Learning Styles of First Year Students:

Their Relationship with Success

in Distance Education Courses

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ABSTRACT

Adults have different learning needs and ways, or 'styles' of learning. Understanding students' needs by knowing who they are, what they bring to a learning situation, and how they learn, should influence how they are taught and the environment in which they are taught, regardless of the method of course delivery. Students' personal circumstances aside, it is often other factors such as teaching style, institutional constraints relating to resources, pedagogy, or administration, which determine their learning experiences.

Accommodating individual learning needs, including learning styles preferences, can be more complicated when courses are delivered in a distance mode as teachers are not physically present to assess or adjust to students' requirements. While research is available concerning the learning styles of students in traditional face-to-face learning environments, little is known or agreed about the learning styles of students in distance education, let alone the teaching styles of the courses which students enrol in. Such knowledge may help to design courses supporting a wider range of individual differences, with a potential improvement in the success of students.

Changing trends in education arising from technology and social-economic developments create further impetus for ensuring that the quality of courses offered can be audited against an empirical base of evidence relating to students' learning preferences. This research study aimed to contribute to such a base by seeking to discover if there was a relationship between the learning styles of students enrolled in a number of first year distance education courses at The Open Polytechnic of New Zealand, and their success in those courses. The students were selected on the basis of studying for the first time with The Open Polytechnic. The teaching styles of the courses were analysed to assess the degree of match or mismatch with students' learning styles. From the study implications are drawn which are applicable to designing courses and supporting students studying by distance education.

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This study is dedicated to my grandfather, the late George Diver, who showed me that learning is a life long adventure despite the challenges it may present, and that you are never too old to learn something completely new. It is also dedicated to my children, Cameron and Leigha, who give me love and inspiration, along with practical experience in dealing with different learning styles

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INTRODUCTION

Introduction

Distance education is becoming increasingly seen as a viable main stream method of providing education (Schreiber & Berge, 1998). As pressures from society mount with the focus being on lifelong learning creating a need for constant upskilling in response to technological and economic change, courses of study which can be taken on a part-time or full time basis to fit in with the lifestyle, location, and needs of the learner are becoming of greater importance (Tait, 1999). The additional facilities provided by the Internet and its widespread adoption as a method of course delivery by all types of institutions is leading to a convergence between distance education and traditional face-to-face teaching as the differences between them decrease. Now, more than ever, it is essential to ensure that the educational models and processes used to design and support distance education are valid and effective in creating the best possible learning environment to meet the needs of learners, recognising that learners are individuals with different ways of learning.

Students learning by distance education

Although the use of the Internet for delivery and support of educational programmes may be changing some of the dynamics associated with studying by distance in terms of providing asynchronous communication and access to different resources, other aspects of studying by distance remain the same. Studying at a distance can present more challenges for students who do not have the immediate physical presence of fellow students or a teacher to motivate them, nor do they have the structure provided by a set timetable of classes. Most students studying by distance at the tertiary level are adults who frequently must juggle their lives to find time to study amongst the competing demands of family, work and social commitments. Many of these students have not studied for some time, therefore they may feel that their learning skills are obsolete, and

they can lack confidence accordingly. While educational institutions cannot cater for every individual learning need or adjust courses to suit the circumstances and changes in students lives, they can look to their support systems and course design to create learning environments which make the best possible use of the available resources to ensure the success of the student.

Students, as individuals, have differences which can impact on how they learn, yet too little is known about how they learn and what influences that learning in a distance education environment (Cookson, 1989, Rowntree, 1985). In contrast, a great deal is known about the problems encountered by adult learners in distance education (Garland, 1993, Moore, 1989, Peters, 1992). Consulting instructional design literature used to guide course design in distance education, constant reference is made to the need to accommodate variations in learner characteristics and address learners' needs (for example Aronson & Briggs, 1983 and Kemp, 1985). That requirement is not backed by research as to how students learn in this environment, what their individual differences or learning styles preferences are, or what course design or support features may contribute to their success. Yet learning styles models and instruments are available that provide information concerning learner characteristics (Blakemore, McCray & Coker, 1984, Smith & Linder, 1986) which could be applied to the distance learner, aiding in creating a learning environment to better support their needs.

Creating the optimal learning environment

Creating an optimal learning environment requires addressing many issues, for example the impact of prior knowledge and experience on students' learning abilities within a given context, the student's current state and situation, the practicalities and impact of using various technologies for delivery and support, as well as variations in learner needs and preferences, including their learning style. It may not be humanly possible, or even desirable, to address all of these issues. Some however, such as learning styles, can be addressed. Whether addressing issues such as learning styles is feasible given the practicalities of resource constraints and the range of variables that could potentially need to be accommodated needs careful consideration against the benefits which could

be gained. Tangible evidence of the benefits is required to support such an investment. The indications from previous research are that accommodating learning styles variables can make a difference to student achievement.

The importance of learning styles should not be overlooked or underestimated when creating learning environments. As Riddle (1992, p. 7) states "understanding the importance of learning styles to education leads to an expectation of the impact they have on the teaching/learning environment", yet there is no knowledge base to evaluate how real this expectation is in distance education. With limited contact between the teacher and learner the impact could be more constrained by the circumstances of the individual, or affected by the course materials provided which largely constitute the learning environment.

Learning environments in tertiary education are changing. As institutions become larger, expanding under the pressure of more enrolments while resources are effectively reduced, meaningful personal contact between student and teacher/lecturer is less likely to occur. This is forcing some changes. Increasing use of the Internet for course delivery and communication, both in traditional face-to-face institutions and distance institutions, is blurring the differences between studying by, what were, quite disparate methods. The converging of distance learning and traditional learning appears to be occurring as more institutions offer courses using a range of methods of delivery (Tait & Mills, 1999). Predictions have been made that the use of technology for course delivery by institutions previously not offering distance or open learning options is, or potentially will, change the nature of education (Bates, 1995). Such changes may be beneficial, but there are risks. The same warning that Roberts (1984, p. 59) gave to distance education as it became more industrialised holds true for all tertiary education "... there is a very real danger, however, that institutions will forget that they are dealing with people: people who have individual needs and aspirations, and particular interests and preferences."

Ensuring that the basis of the assumptions made regarding the learning styles of students in distance education are accurate is one way of validating the instructional design and student support decisions made by educational institutions. It may not right all wrongs

in an educational environment where student access to education does not always equate to success. It may not empower all students to recognise their learning strengths and weaknesses and address these, further developing their independent learning skills. It may, however, highlight the differences between students in a tangible way, providing a foundation for course design and student support, as well as a means of auditing the learning environment.

A basis for course design

This research seeks to fill, at least to some degree, the gap between assumptions about students' learning styles, and the reality of them. The goal of the research was to provide a base of information on which to design courses that better meet the learning styles preferences of students. To achieve this the study investigated the relationship between the learning styles of first-time, first year students studying by distance education with The Open Polytechnic of New Zealand, and the success of these students in various first year courses. Five courses from different programmes and disciplines were selected for inclusion in the study and analysed to determine various aspects of their teaching styles. Students enrolled in these courses were surveyed to ascertain their learning styles profiles which were compared with their course results to discover if any relationship was evident. The learning styles profiles were also compared to the course teaching style to determine if there was a match or mismatch of styles.

From the information gathered arise suggestions for optimising the learning environment to accommodate the learning styles preference of students. These include the instructional design considerations in terms of the structuring of course materials and the technologies used to create and support the learning environment.

Chapter 2

LITERATURE REVIEW

Introduction

This chapter reviews literature about learning styles and distance education. The relevance of learning styles to education in general is examined and a number of learning styles models reviewed. Given the context of learning by distance, various aspects of distance education are explored. Distance education has practices which differ from those used in traditional educational environments, and may attract different students to those studying in other settings, therefore characteristics of distance education students are examined.

A feature of distance education is its high rate of drop-out (Peters, 1992). Factors which may influence drop out include the characteristics of students and the course delivery and support systems used in distance education. Systems used in distance education to mass produce courses also differ from the traditional educational environment, with a team approach to course design being commonly used, based on instructional design theories, with instructional designers assisting in the development of courses. Sound instructional design is based on knowledge of learner needs and characteristics, including learning style, hence learning style in relation to distance education is specifically reviewed.

Learning styles

Learning style has been defined as being "comprised of the conditions under which each person begins to concentrate on, absorb, process, and retain new or difficult information and skills" (Dunn, 1986, p. 3). This definition suggests that a person's learning style could affect how they react to any learning situation, including learning by distance methods, therefore knowledge of learning style could help in the selection of appropriate instructional designs and teaching strategies for courses (Baker, Simon & Bazeli, 1986). Indeed De Bello (1990) states that "Knowledge of personality typology, temperament

and learning style is vital in every aspect of education, from curricular design to pedagogy to teaching strategies" (p. 429). Likewise Riddle (1992) emphasises the impact of learning styles on the teaching environment.

There are numerous other definitions of learning styles, most of which encompass essentially the same elements, but reflect the learning styles' model developed or used by researchers and authors, or their interpretation of that model (Ferrel, 1983). For example Honey and Mumford (1992, p. 1) define the term learning styles "as a description of the attitudes and behaviours which determine an individuals' preferred way of learning." They have developed a model based on Kolb's experiential learning cycle as is reflected in their definition which has a behavioural focus. In comparison when reporting on a study using Kolb's Learning Style Inventory, Baker et al. (1986) describe the concept as "A person's learning style is part of that individual's cognitive structure and refers to the characteristic style of acquiring and using information in learning and/or solving problems" (p. 2): a definition which has a more cognitive focus.

Ferrel (1983), in her analysis of four learning-styles instruments, points out the difficulty of making comparisons between models when a single conception of learning styles has not been established. Although this study was made over15 years ago when the concept of learning styles was comparatively new, there does not appear to have been any further consensus reached on a universal definition of the concept. Wagner, Sass, and Wagner (1996) in a more recent review of the literature found conflicting views still existed as to what the term meant, doubt as to the validity of various measures of learning styles, whether learning styles really needed to be considered, or what to do once learning styles had been identified. From their review they concluded that the studies raised questions about how appropriate some vocational training was in regard to whether it met students' needs, and suggested that both teachers and students should receive training in learning and teaching styles and strategies.

There is, however, general agreement that every person has a learning style and learning style strengths or preferences (Dunn, 1990). It is a term often found in educational literature and policy documents, for example *The New Zealand Curriculum Framework* (New Zealand Department of Education, 1993), although often not substantiated by any

empirical research or attempts to define what exactly is being referred to. It is also acknowledged that people often lack awareness of what their learning style preferences are (Honey & Mumford, 1992, Dunn & Deckinger, 1990).

Various proponents of learning styles have different opinions of the derivation or evolution of an individual's learning style. Some claim that aspects of learning styles are genetic or biological, while others are developmental (Dunn, 1990). Research undertaken using the Dunn and Dunn model indicates that ".. individual responses to sound, light, temperature, design, perception, intake, chronobiological highs and lows, mobility needs, and persistence appear to be biological in nature. In contrast, the sociological preferences, motivation, responsibility and need for structure are thought to be developmental" (Ingham, 1992, p. 39). Dunn (1986) states that some learning style preferences can change with maturation. If a preference is particularly strong a motivated individual may still be able to change it, although it could take some time.

Others argue that learning styles develop solely in response to experience (Honey & Mumford, 1992). Honey and Mumford claim that preferences are "learned as people repeated strategies and tactics that were found to be successful and discontinued those that were not. In this way preferences for certain behaviour patterns develop and become habitual" (p. 5). They also argue that the choice of career can be a reflection of an individual's learning style and can further influence the development of their learning style.

While interest in learning styles was high in the 1970's and 1980's it has waned in comparison in the 1990's. This is possibly due to the perception that so many theories abound, all of which have different viewpoints with little in the way of a single cohesive theory to tie them together. Accordingly, the research done in this area is often viewed as weak (Bonham, 1988). Those involved in the field of learning styles admit that there are problems with some of the research, pointing out that there is evidence of poor design, data being misinterpreted, and faulty conclusions drawn from the data (Dunn, 1988). The validity and reliability of learning styles instruments has also been questioned (James & Blank, 1993), with one criticism being that the research evidence used to support the instruments is based on doctoral dissertations of students being

supervised by faculty members with a vested interest in a particular instrument (O'Neil, 1990, Curry, 1990).

The relevance of learning styles

Educational researchers have developed theory acknowledging the importance of individuals' attributes, including learning styles. This area of study arose from a perceived need to assist educational practitioners (Blakemore, McCray & Coker, 1984). References are made throughout instructional design literature to the need to accommodate variables in learner characteristics (for example Aronson & Briggs, 1983; Kemp,1985). Various suggestions have been put forward to cater for these variables. For instance Dekkers, Cuskelly, Kemp and Phillips (1993) drew on their study of students' use of printed study materials to recommend incorporating a variety of design features in courses to accommodate a range of study techniques, and providing for individual assessment so that students can build on their own interests and experiences. The development of courses with flexible study paths providing options in routes (choices of units or topics and the order in which they are studied) and assessment is suggested by Kember (1990) as appropriate to meet the needs of individuals.

Garland's study (1993) aimed to increase understanding of variables associated with persistence and withdrawal in distance education and included investigating students' attitudes, confidence, learning styles and motivation. This study illustrated the diversity of individuals' abilities and styles, but also highlighted the importance of epistemological variables which could impact on the individual, such as the difference between the epistemology of the course and the student's epistemology. Misko also refers to the latter in a review of research on learning styles (1994, p. 40), pointing out that "Individual styles may differ according to subject areas, and styles may change as individuals become more competent, confident and mature with the content material of the subject or process they are working with."

Research using the Dunn and Dunn model has found that using a person's perceptual strengths for taking in new information can make it easier for the individual to learn and remember (Dunn, 1988, 1990). While students can learn through more than one

modality, complementing their strong learning styles preferences by matching instructional conditions or resources has been found to significantly increase assessment results. For instance in one study students had their learning styles identified and were given lessons using different methods of presentation to support their perceptual preferences, resulting in test scores that were statistically higher (Dunn, 1988).

Models of learning styles

There are a number of learning styles models and instruments available for use with adults which can provide information about learning characteristics (Blakemore, McCray & Coker, 1984, Smith & Linder, 1986). These need to viewed with caution as testing of some instruments or inventories for reliability and validity has provided results that are contradictory or inconclusive (James & Gardner, 1995). Given the range and variables of the models, the instruments "are best used as tools to create awareness that learners differ and as a starting place for each individual's continued investigation of self as learner" (Dixon, 1985, p.17). However they can also be used to provide information for designing courses and providing appropriate support to meet the needs of students.

The models and instruments currently available have various dimensions which James and Blank (1993, p. 48) categorise as "information processing (cognitive), affective (for instance, personality), and physiological (for example, tolerance for noise, time-of day rhythms)". Their critique of 20 learning style instruments applicable to adults includes some of the most commonly known and used ones. The critique included examining the instruments on the basis of the strength of the research base, evidence of validity and evidence of reliability. From this information, as well as other published research, four models and instruments of learning styles will be reviewed here. The instruments included Kolb's Learning Style Inventory (1985), Honey and Mumford's Learning Styles Questionnaire (1992), the Canfield Learning Styles Inventory (1988), and Dunn, Dunn and Price's Productivity and Environmental Preference Survey (1994).

Kolb's Learning Style Inventory (1985) was based on Kolb's theory of experiential learning. It categorises people according to four learning modes: concrete experience,

reflective observation, abstract conceptualisation, and active experimentation. The self report inventory is administered in a written format, taking approximately 20 minutes to fill out. (Blakemore et al., 1984). The model assumes that learners must use the modes in learning situations, and that experience can modify learning style. James and Blank (1993) assess the model as pertaining to the category of information processing, which is only one aspect of learning styles. This can limit the usefulness or applicability of the model.

Honey and Mumford's Learning Styles Questionnaire (1992) is also based on Kolb's experiential learning theory. They label the four learning styles arising from the interpretation and use of the theory as: activist, reflector, theorist, and pragmatist. It is also a self-reporting instrument, taking approximately 20 minutes to fill out. Likewise this instrument only measures aspects of learning style in the information processing area.

The Canfield Learning Styles Inventory was developed by Canfield and Lafferty (1976). Four categories of information on learning style are provided by the instrument: the conditions of the learning environment, the types of subjects of interest to the learner, the mode in which the learner prefers to gather information, and the expectations for success which the learner has. This is another self-report inventory, which takes approximately 30 minutes to fill out. It applies to the three dimensions of learning styles as related by James and Banks (1993): information processing, perceptual modality, and personality.

The Productivity Environmental Preference Survey by Dunn, Dunn and Price (1994) can be administered in a variety of ways: in a written format, tape, or orally. It is based on the Dunn and Dunn Learning styles model, identifying a number of learning styles factors in five areas: environmental factors, emotional facts, sociological factors, physical factors, and physiological factors. The survey takes approximately 25-35 minutes to complete and is computer scored to generate the learning styles profile.

All four instruments and models have been used in research studies. Their validity and reliability measures vary according to James and Bank's (1993) scale, with all but Kolb

achieving scores of moderate or strong in regard to evidence of validity and reliability. PEPS was the only instrument to be judged as having a strong research base.

Although published research focuses on the use of the learning styles instruments in face-to-face learning situations, as the learning styles models must apply to learning styles in general they must also apply to learners studying by distance education.

Distance education

Distance education is generally defined as study which is not under the continuous supervision of tutors who are physically present with their students: there is a physical distance between the student and the tutor (Holmberg, 1995, Naidu, 1994). Other definitions of distance education describe the communication process as being the characteristic distinguishing it from other traditional forms of education. For example Cropley and Kahl (1983, p. 28) describe it as "a kind of education based on communications procedures which permit the establishment of teaching/learning processes even where no face-to-face contact between teacher and learner exists." With the potentially increasing use of the Internet for course delivery by face-to-face and distance education institutes this definition may not be applicable in the future.

The terms *distance education* and *open learning* are frequently used interchangeably (Rowntree, 1992). The standard criteria for determining openness are the grounds of flexibility in regard to entry, time, place, and pace; criteria which can also be used in evaluating or discussing distance education. Some theorists go so far as to argue that distance education is a subset of open learning on the basis that open learning can take place in a lecture room or at a distance, whereas distance education must, by definition, be at a distance (Race, 1994). Given the context of the courses included in this research the term distance education will be used.

The practice of distance education has tended to follow a standard pattern of students enrolling, being sent a package of mass-produced course materials which they work on independently, then sending in work for assessment by a teacher. While practices are

changing, course materials are often heavily reliant on the printed word, sometimes supplemented by audio and video tapes. Most communication between teacher and student is written and restricted to the assessment process, with some students making use of the telephone to contact their teachers. Many courses have compulsory start and finish dates. Some may include a block course at which students attend face to face sessions of a lecture or tutorial nature. Increasing technology options mean that some courses have other means of communication, such as audio and video conferencing. In addition the Internet is becoming more accepted, being used as a means of course delivery and communication (Schreiber & Berge, 1998).

With students having the choice of when and where to study, and at what pace they want to study (within the confines of their own personal circumstances as well as the deadlines set by the course), they have more freedom of choice than students studying in a face-to-face environment (Race, 1994). While in some respects this freedom is an advantage, it can create more problems than could be experienced by learners in a face-to-face environment. All learners potentially face problems of a similar nature, however distance may create additional problems for learners studying in that mode (Moore, 1989), for example the lack of immediate access to a tutor may create problems, or the only place available to study may not be suitable for the learner's needs. Some problems can be ameliorated by the instructional design strategies included in courses, while others can be dealt with by the student support systems used by the institution.

Mills (1982) claims that student support services to meet individual needs form an integral complement to the mass-produced materials of a distance teaching system. Student support takes many forms: some institutions offer student support services such as counselling services, induction courses, learning skills development workshops, and give pre-enrolment advice to help them make informed decisions regarding their study options. Teachers provide support by guiding and directing students to achieve their learning goals. Learning materials can provide support by structuring information in a way which also helps guide and direct students, not merely in the achievement of goals directly related to the content of a particular course, but also in processes which empower students by giving them knowledge and insights enabling them to have more control over their learning strategies. Thus students can be assisted in developing skills

to give them greater independence as learners, a characteristic that is deemed to be important for success in a distance education learning environment (Paul, 1990).

Student characteristics

Within any learning environment the presence or absence of certain learner characteristics may serve to aid the learner, or be a barrier to their learning which can ultimately result in the learner dropping out or failing formal courses of study. Given the differences between learning by distance and in a face-to-face mode, it is conceivable that the method of delivery may advantage or disadvantage students depending on their characteristics. Cropley and Kahl (1983, p.28) refer to distance education and face-to-face education "not as encompassing particular sets of organisational provisions aimed at promoting learning, but as involving particular kinds of learning processes which are facilitated by the presence in learners of certain psychological characteristics and which at the same time promote the growth of such characteristics".

Kasworm and Yao point out that "each learner brings to the learning experience varied psychological and cultural factors, such as individual learning styles, the goals for involvement in learning, expectations and motivations, educational history and beliefs of learning, and maturity" (1992, p. 78). Furthermore they argue that certain characteristics are necessary in distance education, such as internal motivation. Atman (1988) emphasises the importance of self-management as a skill that is critical for the success of individuals engaged in distance education, enabling them to structure things, including time and space. As students do not have a class timetable or teacher to structure their learning times, they must be motivated to do it themselves. For some students the physical absence of a teacher can create a barrier to learning which is demotivating (Myer, Fletcher & Gill, 1992), and distance learners do not usually have access to fellow students who can aid motivation by giving support and encouragement.

A characteristic often referred to as a requirement for distance education students is that of being 'self-directed', or of being 'independent', terms which are at times used interchangeably. Such is the importance of this characteristic that some institutions

such as The Open Polytechnic of New Zealand (1994) specifically aim to create independent learners. Paul (1990, p. 83) describes the concept of an independent learner as

> "not an absolute one, but a notion that graduates should be more 'self-sufficient' learners than they were at the point of entry. It involves changes in personal values (openness to new ideas and to rethinking current beliefs) and attitudes (self-motivation), as well as the development of new skills (time management, study skills, problem conceptualisation, critical and lateral thinking, and research and library skills). A quest never completely fulfilled, it is a process central to the concepts of open learning and lifelong education."

Candy (1991) makes links between independent learning and self-directed learning, claiming that they are both catchall phrases for "educational practices having some bearing on the notion of learner-control" (p. 11). When learners are in "new, unfamiliar situations where they have no experience with the subject area' or where "they have low self-esteem, related to their personal lives or to the instructional situations or they have never experienced self-directed learning", adult learners will be dependent according to Cranton (1989, p. 202). Discussing issues such as dependency Cranton refers to instructional design based on the characteristics of the learner as a solution, with particular reference to addressing learning styles.

Examining different characteristics which could have an effect on student success, Powell, Conway and Ross state that "The question of why some students successfully study through distance education and others do not is becoming increasingly important as distance education moves from a marginal to an integral role in the provision of post-secondary education" (1990, p. 5). This question is just as relevant today, if not more so given the increasing use of the Internet to deliver what is essentially distance education.

Drop-out in distance education

A phenomenon of distance education is its high drop-out rate in comparison to full-time courses presented in a face to face mode (Kember, 1995), which could be partly due to

the presence or absence of particular characteristics in students. Peters defines drop-out in terms of "a student who ends studies prematurely and thus does not sit examinations" (1992, p. 235). Meaningful comparisons with completion rates in face to face institutions and between distance education institutes are difficult to make due to differences in the status of students as full time or part time, the differences in programmes offered, differences in the maintenance of student records, and how drop out figures are determined. Drop-out statistics available from a range of distance education institutes vary with some being cited as high as 88%, or more (Peters, 1992). At The Open Polytechnic of New Zealand drop-out rates vary between programmes, and courses within those programmes, for example in a study of drop-out undertaken by Zajkowski in 1991 drop-out rates for four core business courses were cited as ranging from 56% to 68% (Zajkowski, 1993).

Concern in the past about drop-out has been so great that it has been cited as being the most frequently researched topic in distance education (Cookson, 1990, Garrison, 1987) with studies falling into various categories classified by Cookson: studies of learners' reasons for withdrawal, student profile studies, and studies of institutional factors (p. 202). There are known to be many causes of drop-out in distance education, and many explanations as to why. Taking into account all the various reasons it is doubtful whether one single cause could be isolated as an explanation, nor could there be one single simple solution to reduce or eliminate drop-out (Kember, 1990, 1995).

Moore (1989) notes that traditional forms of education and distance education often attract learners from divergent populations, with the possibility that a larger proportion of distance learners may be affected by learner problems. Likewise Coldeway acknowledges that the population of learners served by distance education is unique (1986). The differences between the populations are summarised by McInnis-Rankin and Brindley (1986):

> As well as being older than the traditional campus-based student, distance learners differ in other ways. In general, they have a greater variety of educational backgrounds, from less than high school to a university degree. Their most recent educational experience may be some years past. As well as being new to distance education, their study strategies may be rusty,

> inappropriate or non-existent. In most cases, distance education students are studying part-time and are engaged in other full-time activities, often paid employment. Their role of student is only one among many. The potential for conflict between the demands of their studies and those in other areas of their life is great (p. 60).

A point brought up in this extract worth further elaboration is that of being new to distance education. Students studying by distance for the first time are often unprepared for the difficulties that may confront them and are conceivably at a greater risk of dropping out. They are less likely to have the skills to cope with independent study, and lack the support structures that might be available to them if they were studying full-time at a face-to-face institution (Paul, 1990).

Claims are made that "a great deal is known about the problems and needs of adult learners in distance education" (Moore, 1989, p. 97) and many reasons have been suggested for the higher rate of student drop-out in distance education courses (Kember, 1995). The high drop-out rates experienced in distance education could be interpreted as a reflection of the end result of learner problems. There are numerous studies which examine various factors possibly contributing to drop-out or being predictors of success, for example Bajtelsmit (1990) cites a study which indicates that educational levels are a predictor of examination performance, the lower the level the less likelihood of success. Summarising Brindley's review of research on learners in distance education (1995), some of the characteristics and behaviours of distance education students gleaned from various studies which may impact on success and retention are:

- students have personal characteristics that contribute to their behavior, for example learning styles,
- many students are unprepared for the difficulty of studying independently, and
- students often have inadequate levels of preparedness. Often they have not assessed their own needs, for example learning style.

Other studies cited by Brindley indicate that:

- personal situations alone cannot account for attrition,
- students usually do drop out early on in their studies,
- some students complete a course no matter what the circumstances, and

- students who complete some work are more likely to finish the course, while students who complete one course successfully are much more likely to be successful in a subsequent course.

Students new to studying by distance are conceivably at a greater risk of dropping out. Such students are often not prepared for the difficulties of studying by distance.

Given the range of problems and challenges facing distance education students it is conceivable that drop-out may, to an extent, be a reflection of distance education's inability to cater for differences in individuals' abilities and styles by providing courses with teaching styles that match or meet the needs of all students. To date little attention has been given to a possible link between the learning styles of students learning by distance education and their retention and success in courses. Many distance education courses are still paper based, with only a limited use of alternative media. This may limit the teaching style of courses, which can vary according to a number of factors, for example the learning style of the writer of the course, the instructional designer, the subject matter, and the constraints of the institution. All of these factors can influence the structure, interactivity, and resources used in a course. The resulting teaching style of courses may suit the learning styles preferences of some students, but not match the learning style preferences of other students, and could therefore be a contributing factor to the high rate of drop-out.

Instructional design

One of the core features of distance education is that teachers are separated from learners. As a result of this separation students rely on course materials to provide instruction to the extent that they are often engaging in self-instruction. As the main method of teaching in most distance education courses, the quality of course materials is therefore of paramount importance. A common feature of distance education course development which helps achieve this quality is the use of a formal system of instructional design. Rogoff (1987) describes instructional design as "the systematic process of designing an instructional solution to an educational or training problem" (p. 146). She outlines a model of instructional design, stipulating that instructional design

"requires identifying causes of the problem, determining instructional objectives, and recommending or outlining instructional methods and materials" (p.146).

In the distance education setting courses are often developed with the assistance of an instructional designer acting as an adviser to a writer, or with a course design team including a designer, writer, project leader, and publishing experts. Such a process is thought to improve the quality of the courses produced (Kelly, 1987) and is guided by educational theories and principles. While instructional designers are also used in face-to-face education to design curriculum, their roles in distance education are more complicated due to the lack of the support system potentially established by the teacher and student in the face-to-face mode (Atman, 1988).

Various theorists have suggested principles to guide the instructional design process. Naidu argues that "teaching learners how to learn and to retrieve what has been learned ought to be the primary concern of instructional systems and instructional designers" (1994, p. 27). Kasworm and Yao (1992) place emphasis on structuring design to encourage active learning, in particular to develop autonomous and self-directed learning strategies, while also recognising the individual experiences and variables, such as learning styles, which a learner brings to a learning situation. Holmberg (1986) takes a similar stance, proposing that there should be a cognitive orientation and strategies developed which enhance deeper-level processing of content. He also suggests that the individuals' learning styles need to be accommodated, this being commonly included as a fundamental consideration for designing courses, albeit that it is often not defined or based on actual knowledge of the learning styles of a particular group of learners. Knowledge of the characteristics of learners is deemed to be essential for effectively designing courses (Dean, 1994), contributing to the overall quality of the course materials produced.

There are many interpretations of what constitutes good quality distance learning materials, some key attributes commonly referred to being: "....academic acceptability..... the presentation and organisation of the materials need to take into account the student's resources, capacities and abilities ... the materials need to be 'self-instructional' "(Kaye, 1981, pp. 57-58). While a textbook could be said to fulfil some

of these criteria, the differences between textbooks and self-instructional materials, as summarised in Table 1 according to Lockwood (1994), are such that they while they may be used as a course resource, other materials are used to guide students. Although textbooks are often prescribed as a compulsory component of a course, analysis of these is not included in this study due to the differences between them and the course materials prepared by the teaching institution.

According to Lockwood the structure of materials is determined by the needs of the learner. The structure of a course is established in the course planning stage, being more than just the types of materials included in the course pack. Course structure is how the course is put together, including the format and the instructional design strategies embedded within the course.

The instructional design strategies used in any educational setting may vary. Reigluth (1983) provides a useful categorisation of those strategies into three types: organisational, delivery, and management. He defines organisation strategies as "methods of organising the subject-matter content that has been selected for instruction. They include such things as use of examples and diagrams, sequence of content, and formatting." (pp. 18-19). Table 2 presents and explains some commonly used instructional strategies for distance learning materials including advance organisers, exercises and problems, graphical organisers, inserted questions, overviews, summaries, and use of text presentation (Valcke & Martens, 1997, Bernard & Lundgren, 1994, Marland & Store, 1982).

These strategies may be used to a greater or lesser degree, or not at all, depending on the design of the course. Valcke and Martens (1997) refer to all of these instructional design strategies as embedded support devices aimed at scaffolding the learning process, noting that the efficiency of the devices is likely to be dependant upon the characteristics of the learner.

Table 1
Differences between textbooks and self instructional materials

Textbooks	Self instructional materials
Assumes interest	Arouses interest
Written for teacher use	Written for learner use
No indication study time	Gives estimates of study time
Designed for a wide market	Designed for a particular audience
Rarely state aims and objectives	Always gives aims and objectives
Usually one route through	May be many ways through it
Structured for specialists	Structured according to needs of learner
Little or no self assessment	Major emphasis on self assessment
Seldom anticipates difficulties	Alert to potential difficulties
Occasionally offers summaries	Always offers summaries
Impersonal style	Personal style
Dense layout	More open layout
Readers views seldom sought	Learner evaluation always conducted
Not study skills advice	Provides study skills advice
Can be read passively	Requires active response
Aims at scholarly presentation	Aims at successful teaching

Source: Lockwood (1994, p. 5-6)

Table 2
Instructional design strategies

Strategies	Explanation
Advance organisers	short prose passages of information appearing before the content to be learned, providing concepts and a theoretical framework to help the learner understand and integrate the material following.
Exercises and problems	formative assessments that provide feedback to the students as to their understanding of the topic covered. These may be self-check exercises which the student can review and correct themselves, or may be reviewed by a tutor.
Graphical organisers	advance organisers in a graphical form.
Graphics	illustrations, tables, graphs and charts.
Inserted questions in text	these can take the form of rote recall questions, comprehension questions, application and/or problem solving questions.
Objectives	usually found at the beginning of a section, they briefly outline what learning should be achieved in the section to follow.
Overviews	descriptive passages introducing a section or topic by summarising it.
Pretests and concept ratings	to determine the level of prior knowledge a student has on a topic.
Study guidelines	these can include guidance as to how to study the course in general, time guidelines for working through the course, and specific guidance and criteria for assessments.
Summaries	found at the end of sections, summarising the preceding material.
Text presentation	the use of headings, subheadings, table of contents and indexes.

Unfortunately, while data is easily obtained relating to certain background variables of learners such as age, educational level, employment, there is little knowledge available about the learning styles of distance education students or how they use their learning materials (Dekkers, Cuskley, Kemp & Phillips, 1993). Kember attests to this stating that "There is currently very little in the way of empirically based work to help choose between the wide variety of formats that can be, and are used for open learning" (1995, p. 21). Indeed available research would appear to give contradictory results as to the usefulness of instructional strategies, for example research by Marland, Patching, Putt and Putt (1993) indicates that students do not use embedded strategies as intended by the instructional design, while a study by Valcke, Martens, Poelmans and Daal (1993) gives a contrary result.

According to some researchers, the effectiveness of instructional materials can be judged by the learner's ability to proceed to the next stage independently, hence their self-directed learning skills are developed during the process (Beaudoin, 1990). A study by Baker (1993) provides a model for analysing the self-directed learning strategies in undergraduate distance education courses, with suggestions arising from the study as to how to facilitate the development and use of self-directed learning strategies.

Learning styles and distance education

Within the field of distance education there is a lack of research in the area of individual differences such as learning styles, and a need for such research is acknowledged (Gibson, 1990, Riddle, 1992). Furthermore it has been suggested that matching learning styles with teaching methods developed to suit the learning style could increase both retention and achievement (Bajtelsmit, 1990). In distance education the main interaction or contact a student has is generally with the course materials they are studying, which can be a reflection of the learning and teaching style of those involved in designing and writing the course. In traditional educational settings there appears to have been no examination of the relationship of the learning and teaching style of students and teachers (Dixon & Woolhouse, 1996), nor does there appear to have been any examination of this in distance education.

There are many factors influencing students studying by distance education, the complexity of these contributing to success and drop-out (Kember, 1990). Although there has been a great deal of research on drop out in distance education, there is a comparatively limited amount done specifically on students' learning via distance education (Coggins, 1988). There is a limited amount of knowledge as to how students learn in this environment, what their individual differences or learning styles preferences are, and what course design or support features may contribute to their success.

Reviewing the research in distance learning relating to learning styles, there are conflicting reports as to what the learning styles preferences of a distance education student are (Cookson, 1990). In a summary of the research on variables influencing learning performance Cookson comments that "Learners whose cognitive personality style favours autonomy, flexibility and tolerance of ambiguity, and whose learning styles favour field-independence appear to prefer distance education over other forms of education, although not in all studies." (p. 113). Eastmond (1992, p. 8) provides another viewpoint: "If I were to typify the learning style of the students who preferred distance education in any way, it would be their strong self-discipline and preference for structure. ... they wanted to be given concrete specifics about precisely what needed to be done, what the instructor expected, and when the assignments had to be completed."

The learning styles' literature, meanwhile, suggests that providing a learning environment matching the student's style is more likely to encourage successful learning experiences (Dunn, 1990, Misko, 1994). While claims that matching learning styles to teaching styles can improve learning performance have been countered on the basis that there is a lack of research evidence to support the premise, it has been acknowledged that investigating learning styles can still give useful information in describing the diversity of students which can be used to guide the design of instruction (Davidson, 1990). Thus it is still a potentially useful area for research for those involved in distance education. Although teachers working in distance education may be unable to alter learning tasks and materials to suit the immediate needs and characteristics of individual learners (Cropley & Kahl, 1983), it is possible that some of these needs

could be met by designing learning materials on the basis of empirically identified learning style preferences.

There is some doubt expressed, however, as to whether distance education can cater for individuals' abilities and style. For instance Holmberg (1986, p. 31) states that "To base the presentation of distance study courses of mass-communication character on the individual student's cognitive structure is naturally an unattainable goal". Given the widely accepted view that diversity is needed to accommodate individual variables such as learning style (Marland & Store, 1982), it is suggested that instructional design strategies could be incorporated into courses based on empirical evidence of what students' learning styles are (Dekkers, Cuskelly, Kemp & Phillips 1993, Hutton, 1995b).

As Ehrman states (1990, p. 18)

> In the field of distance education, much research on individual difference factors needs to be done. Results of such research must then be applied to different learning programs and settings. It is important for investigators and those who apply the result to remain sensitive to the interdependence of individual differences, social and environmental factors, and learning outcomes.

Identification of learning styles provides information on some of the individual differences of students. This is particularly important in a distance education environment where teachers do not necessarily meet their students to assess their individual learning needs. As distance education becomes more integrated into the traditional educational system, and technology is increasingly used to facilitate communication and learning, more attention will need to be focussed on how students are supported in this environment (Dillon, Gunawardena & Parker, 1992; Granger & Benke, 1995).

A small scale study relating to learning styles and distance education was undertaken by this author in 1994 to trial the methodology and to gauge the viability of a wider study to be done over a range of domains and levels of study. The primary aim of the study was to find out whether there was a relationship between the learning styles of students enrolled in a first year course in Accounting and success and retention in the course,

while at the same time developing a learning styles profile of students for the course in order to provide information for future course development. Seventy-seven students new to studying at The Open Polytechnic responded to the survey (Hutton, 1995a).

The study used the Productivity Environmental Preference Survey (Dunn, Dunn and Price, 1994). The most significant result with implications for course design was the need for structure and an apparent link with drop-out and failure in the course. Thirty-five (46%) of the students had a high preference for structure, twelve of these also having a high need for an authority person present. Only thirteen (32%) of the thirty-five students successfully completed the course, compared with a pass rate of 48% for the sample, and an overall pass rate of 46% for the whole course. None of the students with high preferences for both structure and an authority person present successfully completed the course.

There was also a high preference for auditory learning. Learners take in information in various ways, referred to as sensory modalities, or perceptual strengths, with research evidence available indicating that students retain significantly more material if it is introduced through their most preferred modality in comparison to their least preferred modality (Dunn, 1990). In this particular study twenty-one students had a high preference for auditory learning, in comparison to only three students having a high preference for visual learning. There was no apparent relationship between the preference for auditory learning and completion and success in the course.

Analysis of the course on the basis of meeting learning styles preferences as determined by the Dunn and Dunn Learning Styles Model (Dunn & Griggs, 1990), revealed that the course had an analytical, linear, visual text-based, passive teaching style, with information structured to fit the course prescription rather than provide a helpful learning structure for students. When compared with the learning styles profiles of students which showed that significant proportions of students had high preferences for global learning, auditory learning, and structure it was apparent that the learning environment provided by the course did not match the needs of many of the students. This could have been a significant factor contributing to the high drop-out and failure rate of students in the course, with only 37% of first-time students successfully

completing the course. It must be acknowledged, however, that many other factors can impact on students' study decisions and achievements.

Limitations of the study included that it only focussed on one course, other courses possibly being designed in a way that would better meet the learning styles preferences of students. The basis for analysing the structural aspect of the course design was deemed to be of insufficient depth in light of the complexity of this preference and the high preference for this factor exhibited by students.

Garrison (1989) predicted that with the changing nature of education, particularly due to technology developments, distance education was likely to become more integrated with traditional education in the future. This would appear to be happening now. Once a second choice, often used when the time, availability or location of courses prohibited students from enrolling in face-to-face courses distance education is now becoming accepted as an alternative of equal standing. The barriers between distance learning and traditional education are being broken down as institutions use a range of modes of delivery (Tait & Mills, 1999). With more courses offered via the Internet, thus potentially incorporating the use of multimedia and computer software within courses, it is claimed that the gap between learning styles and teaching styles can be bridged (Montgomery, 1995). These courses may be adopted as teaching resources within standard classrooms with minimal teaching support offered by the teacher who is physically present.

The future learning environment must place an even greater emphasis on supporting the learning needs of students in order to make effective use of the resources available (Bates, 1995). The instructional design of courses based on research into the characteristics and needs of students, including their learning styles, may help prevent the high rates of drop out which are currently a feature of much distance education.

Summary

From this literature review it is apparent that there is a need to address the question asked by Coggins (1988, p.25) and others, for example Cookson (1990), which is "what are the factors that account for a student's success or failure in distance learning programs?" There has been much investigation of other variables that may impact on student success or failure, but little on the learning styles of students. Learning styles constitute some of the individual characteristics that should be addressed when formulating the instructional design of courses. While they may not be the only factors that determine success or failure in this learning environment, they are a factor that may be able to be addressed by course design and institutional support. Knowledge of these factors may enable a better targeting of resources for the future.

Research Aims

There are a wide range of variables which can impact on a students ability to work in a distance education environment. Aspects of a person's learning style may make them more suited to working in this mode. Individuals can be of varying ages and stages of life, which can impact on the experiences they have to draw on, their levels of motivation, and the practical details of availability of quality time for study purposes. The level of previous educational qualifications and type of experience may impact on a students' ability to succeed in this environment. It is also possible that there could be gender or cultural differences which might influence students. Another possibility is that variations in learning styles may be influenced by other variables such as age, educational qualifications, gender and ethnic background differences.

The main aim of this research study arising from the review of the literature was to discover if there was a relationship between the learning styles of first year students at The Open Polytechnic of New Zealand, and their success in distance education courses. Other aims of the research included establishing learning styles profiles of groups of

students, and comparison of the learning styles with the teaching style of the courses they were enrolled in.

The main research question arising from these aims is:

- Is there a relationship between the learning styles of first year students and their success in distance education courses?

Success in this context is defined as having passed the course.

Further questions are:

- What are the learning styles profiles of students engaged in distance education courses?

- Are there differences in the learning styles profiles of learners according to the academic course area they are enrolled in, their age, gender, previous educational levels, or ethnic background?

- What teaching styles do distance education courses have, and do these vary between disciplines?

- How does the teaching style of courses compare with the learning styles needs based on the profiles of the students?

- What do the learning styles profiles and other information gathered suggest for the design of distance education courses?

Chapter 3

METHODOLOGY

Course selection

Courses were selected from those offered by The Open Polytechnic of New Zealand, which is New Zealand's only dedicated tertiary distance educational institute. It has approximately 32,000 students and offers 170 programmes ranging from certificate level through to degrees, including 400 courses within those programmes.

Five courses were selected from which to choose the samples of students on the basis of the numbers enrolled at the close of enrolments at the beginning of the academic year. They needed to be first year courses which were part of an on-going programme. The reason for selecting courses in ongoing programmes was that students would be likely to enrol with a view to continuing their studies with The Open Polytechnic, and would therefore have long term study objectives, different characteristics and motivations than if they were doing a stand-alone course. While various courses had significant numbers of students enrolled, the selection was narrowed to those with significant numbers of first-time students new to study with The Open Polytechnic of New Zealand.

Criteria for course selection were that they had to be a first year course in on-going programme with sufficient first year, first-time students enrolled in the course to use as a meaningful sample. A variety of programmes and disciplines were required to enable comparison of groups of students who might have a different background, and possibly learning style which may have influenced the type of course they chose to enrol in. The courses included were:

- Business Communication - a compulsory course which is part of the New Zealand Diploma in Business Studies,
- Counselling Theory - an elective course in the Bachelor of Applied Science,
- Introduction to Information Systems and Technology - a compulsory course in the Bachelor of Business and Bachelor of Applied Science,

- Introduction to Law - a compulsory course which is part of the Business Studies degree,
- Introduction to Landscaping - a core course for the National Certificate in Horticulture.

By choosing a diverse range of courses it was hoped that a variety of strategies and styles of instruction would be found in the courses, and that the students could possibly present different profiles between courses. These courses were reliant on the course materials for teaching, with no additional student support or alternative methods of delivery used, such as tutorials or block courses. Tutors could be contacted by telephone or mail.

Student participants

Students were selected on the basis of being first year, first time students with The Open Polytechnic of New Zealand in one of the five selected courses. As first time students it was likely that studying by distance methods would be a new experience, which might or might not suit their particular needs and learning styles. If it didn't suit them they would be more likely to drop out or not enrol in any further courses.

Table 3
Course enrolments

Courses	Total no. students enrolled	First year students
Business Communications	397	187
Counselling Theory	238	48
Introduction to Information Systems and Technology	136	56
Introduction to Law	127	52
Introduction to Landscaping	110	21
Total	1008	364

Students who were re-enrolling had already shown a preference for this method of learning so would be more likely to stay in a course and be successful. As Table 3 illustrates, 1008 students were enrolled in the courses, but only 364 were first time students.

Sample characteristics

Student enrolment records were accessed to gather data including age, gender, highest educational qualification, and ethnic background, specifically Maori students. In addition students were asked to verify whether they had ever studied by distance before.

Table 4 shows the age ranges of students involved in this study, with a comparison given to all the first year students enrolled in the courses selected. The ranges are evidence of the wide spread of ages of students in distance education, with the majority (60%) of students enrolled for the first time in 1997 being between 26 and 45 . The expectation is that few students aged 19 and under would be enrolled as they would be either still at school, or attending face to face institutions with their peers if they had decided to continue with their studies. There are some variations between courses which would be expected, given the background and nature of the courses, for example Introduction to Landscaping has a significantly higher enrolment of students under 19 as the course is offered to secondary school students. Allowing for the size of the samples, the samples were representative of the ages of students enrolled in the courses.

More females (62%) than males (38%) were enrolled in the courses, with the proportion of respondents mirroring the overall population of 1997 students enrolled in the courses (see Table 5). Overall the samples were representative of the individual courses, with minor variations arising from the sample sizes. There were variations between courses, the most notable being Counselling Theory which had 90% female students, while in contrast only 39% of Information Systems and Technology students were female, thus indicating a bias for course selection which could be interpreted as gender based.

Table 4
Age demographics of sample by course compared with all first-year students

First year students enrolled in courses	Business Communications		Counselling Theory		Introduction to Information Systems and Technology		Introduction to Law		Introduction to Landscaping		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
All 1st year students	187		48		56		52		21		364	
Respondents	72		22		22		17		11		144	
< 19												
All 1st year students	18	10	2	4	2	4	2	4	7	33	31	9
Respondents	8	11	0	0	0	0	0	0	6	55	14	10
20-25												
All 1st year students	47	25	10	45	9	16	13	26	4	19	83	23
Respondents	14	19	3	14	4	18	6	35	2	18	29	20
26-35												
All 1st year students	72	39	15	31	24	43	25	48	4	19	140	39
Respondents	25	35	8	36	7	32	7	41	1	9	48	33
36-45												
All 1st year students	38	20	14	29	13	23	7	13	6	29	78	21
Respondents	17	24	8	36	9	41	3	18	2	18	39	27
46>												
All 1st year students	11	6	7	15	8	14	4	8	0	0	30	8
Respondents	8	11	3	4	2	9	1	6	0	0	14	10

Table 5
Sample by gender and course compared with all first-year students

First year students enrolled in courses	Business Communications		Counselling Theory		Introduction to Information Systems and Technology		Introduction to Law		Introduction to Landscaping		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
All 1st year students	187		48		56		51		21		362	
Respondents	72		22		22		17		11		144	
Female												
All 1st year students	123	66	43	90	22	39	24	47	13	62	225	62
Respondents	42	58	19	86	9	41	11	65	8	73	89	62
Male												
All 1st year students	63	34	5	10	34	61	27	53	8	38	137	38
Respondents	30	42	3	14	13	59	6	35	3	27	55	38

Table 6
Qualifications of sample by course compared with all first-year students

First year students enrolled in courses	Business Communications		Counselling Theory		Introduction to Information Systems and Technology		Introduction to Law		Introduction to Landscaping		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
All 1st year students	187		48		56		52		21		364	
Respondents	72		22		22		17		11		144	
None												
All 1st year students	13	7	5	10	4	7	0	0	3	14	25	7
Respondents	6	8	3	14	1	5	0	0	1	9	11	8
Secondary												
All 1st year students	135	73	24	50	34	61	31	61	16	76	240	66
Respondents	43	60	8	36	13	59	7	41	9	82	90	63
Tertiary												
All 1st year students	25	13	16	33	8	14	15	29	0	0	64	18
Respondents	10	14	11	50	4	18	8	47	0	0	33	23
Other												
All 1st year students	13	7	3	6	10	18	5	10	2	10	33	9
Respondents	3	4	0	0	4	18	2	12	1	9	10	7

Age and open entry policies can further accentuate the variability in educational background of students enrolled in distance education courses. This variation is evident amongst the students who took part in this study as shown in Table 6, their educational backgrounds being representative of the total population from which they were drawn. Previous educational qualifications ranged from none at all (8%) through to tertiary qualifications such as a university degree (23%). Most students had secondary school qualifications (63%) such as School Certificate, University Entrance and Bursery. Some students had qualifications from other countries not readily equating to a New Zealand qualification.

Some variations in learning styles according to ethnic background have been discovered in previous research studies using the Dunn and Dunn model (Dunn & Griggs, 1990). Maori students represented the other main ethnic group enrolled in these courses, with other groups represented numbers too low to form a significant sample. Overall there were 43 (12%) first year students enrolled in the courses who identified themselves as Maori on their enrolment forms. The sample of 12 (8%) is slightly under-representative of the population of first year Maori students (see Table 7).

Table 7
Maori respondents compared with all Maori students in courses

First year students enrolled in courses	Business Communications		Counselling Theory		Introduction to Information Systems and Technology		Introduction to Law		Introduction to Landscaping		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
All 1st year students	187		48		56		52		21		364	
Respondents	72		22		22		17		11		144	
Maori												
All 1st year students	21	11	6	13	7	13	6	12	3	14	43	12
Respondents	6	8	2	9	1	5	1	6	2	18	12	8

Information concerning previous distance education experience was requested along with the consent form (Appendix 1) on the basis that if students had chosen to study by distance before they might be aware of the challenges of learning in the environment. This information was not easily available or could not be identified from the enrolment information in the student database. The information gathered is presented in Table 8, with 28 students indicating that they had previous experience of studying by distance education.

Table 8
Students with previous experience in distance learning

	Business Communication	Counselling Theory	Information Systems and Technology	Introduction to Law	Introduction to Landscaping	Total
Respondents	72	22	22	17	11	144
Previous experience	13	3	5	7	-	28

These students may have already developed strategies for studying this way, and would be demonstrating a preference for it which other first year students might not. As the students were new to studying with The Open Polytechnic, and in most cases had not studied by distance for some years, they were still considered to fulfill the criteria for being first year students for The Open Polytechnic and were included in the study. However to ascertain whether their previous distance education experience had possibly influenced their success in the courses, their results were also analysed separately.

Instruments

The learning style instrument

In order to ascertain the learning styles profiles of students a variety of learning styles models and instruments were reviewed to determine an appropriate instrument for the study. An established and well researched instrument with known validity was considered to be of greater use than creating a new instrument which would need to be proved valid for the results to be credible. Instruments reviewed included Kolb's Learning Style Inventory (1985), Honey and Mumford's Learning Styles Questionnaire (1992), the Canfield Learning Styles Inventory (1988), and the Productivity Environment Preference Survey (PEPS) by Dunn, Dunn and Price (1994).

While the various models had their merits and weaknesses Bonham's advice to "choose an instrument in light of the specific situation in which it will be used: choose one that presents the fewest problems in light of what is to be accomplished" (1988b, p. 15) was followed. James and Blank (1993) recommend that when reviewing learning styles instruments the selection of an instrument should depend on the conceptual base, the research data supporting it, and practical considerations in terms of using it in a particular setting. They critiqued 20 instruments, including those reviewed for the purposes of this study, the criteria applied including evidence of validity, evidence of reliability, strength of research bases, and overall instrument usability. PEPS was the only instrument out of 3 covering the dimensions of information processing, perceptual modality and personality, to achieve acceptable scores on the criteria used by them.

The decision was made to use the PEPS on the basis of the research evidence available supporting it, that the factors or preferences indicated by the survey could easily be identified by analysing the course materials to assess a match or mismatch, and strategies could be developed to support the preferences in a distance learning environment. The research instrument includes 100 questions using a Likert scale for responses (refer Appendix 2). It aims to identify adults' preferences for learning, functioning, and performing in their work or study activities (Blakemore, McCray & Coker, 1984).

The instrument is based on the Dunn and Dunn Learning Styles model, developed after 11 years of research (Dunn, 1986). Since 1978 the model has been used in research studies at more than 70 universities (Dunn, 1993). It is claimed that it is the most widely documented assessment instrument due to the extensive amount of research undertaken using it and is reputed to have one of the highest reliability and validity of learning styles instruments (Dunn, 1990, De Bello, 1990).

From the survey instrument a profile is generated giving 23 preferences which fall into five categories of environmental factors, emotional factors, sociological factors, physiological factors and psychological factors. For each factor students can have a high preference, which means that they have a strong preference for learning using that particular factor. If the preference is strong it indicates that it is extremely important to them and they will learn better if that factor is addressed. If a factor is rated as being only a preference, that is neither high or low, it indicates that they will usually or often learn better if the factor is responded to. The reverse is true for a low preference, which indicates that they require the opposite of that particular factor in order to learn easily. Students may have neither a high or low preference for a factor, indicating that it is not important to them and that they have the ability to use that factor if they are motivated or interested in the topic. There is no set number of high or low preferences a student should exhibit, it being feasible for them to have no high or low preferences.

Using the Dunn and Dunn Learning Style Model (Dunn, 1992), learning style is described as comprising:

- the environment in which learning occurs (the amount and kind of sound versus quiet or illumination needed, temperature comfort levels, and the type of seating most conducive to concentration),
- individual emotionality (motivation, persistence, responsibility, and whether a person functions better or less well with external versus internal structure),
- sociological preferences (whether learning occurs most easily alone, in a pair, in small group, with peers, or with an adult [subdivided into authoritative vs. collegial adults] and whether a variety of patterns or routines is preferred),

- physiology (the perceptual strengths through which individuals should initiate and reinforce new and difficult material, whether or not intake is desirable, the time-of day energy levels each experiences, and the need for mobility vs. passivity), and
- whether the learner processes globally or analytically. (p. 160-161)

The preferences used in the model can be summarised into five categories, as shown in Table 9, corresponding to the preferences which are identified using the PEPs survey instrument (Dunn, Dunn & Price, 1994). Explanation of each factor relevant to this study follows.

Table 9
Dunn and Dunn Learning Styles Preferences

Environmental	Emotional	Sociological	Physiological	Psychological
Sound	Motivation	Learning alone	Perceptual (4)	Global
Light	Persistence	Learning with others	Intake	Analytic
Temperature	Responsibility	Learning with an authority figure	Time (early morning or evening, or late morning, or afternoon)	
Design	Structure	Various ways	Mobility	

Thirteen preferences were selected as relevant for the purposes of the study, chosen on the basis of their possible impact on students studying at a distance. These preferences could be affected by the course being studied, the student support offered, or psychological aspects which could impact on their studies, all of which could be influenced by the educational institute via the instructional design of the courses and student support network. Other preferences, such as the students' environmental conditions and the time of day at which they studied, were outside the control of The Open Polytechnic. Drawing on Dunn (1986, 1989, 1990) the selected preferences, along with explanations, are as follows:

Emotional factors:

- *Motivation for academic learning*

  Learners who are highly motivated, and thus have a high preference in this area, are more likely to enjoy academic learning, and thus apply themselves to it with minimal

supervision, while those with a low preference are not really interested in academic learning. Highly motivated learners are more able to alter certain learning style preferences over time. Learners with low motivation may require more positive feedback, closer supervision and more easily mastered materials with tasks that are divided into small segments.

- *Persistence while learning*

  A high preference indicates that the learner usually prefers to complete the things they begin. A low preference indicates that the person will start but not always finish things.

- *Responsibility for academic learning*

  Learners with a high preference in this area usually do what they believe they ought to do, conforming to what they perceive as other peoples' expectations. Those with a low preference prefer to do things that most other people mightn't do, but which they themselves perceive as being right regardless of what others think or expect.

- *Structure versus options while learning*

  Students with a high preference for structure require clear and logical rules and guidelines to be given for learning new material, with examples provided that start with the simple and build to the complex (Guild, 1989). They often prefer working with a directive supervisor. In comparison those with a low preference like to do things their own way.

Sociological factors:

- *Learning with peers or alone*

  A high preference indicates a predilection for doing things with someone else, while a low preference indicates that they prefer doing things by themselves.

- *Learning with an authority figure*

  Most people with a high preference prefer to have an authority person, such as a teacher, present or readily accessible, and like to do what they have been told to do. A low preference for authority indicates that they will either prefer to not do what an authority person asks them to do, or they will do the opposite.

- *Needing variety*

  Most people with a high preference for variety like change, rarely doing the same thing in the same way twice in a row. People with a low preference prefer routines and patterns.

Physiological factors:

- *Learning by listening (auditory)*

  Auditory learners (those with a high preference) find it easy to learn by listening, being able to remember things they hear. People with a low preference for learning by listening find it difficult to listen for long periods of time. They tune out at lectures and don't really know much of what is being said.

- *Learning by reading or viewing (visual)*

  Most people with a high preference for visual learning remember a great deal of what they read, in comparison with those with a low preference who may need to reread a page they have read because they have absorbed little meaning from it.

- *Learning by touching (tactile)*

  Tactile learners need to use their hands, and often take notes during lectures when they are reading something new or difficult that they want to learn. People with a low preference for tactile learning rarely take notes and may have difficulty with, or not enjoy performing manual tasks.

- *Learning by doing (kinaesthetic)*

  People with a high preference for kinaesthetic learning like being physically active and involved, in comparison to people with a low preference who don't often engage in energetic, action oriented sports or activities.

Psychological factors:

- *Global*

  Global learners prefer learning which is focused on personal needs and feelings where they are able to relate to personal experiences via hands-on learning. They like to be provided with overviews and summaries first so they can understand the concepts before going 'step-by-step' through the detail.

- *Analytic*

  Analytic learners prefer learning which is focused on task and details where information is presented directly in a sequentially organised format through instruction. They like to learn 'step-by-step', building up a conceptual understanding.

Comparing the preferences to various checklists or criteria for designing courses, there is a degree of commonality. For example Dean lists 20 characteristics of adult learners to consider and accommodate if possible when designing courses, 7 of which directly correspond with the Dunn and Dunn model:

- preferences for using sensory perceptions
- motivational orientation to learning
- motivational strength for learning
- learning and cognitive style
- ability and preference for working alone or with others
- need for support, direction, and structure
- persistence
- preferences of conditions for learning (such as amount of sound, light, temperature, room design, time of day, mobility, and food intake).

(Dean 1994, p.33)

Other characteristics included by Dean, such as the ability to cope with life, career and other transitions, are not recognised as being a component of learning style, and are therefore outside the parameters of the learning styles model and this study.

Course teaching materials analysis

Evaluation of the course teaching materials was on the basis of features that should be found to match the various learning styles preferences identified for inclusion in the study, as well as media and instructional design strategies commonly used in distance education courses. The earlier study had identified a preference for structure as a factor which was significantly linked to drop-out or failure, a high need for structure indicating that the student required structure to be imposed (Hutton, 1995a). Given that a high preference for structure equates to a lack of self directedness in learning, the ability to be self-directed being deemed a necessary attribute for working in a distance environment, further analysis was considered to be of use in this area. For this reason a 'Model for Analysing the Self-Directedness of Distance Education Courses' (Baker, 1993) was included as part of the evaluation. Baker states that "the purpose of this model is to provide the means to evaluate the extent to which undergraduate courses integrate opportunities to learn and practice the characteristics associated with self-directed

learning." (p. 61). The model is based on a series of questions used to analyse the course (refer Appendix 3), under six headings of:

1. Diagnose learning needs,
2. Translate learning needs into learning objectives,
3. Identify and use material and human resources relevant to the course,
4. Ability to select effective strategies for making use of learning resources and to perform these skillfully and with initiative,
5. Ability to collect and validate evidence of accomplishment of various kinds of learning objectives,
6. Assessment techniques.

In summary, the course teaching materials were reviewed against a checklist (refer Appendix 4). This was developed to include evaluation criteria established using the learning styles preferences identified by Dunn and Dunn (1990) and excerpts from a questionnaire by Baker (1993), designed to identify the level of self-directedness in distance education courses, self-directedness being associated with the learning styles preference of structure. To achieve some of the evaluation the content and format of courses materials was identified, along with specific instructional design strategies used in distance education.

Procedure

The research plan, including the instrument and correspondence to be sent to students, was presented to The Open Polytechnic's Research Ethics Committee for approval to ensure that it complied with the institute's regulations regarding ethics. Approval was granted on the basis of the following procedures to ensure the confidentiality of students included in the survey.

At the beginning of the academic year five courses were selected for inclusion in the study: Business Communications, Counselling Theory, Information Systems and

Technology, Introduction to Law, Introduction to Landscaping. The course leaders of these courses were approached to inform them of the research and gain their approval and support for the course being included. The writers of the courses were also contacted for the same reason, as well as the instructional designers.

Once the courses were selected, all first time students in those courses were sent a covering letter (Appendix 5), information sheet (Appendix 6), consent form (Appendix 1) Productivity Environmental Preference Survey (Dunn, Dunn, & Price, 1994: Appendix 2). These were sent in March 1997. As data was being gathered and produced that was personal to students from the learning styles instrument and from student records, their written consent was sought to use the data. To protect their privacy each student was given a code number so that their identity remained anonymous when the results were being processed by external sources. A reminder letter was sent in April (Appendix 7).

Once the survey instruments were returned they were processed and learning styles profiles produced. Student records were accessed to gather other data relating to age, gender, and ethnicity. Information regarding previous distance education experience, learning styles profiles and other data gained from student records was entered into a data base. The learning styles profiles were compared with student success with the aim of highlighting any particular learning styles preferences which could be linked with course results. Further analysis of the profiles on the basis of other personal factors, including age, education, gender, and ethnic background was undertaken to determine if there were particular learning styles preferences which could be linked with those factors, or whether the factors themselves could be linked with course results. The results of student's who had previous experience of studying at a distance were

Courses were evaluated to determine their teaching styles as represented by the instructional strategies used and methods of delivery. To achieve the evaluation the content and format of the learning materials contained in the course packs were ascertained. The materials were examined to determine the instructional strategies used. Evaluation on the basis of the course teaching materials checklist was then undertaken.

The teaching styles of the courses were compared with the learning styles profiles of students.

Chapter 4

RESULTS: LEARNING STYLES

Introduction

This chapter presents results of the survey of students to ascertain their learning styles. An overall learning style profile is drawn for all respondents which is then broken down on the basis of learning styles profiles within courses, before profiles are examined on the basis of other variables.

Survey response

There was a 40% response rate to the learning styles survey overall, with response rates ranging from 33% to 52% across the five courses (see Table 10).

Table 10
Learning style survey response rate from five first year distance education courses

Courses	Students Surveyed	No. of respondents	Return %
Business Communication	187	72	39%
Counselling Theory	48	22	46%
Introduction to Information Systems and Technology	56	22	40%
Introduction to Law	52	17	33%
Introduction to Landscaping	21	11	52%
	364	144	40%

Analysis of dropout and failure rates showed that non-respondents had higher dropout and failure rates than respondents, possibly reflecting that they had already made the decision not to continue with their studies and therefore did not return the survey instrument (see Table 11). A similar pattern was found in an earlier small-scale study of the learning styles of distance education students (Hutton, 1995a). Introduction to Landscaping and Counselling Theory did not have students who could be categorised as

failures due to the nature of the courses and the programmes they were in. The drop-out rates for the courses overall were historically normal, and within the range of drop-out experienced by other distance education institutes (Peters, 1992, Zajkowski, 1993).

Table 11
Success vs. drop out/failure for non-respondents and respondents from five first year distance education courses

	Students 1997		Non-respondents		Respondents	
	n	%	n	%	n	%
Business Communications						
Enrolled 25/2	187		115		72	
Passed course	112	60	59	51	53	74
Drop-out	70	37	53	46	17	24
Fail	5	3	3	3	2	2
Counselling Theory						
Enrolled 25/2	48		26		22	
Passed course	13	27	2	8	11	50
Drop-out	35	73	24	92	11	50
Information Systems and Technology						
Enrolled 25/2	56		34		22	
Passed course	18	32	7	21	11	50
Drop-out	35	63	25	73	10	45
Fail	3	5	2	6	1	5
Introduction to Law						
Enrolled 25/2	52		35		17	
Passed course	21	40	11	31	10	59
Drop-out	27	52	21	60	6	35
Fail	4	8	3	9	1	6
Introduction to Landscaping						
Enrolled 25/2	21		10		11	
Passed course	4	19	1	9	3	30
Drop-out	17	81	10	91	7	70
TOTAL						
Enrolled 25/2	364		220		144	
Passed courses	168	46	80	36	88	61
Drop-out	184	51	132	60	52	36
Fail	12	3	8	4	4	3

Learning styles profiles

The profiles generated according to the Dunn and Dunn Learning Styles Model indicate preferences for learning in particular ways, with high or low preferences influencing a person's ability to learn new information easily and to retain it better when the needs arising from the factor are met. Students may not have a preference either way for a particular factor, and therefore have the ability to utilise that factor if they are sufficiently motivated or interested (Dunn, 1992). Of the 144 respondents in the survey, 26 (18%) had no high or low preferences for any of the factors examined in the study. The figures presented show the percentage of students with high preferences and low preferences for each factor. Figures 1 and 2 provide a summary of the learning styles profiles of all the respondents to the survey. Discussion of the figures follows.

Physiological factors

Only preferences relating to perceptual aspects of learning styles were included in this study. These are the sensory modalities people use to take in information, and include visual, auditory, tactile, and kinesthetic. Research indicates that most people have a primary perceptual strength through which they are able to take in information more easily than through others (Dunn, 1990).

Of the 144 respondents, only 4 (3%) had a high preference for visual learning (see Figure 1). There were twice as many tactile learners as visual learners - 8 (6%), while only 3 (2%) were kinesthetic. An interesting result was the high preference for auditory learning with 43 students (30%) having this preference. More than a third of students (38%) had neither high or low preferences for using any sensory modalities.

Emotional factors

Emotional factors included were motivation, persistence during learning, responsibility, or non-conforming versus conforming, and structure versus options while learning.

Few students had a high preference for motivation, persistence, or responsibility: characteristics which would be useful in a learning environment where students have to be more self-motivated, persistent and responsible as they don't have the immediate support of a teacher or fellow students. With reference to Figure 1, seven (5%) students had a high preference for motivation, which means they viewed themselves as being highly motivated. Ten (7%) students had a low preference for motivation, as indicated on Figure 2. Only 11 (8%) students had a high persistence score while 13 (9%) rated themselves low in this area. People with a low preference for persistence often start many things which they don't finish, as compared to those with a high preference who usually complete the things they start. Four (3%) students had a high responsibility

Figure 1
Learning styles profile for all respondents - high preferences

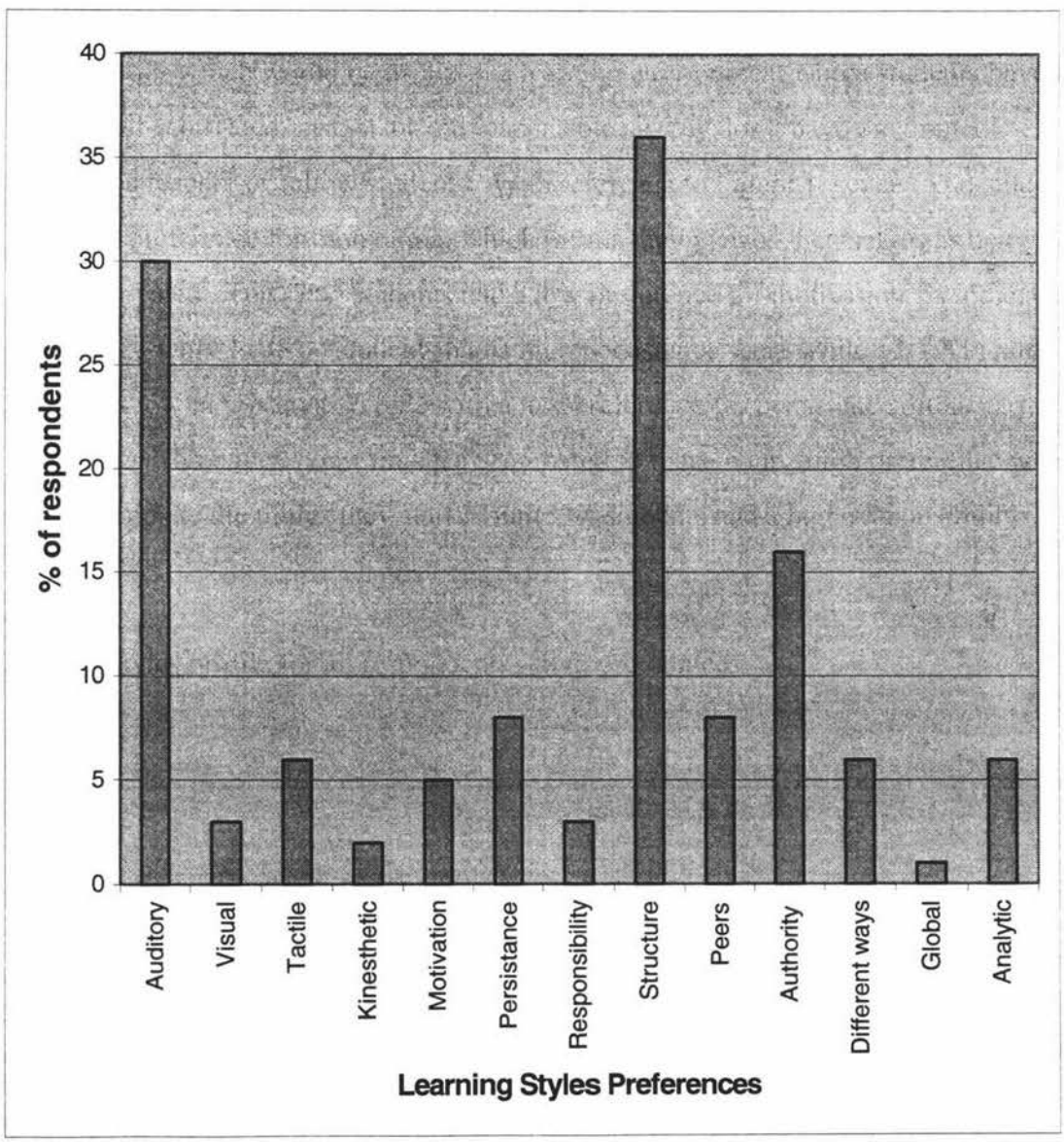
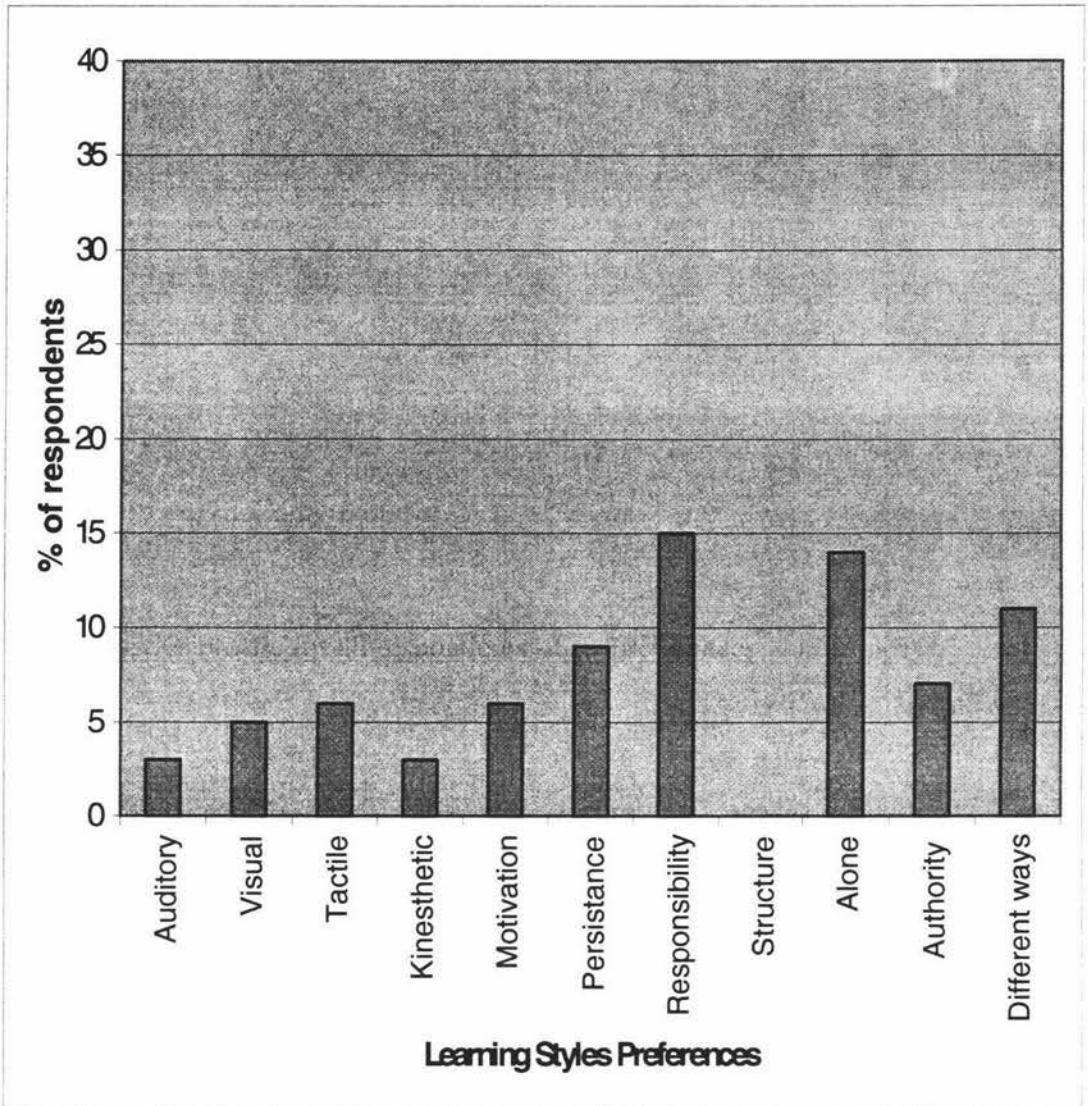


Figure 2:
Learning styles profile for all respondents - low preferences



preference, while 22 (15%) were low in this area. The latter preference is associated with being easily diverted from learning tasks, while a high preference is associated with being able to complete tasks with minimal supervision.

The most significant result in this area was that 52 (36%) had a high preference for structure. A low preference for structure relates to people being more self-directed and able to work on their own without being told what to do. In comparison those with a high need for structure often need to be told exactly what to do with very explicit directions. A high need for structure is something which can change with age and maturity (Dunn, 1986).

Nearly half of the respondents (68 - 47%) had no high or low preferences for any of the factors included in this group.

Sociological factors

These include a need to study alone, or with peers; the need for an authority figure present, and the need to learn in several ways. Students with a high need for working with peers will show as having a high preference, while those who prefer to study alone will show a low preference. Only 8% of students preferred to work with their peers, compared with 14% who preferred to work on their own. 16% of all respondents had a high need for an authority figure, such as a teacher, present. Only 7 (5%) students preferred learning in several ways, this factor indicating that they could become easily bored if they had to maintain patterns and routines, while 16 (11%) had a low preference for this factor.

Psychological factors

According to the Dunn and Dunn Learning Style Model (Dunn & Griggs, 1990) students either have a preference for thinking globally or analytically, or no preference either way. Unlike the other preferences there is no low preference for these factors. Few students had strong preferences in these areas, only 2 (1%) being strongly global thinkers, and 9 (6%) being strongly analytical. These particular preferences can change over time, therefore students could develop stronger preferences as they develop in response to an academic environment.

Learning styles profiles by courses

To enable easy comparison separate figures including each of the five courses are used for the four relevant categories of the Dunn and Dunn Learning Styles Model (physiological factors, emotional factors, sociological factors, and psychological factors). Variations in learning styles of students studying different courses were

generally minimal, although a few are worth noting. These are shown in Figures 3 to 8, with a discussion of the results as follows.

Physiological factors

A surprising result was evident when comparing profiles between courses with regard to a high preference for auditory learning (see Figure 3). Overall 30% of students had a high auditory preference, while only 18% of those studying Counselling Theory had a high preference for this factor. Given the nature of counselling the expectation could be that students who wanted to study it would exhibit the highest preference when compared with other courses. Few students had a low preference for any of these factors (see Figure 4).

Emotional factors

Compared to students in the other courses more Introduction to Information Systems and Technology students had a higher preference for structure (59% - see Figure 5), while none had a low preference for motivation (see Figure 6). Meanwhile more Introduction to Landscaping students (27%) were deemed to be highly motivated (see Figure 5). No students in any of the courses had a low preference for structure (see Figure 6).

Sociological factors

There was a noticeable variation between courses in terms of the need for an authority figure present, varying from 6% for Introduction to Law to 23% for Introduction to Information Systems and Technology (see Figure 7). Although only 12 students overall preferred to work with their peers, a proportionally larger number (5) of these were in the Counselling Theory course which is perhaps indicative of the nature of the course and the students it would attract who would be expected to be more people oriented. In comparison, of the 20 (14%) students who preferred to work on their own, 5 of these were in the Introduction to Law course (see Figure 8).

Psychological factors

As few students had strong preferences for global (2) or analytical (9) thinking, comparisons between the courses do not provide meaningful information.

Figure 3

Respondents' learning styles preferences by courses:

High physiological factors - sensory modalities

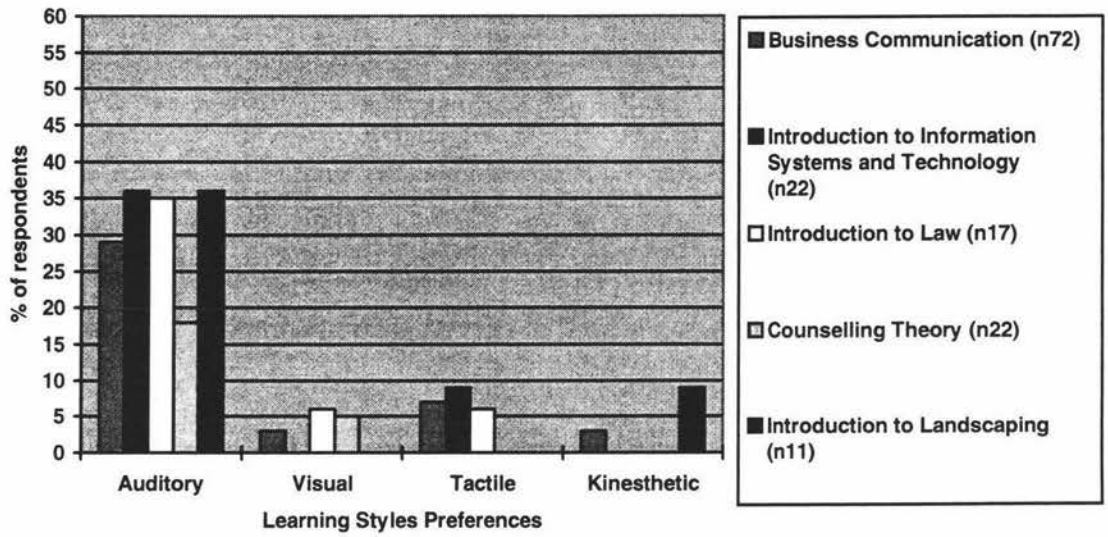


Figure 4

Respondents' learning styles preferences by courses:

Low physiological factors - sensory modalities

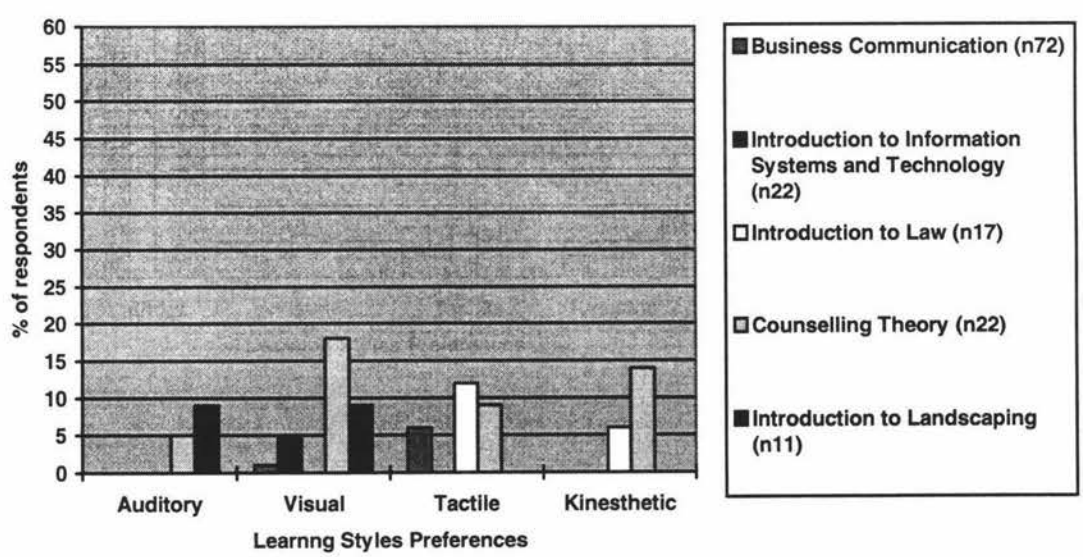


Figure 5
Respondents' learning styles preferences by courses:

High emotional preferences

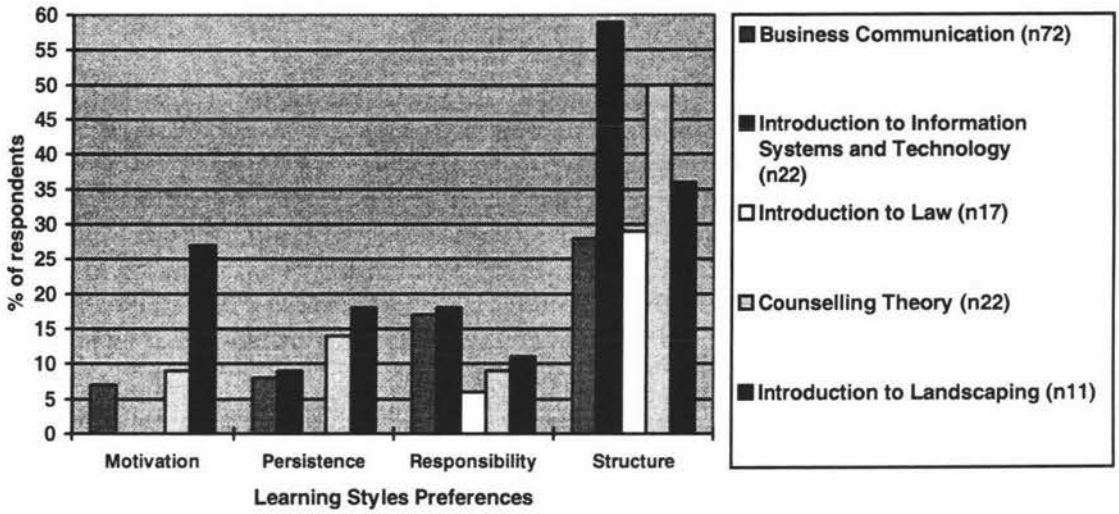


Figure 6
Respondents' learning styles preferences by courses:

Low emotional preferences

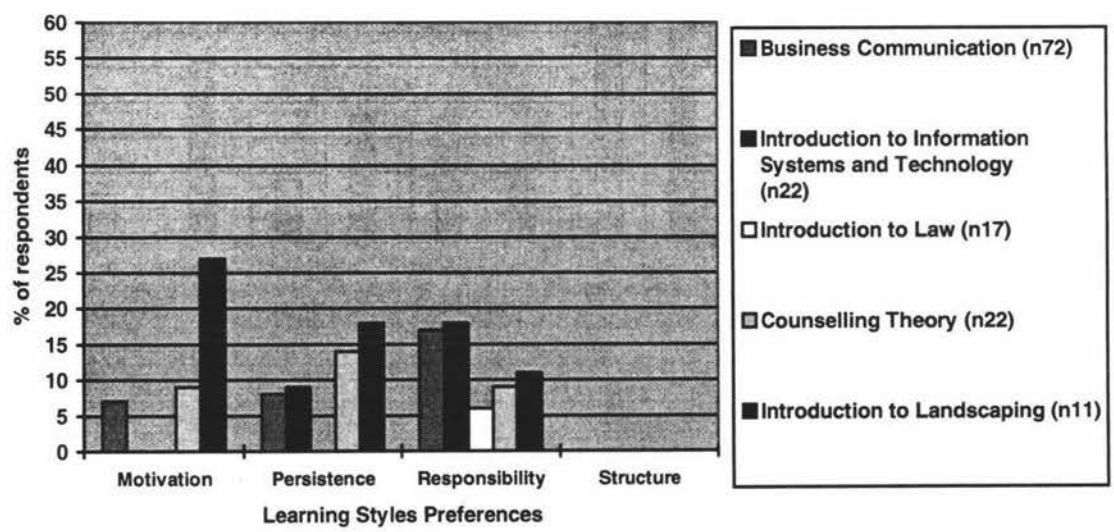


Figure 7
Respondents' learning styles preferences by courses:

High sociological preferences

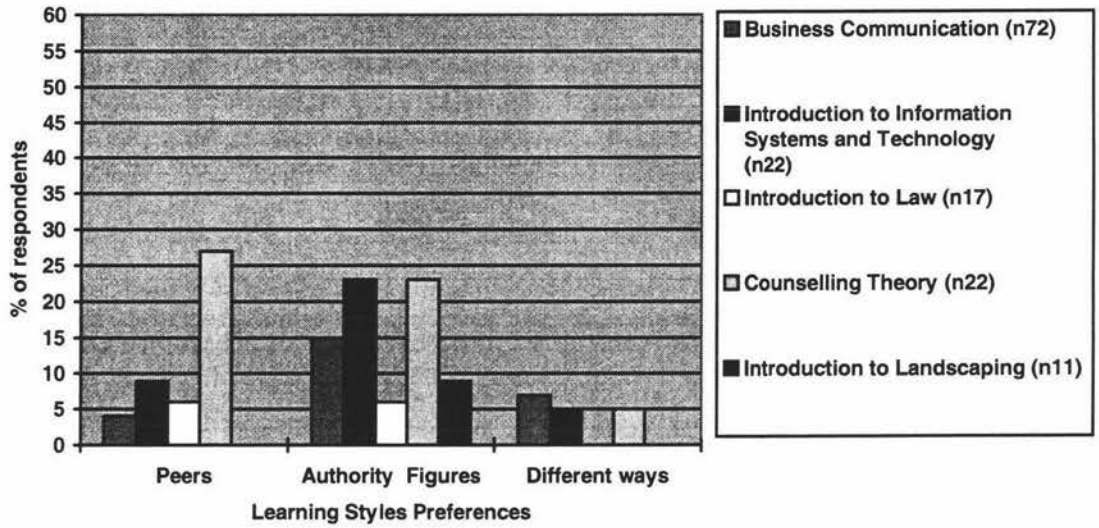


Figure 8
Respondents' learning styles preferences by courses:

Low sociological preferences

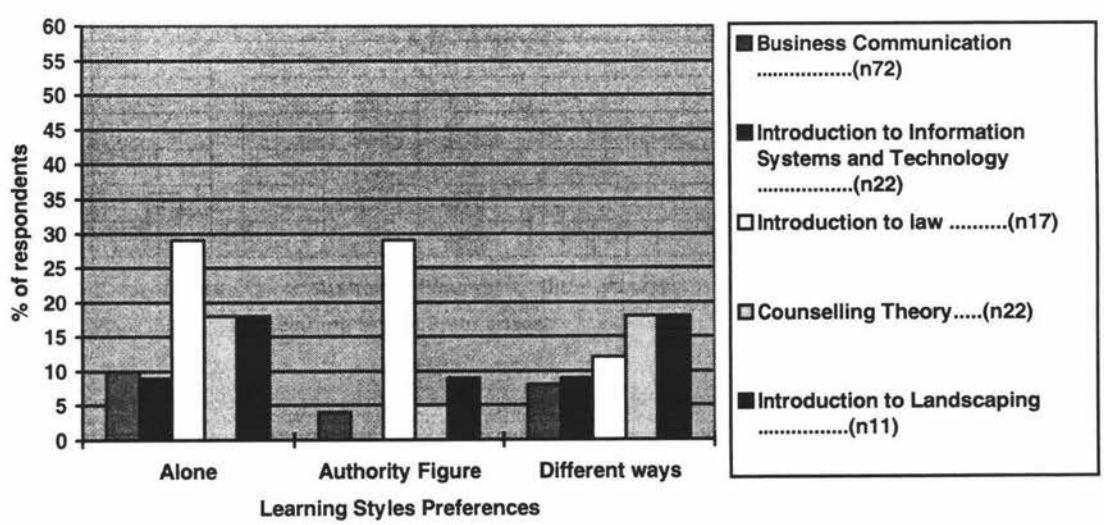
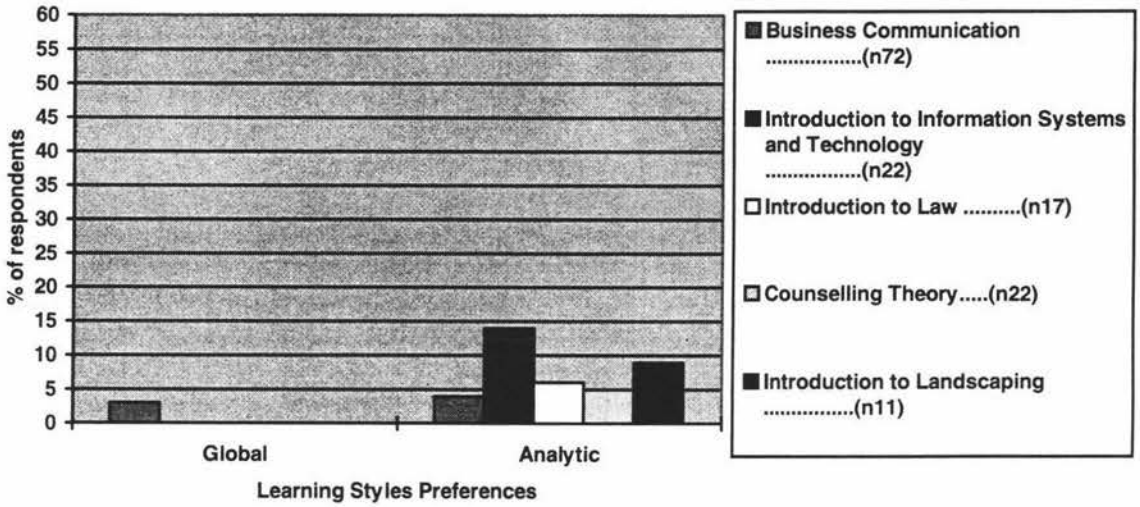


Figure 9
Respondents' learning styles preferences by courses:
Psychological preferences



Learning styles and student differences

It is conceivable that learning styles could vary as a result of a number of differences between students such as age, gender, prior qualifications and ethnic background. For example Dunn notes that preferences can change with maturation (Dunn, 1986), while differences have been found between ethnic groups (Dunn & Griggs, 1990). Students learning styles profiles were further sorted according to the differences mentioned to ascertain whether variation in profiles could be detected on this basis.

Learning styles and age

One of the notable differences between students studying by distance and face-to face, is the variability in ages. Face-to-face tertiary institutions tend to have more younger students who have gone straight from secondary school to full time tertiary study. In contrast distance education attracts more older students who tend to study part-time and have a greater diversity of backgrounds. Bernt and Bugbee (1993) raise the issue of how this may influence adult learners' studying patterns and strategies, citing studies which compare younger students with older students, finding that older students have a

preference for more self-directed methods of learning. This pattern is not apparent from examining the learning styles profiles of older (20 years and over) and younger (under 20) students in this study (refer Appendix 8). More older students could be expected to exhibit a low preference for structure which correlates with being self-directed, or possibly no preference either way, however was not the case. Reviewing the learning styles profiles indicated only one minor variation: a higher proportion of students under the age of 20 had low motivation, and low responsibility. Given the small numbers (14) no generalisations could be made.

Learning styles and gender

Analysing the learning styles profiles on the basis of gender, few notable variations were found (refer Appendix 9). More male students had a preference for auditory learning (males - 38%, females - 25%). Females had a greater preference for an authority figure present (females - 18%, males - 9%).

Learning styles and qualifications

There is evidence to suggest that prior educational qualifications can be a significant predictor of success in distance education courses (Batjelsmit, 1990). Analysing the learning styles profiles according to educational background did not show any major variations (refer Appendix 10). Although a study by Bernt and Bugbee (1993) found that there were differences in study strategies according to educational levels, suggesting that students with lower levels of education needed more structure and direction, this was not evident in the profiles. Higher preferences for structure did not appear to be associated with lower prior qualifications.

Learning styles and ethnic background

The number of Maori respondents (12: 8%) was too small to generate meaningful comparisons. Other research studies involving children from different ethnic backgrounds have shown that differences in learning styles exist between one group and another (Dunn, Gemake, Jalai, Zenhausern, Quinn, & Spiridakis, 1990, Dunn, 1993), however there was insufficient evidence from this study to make observations.

Summary

The learning styles profiles indicated a range of preferences, providing information which could be useful for designing distance education courses. 62% of students had either low or high preferences for particular sensory modalities, the highest preference being for auditory learning (30%). Few students (3%) had a high preference for visual learning. Reviewing the results of preferences related to emotional factors, few students had a high preference for motivation, persistence, or responsibility. In contrast a high preference for structure was evident with 37% of students. Sociological factors of the learning styles profiles suggest that few students are strongly influenced by preferences for working alone, or with others, or need to have a teacher present. Likewise few students exhibited strong global or analytical learning preferences.

Reviewing students learning styles profiles according to the courses they were enrolled in revealed few variations that could be attributed to students with different styles being attracted to different types of courses. Likewise few differences were found when examining the learning styles profiles on the basis of age, gender, qualifications, and ethnic background.

Chapter 5

RESULTS: THE TEACHING STYLES OF COURSES

Introduction

The course materials sent to students enrolled in distance education courses are often the main method of teaching. The teaching style of the course as evidenced by the materials can be influenced by a number of factors: the teaching style of the course writer or writers; the style of the instructional designers involved in the design of the course; institutional factors such as style sheets used by an institute that determine the format of the materials. All these can vary between courses and programmes, the resources available to be used, the philosophies and policies guiding a programme.

This chapter examines the contents of the course packs sent to students, focussing on the materials prepared by the teaching institution. A description of the contents of each course pack, including formats, is followed by a summary of instructional strategies. The courses are then evaluated using a checklist based on the Dunn and Dunn Learning Style Model and Baker's Model for Analysing the Self Directedness of Distance Education courses (1993).

Course materials

Once enrolled in a course students are sent packs containing the learning materials they will use during the course. Some courses may require students to purchase a textbook in addition to the materials in the packs. What is included in a pack of course materials may vary, but can contain:

Course Materials

- course information, including additional newsletters for course coordinators and tutors
- course folders or books
- readings
- study instructions
- other resources such as computer disks, videos, audio tapes

Support materials

- student library service folder
- student handbook
- envelopes
- student services welcome letter

Administration materials

- labels and coversheets for assignments

The format of course materials consist of the headings and content which structure the material, headings acting as guides to help students access the content (Hartley & Trueman, 1985). Formats can vary markedly between programmes within an institution, for example a degree programme or a diploma programme. Greater similarity may be found between courses within a programme as a style template can be used to create some uniformity. Differences may still occur as result of a variety of factors including the nature of the subject, the teaching style of the writer and instructional designer all of which can influence the choice of instructional design strategies and media used.

Instructional design strategies in a distance education context include the format of course materials, as well as other strategies embedded within the materials, such as overviews, summaries, activities and tasks. These strategies are designed to promote access, engender learning, and contribute to the structure of the course. Other media may be incorporated as part of the course design to deliver and support the course, for

example audio and video tapes, and the Internet, which can be used for delivery of content and support via use of discussion groups.

To help determine the teaching style of the courses the course materials were reviewed to ascertain what students were sent and the general format of the materials as shown by the headings used in the written materials (see Table 12). Further analysis of the materials was undertaken to establish other instructional strategies used (refer to Table 13). Data gathered from this review was incorporated into the evaluation of the courses.

Table 12
Course materials: contents and format features - Business Communications

Contents of course package	Format of learning materials
Study Instructions Meetings (booklet) Course map Course information Study guides Assessment Supplementary material Audio tape Standard support and administration materials	1. Course information List of course materials Course learning outcomes Course outline Planning your study Using the study guide Assessment and study information Bibliography 2. Each study guide (unit) contains: Introduction/Overview - objectives Topics - Introduction (paragraph) - Reference to course reading - Points to consider while reading with follow-on paragraphs linking to student personally - Direction to review exercises Terms for revision Review exercises - self checking exercises - exercises to be sent in and assessed by a tutor. Assessment schedule (provides the criteria for Assessment of the review exercises).

Table 13
Course materials: contents and format features - Introduction to Information Systems and Technology

Contents of course package	Format of learning materials
Course information guide and assessment tasks Learning Guide, including - four learning sections - appendices Book of readings Standard support and administration materials	1. Course information guide and assessment tasks Introduction How to start the course Learning outcomes Assessment Course deadlines Resources Assessment tasks - assessment checklist - Introduction - Your tasks - Guidance - Weeks - time allocation - Resources - Case study notes 2. Learning Guide Each section contains - Weeks - time allocation - Setting the Scene - The Problem - Activities - Resources - Assessment - Notes including note pad Activities - Weeks *(time allocation)* - Introduction - The Problem - Discussion - Your Tasks - Resources - Note Pad

Table 14
Course materials: contents and format features - Counselling Theory

Contents of course package	Format of learning materials
Learning Guide, including	1. Course Information
- Course Information	Contents + Recommended Approach
- Sections	Introduction
- Appendices	About this course
Book of readings	Learning outcomes
Audio tape	Course outline
Textbook	
Standard support and administration materials	Section outline
	Assessment
	Course dates and deadlines
	Contact details
	Resources
	Study timetable
	2. Sections
	Overview
	Assessment
	Activities
	Feedback on activities

Table 15
Course materials: contents and format features - Introduction to Law

Contents of course package	Format of learning materials
Course Information	Course Information
Learning Guide, including	Course description
Modules	Using the Learning Guide and commentaries
Activity comments	Doing the learning Activities
Readings	Planning your study programme
A Guide to Essay Writing	How you will be assessed
Computer disk	Contacting your tutor
CECL Contract	Using the library
Practice Exercises	
Letter from course leader	2. Learning Guide
Assessments	Each module contains:
Standard support and administration materials	Objectives
	Resources
	Reminder
	Overview
	Commentary
	Practicing Module skills
	Activities

Table 16
Course materials: contents and format features - Introduction to Landscaping

Contents of course package	Format of learning materials
Introduction Modules Assessments Tutor help paper Course appraisal Standard support and administration materials	Introduction Includes Student Guide Introduction Guidance on assessment and study information Student profile questionnaire Modules Introduction Learning outcomes Topics Summaries Progress checks

Tables 12 to 16 highlight the differences between courses in regards to the materials sent to students and the formats used. For example Counselling Theory, Introduction to Information Systems and Technology, and Introduction to Law had books of readings. Business Communication and Counselling Theory use audio tapes to present case studies for assessment purposes, both courses being in discipline areas which require spoken communication. The formats of the learning materials varied markedly with different headings used and different types of content included to structure and guide students' learning. Further discussions of the differences are included in relation to the overall evaluation of the courses.

Instructional design strategies

Various instructional design strategies are commonly used in distance education courses, such as including overviews and summaries (see Table 2). These strategies contribute to the overall structure of a course. The course materials were reviewed to ascertain the specific strategies used (see Table 17).

Table 17
Summary of instructional design strategies included in courses

	Business Communications	Introduction to Law	Introduction to Information Systems and Technology	Counselling Theory	Introduction to Landscaping
Advance organisers					
Exercises, activities, problems	✓	✓	✓	✓	✓
Graphics - illustrations, tables, graphs and charts	✓	✓	✓		✓
Graphical organisers					
Inserted questions in text	✓	✓	✓	✓	
Objectives	✓	✓	✓	✓	✓
Overviews	✓	✓	✓	✓	✓
Pretests and concept ratings			✓ (minimal)		
Study guidelines					
- course intro/info	✓	✓	✓	✓	✓
- general- interspersed through-out course materials	✓	✓	✓	✓	
- time guidelines	✓			✓	
- assessment criteria					
Summaries	✓				✓
Text presentation	✓	✓	✓	✓	✓

No course used either advance or graphical organisers. All courses incorporated exercises, activities or problems within the course content, although to varying extents and purposes. Likewise some form of graphics were used in most courses to varying degrees, the exception being Counselling Theory. A pretest was included in only one course to ascertain the level of skills related to the use of specific computing packages. While it could be expected that prior knowledge of specific academic content would be limited with most students, some generic knowledge could exist which would enable students to more easily study a particular subject area. This would apply to a course such as Business Communications, which covers generic communication skills that many students would already possess or be familiar with from their previous work and life experience. Prior knowledge of a subject can enable easier access to course content and thus influence student progress (Verduin & Clark, 1991).

Course analysis

Courses were further analysed on the basis of the checklist derived from the Dunn and Dunn Learning Styles Model (Dunn, 1986), and the Model for Analysing the Self-Directedness of Distance Education Courses (Baker, 1993: see Table 18). The results of this analysis are reviewed under the same headings as used in the Dunn and Dunn Learning Styles Model. The analysis is summarised in tables included under each area reviewed. The figures provided give a quantitative count of the number of types of strategies found in the evaluation to support that particular learning styles preference, and are not indicative of the quality of the strategies, nor do they represent the number of times the strategies were used within a course.

Physiological

The physiological aspects included in the study were in relation to the sensory modalities used by students as determined by the course materials and activities. Various options can be used to support the modalities in a learning environment. A visual preference can be supported by printed materials, video tapes and clips, computer graphics, or anything else which incorporates the use of visual cues to take in information. An auditory preference can be supported by a range of materials, including audio and video tapes and clips, group or one-to-one discussions requiring vocalisation and listening. Tactile preferences can be supported by use of hands, such as from writing or using a computer. Kinesthetic preferences require more whole body involvement.

All courses relied on printed materials as the main medium of instruction, and were therefore visual. Supplementary material was provided using other forms of media. Both Business Communication and Counselling Theory made use of audio tapes, while

Table 18
Course analysis using the Course Teaching Materials Checklist

	Business Comm.	Intro. to Law	Intro. to Info. Systems	Counselling Theory	Intro. to Landscaping
Physiological (Sensory Modalities)					
1. What media are used in the course?					
- printed materials	✓	✓	✓	✓	✓
- audio tapes	✓			✓	
- video		✓			
- computer		✓	✓		
- other					
2. What sensory modalities are students required to use in the course activities and assessments?					
- auditory	✓		✓	✓	
- kinesthetic					
- tactile	✓	✓	✓	✓	✓
- visual	✓	✓	✓	✓	✓
Emotional					
(from the Model For Analysing Self Directedness In Distance Education Courses, Baker, 1993) I ***Diagnose Learning Needs*** 1. Is there information in the course package about the importance of					
(a) being a self-directed learner?					
(b) diagnosing one's own learning needs"					
2. Are the students asked why they have registered in this specific course?					✓
3. Are the students asked to indicate their previous knowledge or background in the subject matter of the course					
4. Are the students asked to write down what knowledge, skills or attitudes they want to get from the course ie' what they want to learn?					
5. Are the students asked to complete a self-marked, pre-test that would indicate their level of knowledge, skills and attitudes to the material that will be covered in this course?			✓		

	Business Comm.	Intro. to Law	Intro to Info. Systems	Counselling Theory	Intro. to Landscaping
II ***Translate Learning Needs into Learning Objectives*** 6. Is there information in the course package about					
(a) why learning objectives are important?					
(b) how to formulate learning objectives?					
7. Are sample learning objectives for the course given?	✓	✓	✓	✓	✓
III ***Identify and Use Material and Human Resources Relevant to the Course***					
8. Are the students required to find and use resources on their own in order to complete the course requirements?	✓		✓	✓	
9. Is information provided about how to find and use library resources?	✓				
10. Is information given about how to find library materials through such means as interlibrary loan etc					
11. Are students given help in learning the techniques of evaluating information?	✓	✓			
IV ***Ability to select effective strategies for making use of learning resources and to perform these skillfully and with initiative***					
12. Are there activities in the course package to provide students with experience in using a variety of learning strategies (learning contracts, projects, written assignments, etc)?	✓				
13. Is information given about how to find and use resource people?					
14. Are the students given the opportunity to pursue a learning activity in an area relevant to their own interests within the parameters of the subject of the course?	✓				
V ***Ability to Collect and Validate Evidence of Accomplishment of Various Kinds of Learning Objectives***					
15. Are there opportunities for self-assessment?	✓	✓	✓		✓
16. Is information provided about ways students can use their learning objectives as guidelines for assessing their learning?					

	Business Comm,	Intro. to Law	Intro to Info. Systems	Counselling Theory	Intro. to Landscaping
(Additional questions on the basis of the Dunn and Dunn Learning Styles Model)					
Are any strategies used to help build on motivation, for example goal setting activities?	✓				
Are explicit instructions and guidelines given as to learning and assessment requirements?	✓		✓		
Are study timetables provided?			✓		
Is a summarised structure given of the course content and how it interrelates?	✓				
Are linkages between components of the course made explicit, enabling students to see how a component fits in relation to the whole course?					
Sociological					
1.Are students actively encouraged to work with others via - study groups - teleconferencing - other					
Psychological					
1. Does the course emphasise personal needs and feelings?	✓				
2. Is information linked to personal context?	✓				✓
3. Do the materials focus on facts and details?	✓	✓	✓	✓	✓

Introduction to Law and Introduction to Information Systems and Technology included compulsory use of computer packages, which were deemed to support both visual and tactile sensory modalities. Introduction to Law was the only course to use a video (see Table 18).

Course activities and assessments were again heavily reliant on the written word, and therefore visual. The act of writing responses to activities and assignments is, however, a tactile activity. Audio tapes were used for assessment purposes for Business Communication, while activities in Counselling Theory and Introduction to Information Systems and Technology required interaction with people involving auditory senses.

Table 19
Summary of number of different types of sensory modality instructional support strategies contained in course materials

	Business Communications	Introduction to Law	Introduction to Information Systems and Technology	Counselling Theory	Introduction to Landscaping
Visual	1	3	2	1	1
Auditory	1	1	1	1	-
Tactile	1	2	2	1	1
Kinesthetic	-	-	-	-	-
Total no. of different support strategies	3	6	5	3	2

Summarising the different types of instructional support strategies relating to sensory modalities, the numbers used varied from course to course with Introduction to Landscaping having the least number at 2, while Introduction to Law had the most at 6 (see Table 19).

Emotional

Factors included in this category were motivation, persistence, responsibility and structure. While some factors such as motivation, persistence and responsibility, could be viewed as intrinsic to the learner and may be context dependant, the learning environment can be designed to cultivate and develop these factors in relation to the course. For example learning materials and activities may incorporate goal setting which can aid in maintaining or increasing learner motivation. Assistance given in developing information search strategies may assist in learners persisting and taking responsibility for their learning.

Little was done in any of the courses to aid students in diagnosing their learning needs, or to assist them in translating their learning needs into learning objectives (see Table 18). A mechanism for aiding in focussing students on learning needs and the direction of the course is to include learning objectives, and while these were included in each course, no explanation was given as how to use them as an aid to learning (Baker, 1993). Minimal assistance was given in the courses in helping students identify and use

relevant material and resources outside of what was included in the course materials, yet most courses, with the exception of Introduction to Landscaping, expected this to occur.

Table 20
Summary of number of different types of emotional instructional support strategies contained in course materials

	Business Communications	Introduction to Law	Introduction to Information Systems	Counselling Theory	Introduction to Landscaping
Motivation	2	-	-	-	1
Persistence	-	-	1	-	-
Responsibility	1	1	1	-	1
Structure	7	2	4	2	1

As can be seen in Table 19 the number of strategies included in the course materials to support the learning styles preferences varied from preference to preference. Few strategies were incorporated to encourage motivation, only one course had a support strategy which aided in persistence, and all but one course had a strategy which supported responsibility. By far the most strategies to support a learning styles preference for structure were to be found in relation to the provision of structure, with Business Communication incorporating the largest number of strategies (8).

Sociological

Learners may prefer to learn alone, with peers or with an authority person such as a teacher present. Learning by distance is by definition usually learning alone without a teacher present. Some mechanisms, such as teleconferencing, audio-conferencing face-to-face tutorials, online forums, and block courses may be used as a method of bridging the distance between students and teachers.

There were limited means of meeting the sociological needs of students in these courses, unless they were for learning alone (see Table 18 and Table 21). Although students had the option of working in study groups in some of the courses and this was addressed briefly in the learning materials, it was not explicitly supported, nor were there teleconferencing or other means available of working with other students. Students

were essentially working by themselves, with telephone and mail contact available with their tutors if they initiated the contact.

Table 21
Summary of number of different types of sociological instructional support strategies contained in course materials

	Business Communications	Introduction to Law	Introduction to Information Systems	Counselling Theory	Introduction to Landscaping
Learning with peers	*	*	*	*	*
Learning alone	1	1	1	1	1
Authority person	*	*	*	*	*

* Available, but not explicitly supported in the course.

Psychological

Courses may be analytical by design, with information presented in a sequential format, or they may incorporate global features such as linking information to personal context or emphasising personal needs or feelings. The courses examined were of an analytical nature with only two courses including strategies of a global nature (refer Table 18 and 22).

Table 22
Summary of number of different types of psychological instructional support strategies contained in course materials

	Business Communications	Introduction to Law	Introduction to Information Systems	Counselling Theory	Introduction to Landscaping
Global	2	-	-	-	1
Analytic	1	1	1	1	1

Summary

The foregoing analysis highlights the variability between courses in the study in terms of the media and instructional design strategies used. All courses were reliant on printed learning materials, which some courses supplemented to varying degrees with other media, such as audio, video and computer packages. While there was a degree of commonality of instructional design strategies used, a more indepth analysis of the courses against criteria established by the Dunn and Dunn Learning Styles Model (Dunn, 1986) and Baker's Model of Analysing the Self Directedness of Distance Education courses (Baker, 1993) revealed differences in the types of strategies used to support learners. These strategies give some indication of the teaching styles of the course materials, against which the learning styles preferences of the students can be compared.

Chapter 6

RESULTS: LEARNING STYLES AND TEACHING STYLES

Introduction

This chapter reviews the overall success of students in the courses surveyed in terms of passing their course. Other variables are examined which previous studies have indicated as having some possible influence on success in a distance education learning environment, before reviewing each learning styles preference in relation to success in the courses. Comparisons are made between the teaching style of the courses, the learning styles preferences of students and their results in the courses. From the review and discussion of results arise suggestions for instructional strategies to consider when designing courses.

Student success

Of the 1008 students enrolled in the five courses, 424 (42 %) passed their course, while 584 (58 %) dropped out or failed (see Table 22). When broken down into various groupings the statistics present some variations in patterns across the courses. Of the 644 students who had previously studied with The Open Polytechnic, 256 (40 %) passed their course, while 388 (60 %) dropped out or failed. In comparison, of the 364 students enrolling for the first time in 1997, 168 (46 %) passed their courses and 196 (54 %) dropped out or failed. Without further analysis this would appear to go against the pattern of students with previous experience studying with The Open Polytechnic being more successful than first time students (Hutton, 1995a). On closer examination the courses with success rates contrary to the expected pattern were Counselling Theory and Introduction to Landscaping, both of which had open enrolment periods, unlike the other courses included in the study. Courses with open enrolment periods have historically had higher dropout rates. Changes in the length of the enrolment periods came into force for 1997 and are known to have affected rates of success and retention.

Table 23

Success and drop-out statistics for students enrolled in courses included in the study

	Total		Students <=1996		Students 1997		Non-respondents		Respondents		Respondents with previous DE experience	
	n	%	n	%	n	%	n	%	n	%	n	%
Business Communications												
Enrolled 25/2	397		210		187		115		72		13	
Passed course	257	65	145	69	112	60	59	51	53	74	12	92
Drop-out/fail	140	35	65	31	75	40	56	49	19	26	1	8
Counselling Theory												
Enrolled 25/2	238		190		48		26		22		3	
Passed course	42	18	29	15	13	27	2	8	11	50	1	33
Drop-out/fail	196	82	161	85	35	73	24	92	11	50	2	67
Introduction to Information Systems and Technology												
Enrolled 25/2	136		80		56		34		22		5	
Passed course	54	40	36	45	18	32	7	21	11	50	4	80
Drop-out/fail	82	60	44	55	38	68	27	79	11	50	1	20
Introduction to Law												
Enrolled 25/2	127		75		52		35		17		7	
Passed course	56	44	35	47	21	40	11	31	10	59	4	57
Drop-out/fail	71	56	40	53	31	60	24	69	7	41	3	43
Introduction to Landscaping												
Enrolled 25/2	110		89		21		10		11			
Passed course	15	14	11	12	4	19	1	9	3	30		
Drop-out	95	86	78	88	17	81	10	91	7	70		
TOTAL												
Enrolled 25/2	1008		644		364		220		144		28	
Passed courses	424	42	256	40	168	46	80	36	88	61	21	75
Drop-out/fail	584	58	388	60	196	54	140	64	56	39	7	25

Proportionally more respondents (61%) passed their courses than non-respondents (36%). Participation in the research could be interpreted as indicating that respondents were more motivated, or had made a greater commitment to their studies than students who did not respond. A greater proportion of students with previous distance education experience passed the courses.

When broken down into individual courses the statistics show the same trend, however there are variations from course to course, as Table 23 illustrates. Business

Communications achieved the highest success rate, with 65% overall passing the course, and 60% of the new 1997 students passing. This contrasts to only 14% of all Introduction to Landscaping students enrolled at the time the sample was drawn completed their course, with 19% of the new 1997 students completing.

Comparisons made on the basis of age indicate no direct relationship between that particular variable and success in the course. As Table 24 shows, on the basis of five ages groups the success rates only varied from 64% for the 20 and under group, to 57% for the 45 and over group. This variation, while not significant, could be attributed to recent study experience for the under 20's potentially giving them a slight study success advantage in comparison to older students. It could also be reflective of the additional responsibilities that older students may have which may determine the amount or quality of time available for study. No verifiable conclusions can be drawn on the basis of this data.

Table 24
Success rates of respondents grouped according to age

Age groups	Numbers Enrolled		Success	
	n	%	n	%
< 20	14	10	9	64
20-25	29	20	18	62
26-35	48	33	30	63
36-45	39	27	23	59
45 >	14	10	8	57
Total	144		88	61

Analysing the results on the basis of gender provides no significant variation between the success of females and males, with 62% of females passing their courses compared with 60% of males (see Table 25).

Table 25
Success rates of respondents according to gender

Gender	Numbers Enrolled		Success	
	n	%	n	%
Female	89	62	55	62
Male	55	38	33	60
Total	144		88	61

Examining the results on the basis of qualifications presents a possibly conflicting picture (see Table 26). The lowest success rates were for those who generally had lower levels of qualifications, such as no qualifications, school certificate, and "other", which included overseas qualifications that were not known to match with New Zealand qualifications, such as degrees, or those which did not fit into the other remaining categories. This would suggest that, as other studies have found (for example Bajtelsmit, 1990) the level of previous qualifications may impact on the success of students studying by distance education. Those who had other qualifications achieved the lowest rate of success, which may have been a reflection of the level of their previous qualifications, or that they may have further challenges by studying with English as a second language. The exception to this trend found in these results was that students who had seventh form qualifications had the same rate of success as those with no qualifications.

Table 26
Success rates of respondents by prior qualifications

Qualification	Enrolled		Success	
	n	%	n	%
None	11	8	6	55
School certificate	29	21	14	48
6th form	22	15	17	77
UE	23	16	17	74
7th form	22	15	12	55
Polytechnic	13	9	8	62
University	12	8	10	83
Other	12	8	4	33
Total	144		88	61

Learning styles, success, and teaching styles

Analysis of success in relation to learning styles proved to be a complicated matter due to the range of variables included for analysis and the limited number of students, hence statistical analysis was not possible. Statistical analysis of teaching styles in relation to the other factors was not feasible, nor valid due to the nature of the information gleaned which could not be statistically compared in a meaningful way.

In summarising the information gained about the success of students, their learning styles, and the teaching styles of the courses they were enrolled in, tables were created to enable discussion of the results (see Tables 27 to 31). The numbers of students with a particular learning style preference are noted in the 'n' column, while the number of those students with that preference who passed are noted in the 'Pass' column. As students can have more than one preference the numbers in the 'n' column do not correspond to the total numbers of respondents in the course. The teaching styles of the courses as indicated by the support strategies included in the course that would match a particular learning styles preference as determined by the number of strategies used according to the course analysis, are also included.

Business Communication

Reviewing the results of students enrolled in Business Communications against their learning styles preferences gives a potentially mixed picture as few areas had sufficient numbers to draw reliable conclusions. The possible exceptions are for structure, authority, and auditory preferences, where there also appears to be a possibility of correlation between the learning styles preferences and success in the course that could be linked to the teaching styles. Of the 20 students with a high preference for structure, 14 passed the course (see Table 27). There were 7 structural support strategies used in the course (see Table 20). In addition to the structural support this course used the most instructional design strategies (11 out of a possible 14 - see Table 16). Learners with a high preference for auditory learning also did well in the course, with 17 out of 21 passing the course. Assessments in the course made use of audio tapes which would have suited those with a high auditory preference. A conflicting result is found in relation to students with a high preference for an authority person present, with 8 of the 11 students passing the course, despite the lack of specific course design supports in this area.

Counselling Theory

The low numbers of students displaying high or low preferences in this course make it difficult to draw meaningful conclusions to compare with the teaching style of the course, with the exception of a high preference for structure. Of the 10 students with a high preference for structure, only 4 passed (see Table 28). This course had only 2

elements of course design supports for structure as determined by the course evaluation (see Table 20), and 9 out of 14 instructional design strategies as indicated by Table 17.

Introduction to Information Systems and Technology

This course also had too low numbers of students with high or low preferences to draw meaningful conclusions, with the exception of a high need for structure. Of the 13 students with a high preference for structure, 6 passed the course (see Table 29). The course had 4 course design supports (see Table 19), and 10 instructional design supports (see Table 17).

Introduction to Law

The numbers of high or low preferences were, once again, too few to make generalisations. Once again note should be made of the preference for structure, where of the 5 students with a high need for structure, 3 passed the course (see Table 30). There were 2 course design supports and 9 instructional design strategies incorporated in the course (see Tables 20 and 17).

Introduction to Landscaping

Of the 4 students with a high preference for structure, only 1 completed the course. This course had the lowest number of course design supports (1) and instructional design strategies (7) in the area of structure. It also had the highest dropout rate of any of the courses in the study.

Table 27

Business Communication - learning styles, success, and teaching styles

Learning Styles Preferences	Students with high preferences			Students with low preferences		
	n	Pass	Course Design Supports	n	Pass	Course design supports
Motivation	3	2	-	5	5	2
Persistence	4	2	-	6	4	-
Responsibility	1	0	-	12	6	1
Structure	20	14	7	0		
Learning with Peers	3	3	-			
Learning Alone	7	2	1			
Authority	11	8	-	3	3	-
Variety	5	3		6	3	
Auditory	21	17	1	2	1	-
Visual	2	1	1	1	1	-
Tactile	5	4	1	4	3	-
Kinesthetic	2	2	-	0		-
Global	2	2	2			
Analytic	3	3	1			

Table 28

Counselling Theory - learning styles, success, and teaching styles

Learning Styles Preferences	Students with high preferences			Students with low preferences		
	n	Pass	Course design supports		Pass	Course design supports
Motivation	1	1	-	2	0	-
Persistence	2	1	-	3	0	-
Responsibility	1	1	-	2	0	-
Structure	10	4	2	0	0	-
Learning with Peers	6	0	-			
Learning Alone	4	0	1			
Authority	5	1	-	1	1	-
Variety	1	1		4	0	
Auditory	4	2	1	1	1	-
Visual	1	1	1	4	0	-
Tactile	0	0	1	2	0	-
Kinesthetic	0	0	-	3	0	-
Global	0	0	-			
Analytic	1	0	1			

Table 29
Introduction to Information Systems and Technology - learning styles, success, and teaching styles

Learning Styles Preferences	Students with high preferences			Students with low preferences		
	n	Pass	Course design supports	n	Pass	Course design supports
Motivation	1	1	-	0		-
Persistence	3	3	-	2	1	1
Responsibility	1	1	-	4	2	1
Structure	13	6	4	0		
Learning with Peers	2	2	-			
Learning Alone	2	2	1			
Authority	5	3	-	0		
Variety	1	1		2	1	
Auditory	8	5	1	0		
Visual	0		1	1	0	-
Tactile	2	2	1	0		-
Kinesthetic	0		-	0		-
Global	0		-			
Analytic	3	1	1			

Table 30
Introduction to Law - learning styles, success, and teaching styles

Learning Styles Preferences	Students with high preferences			Students with low preferences		
	n	Pass	Course design supports	n	Pass	Course design supports
Motivation	2	1	-	0	0	-
Persistence	1	1	-	0	0	-
Responsibility	1	1	-	1	0	1
Structure	5	3	2	0		-
Learning with Peers	1	1	-			
Learning Alone	5	4	1			
Authority	1	1	-	5	2	-
Variety	0	0		2	2	
Auditory	6	2	1	0	0	-
Visual	1	1	3	0	0	-
Tactile	1	1	2	2	2	-
Kinesthetic	0	0	1	1	1	-
Global	0	0	-			
Analytic	1	0	1			

Table 31
Introduction to Landscaping - learning styles, success, and teaching styles

Learning styles Preferences	Students with high preferences			Students with low preferences		
	n	Pass	Course design supports	n	Pass	Course design supports
Motivation	0	0	1	3	1	-
Persistence	1	0	-	2	0	-
Responsibility	0	0	-	3	1	1
Structure	4	1	1	0	0	-
Learning with Peers	0	0	-			
Learning Alone	2	2	1			
Authority	1	0	-	1	1	-
Variety	0	0		2	0	
Auditory	4	0	-	1	1	-
Visual	0	0	1	1	0	-
Tactile	0	0	1	0	0	-
Kinesthetic	1	0	-	0	0	-
Global	0		1			
Analytic	0		1			

Summary

Given the low number of participants in the research relative to the high number of variables examined, it is difficult to draw any firm conclusions. Overall the results did not suggest any conclusive relationship between the learning styles of students, success, and teaching styles. One possible exception was a high preference for structure. Reviewing the results from each course, it appeared that the greater the level of instructional design strategies included to support a high preference for structure, the more likely those students were to succeed. There did not appear to be any significant link between other variables and success in the courses.

Comparing the teaching styles of the courses with the learning styles profiles indicates that there was not always a match between the various preferences. While not proving a conclusive link to success, the learning styles profiles do provide evidence of the variation in learning styles preferences of distance education students.

Chapter 7

DISCUSSION AND CONCLUSIONS

Learning styles of first year students: their relationship with success in distance education courses

The aim of the research was to discover if there was a relationship between the learning styles of first year students and their success in distance education courses. This was not substantiated by this study, either because of the nature of the study itself and the variables that can affect distance education students making such an aim unachievable, or because of the limitations impacting on the research. With instructional design and educational policy advice to address the learning styles of students, for example Bajtelsmit, 1990 and New Zealand Department of Education, 1993, lack of correlation between the construct and success raises doubts as to the validity of such advice in respect of these having a direct impact on success.

Further questions raised were addressed in the research. The learning styles profiles of students indicated a range of learning styles preferences (see Figures 1 and 2), the most notable being comparatively high preferences for structure (36%) and auditory learning (30%). Few students had a high preference for visual learning (3%).

Other variables examined, including age, gender, previous educational levels, or ethnic background, did not provide evidence of the variables themselves impacting on student success. There was no evidence of variations in learning styles preferences on the basis of the variables.

The teaching styles of the courses the students were enrolled in were largely paper-based and did not include the many instructional design strategies which can be used to support students learning at a distance, or included them to varying degrees. While some of the learning styles preferences were matched with the teaching styles of the courses, this was not always the case.

Limitations of the research

The research was limited by the relatively small numbers of students enrolled in courses which restricted the size of the sample available for the research. Focussing on first time students at The Open Polytechnic of New Zealand limited the numbers of students eligible from each course. Including all students in each course would have provided a larger base of data from which to draw a learning styles profile of students, however this was not the main purpose of this particular research.

Although the response rate was acceptable for a distance education context, there was a significantly higher rate of failure or dropout for non-respondents. Potentially, data from the non-respondents may have been of more interest in establishing needs that were not met by the courses.

More data could have been gathered to provide greater depth of understanding in some areas that might have influenced student success rates. For example an additional questionnaire to students to determine their degree of prior knowledge of the subject area and their likes or dislikes of the course in specific and general terms, or whether their studies were being funded by their workplace and on what basis, may have provided valuable information that could be linked with success.

Each course creates its own learning environment to an extent; for example by virtue of being in a different subject area one course is different from another, thus comparison between courses is complicated. Furthermore, the teaching staff in each course can have a different approach to content and student support, adding another dimension to the environment. The varied backgrounds of students enrolled in the courses add yet another dimension. Taking into account all of these variations, each learning environment is unique making comparisons tenuous. It was not possible for this research to isolate and control one set of variables impacting on students learning by distance education, nor is it conceivably possible for other research studies to achieve this. As Moore states "The effectiveness of distance education is determined by a complex interaction of variables which include learner variables, teacher variables,

subject variables, and communication variables" (1986, p.11). Thus, as in other research studies (Kember, 1990) it is not possible to state categorically that a particular variable, or part of it, could be solely responsible for the success, or lack of it, of students involved in this research. The large range of learning styles preferences and the absence of strong learning styles preferences of the participants combined with the comparatively small amount of data, plus the complexity of the other variables which could impact on the success of students, makes generalisations difficult.

Although the study was undertaken after a pilot study had been carried out to determine the feasability and trial the methodology, a full literature review had not been part of the pilot study. The literature review raised doubts as to the validity of the construct of learning styles, particularly in regard to the statistical validity and reliability of learning styles instruments including the PEPS (James & Blank, 1993, Curry, 1990, O'Neil, 1990). Although many articles concerning the use of the Dunn and Dunn Learning Styles Model and associated instruments were critiqued as part of the literature search, if references were made in them to the reliability and validity of the learning styles instruments these did not give specific details. The research evidence appeared to be reliant on doctoral dissertations, for example Dunn, 1988 and James and Blank, 1993. This does raise some concerns as to the validity and reliability of the PEPS instrument in terms of the rigour of its testing.

Design of distance education courses

The learning styles profiles can be used as a guide for assessing students needs, as a foundation for building the design of distance education courses, and for providing or improving student support. Attempts to better address the individual needs of students should not be dismissed due to the inconclusive results of this study in regard to the impact of learning styles on success, when it is acknowledged that many variables can affect students studying at a distance. A number of suggestions for instructional design strategies and media use arise from the profiles, which could contribute to a greater match between learning styles and teaching styles, or at least be used as a framework to

Chapter 7

DISCUSSION AND CONCLUSIONS

Learning styles of first year students: their relationship with success in distance education courses

The aim of the research was to discover if there was a relationship between the learning styles of first year students and their success in distance education courses. This was not substantiated by this study, either because of the nature of the study itself and the variables that can affect distance education students making such an aim unachievable, or because of the limitations impacting on the research. With instructional design and educational policy advice to address the learning styles of students, for example Bajtelsmit, 1990 and New Zealand Department of Education, 1993, lack of correlation between the construct and success raises doubts as to the validity of such advice in respect of these having a direct impact on success.

Further questions raised were addressed in the research. The learning styles profiles of students indicated a range of learning styles preferences (see Figures 1 and 2), the most notable being comparatively high preferences for structure (36%) and auditory learning (30%). Few students had a high preference for visual learning (3%).

Other variables examined, including age, gender, previous educational levels, or ethnic background, did not provide evidence of the variables themselves impacting on student success. There was no evidence of variations in learning styles preferences on the basis of the variables.

The teaching styles of the courses the students were enrolled in were largely paper-based and did not include the many instructional design strategies which can be used to support students learning at a distance, or included them to varying degrees. While some of the learning styles preferences were matched with the teaching styles of the courses, this was not always the case.

Limitations of the research

The research was limited by the relatively small numbers of students enrolled in courses which restricted the size of the sample available for the research. Focussing on first time students at The Open Polytechnic of New Zealand limited the numbers of students eligible from each course. Including all students in each course would have provided a larger base of data from which to draw a learning styles profile of students, however this was not the main purpose of this particular research.

Although the response rate was acceptable for a distance education context, there was a significantly higher rate of failure or dropout for non-respondents. Potentially, data from the non-respondents may have been of more interest in establishing needs that were not met by the courses.

More data could have been gathered to provide greater depth of understanding in some areas that might have influenced student success rates. For example an additional questionnaire to students to determine their degree of prior knowledge of the subject area and their likes or dislikes of the course in specific and general terms, or whether their studies were being funded by their workplace and on what basis, may have provided valuable information that could be linked with success.

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research studies (Kember, 1990) it is not possible to state categorically that a particular variable, or part of it, could be solely responsible for the success, or lack of it, of students involved in this research. The large range of learning styles preferences and the absence of strong learning styles preferences of the participants combined with the comparatively small amount of data, plus the complexity of the other variables which could impact on the success of students, makes generalisations difficult.

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Design of distance education courses

Distance education, as it is, does cater for some individual differences, for example it enables student to adjust the pace of learning to suit themselves by providing physical resources giving a permanent record of the instructional treatment (Taylor, 1991). Although providing a permanent record can be criticised on the grounds that mass-produced materials present a 'one size fits all' course for students, this can be countered by arguing that the materials give a consistent base for learning for all. In comparison the quality of lectures and classroom presentations may vary according to the skills or mood of the teacher/lecturer, further complicated by class dynamics. While mass-produced materials may not provide for all individual differences, careful instructional design of the learning environment, including a range of appropriate media and student

support mechanisms, can further tailor courses to meet student needs. High-quality course design and high-quality student support have been cited as the two factors contributing to success in distance education (Moore, 1989).

The learning styles profiles can be used as a guide for assessing students needs, as a foundation for building the design of distance education courses, and for providing or improving student support. Attempts to better address the individual needs of students should not be dismissed due to the inconclusive results of this study in regard to the impact of learning styles on success, when it is acknowledged that many variables can affect students studying at a distance. This should be done more on the basis of recognising the need to include a variety of instructional methods and supports, rather than a requirement to assess learning styles and tailor instruction accordingly. A number of suggestions for instructional design strategies and media use arise from the profiles, which could contribute to a greater match between learning styles and teaching styles, or at least be used as a framework to describe student diversity and thus "...promote a diversity of instructional methods to support and enhance variations among students" (Davidson, 1990, p. 38).

The results of this research indicated a wide range of learning styles preferences of first year distance education students that did not always match the teaching style of the course. There is not complete agreement on whether providing a learning environment matching the students style is more likely to engender successful learning experiences, some arguments put forward suggesting that a mismatch will force students to be more flexible (Misko, 1994). According to research students learn more easily and remember more when the method of presentation matches their perceptual strength, even though most people can learn through other modalities (Dunn, 1988). Although some of the courses in this did include audio and video tapes for assessment purposes or to provide examples of the content being studied, the main media for presenting the courses was printed materials. The profiles suggest a wider range of media be used in courses to support different sensory modalities. Alternatively other teaching or communication methods could be incorporated into the courses to meet the needs of, for example, students with a high auditory preference. Teleconferencing is one possible means of accommodating an auditory preference.

Emotional factors can be supported in a distance education environment in a variety of ways. Few students in this study viewed themselves as highly motivated, yet goal setting strategies can be included in courses which help develop motivation. Similarly few students rated themselves as being highly persistent. Persistence can be fostered through additional student support, recognising that attention spans of those without a high preference in this area may be limited. This may be particularly relevant for students who have not studied for many years as they may have a limited concentration ability for academic work due to being unaccustomed to studying. Breaking down study materials into sections which can be worked through in relatively short periods of time, and providing assessments which do likewise, can help achieve this. A high preference for structure was the most notable requirement from the learning styles profiles, suggesting the need for course design strategies to ensure that directions were explicit, not only in what the students were required to do, but how they could go about doing it. The way the course content is put together can also help provide a coherent structure of the body of knowledge included in the course; overviews, summaries, conceptual maps and advance organisers all providing links which make the structure more explicit.

Sociological preferences as indicated by the learning styles profiles, suggest that these are of little importance to students overall, with few students having a high preference for working with their peers or having a teacher present. Thus separation from the teacher or the lack of support otherwise gained from working directly with their peers would not appear to be factors which need to be accommodated by course design, although this could vary depending on the nature of the course.

Teachers and instructional materials can only be partly responsible for a student's success in learning. Ultimately the student must be responsible for their own learning, however much can be done to develop a student's capacity to do so. Developing the ability of students to learn flexibly and independently should be based on how they learn initially, providing learning to learn skills which encourage development of other skills, thereby reducing the impact of individual differences (Gropper, 1983). Education, after all, is not just about content, it is about learning processes and an important goal, which

should be reflected in the instructional materials, is improving the skills of the learner (Fenwick, 1991).

Learning environments for tomorrow's world

As we move to a more information based society and incorporate a greater use of technology into our courses, regardless of the delivery mode, even greater attention needs to be paid to the instructional design of courses. Resource constraints necessitate the optimal use of technology, and effective learning should guide their development and implementation, not just as an add on feature of a course, but as an integral part of the learning package. Recognition of learning styles variables may contribute to the effective use of technology with the possibility that the technology itself may directly support some learning styles preferences (Montgomery, 1995).

Touted as the way of the future leading to a new age of education (Dezell, 1990), technology has been incorporated into distance education courses in a variety of forms such as audio and video tapes. As technology becomes more sophisticated other forms are being used, such as audio and computer conferencing, multi-media using CDROM, and the use of the Internet for course delivery and support. Acknowledging that technology does have some potential to cater for individual differences, for example a CDROM gives a multi-sensory presentation which can incorporate flexible pathways enabling students to make choices on the basis of their hemispheric preferences, it also needs to be recognised that it should be used with care. "If we are to strive to incorporate new technologies in distance education we must do so because of the increased potential for catering for individual learning effectiveness" (Mills, 1989, p. 7). Technology such as computer based learning may have its limitations. As Romiszowski (1993, p. 64) points out "There may be whole areas of human thinking that are not only dependent on the analysis, organization and manipulation of knowledge but are also highly dependent on personality and emotional traits that may be well beyond the capabilities of replication within computer software."

Limitations aside, technology may go some way towards bridging the distance in distance education by, for example, enabling easier communication between learners and teachers. Garrison points out that "Educational technology makes possible real control for more learners to achieve their educational goals through expanded opportunities to communicate freely with their teachers and to access a wide range of educational resources." (1989, p.49). Personal empowerment of the individual can be facilitated by use of technology such as an electronic classroom where students are linked by audio and television: empowerment in this context meaning that a student is able to take a visible and meaningful role in the classroom (Myers, Fletcher, & Gill, 1993). However once again this is heavily dependant on instructional design of strategies to engage and support the learner. Incorporating an awareness of the pedagogical needs of various learning styles can enhance the design of, for example, multimedia software (Montgomery,1995).

Conclusion

The results of the research in terms of discovering if a relationship existed between the learning styles of first year students and their success in distance education were inconclusive. The teaching styles of each course when compared with the learning styles profiles indicated that there was not always a match between them. This did not appear to impact on the success of students in the courses, with the possible exception of the high learning styles preference for structure. Business Communication had the highest number of support features related to structure and had the highest student success rate for students with a preference for structure.

Although agreeing with Rowntree (1985, p. 29) that it would "be dangerous to assume that our students possess learning styles that are inherent, unalterable, and inflexible", discovering our students' learning styles and the teaching style of our course materials provide us with information to create courses which cater for a wider variety of learning needs. Some might question whether it is necessary to do this if there is no conclusive link between learning styles and success..... If we accept that there is a need to individualise learning and teaching, then this must be addressed when designing courses, and should incorporate some consideration of learning styles. "Knowledge of

personality typology, temperament and learning styles is vital in every aspect of education, from curricular design to pedagogy to teaching strategies." (Carland, Carland, Ensley, & Stewart, 1994, p. 429). Utilising such knowledge may make it possible for distance education to meet the potential which it has to cater for students' needs so that they can achieve their potential and maximising the benefits to society of investing in educational resources.

All "... institutions of higher education must consider carefully the question of individual differences and the implications of such differences for the manner in which they approach their institutional purposes and educational practices" (Thompson & O'Brien, 1991, p.11). One individual is not the same as the next individual: course designs need to recognise this, and student support systems developed accordingly. This is as true for traditional education as it is for distance education. A greater use of technology may go some way towards meeting a wider range of individual needs, but should not be seen as a panacea for student centred courses which ultimately must rely on sound design and support to meet the needs of the individual. Fostering and making use of the growing base of educational theory and research to audit existing courses and processes, implementing changes and innovations, can help cater for individual abilities and learning styles, creating learning environments to meet the challenges of the future.

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Appendix 1

Consent form

Learning Styles of First Year Students: Their relationship with retention and success in Distance Education courses

CONSENT FORM

I have read the information letter and have had the details of the study explained to me.

I agree to provide information to the researcher on the understanding that my name will not be used without my permission. The information will be used only for this research and publications arising from this research project. The information will be presented in a summarised form so that individual students will not be identified.

I agree to participate in this study under the conditions set out in the Information Letter.

I would like a copy of my Learning Styles Profile sent to me. **Yes / No**

I would like a summary of the research findings sent to me. **Yes / No**

Please circle the options of your choice.

I **have / have not** (delete whichever is inappropriate) previously studied by open learning, distance or correspondence. If you have, please give details:

_____

_____

Signed: .....

Name: .....

Date: .....

Appendix 2

Productivity Environment Preference Survey

SCAN & SCORE

PRODUCTIVITY ENVIRONMENTAL PREFERENCE SURVEY for ADULTS

Dunn, Dunn & Price

Printed in New Zealand by
Acorn Print Management Ltd
☎ 0-9-274 4488 Fax 0-9-274 7703

- **Use 2B pencil only for filling in the bubbles**
- **Press firmly; do not tick or cross bubbles!**
- **Do not fold or staple this form; mail for processing**

Read each statement and decide to what extent you agree or disagree if you had **something new or difficult to learn or concentrate on.** Mark (SD), if you strongly disagree, (D), if you disagree, or (U), uncertain, if you don't mind, or it does not matter; (A), if you agree, or (SA), if you strongly agree. Give your immediate or first reaction to each statement and do NOT analyse. As this is a scientific instrument with high validity, statements are repeated to achieve accurate results. Please be very consistent in your responses and complete both sides of the scan form.

THANK YOU!

MAIN OCCUPATION:

SMOKER (Y) (N)

NAME

LAST NAME FIRST

1.	I prefer working in bright light.	SD	D	U	A	SA
2.	I like to work alone.	SD	D	U	A	SA
3.	It is easy for me to concentrate late at night.	SD	D	U	A	SA
4.	I like to draw or use diagrams when I work.	SD	D	U	A	SA
5.	I often have to be reminded to complete certain tasks or assignments.	SD	D	U	A	SA
6.	The one job I like doing best, I like to do with an expert in the field.	SD	D	U	A	SA
7.	I can think better lying down than sitting.	SD	D	U	A	SA
8.	I prefer cool temperatures when I need to concentrate.	SD	D	U	A	SA
9.	I can block out noise or sound when I work.	SD	D	U	A	SA
10.	People keep reminding me to do things.	SD	D	U	A	SA
11.	It is difficult for me to concentrate when I am warm.	SD	D	U	A	SA
12.	The one job I like doing best, I do with two or more people.	SD	D	U	A	SA
13.	I often work in an area where the lights are shaded.	SD	D	U	A	SA
14.	When I concentrate I like to sit on a soft chair or couch.	SD	D	U	A	SA
15.	I usually finish what I start.	SD	D	U	A	SA
16.	The things I remember best are the things that I hear.	SD	D	U	A	SA
17.	I enjoy tasks that allow me to take breaks.	SD	D	U	A	SA
18.	I can work more effectively in the afternoon than in the morning.	SD	D	U	A	SA
19.	I like to "snack" when I'm concentrating.	SD	D	U	A	SA
20.	When I have a lot of work to do I like to work with several colleagues.	SD	D	U	A	SA
21.	Noise or extraneous sound usually keeps me from concentrating.	SD	D	U	A	SA
22.	I often forget to do the things I've said I would do.	SD	D	U	A	SA
23.	I take lots of notes in a lecture, to help me remember.	SD	D	U	A	SA
24.	I like to work or analyse an assignment with another individual.	SD	D	U	A	SA
25.	I prefer cool temperatures when I'm working.	SD	D	U	A	SA
26.	The one job I like doing best, I do with several people.	SD	D	U	A	SA
27.	I concentrate best in the late afternoon.	SD	D	U	A	SA
28.	The things I remember best are the things that I read.	SD	D	U	A	SA
29.	I usually complete tasks that I start.	SD	D	U	A	SA
30.	I can concentrate better when I sit up rather than when I recline.	SD	D	U	A	SA
31.	I like to learn or work with a person in authority.	SD	D	U	A	SA
32.	I work best early in the morning.	SD	D	U	A	SA
33.	I get a lot done when I work on my own.	SD	D	U	A	SA
34.	When I work I turn all the lights on.	SD	D	U	A	SA
35.	I prefer that others share responsibility for a task we're doing.	SD	D	U	A	SA
36.	I really enjoy television.	SD	D	U	A	SA

SEX
FEMALE ○
MALE ○

IDENTIFICATION NUMBER

BIRTHDAY

YEAR		MONTH	

SPECIAL CODES

HIGHEST EDUCATION COMPLETED

(4) (5) (6) (7) (8) (9) (10) (11) (12) (13)

4 - No Formal Education	9 - Bachelor's Degree
5 - School Certificate	10 - Master's Degree
6 - Sixth Form Certificate	11 - Doctorate
7 - Bursary	12 - Polytech Diploma
8 - Undergraduate	13 - Other

37. I like either a teacher or supervisor to outline tasks I have to complete. SD D U A SA
38. I like to sit on a straight-back chair when I concentrate. SD D U A SA
39. I work or study best by myself. SD D U A SA
40. I can remember things best when I study them in the evening. SD D U A SA
41. The things I remember best are those I have seen in a book or magazine. SD D U A SA
42. I always finish tasks that I start. SD D U A SA
43. If I have to learn something new, I prefer to learn about it by hearing a record, tape, lecture. SD D U A SA
44. I am most alert in the evening. SD D U A SA
45. The one job I like doing best, I do with a group of people. SD D U A SA
46. I am uncomfortable when I work or try to study in a warm room. SD D U A SA
47. I prefer to have teachers or supervisors set deadlines for my work. SD D U A SA
48. I like to eat while I'm concentrating. SD D U A SA
49. I prefer completing one thing before I start something else. SD D U A SA
50. It is difficult for me to start a new task before I finish the task I am doing. SD D U A SA
51. I really enjoy movies. SD D U A SA
52. I have to be reminded to do things I've said I would do. SD D U A SA
53. I work best when the lights are shaded. SD D U A SA
54. I prefer that persons in authority stay away until I have completed my work. SD D U A SA
55. I keep trying to accomplish a task even if it appears that I may not succeed. SD D U A SA
56. I like to learn about something new by hearing a tape or a lecture. SD D U A SA
57. I feel I am self-motivated. SD D U A SA
58. The one job I like doing best, I prefer doing alone. SD D U A SA
59. Eating something would distract me when I'm working. SD D U A SA
60. My performance improves if I know my work will be checked. SD D U A SA
61. I prefer to work with music playing. SD D U A SA
62. I stay at a task until it is finished, even if I don't like what has to be done. SD D U A SA
63. I learn best by being directly involved in what I am doing. SD D U A SA
64. I always do the best I can. SD D U A SA
65. I remember how to do a new task when I learn how by actually doing it. SD D U A SA
66. I often read in dim light. SD D U A SA
67. If I have to learn something new, I like to learn about it by reading. SD D U A SA
68. I prefer someone else carefully outlining how a task should be done. SD D U A SA
69. I would rather start work in the morning than in the evening. SD D U A SA
70. I constantly change positions in my chair. SD D U A SA
71. The things I remember best are the things that I hear. SD D U A SA
72. I like my instructor(s) or supervisor(s) to recognize my efforts. SD D U A SA
73. I learn better by reading than by listening to someone. SD D U A SA
74. I get more done in the afternoon than in the morning. SD D U A SA
75. I can block out most sound when I work. SD D U A SA
76. I really like to build things. SD D U A SA
77. I prefer to work under a shaded lamp with the rest of the room dim. SD D U A SA
78. I choose to eat, drink, smoke or chew only after I finish working. SD D U A SA
79. I remember things better when I study in the evening. SD D U A SA
80. If I have to learn something new, I like to learn about it by seeing a movie. SD D U A SA
81. I feel good when my spouse, colleague or supervisor praises me for doing well at my job. SD D U A SA
82. I prefer a cool environment when I try to study. SD D U A SA
83. It's difficult for me to block out sound (music, T.V., talking) when I work. SD D U A SA
84. I would rather learn by experience than by reading. SD D U A SA
85. I like being praised for a "job well done." SD D U A SA
86. It's difficult for me to sit in one place for a long time. SD D U A SA
87. I like to have something to drink when I work. SD D U A SA
88. I enjoy doing experiments. SD D U A SA
89. If a task becomes very difficult, I tend to lose interest in it. SD D U A SA
90. I like to learn new things. SD D U A SA
91. I can sit in one place for a long time. SD D U A SA
92. I can concentrate best in the evening. SD D U A SA
93. I prefer to study with someone who really knows the material. SD D U A SA
94. I often change my position when I work. SD D U A SA
95. I would work more effectively if I could eat while I'm working. SD D U A SA
96. If I can go through each step of a task, I always remember what I learn. SD D U A SA
97. I learn better when I read the instructions than when someone tells me what to do. SD D U A SA
98. I only begin to feel wide awake after 10.00 A.M. SD D U A SA
99. I often complete unfinished work on a bed or couch where I can recline. SD D U A SA
100. I often wear a sweater or jacket indoors. SD D U A SA

Appendix 3

Model for Analysing the Self-Directedness of Distance Education courses

Model For Analysing Self Directedness In Distance Education Courses

(Baker, 1993, p. 61-65)

I ***Diagnose Learning Needs***

1. Is there information in the course package about the importance of
(a) being a self-directed learner?
(b) diagnosing one's own learning needs?
2. Are the students asked why they have registered in this specific course?
3. Are the students asked to indicate their previous knowledge or background in the subject matter of the course?
4. Are the students asked to write down what knowledge, skills or attitudes they want to get from the course ie what they want to learn?
5. Are the students asked to complete a self-marked, pre-test that would indicate their level of knowledge, skills and attitudes to the material that will be covered in this course?

II ***Translate Learning Needs into Learning Objectives***

6. Is there information in the course package about
(a) why learning objectives are important?
(b) how to formulate learning objectives?
7. Are sample learning objectives for the course given?

III ***Identify and Use Material and Human Resources Relevant to the Course***

8. Are the students required to find and use resources on their own in order to complete the course requirements?
(a) Print material - books, journal articles, conference papers, etc.?
(b) Non-print material - films, videotapes/cassettes, slides, audio cassettes, etc.?
(c) Human resources?
(d) Other?
9. Is information provided about how to find and use library resources (e.g. on-line catalogues, CD-ROM indexing and abstracting services, such as ERIC, MLA, Psychological Abstracts, etc., print indexes and abstract (e.g. Social Science Citation Index, Canadian Periodical Index, etc.)?
10. Is information given about how to find library materials through such means as interlibrary loan , bibliographic indexes and services, directories of special libraries, etc?
11. Are students given help in learning the techniques of evaluating information?

IV ***Ability to select effective strategies for making use of learning resources and to perform these skillfully and with initiative***

12. Are there activities in the course package to provide students with experience in using a variety of learning strategies (learning contracts, projects, written assignments, etc)?

13. Is information given about how to find and use resource people (e.g. how to conduct an information interview)?
14. Are the students given the opportunity to pursue a learning activity in an area relevant to their own interests within the parameters of the subject of the course?

V ***Ability to Collect and Validate Evidence of Accomplishment of Various Kinds of Learning Objectives***

15. Are there opportunities for self-assessment (e.g. information about how to carry out self assessment and opportunities to do it)?
16. Is information provided about ways students can use their learning objectives as guidelines for assessing their learning?

VI. ***Assessment Techniques***

17. Are the students given opportunities to be assessed in a variety of ways?

Appendix 4

Course Teaching Materials Checklist

Course Teaching Materials Checklist

Physiological (Sensory Modalities)
1. What media are used in the course?
- printed materials
- audio tapes
- video
- computer
- other
2. What sensory modalities are students required to use in the course activities and assessments?
- auditory
- kinesthetic
- tactile
- visual

Emotional
(from the Model For Analysing Self Directedness In Distance Education Courses, Baker, 1993)
I ***Diagnose Learning Needs***

1. Is there information in the course package about the importance of
(a) being a self-directed learner?
(b) diagnosing one's own learning needs?
2. Are the students asked why they have registered in this specific course?
3. Are the students asked to indicate their previous knowledge or background in the subject matter of the course?
4. Are the students asked to write down what knowledge, skills or attitudes they want to get from the course ie' what they want to learn?
5. Are the students asked to complete a self-marked, pre-test that would indicate their level of knowledge, skills and attitudes to the material that will be covered in this course?

II ***Translate Learning Needs into Learning Objectives***

6. Is there information in the course package about
(a) why learning objectives are important?
(b) how to formulate learning objectives?
7. Are sample learning objectives for the course given?

III ***Identify and Use Material and Human Resources Relevant to the Course***

8. Are the students required to find and use resources on their own in order to complete the course requirements?
9. Is information provided about how to find and use library resources?
10. Is information given about how to find library materials through such means as interlibrary loan etc?
11. Are students given help in learning the techniques of evaluating information?

IV ***Ability to select effective strategies for making use of learning resources and to perform these skillfully and with initiative***

12. Are there activities in the course package to provide students with experience in using a variety of learning strategies (learning contracts, projects, written assignments, etc)?
13. Is information given about how to find and use resource people?
14. Are the students given the opportunity to pursue a learning activity in an area relevant to their own interests within the parameters of the subject of the course?

V ***Ability to Collect and Validate Evidence of Accomplishment of Various Kinds of Learning Objectives***

15. Are there opportunities for self-assessment?
16. Is information provided about ways students can use their learning objectives as guidelines for assessing their learning?

(*Additional questions on the basis of the Dunn and Dunn Learning Styles Model*)
Are any strategies used to help build on motivation, for example goal setting activities?
Are explicit instructions and guidelines given as to learning and assessment requirements?
Are study timetables provided?

Is a summarised structure given of the course content and how it interrelates?
Are linkages between components of the course made explicit, enabling students to see how a component fits in relation to the whole course?

Sociological
1.Are students actively encouraged to work with others via
- study groups
- teleconferencing
- other

Psychological
1. Does the course emphasise personal needs and feelings?
2. Is information linked to personal context?
3. Do the materials focus on facts and details?

Appendix 5

Covering letter

Wyndrum Avenue
Lower Hutt, New Zealand
Telephone 04 566 6189
Facsimile 04 566 5633
http://www.topnz.ac.nz

Private Bag 31914, Lower Hutt

He Wharekura-tini
Kaihautu o Aotearoa
The Open Polytechnic
of New Zealand

12 March, 1997

Dear

Would you like to learn more about how you learn?

This letter invites you to take part in a research study about the different ways students learn. My name is Lynley Hutton and I am a lecturer at The Open Polytechnic of New Zealand. As part of the requirements for a Master in Education degree at Massey University I am undertaking a study on the learning styles of first year students new to studying at a distance and enrolled in courses at The Open Polytechnic of New Zealand. It is hoped that the information from this study will help the Polytechnic meet the learning needs of students as much as possible, as well as provide you with information on your own personal learning style.

All you need to do is:

- Read this letter.
- Complete the attached consent form if you decide to participate in the study.
- Read the questionnaire information and complete the questionnaire. This should take you approximately 30 minutes.
- Return the questionnaire to me by 31 March together with the attached consent form, in the reply paid envelope.

Because the study is confidential the questionnaire has a code already inserted where your name would normally go. At the end of the semester I will be comparing your results with your learning styles profile and the teaching style of the course - Counselling Theory. I am not involved with this course in any way, for example as a tutor or course leader. Whether or not you choose to participate, and the nature of your responses, will not influence the results you get for this course. You can request a copy of your learning styles profile and a summary of the research findings when the study is completed at the end of the year.

The more people who take part in the study, the more useful the information generated from it. Your input would be greatly valued although you are under no obligation to participate in the study. However I would like to point out that your learning styles profile could help you in the future with your own studies, and you would be helping other students by providing more information on the learning needs of our students. If you have any queries please call me. The research supervisors are Dr Alison St. George and Mrs Kathy Broadley. Contact details are provided on the back of this page

Thank you for your time and effort. It is very much appreciated.

Yours sincerely,

J. Lynley Hutton

CONTACT DETAILS

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The Open Polytechnic of New Zealand
Freephone 0800 507333

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Dept. of Educational Psychology
Massey University College of Education
Turitea Campus
Palmerston North
Ph (06) 350 4533

Kathy Broadley
Professional and Community Education
Massey University College of Education
Hokowhitu Campus
Palmerston North
Ph (06) 357 9104

Appendix 6

Information sheet

Productivity Environmental Preference Survey (PEPS questionnaire)

Read Me First

Before you fill in this questionnaire please take a few minutes to familiarise yourself with the contents of this leaflet. Completing the questionnaire without the benefit of this background information may cause processed results to be quite meaningless.

This leaflet is an introduction to the DUNN and DUNN Learning Styles Model. It provides a brief overview of the model, and explains how to fill in the questionnaire now before you.

Learning Styles research has been carried out since 1894. While it has yielded a number of different models to explain the observed facts, researchers agree about one thing: each individual has a unique way of learning new and difficult information. Hence, the following definition is generally accepted:

> *Learning Style is the way in which an individual learner begins to concentrate on, process and retain new and difficult information.*

That interaction is different for everyone. We also need to remember that no learning style is 'better' or 'worse' than any other, and that each style is encountered across all intelligence ranges. In other words, learners with widely differing skill levels may have similar learning style preferences, and *vice versa.*

The questionnaire is designed to identify your personal learning style according to the *DUNN and DUNN Learning Styles Model.* Professors Ken and Rita Dunn began developing this model in 1970 and over the past 25 years they have developed and expanded the model through extensive research in the field. While much of that research has been done at St John's University, New York (the largest Catholic university in the USA), at least 88 other institutions of higher learning have carried out research on their model.

Let us take a brief look at each of the 21 elements of the model. These elements (names in **boldface**) are grouped into five strands: *environmental, emotional, sociological, physiological and psychological.*

The *environmental strand* looks at whether you like to have **sound** present while you work or prefer silence; how much **light** you need, your **temperature** needs and finally the **design** element, that is, whether you like to sit on a straight-backed chair at a desk or instead prefer to study on the floor with cushions, or on a sofa or bed.

The *emotional strand* covers **motivation**, **persistence** (whether you prefer to concentrate on and finish one task at a time, or are able to do several things simultaneously), **responsibility**, and finally **structure**—whether you need precise information on how to perform a task.

The *sociological strand* examines whether you prefer to learn **alone**, with a friend, or as part of a group learning situation, with or without an **adult** or **expert** present or whether you prefer **variety** in this respect.

The *physiological strand* includes the elements of **mobility**—one in two students needs to move in order to be able to learn, only one in four likes to sit and be passive, **intake**—the need for food and drink while learning new and difficult information, to keep the blood sugar levels up and the brain alert. Others prefer not to eat or drink at all while studying. **Time of day** is another important element in this strand—the best time for each of us to sit down and study can vary from early morning to long after dark. This strand also covers the matter of **perceptual modes**. We all start off as *kinesthetic* learners, learning by doing; next we develop the ability to learn through *tactual* means whereby we learn about objects by manipulating them.

The fifth and final strand in the model looks at different *processing styles*. Do you prefer to build things up bit by bit from facts and figures, or would you rather get the big picture first, then slot in the detail? Both are equally valid methods to go about learning new and difficult information, known as the **analytic** vs. **global** processing styles.

The above should clarify what this questionnaire is testing for. It should also help to explain that there are ***NO RIGHT OR WRONG ANSWERS***. Each of us is different and unique. Keep in mind as you answer these questions that you are doing this to find out about your unique and special individual learning style. This information will help ***you*** determine how best to approach new and difficult material, thereby enabling you to control your learning or study environment.

Respond to the questions as if you had to learn something NEW and DIFFICULT. Record your initial response and do not tone it down on second thought, however tempting this may be. Be assertive. If you strongly disagree, mark that box, and don't then dive for cover with a "well, maybe not, after all, sometimes....." Go with that initial gut response.

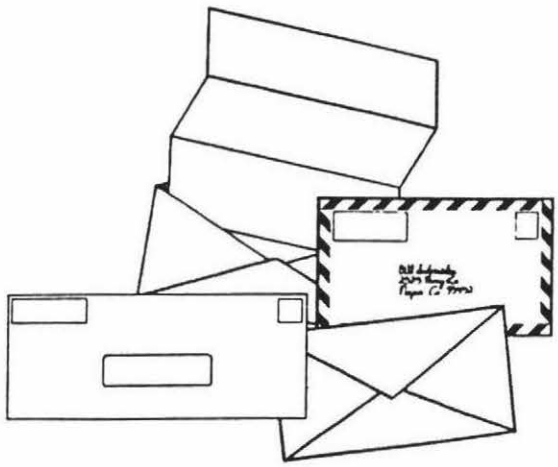
Please make sure you read the instructions on the PEPS form carefully before you begin. This is important. Some of us are impulsive and like to rush in—try to resist that impulse. And above all, relax. If working through the whole thing in one go seems too much, answer just a few and take a short break.

Appendix 7

Reminder letter

Wyndrum Avenue
Lower Hutt, New Zealand
Telephone (04) 566 6189
Facsimile (04) 566 5633
Correspondence:
Private Bag 31914, Lower Hutt

He Wharekura-tini Kaihautu o Aotearoa
THE OPEN POLYTECHNIC OF NEW ZEALAND



REMINDER

Re: Research Study
Learning Styles of First Year Students - Their relationship with retention and success in Distance Education courses

A few weeks ago you were sent a letter and survey form in the mail. If you want to be included in the study and haven't returned the form and consent letter, there is still time. Your input would be greatly appreciated and benefit not only yourself, but other students. Many thanks if you have already returned the form and letter - we've probably crossed in the post.

Don't forget if you want to contact me with any queries about the study I am available on Freephone 0800 507333, or directly on 04-560 5876.

I hope you have a relaxing and enjoyable Easter weekend.

Regards

Lynley Hutton

Table
Age and learning styles -High Preferences

Age Groups	<20 n =14		20-25 n=29		26-35 n=48		36-45 n=39		45> n=14		TOTAL n=144	
	n	%	n	%	n	%	n	%	n	%	n	%
Auditory	5	36	9	31	10	21	14	36	5	36	43	30
Visual	0	0	1	3	1	2	2	5	0	0	4	3
Tactile	2	14	1	3	5	10	0	0	0	0	8	6
Kinesthetic	0	0	0	0	2	4	1	3	0	0	3	2
Motivation	1	7	2	7	3	6	1	3	0	0	7	5
Persistence	2	14	2	7	2	4	3	8	2	14	11	8
Responsibility	0	0	2	7	0	0	2	5	0	0	4	3
Structure	6	43	9	31	17	35	15	38	5	36	52	36
Peers	2	14	2	7	6	13	2	5	0	0	12	8
Authority figures	2	14	5	17	9	19	6	15	1	7	23	16
Different ways	3	21	0	0	1	2	3	8	0	0	7	5
Global	0	0	0	0	0	0	1	3	1	7	2	1
Analytical	0	0	0	0	3	6	4	10	1	7	9	6

Table
Age and learning styles - Low Preferences

Age Groups	<20 n =14		20-25 n=29		26-35 n=48		36-45 n=39		45> n=14		TOTAL n=144	
	n	%	n	%	n	%	n	%	n	%	n	%
Auditory	1	7	0	0	1	2	2	5	0	0	4	3
Visual	0	0	3	3	0	0	3	8	1	7	7	5
Tactile	0	0	2	2	4	8	2	5	0	0	8	6
Kinesthetic	0	0	0	0	1	2	3	8	0	0	4	3
Motivation	4	29	2	2	3	6	1	3	0	0	10	7
Persistence	1	7	3	3	7	15	2	5	0	0	13	9
Responsibility	5	36	4	4	10	21	1	3	2	14	22	15
Structure	0	0	0	0	0	0	0	0	0	0	0	0
Alone	2	14	6	6	3	6	7	18	2	14	20	14
Authority figures	0	0	3	3	4	8	3	8	0	0	10	7
Different ways	3	21	4	4	2	4	7	18	0	0	16	11

Appendix 9

Tables: Gender and learning styles

Table
Gender and learning styles -High Preferences

Gender Total number=144	Female n=89		Male n=55		TOTAL n=144	
	n	%	n	%	n	%
Auditory	22	25	21	38	43	30
Visual	3	3	1	2	4	3
Tactile	3	3	5	9	8	6
Kinesthetic	1	1	2	4	3	2
Motivation	4	4	3	5	7	5
Persistence	5	6	6	11	11	8
Responsibility	3	3	1	2	4	3
Structure	30	34	22	40	52	36
Peers	6	7	6	11	12	8
Authority figures	16	18	7	13	23	16
Different ways	5	6	2	4	7	5
Global	1	1	1	2	2	1
Analytical	6	7	3	5	9	6

Table
Gender and learning styles - Low Preferences

Gender Total number=144	Female n=89		Male n=55		TOTAL n=144	
	n	%	n	%	n	%
Auditory	2	2	2	4	4	3
Visual	6	7	1	2	7	5
Tactile	5	6	3	5	8	6
Kinesthetic	3	3	4	2	4	3
Motivation	6	7	4	7	10	7
Persistence	6	7	7	13	13	9
Responsibility	13	15	9	16	22	15
Structure	0	0	0	0	0	0
Alone	14	16	6	11	20	14
Authority figures	5	6	5	9	10	7
Different ways	7	8	9	16	16	11

Appendix 10

Tables: Qualifications and learning styles

Table
Qualifications and learning styles -High Preferences

Age Groups	None n=11		Sc..Cert n=29		6th form n=22		UE n=23		7th form n=22		Polytechnic n=13		University n=12		Other n=12		TOTAL n=144	
	n	%	n	%	n	%	n	%			n	%	n	%	n	%	n	%
Auditory	2	18	10	34	7	24	5	22	10	45	3	25	6	46	0	0	43	30
Visual	0	0	0	0	1	3	2	9	0	0	0	0	0	0	1	2	4	3
Tactile	0	0	2	7	2	7	1	4	0	0	1	8	1	8	1	2	8	6
Kinesthetic	1	9	2	7	0	0	0	0	0	0	0	0	0	0	0	0	3	2
Motivation	2	18	0	0	1	3	0	0	1	5	0	0	1	8	2	17	7	5
Persistence	3	27	1	3	0	0	1	4	2	9	1	8	2	15	1	8	11	8
Responsibility	0	0	1	3	0	0	0	0	1	5	0	0	1	8	1	8	4	3
Structure	4	36	12	41	6	21	4	17	9	41	6	50	8	62	3	25	52	36
Peers	2	18	2	7	4	14	1	4	1	5	1	8	0	0	1	8	12	8
Authority figures	3	27	4	14	5	17	3	13	3	14	2	15	1	8	2	17	23	16
Different ways	0	0	0	0	2	7	1	4	2	9	0	0	1	8	1	8	7	5
Global	0	0	0	0	0	0	1	4	0	0	0	0	0	0	1	8	2	1
Analytical	1	9	1	3	3	10	0	0	2	9	0	0	1	8	1	8	9	6

Table
Qualifications and learning styles -High Preferences

Age Groups Total Number - 144	None n=11		Sc..Cert n=29		6th form n=22		UE n=23		7th form n=22		Polytechnic n=13		University n=12		Other n=12		Other n=12	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Auditory	0	0	1	3	1	3	0	0	1	5	0	0	1	8	0	0	4	3
Visual	2	18	2	7	1	3	1	4	1	5	0	0	0	0	0	0	7	5
Tactile	1	9	2	7	0	0	2	9	2	9	0	0	1	8	0	0	8	6
Kinesthetic	0	0	1	3	0	0	0	0	0	0	2	15	1	8	0	0	4	3
Motivation	1	9	2	7	2	7	2	9	2	9	1	8	0	0	0	0	10	7
Persistence	1	9	3	10	1	3	2	9	4	18	1	8	1	8	0	0	13	9
Responsibility	1	9	5	17	2	7	4	17	5	23	1	8	2	17	2	17	22	15
Structure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alone	0	0	4	14	1	3	2	9	3	14	5	38	2	17	3	25	20	14
Authority figures	0	0	1	3	0	0	3	13	1	5	2	15	2	17	1	8	10	7
Different ways	3	27	3	10	3	10	2	9	1	5	1	8	2	17	1	8	16	11