations*. New York: Simon & Schuster.

Reigeluth, C. (1999). The elaboration theory: Guidance for scope and sequence decisions. *Instructional design theories and models: A new paradigm of instructional theory, 2*, 425–453.
Riding, R., & Cheema, I. (1991). Cognitive styles: An overview and integration. *Educational Psychology, 11*, 193-215.
Riding, R., & Rayner, S. (1999). *Cognitive styles and learning strategies: Understanding style differences in learning and behaviour*. London: David Fulton Publishers.
Riding, R. J. (1997). On the nature of cognitive style. *Educational Psychology*(17), 29-50.
Riding, R. J., & Douglas, G. (1993). The effect of cognitive style and mode of presentation on learning performance. *British Journal of Educational Psychology*(63), 297-307.
Riding, R. J., & Grimley, M. (1999). Cognitive style, gender and learning from multi-media materials in 11-year-old children. *British Journal of Educational Technology, 30*(1).
Roberts, C. (2006, 3-5 July). *Stopouts and dropouts - the problem of retention and completion in elearning*. Paper presented at the DEANZ 2006 Conference: E-Learning Approaches in C21, Auckland University of Technology, Auckland.
Roodenburg, J. (2003). Cognitive style: a psycholexically-derived personality-centred model. *European Journal of Personality, 17*(2), 119-141.
Rooney, M. (2003). Freshmen show rising political awareness and changing social views. *Chrionicle of Higher Education, 49*(21), A35-39.
Rothblum, E. (1986). Affective, Cognitive, and Behavioral Differences Between High and Low Procrastinators. *Journal of Counseling Psychology, 33*(4), 387-394.
Sadler-Smith, E. (1996a). Approaches to studying: Age, gender and academic performance. *Educational Studies, 22*(3), 367-379.
Sadler-Smith, E. (1996b). Learning styles: A holistic approach. *Journal of European Industrial Training, 20*(7), 29-36.
Sadler-Smith, E., & Riding, R. (1999). Cognitive style and instructional preferences. *Instructional Science, 27*, 355-371.
Sadler-Smith, E., & Smith, P. (2004). Strategies for accommodating individuals' styles and preferences in flexible learning programmes. *British Journal of Educational Technology, 35*(4), 395-412.
Sax, L. J. (2003). Our incoming students: What are they like? *About Campus, 8*(3), 15-20.
Scott, D. (2005). Retention, completion and progression in tertiary education in New Zealand. *Journal of Higher Education, 27*(1), 3-17.
Shaffer, D. W., & Resnick, M. (1999). "Thick" authenticity: New media and authentic learning. *Journal of Interactive Learning Research, 10*(2), 195-215.
Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effects on achievment, attitudes and ethnic relations. *Review of Educational Research, 50*(2), 241-271.
Shaw, G., & Marlow, N. (1999). The role of student learning styles, gender, attitudes and perceptions on information and communication technology assisted learning. *Computers & Education, 33*, 223-234.
Shaw, M. E. (1981). *Group Dynamics: The Psychology of Small Group Behaviour*. New York: McGraw-Hill.
Shea, P., Swan, K., Fredericksen, E., & Pickett, A. (2001). Student satisfaction and reported learning in the SUNY Learning Network. *Elements of Quality Online Education, 3*.
Shimizu, Y. (1999). Towards a new distance of education system. In G. Cumming, T. Okamoto & L. Gomez (Eds.), *Advanced research in computers and communications in education: New human abilities for the networked society*. Amsterdam: IOS Press.
Shipman, S., & Shipman, V. C. (1985). Cognitive styles: Some conceptual, methodological, and applied issues. In E. W. Gordon (Ed.), *Review of Research in Education*. Washington, D.C.: American Educational Research Association.
Silverthorne, S. (2002). Time pressure and creativity: Why time pressure is not on your side. *Working Knowledge*.

Slavin, R. E. (1980). Cooperative learning. *Review of Educational Research, 50*(2), 315-342.
Slavin, R. E. (1983). *Cooperative learning*. New York: Longman.
Smith, P. (2000). Flexible delivery and apprentice training: Preferences, problems and challenges. *Journal of Vocational Education and Training*(52), 483-502.
Smith, P. (2001). Technology students learning preferences and the design of flexible learning programmes. *Instructional Science, 29*, 237-254.
Snow, R. E. (1987). Aptitude complexes. In R. E. Snow & M. Farr (Eds.), *Aptitude, learning and instruction, conative and affective process analysis* (Vol. 3). Hillsdale, NJ: Lawerence Erlbaum.
Snow, R. E. (1992). Aptitude theory: Yesterday, today and tomorrow. *Educational Psychologist, 27*, 5-11.
Snow, R. E., & Jackson III, D. (1997). *Individual differences in cination: Selected constructs and measures* (No. CRESST CSE Technical Report 447). Palo Alto: Department of Education, Standford University.
Song, C.-R. (2002). Literature review for hypermedia study from an individual learning difference perspective. *British Journal of Educational Technology, 3*(4), 435-447.
Sonnenwald, D. H., & Li, B. (2003). Scientific collaboratorsa in higher education: Exploring learning style preferences and perceptions of technology. *British Journal of Educational Technology, 34*(4), 419-431.
Spennemann, D. H. R. (1996). Gender imbalances in computer access among environmental students. *Journal of Instructional Science and Technology, 1*(2).
Spring, C. (1985). Comprehension ans study strategies reported by university freshmen who are good and poor readers. *Instructional Science*(14), 157-167.
Sternberg, R. J. (1997). *Thinking Styles*. New York: Cambridge University Press.
Strange, C. C. (2004). Constructions of student development across the generations. *New Directions for Student Services, Summer*(106), 47-57.
Sveiby, K. E. (1992). *The knowhow company: Strategy formulation in knowledge intensive industries. International review of strategic management*. Chicester: John Wiley.
Swanson, L. J. (1995). *Learning styles: A review of the literature*. Unpublished ERIC Document Reproduction Service No. ED 235 185, U.S. Department of Education.
Sweller, J. (1994). Cognitive load theory, learning difficulty and instructional design. *Learning and Instruction*(4), 295-312.
Tabachnick, B. G., & Fidell, L. S. (1989). *Using Multivariate Statistics* (3rd ed.). New York, USA: Harper and Collins College Publishers.
Thurstone, L. L. (1947). *Multiple factor analysis*. Chicago: University of Chicago Press.
Tobias, S. (1985). Test anxiety: Interference, defective skills, and cognitive capacity. *Educational Psychologist, 20*(3), 135-142.
Trigwell, K., & Prosser, M. (1991). Relating approaches to study and quality of learning outcomes at the course level. *British Journal of Educational Psychology, 61*, 265-275.
van Dam, A. (2005). Visualization research problems in the next-generation educational software. *IEEE Computer Graphics & Applications;*(September/October).
Veenman, M. V. J., & Beishuizen, J. J. (2004). Intellectual and metacognitive skills of novices while studying texts under conditions of text difficulty and time constraint. *Learning and Instruction, 14*(6), 621-640.
Webb, N. M. (1980). Group process: The key to learning in groups. *New Directions for Methodology of Social and Behavioural Sciences, 6*, 77-87.
Wegerif, R. (1998). The social dimension of asynchronous learning networks. *Journal of Asynchronous Learning Networks, 2*(1).
Wellner, A. (1999). Get ready for Generation Next. *Training, 36*(2), 42-46.
Wileman, R. E. (1993). *Visual Communicating*. Englewood Cliffes, NJ: Educational Technology Publications.

Wilson, M. E. (2004). Teaching, learning, and millennial students. *New Directions for Student Services, Summer*(106), 59-71.

Windschitl, M. (1998). The WWW and classroom research: What path should we take? *Educational Researcher, 27*(1), 28-33.

Witkin, H. A., Moore, C., Goodenough, D., & Cox, P. (1977). Field-dependent and field-independent cognitive styles and their educational implications. *Review of Educational Research, 47*, 1-64.

Wooldridge, B. (1995). Increasing the effectiveness of university/college instruction: Integrating the results of learning style research into course design and delivery. In R. R. Sims & S. J. Sims (Eds.), *The importance of learning styles: Understanding the implications for learning, course design and education* (pp. 49-67). London: Greenwood Press.

Zemke, R., Raines, C., & Filpczak, R. (2000). *Generations at Work: Managing the Clash of Veterans, Boomers, Xers, and Nexters in Your Workplace*. New York: AMACOM.

APPENDIX A

Table 1: ANOVA – Generations and Learning Orientations

First Order Components		Sum of Squares	df	Mean Square	F	Sig.
Listening	Between Groups	18.400	2	9.200	16.753	.000
	Within Groups	979.131	1783	.549		
	Total	997.531	1785			
Effort	Between Groups	82.391	2	41.195	125.377	.000
	Within Groups	585.186	1781	.329		
	Total	667.577	1783			
Achievement motivation	Between Groups	2.685	2	1.343	2.871	.057
	Within Groups	832.769	1781	.468		
	Total	835.455	1783			
Time-poorness	Between Groups	.502	2	.251	.435	.648
	Within Groups	1028.734	1783	.577		
	Total	1029.235	1785			
Factual - Relativistic reasoning	Between Groups	3.981	2	1.990	1.818	.163
	Within Groups	1940.545	1772	1.095		
	Total	1944.526	1774			
Visual - text	Between Groups	54.486	2	27.243	16.315	.000
	Within Groups	2973.901	1781	1.670		
	Total	3028.387	1783			
Collaboration – Working alone	Between Groups	85.012	2	42.506	20.301	.000
	Within Groups	3726.894	1780	2.094		
	Total	3811.905	1782			
Extrinsic – Intrinsic motivation	Between Groups	250.841	2	125.421	88.084	.000
	Within Groups	2537.343	1782	1.424		
	Total	2788.184	1784			
Dependent - independent learning	Between Groups	101.889	2	50.945	32.091	.000
	Within Groups	2817.819	1775	1.588		
	Total	2919.708	1777			
Sequential- Global	Between Groups	1.490	2	.745	.537	.585
	Within Groups	1941.611	1400	1.387		
	Total	1943.101	1402			
Goal focus	Between Groups	7.972	2	3.986	11.443	.000
	Within Groups	620.366	1781	.348		
	Total	628.337	1783			

Table 2: Scheffe Post Hoc Test Generations and Learning Orientations

Dependent Variable	Generation		Mean Difference	Std. Error	Sig.
	1 = Millennials, 2 = Generation X 3 = Baby Boomers				
Listening	1.00	2.00	.12360(*)	.03894	.007
		3.00	.28159(*)	.05032	.000
	2.00	1.00	-.12360(*)	.03894	.007
		3.00	.15799(*)	.05302	.012
	3.00	1.00	-.28159(*)	.05032	.000
		2.00	-.15799(*)	.05302	.012
Effort	1.00	2.00	-.34887(*)	.03015	.000
		3.00	-.54147(*)	.03893	.000
	2.00	1.00	.34887(*)	.03015	.000
		3.00	-.19260(*)	.04103	.000
	3.00	1.00	.54147(*)	.03893	.000
		2.00	.19260(*)	.04103	.000
Text-visual	1.00	2.00	.18170(*)	.06794	.028
		3.00	.49457(*)	.08778	.000
	2.00	1.00	-.18170(*)	.06794	.028
		3.00	.31287(*)	.09245	.003
	3.00	1.00	-.49457(*)	.08778	.000
		2.00	-.31287(*)	.09245	.003
Working alone-collaborative	1.00	2.00	.33668(*)	.07609	.000
		3.00	.56529(*)	.09830	.000
	2.00	1.00	-.33668(*)	.07609	.000
		3.00	.22861	.10352	.088
	3.00	1.00	-.56529(*)	.09830	.000
		2.00	-.22861	.10352	.088
Extrinsic-intrinsic motivation	1.00	2.00	-.46559(*)	.06272	.000
		3.00	-1.03619(*)	.08105	.000
	2.00	1.00	.46559(*)	.06272	.000
		3.00	-.57060(*)	.08537	.000
	3.00	1.00	1.03619(*)	.08105	.000
		2.00	.57060(*)	.08537	.000
Dependent-independent	1.00	2.00	-.36687(*)	.06638	.000
		3.00	-.62122(*)	.08571	.000
	2.00	1.00	.36687(*)	.06638	.000
		3.00	-.25435(*)	.09034	.019
	3.00	1.00	.62122(*)	.08571	.000
		2.00	.25435(*)	.09034	.019
Goal focus	1.00	2.00	-.13833(*)	.03103	.000
		3.00	-.12250(*)	.04013	.010
	2.00	1.00	.13833(*)	.03103	.000
		3.00	.01583	.04228	.932
	3.00	1.00	.12250(*)	.04013	.010
		2.00	-.01583	.04228	.932

* The mean difference is significant at the .05 level.

Table 3: ANOVA – Educational Institution and Learning Orientations

		Sum of Squares	df	Mean Square	F	Sig.
Listening	Between Groups	40.901	3	13.634	25.377	.000
	Within Groups	969.738	1805	.537		
	Total	1010.639	1808			
Effort	Between Groups	27.392	3	9.131	25.372	.000
	Within Groups	648.865	1803	.360		
	Total	676.257	1806			
Achievement motivation	Between Groups	10.862	3	3.621	7.851	.000
	Within Groups	831.507	1803	.461		
	Total	842.369	1806			
Factual-relativistic reasoning	Between Groups	13.586	3	4.529	4.116	.006
	Within Groups	1973.003	1793	1.100		
	Total	1986.589	1796			
Text-visual	Between Groups	41.262	3	13.754	8.169	.000
	Within Groups	3034.031	1802	1.684		
	Total	3075.293	1805			
Working alone-collaborative	Between Groups	90.672	3	30.224	14.385	.000
	Within Groups	3786.264	1802	2.101		
	Total	3876.936	1805			
Extrinsic-intrinsic motivation	Between Groups	48.221	3	16.074	10.401	.000
	Within Groups	2786.304	1803	1.545		
	Total	2834.526	1806			

Table 4: Scheffe Post Hoc Test Educational Institution and Learning Orientations

Dependent Variable	Educational Institutions 1 = Universities 2 = Polytechnics 3 = Institutes 4 = Private training organisations		Mean Difference	Std. Error
Listening	1	2	.30893	.04224
		4	-.25812	.07395
	2	1	-.30893	.04224
		3	-.34766	.08158
		4	-.56705	.07973
	3	2	.34766	.08158
	4	1	.25812	.07395
		2	.56705	.07973
Effort	1	2	-.21135	.03458
		4	-.41426	.06053
	2	1	.21135	.03458
		3	.23114	.06677
		4	-.20291	.06526
	3	2	-.23114	.06677
		4	-.43405	.08323
	4	1	.41426	.06053
		2	.20291	.06526
		3	.43405	.08323
Achievement motivation	1	4	-.33183	.06852
	2	4	-.31692	.07387
	3	4	-.30693	.09421
	4	1	.33183	.06852
		2	.31692	.07387
		3	.30693	.09421
Visual-Text	1	2	.33602	.07481
	2	1	-.33602	.07481
		4	-.49920	.14115
	4	2	.49920	.14115
Working Alone- Collaborative	1	2	.47209	.08357
	2	1	-.47209	.08357
		3	-.60484	.16134
		4	-.78652	.15768
	3	2	.60484	.16134
	4	2	.78652	.15768
Extrinsic- Intrinsic Motivation	1	2	-.38949	.07166
	2	1	.38949	.07166

All mean difference are significant at the .05 level or better.

Table 5: ANOVA – Qualifications and Learning Orientations

		Sum of Squares	df	Mean Square	F	Sig.
Listening	Between Groups	5.604	4	1.401	2.511	.040
	Within Groups	1004.261	1800	.558		
	Total	1009.865	1804			
Effort	Between Groups	30.293	4	7.573	21.098	.000
	Within Groups	645.413	1798	.359		
	Total	675.706	1802			
Achievement motivation	Between Groups	6.332	4	1.583	3.409	.009
	Within Groups	834.948	1798	.464		
	Total	841.280	1802			
Time poorness	Between Groups	7.050	4	1.763	3.046	.016
	Within Groups	1042.251	1801	.579		
	Total	1049.301	1805			
Factual-relativistic reasoning	Between Groups	42.983	4	10.746	9.926	.000
	Within Groups	1935.676	1788	1.083		
	Total	1978.659	1792			
Text-visual	Between Groups	14.494	4	3.623	2.128	.075
	Within Groups	3059.420	1797	1.703		
	Total	3073.913	1801			
Working alone-collaborative	Between Groups	37.797	4	9.449	4.431	.001
	Within Groups	3831.874	1797	2.132		
	Total	3869.671	1801			
Extrinsic-intrinsic motivation	Between Groups	48.579	4	12.145	7.846	.000
	Within Groups	2782.949	1798	1.548		
	Total	2831.528	1802			
Dependent-independent	Between Groups	60.247	4	15.062	9.233	.000
	Within Groups	2923.366	1792	1.631		
	Total	2983.613	1796			
Sequential-global	Between Groups	31.885	4	7.971	5.790	.000
	Within Groups	1944.040	1412	1.377		
	Total	1975.925	1416			
Goal focus	Between Groups	1.571	4	.393	1.114	.348
	Within Groups	633.844	1798	.353		
	Total	635.415	1802			

Table 6: Scheffe Post Hoc Test Qualifications and Learning Orientations

Learning Orientations	Qualifications 1 = certificate 2 = diploma 3 = degree 4 = post graduate diploma 5= post graduate degree		Mean Difference	Std. Error
Effort	3	1	-.28772	.05076
	3	2	-.28892	.04557
	3	4	-.26920	.06379
	3	5	-.25622	.05864
Achievement motivation	1	3	.20084	.05790
Time poor	1	4	.30558	.09888
Factual-Relativistic Reasoning	2	4	-.42794	.13001
	5	1	.43132	.12803
	5	2	.67126	.12199
	5	3	.53752	.10188
Working Alone-Collaborative	1	2	.49522	.15553
	1	4	.71555	.18981
	1	5	.46783	.17969
Extrinsic-Intrinsic Motivation	5	1	.50280	.15309
	5	3	.58629	.12178
Dependent-Independent Learning	4	1	.56545	.16622
	4	2	.53888	.15915
	4	3	.55791	.13600
	5	1	.59177	.15738
	5	2	.56520	.14989
	5	3	.58422	.12504
Sequential-Global	5	1	.49772	.15083
	5	2	.66185	.14559
	5	3	.38470	.12309

* The mean difference is significant at the .05 level or better.

Table 7: ANOVA – Ethnicity and Learning Orientations

		Sum of Squares	df	Mean Square	F	Sig.
Listening	Between Groups	36.724	4	9.181	17.146	.000
	Within Groups	950.970	1776	.535		
	Total	987.694	1780			
Effort	Between Groups	11.970	4	2.993	8.136	.000
	Within Groups	652.497	1774	.368		
	Total	664.467	1778			
Achievement motivation	Between Groups	22.517	4	5.629	12.482	.000
	Within Groups	800.061	1774	.451		
	Total	822.578	1778			
Time poorness	Between Groups	.512	4	.128	.222	.926
	Within Groups	1024.434	1776	.577		
	Total	1024.947	1780			
Factual-relativistic reasoning	Between Groups	15.338	4	3.835	3.509	.007
	Within Groups	1928.814	1765	1.093		
	Total	1944.152	1769			
Text-visual	Between Groups	57.400	4	14.350	8.552	.000
	Within Groups	2976.831	1774	1.678		
	Total	3034.231	1778			
Working alone-collaborative	Between Groups	312.172	4	78.043	39.846	.000
	Within Groups	3472.642	1773	1.959		
	Total	3784.814	1777			
Extrinsic-intrinsic motivation	Between Groups	330.050	4	82.512	59.861	.000
	Within Groups	2446.657	1775	1.378		
	Total	2776.707	1779			
Dependent-independent	Between Groups	56.199	4	14.050	8.614	.000
	Within Groups	2883.556	1768	1.631		
	Total	2939.755	1772			
Sequential-global	Between Groups	16.540	4	4.135	2.980	.018
	Within Groups	1931.234	1392	1.387		
	Total	1947.774	1396			
Goal focus	Between Groups	2.731	4	.683	1.943	.101
	Within Groups	623.313	1774	.351		
	Total	626.044	1778			

Table 8: Scheffe Post Hoc Test Ethnicity and Learning Orientations

Dependent Variable	Ethnicity 1 = European, 2 = NZ Maori 3 = Polynesian, 4 = Chinese 5 = Asian (excluding Chinese)		Mean Difference	Std. Error
Listening	1	2	-.39690	.08378
	1	3	-.36869	.08426
	1	4	-.25202	.04237
	1	5	-.27349	.07202
Effort	3	1	.33990	.06984
	3	4	.40496	.07374
	3	5	.36010	.08813
Achievement Motivation	3	1	.44631	.07733
	3	4	.53914	.08169
	3	5	.32521	.09759
Relativistic Reasoning	1	4	-.20314	.06098
Text-Visual	4	1	.39535	.07514
	4	5	.42875	.13723
Working Alone-Collaborative	1	2	-.52281	.16024
	1	3	-.66987	.16116
	1	4	-.98218	.08119
	1	5	-.58605	.13774
Extrinsic-Intrinsic Motivation	1	2	.41714	.13442
	4	1	-1.04885	.06798
	4	2	-.63171	.14203
	4	3	-.69622	.14276
	4	5	-.69518	.12474
Dependent-Independent Learning	1	4	.33639	.07435
	1	5	.53251	.12569

* The mean difference is significant at the .05 level or better.

Table 9: ANOVA – Major Subject and Learning Orientations

		Sum of Squares	df	Mean Square	F	Sig.
Listening	Between Groups	8.479	6	1.413	2.545	.019
	Within Groups	991.291	1785	.555		
	Total	999.770	1791			
Effort	Between Groups	5.786	6	.964	2.604	.016
	Within Groups	660.368	1783	.370		
	Total	666.154	1789			
Achievement motivation	Between Groups	4.577	6	.763	1.655	.128
	Within Groups	822.122	1783	.461		
	Total	826.700	1789			
Time poorness	Between Groups	9.941	6	1.657	2.862	.009
	Within Groups	1033.211	1785	.579		
	Total	1043.152	1791			
Factual-relativistic reasoning	Between Groups	207.365	6	34.561	34.715	.000
	Within Groups	1765.151	1773	.996		
	Total	1972.517	1779			
Text-visual	Between Groups	66.077	6	11.013	6.557	.000
	Within Groups	2992.914	1782	1.680		
	Total	3058.991	1788			
Working alone-collaborative	Between Groups	98.265	6	16.378	7.804	.000
	Within Groups	3739.959	1782	2.099		
	Total	3838.224	1788			
Extrinsic-intrinsic motivation	Between Groups	225.065	6	37.511	25.927	.000
	Within Groups	2579.580	1783	1.447		
	Total	2804.645	1789			
Dependent-independent	Between Groups	38.113	6	6.352	3.858	.001
	Within Groups	2925.511	1777	1.646		
	Total	2963.624	1783			
Sequential-global	Between Groups	68.455	6	11.409	8.414	.000
	Within Groups	1894.339	1397	1.356		
	Total	1962.794	1403			
Goal focus	Between Groups	15.350	6	2.558	7.494	.000
	Within Groups	608.669	1783	.341		
	Total	624.019	1789			

Table 10: Scheffe Post Hoc Test Major Subject and Learning Orientations

Dependent Variable	Majors 1 = Business, 2 = Humanities, Education, Human Resource Management, Law, Sport, 3 = Medicine and Science, 4 = Fine Arts, 5 = Technology and Engineering, 6 = Finance, Accounting, Economics, 7 = IT and Library Studies		Mean Difference	Std. Error
Listening	1	2	.17769	.04965
Effort	4	7	-.30799	.08431
Factual-Relativistic Reasoning	1	5	.49883	.13957
	1	6	.48869	.08609
	1	4	-.91576	.12854
	2	5	.50752	.13480
	2	6	.49738	.07812
	3	1	-.65300	.08116
	3	2	-.66169	.07266
	3	7	-.53723	.09577
	4	1	.91576	.12854
	4	2	.90708	.12335
	4	3	1.56877	.13168
	4	5	1.41459	.17387
	4	6	1.40445	.13477
	4	7	1.03154	.13823
	6	7	-.37291	.09998
Text-Visual	1	2	.34035	.08653
	2	4	-.79612	.16022
	4	6	.67360	.17456
Working Alone-Collaborative	1	2	.49522	.09653
	1	3	.58749	.11734
	5	2	.71551	.19570
	5	3	.80778	.20677
Extrinsic-Intrinsic Motivation	1	2	-.75291	.08022
	1	3	-.73927	.09749
	1	4	-1.25948	.15480
	1	7	-.54364	.10998
	4	5	.89212	.20960
	4	7	.71584	.16664
	6	2	-.66754	.09353
	6	3	-.65391	.10871
	6	4	-1.17412	.16210
	6	7	-.45828	.12003
Sequential-Global	2	6	.43763	.11777
	4	1	.84393	.16133
	4	2	.60694	.14509
	4	3	.88765	.15386
	4	5	.79763	.20292
	4	6	1.04457	.17312
	4	7	.77378	.16513
Goal Focus	4	1	-.36045	.07518

	4	2	-.43251	.07223
	4	3	-.48302	.07708
	4	6	-.41446	.07879
	4	7	-.37265	.08094

- The mean difference is significant at the .05 level or better.

Table 11: t-test for Equality of Means for Domestic and International Students.

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Listening	-3.890	821.587	.000	-.14191	.03648
Effort	3.563	813.066	.000	.10700	.03003
Achievement Motivation	3.276	701.038	.001	.11851	.03617
Relativistic Reasoning	-4.063	842.623	.000	-.20492	.05044
Text-Visual	-3.921	729.131	.000	-.26629	.06791
Collaborative-working Alone	-9.919	666.762	.000	-.78037	.07868
Extrinsic-Intrinsic Motivation	13.294	684.649	.000	.86441	.06502
Dependent-Independent Learning	5.249	788.582	.000	.33465	.06375
Sequential-Global	1.776	206.909	.077	.15176	.08543
Goal Focus	2.155	709.964	.032	.06737	.03127

A significant result from the Levene's Test determined that there was not equality of variance so the "equal variances not assumed" results are presented.

Table 12: t-test for Equality of Means for Gender Differences

		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Listening	Equal variances assumed	2.301	1788	.022	.08545	.03714
Effort	Equal variances assumed	-6.432	1786	.000	-.19331	.03006
Achievement Motivation	Equal variances assumed	-2.986	1786	.003	-.10092	.03380
Time - poorness	Equal variances assumed	-2.730	1788	.006	-.10349	.03791
Relativistic Reasoning	Equal variances not assumed	2.539	1306.811	.011	.13074	.05150
Text-Visual	Equal variances not assumed	5.197	1363.243	.000	.32564	.06266
Collaborative-Working Alone	Equal variances assumed	4.663	1785	.000	.33878	.07265
Extrinsic-Intrinsic Motivation	Equal variances assumed	-7.225	1786	.000	-.44458	.06153
Dependent-Independent Learning	Equal variances assumed	3.624	1780	.000	.23243	.06413
Sequential-Global	Equal variances not assumed	2.281	850.593	.023	.15009	.06579
Goal Focus	Equal variances assumed	-4.319	1786	.000	-.12642	.02927

Table 13: ANOVA- Generations and Learner Profiles

Second Order Components		Sum of Squares	df	Mean Square	F	Sig.
Cognitive voyager	Between Groups	11.908	2	5.954	6.472	.002
	Within Groups	1286.132	1398	.920		
	Total	1298.039	1400			
Strategic competitor	Between Groups	16.905	2	8.453	34.837	.000
	Within Groups	430.201	1773	.243		
	Total	447.107	1775			
Multimedia Loner	Between Groups	81.698	2	40.849	65.035	.000
	Within Groups	1112.380	1771	.628		
	Total	1194.077	1773			

Table 14: Scheffe Post Hoc Test Generation and Learner Profiles

Dependent Variable	Generation		Mean Difference	Std. Error	Sig.
	1 = Millennials 2 = Generation X 3 = Baby Boomers				
Cognitive voyager	1.00	2.00	-.11297	.05758	.146
		3.00	-.24421*	.06906	.002
	2.00	1.00	.11297	.05758	.146
		3.00	-.13123	.07105	.182
	3.00	1.00	.24421*	.06906	.002
		2.00	.13123	.07105	.182
Strategic competitor	1.00	2.00	-.18681*	.02597	.000
		3.00	-.21081*	.03352	.000
	2.00	1.00	.18681*	.02597	.000
		3.00	-.02400	.03532	.794
	3.00	1.00	.21081*	.03352	.000
		2.00	.02400	.03532	.794
Multimedia collaborator	1.00	2.00	.26642*	.04177	.000
		3.00	.59259*	.05390	.000
	2.00	1.00	-.26642*	.04177	.000
		3.00	.32617*	.05671	.000
	3.00	1.00	-.59259*	.05390	.000
		2.00	-.3261(*	.05671	.000

Table 15: ANOVA – Educational Institution and Learner Profiles

		Sum of Squares	df	Mean Square	F	Sig.
Strategic competitor	Between Groups	8.108	3	2.703	10.956	.000
	Within Groups	442.795	1795	.247		
	Total	450.903	1798			
Multi-media collaborator	Between Groups	45.477	3	15.159	23.246	.000
	Within Groups	1168.571	1792	.652		
	Total	1214.048	1795			

Table 16: Scheffe Post Hoc Test Educational Institutions and Learner Profiles

Dependent Variable	Educational Institutions 1 = Universities 2 = Polytechnics 3 = Institutes 4 = Private training organisations		Mean Difference	Std. Error
Strategic Competitor	1	2.	-.08462*	.02865
	1	4	-.26001*	.05013
	2	1	.08462*	.02865
	2	4	-.17539*	.05403
	2	4	-.27458*	.06890
	4	1	.26001*	.05013
	4	2	.17539*	.05403
	4	3	.27458*	.06890
Multimedia Collaborator	1	2	.37051*	.04660
	2	1	-.37051*	.04660
	2	3	-.38368*	.08988
	2	4	-.46074*	.08784
	3	2	.38368*	.08988
	4	2	.46074*	.08784

All mean difference are significant at the .05 or better.

Table 17: ANOVA – Qualifications and Components Learner Profiles

		Sum of Squares	df	Mean Square	F	Sig.
Cognitive voyager	Between Groups	41.039	4	10.260	11.188	.000
	Within Groups	1293.003	1410	.917		
	Total	1334.043	1414			
Strategic competitor	Between Groups	4.618	4	1.154	4.633	.001
	Within Groups	446.013	1790	.249		
	Total	450.631	1794			
Multi-media collaborator	Between Groups	8.532	4	2.133	3.165	.013
	Within Groups	1205.153	1788	.674		
	Total	1213.685	1792			

Table 18: Scheffe Post Hoc Test Qualifications and Learner Profiles

Learning Orientations	Qualifications		Mean Difference	Std. Error
Cognitive Voyager	4	2	.48145*	.13018
	5	1	.56280*	.12326
	5	2	.68355*	.11882
	5	3	.55168*	.10046
Strategic Competitor	1	3	.13377*	.04242

* The mean difference is significant at the .05 level or better.

Table 19: ANOVA – Ethnicity and Learner Profiles

		Sum of Squares	df	Mean Square	F	Sig.
Cognitive voyager	Between Groups	13.412	4	3.353	3.583	.006
	Within Groups	1300.745	1390	.936		
	Total	1314.157	1394			
Strategic competitor	Between Groups	10.111	4	2.528	10.329	.000
	Within Groups	432.180	1766	.245		
	Total	442.292	1770			
Multimedia collaborator	Between Groups	141.445	4	35.361	59.005	.000
	Within Groups	1057.155	1764	.599		
	Total	1198.600	1768			

Table 20: Scheffe Post Hoc Test

Dependent Variable	Ethnicity 1 = European, 2 = NZ Maori 3 = Polynesian, 4 = Chinese 5 = Asian (excluding Chinese)		Mean Difference	Std. Error
Strategic Competitor	3	1	.29546	.05697
	3	4	.36225	.06024
	3	5	.25689	.07189
	4	2	-.18483	.05993
Multimedia collaborator	1	2	-.45653	.08864
	1	3	-.38020	.08915
	1	4	-.67161	.04524
	1	5	-.28774	.07650
	4	3	.29142	.09432
	4	5	.38387	.08247

* The mean difference is significant at the .05 level or better

Table 21: ANOVA – Major Subject and Components from Second Order Principal Components Analysis

		Sum of Squares	df	Mean Square	F	Sig.
Cognitive voyager	Between Groups	88.693	6	14.782	16.652	.000
	Within Groups	1238.332	1395	.888		
	Total	1327.025	1401			
Strategic competitor	Between Groups	5.217	6	.870	3.526	.002
	Within Groups	437.728	1775	.247		
	Total	442.945	1781			
Multimedia collaborator	Between Groups	55.646	6	9.274	14.359	.000
	Within Groups	1144.555	1772	.646		
	Total	1200.201	1778			

Table 22: Scheffe Post Hoc Test

Dependent Variable	Majors 1 = Business, 2 = Humanities, Education, Human Resource Management, Law, Sport 3 = Medicine and Science, 4 = Fine Arts, 5 = Technology and Engineering, 6 = Finance, Accounting, Economics, 7 = IT and Library Studies		Mean Difference	Std. Error
Cognitive Voyager	2	3	.45475	.07041
	2	6	.50014	.09529
	3	7	-.34602	.09501
	4	1	.71054	.13074
	4	2	.53680	.11739
	4	3	.99155	.12449
	4	5	.88128	.16418
	4	6	1.03694	.14007
	4	7	.64553	.13361
Strategic Competitor	4	2	-.25721	.06139
	4	3	-.26463	.06551
	4	6	-.26669	.06708
Multimedia Collaborator	1	2	.44945	.05391
	1	3	.35031	.06539
	1	7	.27893	.07370
	2	5	-.41332	.10858
	2	6	-.33211	.06293

- The mean difference is significant at the .05 level or better.

Table 23: t-test for Equality of Means for Domestic and International Students.

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Strategic Competitor	3.827	742.653	.000	.09778	.02555
Multimedia Collaborator	-12.873	779.380	.000	-.50926	.03956

A significant result from the Levene's Test determined that there was not equality of variance so the "equal variances not assumed" results are presented.

Table 24: t-test for Equality of Means for Gender Differences

		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Cognitive Voyager	Equal variances assumed	3.699	1400	.000	.21118	.05709
Strategic Competitor	Equal variances not assumed	-5.726	1281.709	.000	-.13957	.02438
Multimedia Collaborator	Equal variances assumed	6.584	1775	.000	.26767	.04065

Table 25: ANOVAS – Descriptive Statistics Qualifications and Sources of Information

Sources of Information	Qualifications	Mean	Std. Deviation	Std. Error
Internet	Certificate	3.7898	1.14372	.09128
	Diploma	4.1244	.99471	.07016
	Degree	4.1543	.99617	.02831
	Post graduate diploma	4.2632	.87775	.09005
	Post graduate degree	4.2105	1.03457	.09690
	Total	4.1285	1.01108	.02380
Textbooks, study guides	Certificate	3.8790	.99583	.07948
	Diploma	4.4080	.75679	.05338
	Degree	4.2184	.85604	.02435
	Post graduate diploma	4.3789	.74632	.07657
	Post graduate degree	4.1579	.73568	.06890
	Total	4.2146	.85455	.02013
Library – printed books and journals	Certificate	3.0318	1.23735	.09875
	Diploma	3.4478	1.16555	.08221
	Degree	3.5653	1.19896	.03414
	Post graduate diploma	3.8316	1.17285	.12033
	Post graduate degree	3.6842	1.19967	.11236
	Total	3.5272	1.20833	.02848
Library – online resources	Certificate	2.6879	1.30509	.10416
	Diploma	3.0299	1.29580	.09140
	Degree	3.2601	1.22010	.03473
	Post graduate diploma	3.7263	1.15263	.11826
	Post graduate degree	3.7807	1.27438	.11936
	Total	3.2421	1.26017	.02969
Other students	Certificate	2.7133	1.16629	.09523
	Diploma	2.1160	1.19388	.08874
	Degree	2.4744	1.20104	.04008
	Post graduate diploma	2.1467	1.12338	.12972
	Post graduate degree	2.3125	1.23384	.12593
	Total	2.4250	1.20463	.03220

Table 26: ANOVA – Sources of information and qualifications

		Sum of Squares	df	Mean Square	F	Sig.
Internet	Between Groups	21.326	4	5.331	5.265	.000
	Within Groups	1822.855	1800	1.013		
	Total	1844.181	1804			
Textbooks, study guides	Between Groups	28.150	4	7.038	9.826	.000
	Within Groups	1287.783	1798	.716		
	Total	1315.933	1802			
Library - printed books and journals	Between Groups	53.193	4	13.298	9.275	.000
	Within Groups	2573.473	1795	1.434		
	Total	2626.666	1799			
Library – online resources	Between Groups	113.022	4	28.255	18.484	.000
	Within Groups	2745.428	1796	1.529		
	Total	2858.450	1800			
Other students	Between Groups	38.966	4	9.741	6.825	.000
	Within Groups	1991.159	1395	1.427		
	Total	2030.125	1399			

Table 27: Scheffe Post Hoc Tests

Dependent Variable	1 = certificate, 2 = diploma 3 = degree, 4 = post grad diploma 5 = post grad degree		Mean Difference	Std. Error	Sig.
Internet	1	2	-.33457	.10718	.045
	1	3	-.36447	.08525	.001
	1	4	-.47335	.13081	.011
	1	5	-.42072	.12383	.021
Textbooks, study guides	1	2	-.52898	.09014	.000
	1	3	-.33947	.07170	.000
	1	4	-.49997	.11001	.000
Library – printed books and journals	1	2	-.41591	.12753	.031
	1	3	-.53344	.10146	.000
	1	4	-.79973	.15564	.000
	1	5	-.65236	.14734	.001
Library online resources	1	3	-.57223	.10476	.000
	1	4	-1.03842	.16071	.000
	1	5	-1.09280	.15214	.000
	2	4	-.69647	.15394	.000
	2	5	-.75085	.14496	.000
	3	4	-.46619	.13164	.014
	3	5	-.52057	.12103	.001
Other students	1	2	.59731	.13192	.000
	3	2	.35837	.09734	.009

Table 28: ANOVAS – Descriptive Statistics Generation and Sources of Information

Sources of Information	Generations	Mean	Std. Dev.	Std. Error
Internet	Millennials	4.1509	.99138	.03327
	Generation X	4.1326	1.01000	.04086
	Baby Boomers	4.0732	1.07330	.06335
	Total	4.1283	1.01198	.02385
Textbooks, study guides	Millennials	4.0316	.90267	4.0316
	Generation X	4.3061	.80344	4.3061
	Baby Boomers	4.5679	.64349	4.5679
	Total	4.2162	.85451	4.2162
Library – printed books & journals	Millennials	3.3529	1.19845	.04024
	Generation X	3.6013	1.19647	.04856
	Baby Boomers	3.8990	1.15279	.06805
	Total	3.5284	1.20896	.02853
Library – online resources	Millennials	3.1321	1.22661	.04121
	Generation X	3.3136	1.29847	.05262
	Baby Boomers	3.4355	1.23831	.07310
	Total	3.2443	1.25877	.02969
Other students	Millennials	2.7095	1.17346	.04795
	Generation X	2.3069	1.18976	.05294
	Baby Boomers	2.0674	1.16552	.06941
	Total	2.4250	1.20463	.03220

Table 29: ANOVA – Sources of information and Generations

		Sum of Squares	df	Mean Square	F	Sig.
Internet	Between Groups	4.534	2	1.511	1.477	.219
	Within Groups	1838.838	1797	1.023		
	Total	1843.371	1800			
Set textbooks, study guides	Between Groups	74.645	2	24.882	36.069	.000
	Within Groups	1238.241	1795	.690		
	Total	1312.886	1798			
Library - printed books and journals	Between Groups	71.680	2	23.893	16.779	.000
	Within Groups	2551.872	1792	1.424		
	Total	2623.552	1795			
Library – online resources	Between Groups	24.950	2	8.317	5.286	.001
	Within Groups	2820.804	1793	1.573		
	Total	2845.754	1796			
Other students	Between Groups	98.666	2	32.889	23.771	.000
	Within Groups	1931.459	1396	1.384		
	Total	2030.125	1399			

Table 30: Scheffe Post Hoc Tests Generations and Sources of Information

Dependent Variable	1 = Millennials 2 = Generation X 3 = Baby Boomers		Mean Difference	Std. Error	Sig.
Textbooks, study guides	1	2	-.27445	.04368	.000
	1	3	-.53634	.05641	.000
	3	2	.26189	.05944	.000
Library – printed books and journals	1	2	-.24844(*)	.06286	.001
	1	3	-.54608(*)	.08104	.000
	3	2	.29764(*)	.08549	.007
Library – online resources	1	3	-.30349(*)	.08519	.005
Other students	1	2	.40259(*)	.07106	.000
	1	3	.64214(*)	.08495	.000

APPENDIX B

Questionnaire

Section One: *Teaching and Learning Preferences*

	Teaching Mode For each of the teaching modes below please circle the number which best describes how you feel.	**Level of Liking** Strongly Dislike	Dislike	Neutral	Like	Strongly Like
1	**Lectures**	1	2	3	4	5
2	**Tutorials**	1	2	3	4	5
3	**Printed study materials such as study guides, textbooks**	1	2	3	4	5
4	**Group Projects**	1	2	3	4	5
5	**Student Presentations**	1	2	3	4	5
6	**Fully online courses**	1	2	3	4	5
7	**Online discussions, chatrooms developed by teachers**	1	2	3	4	5
8	**Mixture of online and lectures**	1	2	3	4	5

	Information Sources How often do you use the sources below to get information for assignments or studying for exams or tests?	**How Often** Not Very Often	Occasionally	Sometimes	Often	Very Often
1	**Internet**	1	2	3	4	5
2	**Set textbooks, study guides**	1	2	3	4	5
3	**Library – printed books and journals**	1	2	3	4	5
4	**Library – online resources**	1	2	3	4	5
5.	**Other students**	1	2	3	4	5
6	**Other:** (please specify)	1	2	3	4	5

	What's Important to Know For your future (or current) career, what are the important skills and knowledge you must have.	Level of Importance Not Very Important	Little Importance	Some Importance	Quite Important	Very Important
1	**Being able to use computer technology**	1	2	3	4	5
2	**Being able to evaluate the worth of information**	1	2	3	4	5
3	**Knowing how to learn effectively**	1	2	3	4	5
4	**Knowing how to get information you need**	1	2	3	4	5
5	**Having a large amount of knowledge about the subjects you study**	1	2	3	4	5
6	**Other**: (please specify)	1	2	3	4	5

Section Two: *Learning Styles – your attitudes and your preferences*

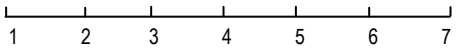
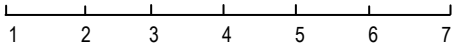
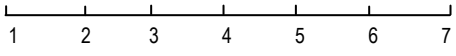
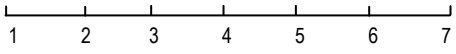
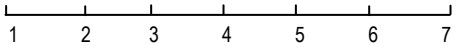
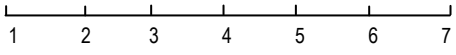
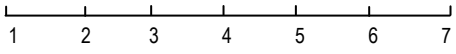
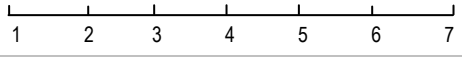
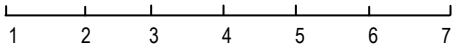
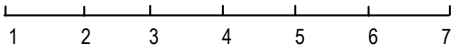
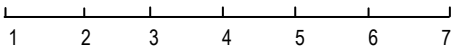
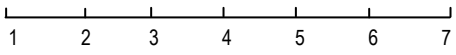
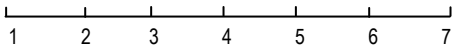
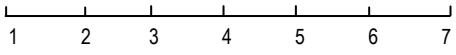
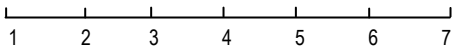
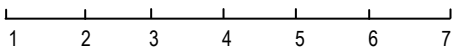
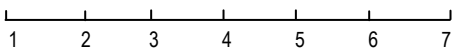
This section is about your preferences and attitudes to learning. Circle the number that most closely says how well the statement describes you. There are no right or wrong answers to these statements. Please work as quickly as you can without being careless and *please complete all the items.*

	Statements	Level of Agreement Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I remember best things that are spoken.	1	2	3	4	5
2	I usually put a lot of effort into trying to understand things that at first seem difficult.	1	2	3	4	5
3	When working on an assignment, I try to keep in mind exactly what the particular lecturer seems to want.	1	2	3	4	5
4	Often I don't have enough time to really understand the ideas I read about.	1	2	3	4	5
5	I want top grades in my studies so that I will be able to select from among the best jobs available.	1	2	3	4	5
6	I usually set out to understand thoroughly the meaning of what I am asked to read.	1	2	3	4	5
7	I take care to find as much information as possible on what will be in an exam.	1	2	3	4	5
8	I prefer listening to the lecturer than reading textbooks.	1	2	3	4	5
9	It is really important to me to do really well in my studies so I make study a top priority.	1	2	3	4	5
10	I don't have enough time to do as much study as I need to for my course.	1	2	3	4	5

11	Lecturers sometimes indicate what is likely to be in the exams, so I look out for hints.	1	2	3	4	5
12	I see myself as an ambitious person.	1	2	3	4	5
13	I remember best what I hear.	1	2	3	4	5
14	Other things such as work and family do not leave me enough time to think about the ideas from my studies.	1	2	3	4	5
15	I try to be strict with myself in my study habits, so that I can do the very best I can.	1	2	3	4	5
16	I make sure I clearly understand the assessment requirements early in the course.	1	2	3	4	5
17	The main benefit of a tertiary education is that it will enable me to earn more money.	1	2	3	4	5
18	I understand better if the lecturer explains things rather than reading about them.	1	2	3	4	5
19	I usually don't have time to think about the implications of what I have read.	1	2	3	4	5
20	I set out to get full marks for an assignment, and try as hard as I can to achieve them.	1	2	3	4	5
21	I pay close attention to information the lecturer gives about exams.	1	2	3	4	5
22	I am very competitive in my studies.	1	2	3	4	5
23	I prefer listening to reading.	1	2	3	4	5
24	I tend not to think about my study outside of class.	1	2	3	4	5
25	I look at most of the additional readings suggested by the lecturer.	1	2	3	4	5
26	It is more important to me to get good grades than to be on friendly terms with my classmates	1	2	3	4	5

The questions below have two statements that are opposites of each other. Circle the number that shows how close you are to the statement you most agree with.

		Strongly agree with statement on this side	Agree with both about the same	Strongly agree with statement on this side
27	I prefer to get new information in written form.	1 2 3 4 5 6 7		I prefer to get new information in pictures, diagrams, or graphs.
28	I find working in a group more stimulating and productive.	1 2 3 4 5 6 7		I find working on my own more stimulating and productive.
29	I prefer to accept the lecturer's ideas as being right.	1 2 3 4 5 6 7		I prefer to check for myself before I accept my lecturer's ideas
30	I prefer courses where the answers are factually right or wrong.	1 2 3 4 5 6 7		I prefer courses in which the answers are based on my own argument and reasoning.
31	The course I'm taking is so interesting, I would like to continue learning about the subject after I finish this course.	1 2 3 4 5 6 7		I am more interested in the qualifications I'll get than in the courses I'm taking.
32	When reading a textbook I prefer to work through it logically from beginning to end.	1 2 3 4 5 6 7		When reading a textbook I prefer to skip about and dip in to the relevant parts.
33	I prefer lecturers to tell me exactly how they want the assignment done.	1 2 3 4 5 6 7		I like projects that let me decide what I want to do and how to do it.
34	When studying I prefer to summarise information as notes.	1 2 3 4 5 6 7		When studying I prefer to summarise information as diagrams.
35	I can get better grades working in a group.	1 2 3 4 5 6 7		I can get better grades working on my own.
36	I find courses with no clear right and wrong answers frustrating.	1 2 3 4 5 6 7		I enjoy developing my own interpretation of the ideas presented in the course.
37	I don't disagree with my lecturers because they are the experts.	1 2 3 4 5 6 7		I sometimes disagree with my lecturers because they are not always right.
38	I spend a good deal of my spare time finding out more about interesting topics that have been discussed in classes.	1 2 3 4 5 6 7		I do not spend much time thinking about lectures outside of class.

39	I like to learn new content in straightforward logical steps.		I usually jump around a topic a lot, then find it suddenly falls into place.
40	I prefer courses that specify in detail what I must do to pass.		**I prefer courses that allow me a lot of freedom to choose which aspects I want to focus on.**
41	I make notes to summarise material in my courses.		I make simple charts, diagrams or tables to summarise material in my courses.
42	The idea of group projects, with one grade for the entire group, appeals to me.		The idea of working alone appeals to me.
43	I like to stay focused on the facts and hard data.		I like to explore ideas from a number of different viewpoints before making up my own mind.
44	I find that studying academic topics can often be really exciting and gripping.		I don't find academic study interesting.
45	When studying I focus only on the topic I'm working on.		When studying a topic I am often reminded of ideas from other courses.
46	I think it's up to the lecturer to decide what should be taught.		I like courses that allow me to pursue my personal goals and interests.
47	I understand written explanations more easily.		I understand diagrams more easily.
48	Working with other people helps me in my studies.		Working with other people slows down my learning.
49	I would rather take a course that deals with facts and real life situations.		I would rather take a course that deals with ideas and theories.
50	I don't feel confident enough to challenge the opinions of lecturers.		I feel confident challenging the opinions of my lecturers.
51	I chose my present course because it is an area I know I will enjoy working in.		I chose my present courses because I felt I had to, more than because I'm interested in the subject.
52	I prefer my lecturer to present the material in systematic steps.		I prefer my lecturer to give me an overview of the subject, and relate it to other subjects and ideas.
53	I prefer classes to focus on the ideas being presented by the lecturer.		I prefer lecturers who allow me to share my experience and knowledge with the class.
54	I remember best what I what read.		I remember best what I see in pictures or graphs.
55	I prefer to work in a group		I prefer to work on my own

56	I prefer courses that emphasis practical, concrete material (facts, data)	1 2 3 4 5 6 7	I prefer courses that emphasis abstract material (concepts, theories)
57	Lecturers know the right answers so I don't argue with them.	1 2 3 4 5 6 7	Lecturers are not always right so I am prepared to argue with them.
58	I am studying because I enjoy it.	1 2 3 4 5 6 7	I am studying because I feel its expected of me, not because I really want to.
59	When working on assignments or solving problems I keep focused on the topic.	1 2 3 4 5 6 7	When working on assignments or solving problems I often find connections between what I'm working on and other subjects or problems
60	I get frustrated with classes that get side-tracked into other topics.	1 2 3 4 5 6 7	I get frustrated with classes that do not explore interesting ideas that might come up in class.
61	In a book with lots of pictures and diagrams, I prefer to focus on the written text.	1 2 3 4 5 6 7	In a book with lots of pictures and diagrams, I prefer to focus on the pictures and diagrams.
62	For most questions there is one best answer.	1 2 3 4 5 6 7	For most questions there is rarely a single best answer.
63	I enjoy my studies so much I often become absorbed in an assignment.	1 2 3 4 5 6 7	I find assignments boring and stressful.
64	I like courses that are structured and organized.	1 2 3 4 5 6 7	I enjoy classes that are flexible and spontaneous.
65	I believe a lecturer's job is to explain the way things are.	1 2 3 4 5 6 7	I believe a lecturer's job is to help us discover our own knowledge.
66	When studying for a test, I like to systematically summarise the material	1 2 3 4 5 6 7	When studying for a test, I often add extra notes or diagrams to my notes at a later stage as new ideas come to me.

Computer Use How often do you use a computer for the following applications:		**Frequency of Use**				
		Rarely or Never	Occasionally	Regularly	Often	Very Often
1	Email	1	2	3	4	5
2	Word processing	1	2	3	4	5
3	Spreadsheets (eg. Excel)	1	2	3	4	5
4	Design tools (eg. Photoshop, Dreamweaver, Powerpoint, Coral Draw)	1	2	3	4	5
5	Entertainment (such as games, music, videos)	1	2	3	4	5

6	Looking for information on the internet	1	2	3	4	5
7	Shopping on the internet	1	2	3	4	5
8	Communication (chatrooms, MSN etc)	1	2	3	4	5

Section Three: *Biographical Information*

1. What is the name of your educational institution? _____

2. What qualification are you studying for:
Certificate ☐ Diploma ☐ Degree ☐ Postgraduate diploma ☐ Postgraduate degree ☐

3. Intended Major or main subject area: _____

4. Are you a domestic student ☐ or an international student ☐

4. Gender: Male ☐ Female ☐

5. Age: How old are you? _____

6. Ethnic Origin (if you belong to more than one ethnic group, please tick the one with which you MOST identify)
NZ European / Pakeha ☐ NZ Maori ☐ Samoan ☐ Cook Island Maori ☐
Chinese ☐ Indian ☐
Other Pacific Island (please specify) _____ Other (please specify) _____

7. Where you born in NZ? Yes ☐ No ☐

8. If you were **NOT** born in New Zealand, how long have you lived here

Less than 1 year ☐ 1 to 3 years ☐ 4 to 6 years ☐
7 to 9 years ☐ 10 or more years ☐

9. In which country did you do most of your high school education _____

10. How many years of TERTIARY study have you completed?

In New Zealand		In another country (please say where _____)	
Less than 1 year		Less than 1 year	☐
1 to 2 years	☐	1 to 2 years	☐
3 to 4 years	☐	3 to 4 years	☐
5 or more years	☐	**5 or more years**	

11. Do you have access to:

Computer at home: No ☐ Yes ☐
Computer at work/campus: No ☐ Yes ☐
Internet: No ☐ Broad band ☐ dial up ☐ Don't know ☐

12. How many years have you used computers for: _____