

Developing an information seeking
profile for nursing students:
the role of personality, learning style
and self-efficacy

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ABSTRACT

This study explored the information seeking behaviour of a group of nursing students at a single university in the United Kingdom to determine whether any of personality, learning style, or self-efficacy with information literacy impacted on this behaviour.

A concurrent embedded quantitative dominant mixed-methods approach was used comprising of a questionnaire and interviews, and took place during the academic year 2008-9. Phase 1 of the research used a questionnaire (sample n=194) consisting of three validated scales (for personality, learning styles, and self-efficacy respectively), plus a section on information seeking preferences based on Foster's (2004, 2005) non-linear model, and some demographic questions. For Phase 2 a sample (n=11) of students took part in semi-structured interviews using the Critical Incident Technique, the resulting data analysed using a blended method of data collection, analysis and display – Qualitative Interpretative Categorisation (QIC).

Results from the questionnaire data (through Chi-square, Odds ratios, and Binomial regression) showed clear links between differing personality traits, learning style preferences, and levels of self-efficacy with information literacy, and with particular elements of Foster's model. This enabled seven specific profiles and a 'level of understanding' continuum to be formulated. The interview data enabled an information search process model to be produced indicating the 'route' students' use during their information seeking and emphasised the role of situation. Finally incorporating the student's personal profile into the model allowed a complete information seeking process model to be produced.

Key recommendations from the study are that students should wherever possible have their information seeking profile determined via questionnaire and that a 'long and thin' information skills training programme be embedded into the curriculum. This programme should contain a range of types of session and that can be moulded to the situation the students are in.

Keywords: information seeking behaviour, nursing students, mixed-methods

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TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	ix
LIST OF TABLES	x
LIST OF ACRONYMS	xii
Chapter 1 OVERVIEW AND INTRODUCTION	1-1
1.1 Background	1-1
1.2 Aim	1-3
1.3 Purpose statement	1-4
1.4 Research questions	1-4
1.5 Objectives	1-5
1.6 Outline of thesis	1-5
Chapter 2 LITERATURE SEARCHING STRATEGY	2-7
Chapter 3 METHODOLOGY	3-12
3.1 Philosophical perspective	3-12
3.2 The quantitative strategy	3-14
3.3 The qualitative strategy	3-15
3.4 The mixed methods approach	3-17
3.5 Pragmatism or a 'pragmatic approach'?	3-20
3.6 Mixed-methods – for and against	3-22
Chapter 4 INFORMATION SEEKING BEHAVIOUR	4-28
4.1 Information	4-28
4.2 Information behaviour, Information seeking behaviour, and Information searching behaviour	4-30
4.3 Models	4-33
4.3.1 IB Models	4-33
4.3.2 Factor relationship models	4-35
4.3.3 Search process models	4-38
4.3.4 Task based models	4-39
4.3.5 Non-linear process model	4-41
4.3.6 Integrated general models	4-43
4.4 Tasks	4-52
4.5 Situation/Context	4-54
4.6 Collaborative information behaviour	4-57
4.7 Enough information	4-59
4.8 Serendipity	4-62

4.9 Information retrieval	4-63
4.10 Relevance	4-64
4.11 User studies	4-68
4.12 Information seeking behaviour	4-69
4.12.1 Searching for health information - The example of CANCER	4-69
4.12.2 HCPs	4-72
4.12.3 Doctors	4-74
4.12.4 Nurses and nursing education	4-75
4.13 Information searching behaviour	4-81
4.13.1 HCP's	4-82
4.14 Information literacy	4-85
Chapter 5 MEASURING PERSONALITY	5-89
5.1 History	5-89
5.1.1 Neo-Freudians	5-91
5.1.2 Early personality theorists	5-92
5.2 Measuring traits	5-97
5.2.1 Two characteristics	5-97
5.2.2 The 3 factor model	5-98
5.2.3 Five Factor Model	5-98
5.2.4 The HEXACO model	5-101
5.3 Use of personality scales in education	5-102
5.3.1 Medical education	5-104
5.3.2 Nursing	5-105
5.4 Suitability of the Mini-markers	5-107
Chapter 6 MEASURING SELF-EFFICACY	6-108
6.1 Development of the concept	6-108
6.2 Problems with the concept of self-efficacy	6-112
6.3 Academic settings	6-113
6.3.1 Autonomous learning	6-114
6.3.2 Academic motivation	6-116
6.4 Development of research tools	6-118
6.4.1 Efficacy in teaching	6-119
6.4.2 Teacher Self-efficacy scales	6-120
6.4.3 Efficacy in computing	6-122
6.4.4 Efficacy in information seeking and information literacy	6-124
6.5 Suitability of the Information Literacy Self-Efficacy Scale (ILSES)	6-125
Chapter 7 MEASURING LEARNING STYLES	7-128
7.1 'Learning' styles or 'cognitive' styles?	7-128
7.2 Development of research tools	7-129

7.2.1 Cognitive-based styles	7-131
7.2.2 Learning-based styles	7-135
7.2.3 Learning approaches strategies, orientations and concepts of learning	7-138
7.2.4 Summary	7-141
7.3 Learning styles in nurse education	7-143
7.4 Use of the ASSIST in research	7-148
7.5 Autonomous learning in nurse education	7-151
7.6 Critical thinking in nurse education	7-152
7.7 Suitability of the ASSIST	7-152
Chapter 8 THE ROLE OF PERSONALITY, SELF-EFFICACY AND LEARNING STYLES IN ISkB	8-154
Chapter 9 GENERAL RESEARCH PROCEDURES	9-158
9.1 Ethical approval	9-163
9.1.1 Access arrangements	9-163
9.2 Sample	9-164
9.3 Participant forms	9-166
Chapter 10 DATA COLLECTION	10-168
10.1 Stage 1: quantitative	10-168
10.1.1 Development of questionnaire	10-169
10.1.2 Foster's model	10-169
10.1.3 Research Tools	10-173
10.1.4 Data analysis – statistical tests used in quantitative analysis	10-176
10.2 Stage 2: qualitative	10-177
10.2.1 Data analysis and the use of pre-determined categories	10-179
10.2.2 Methodological development - Qualitative Interpretative Categorisation (QIC)	10-182
10.2.3 Critical Incident Technique (CIT)	10-189
10.2.4 Development of Interview Guide	10-192
10.2.5 Coding	10-194
10.2.6 Data analysis – reflecting on the QIC process	10-197
Chapter 11 RESULTS	11-201
11.1 Quantitative	11-201
11.1.1 Scale reliability	11-201
11.1.2 Self-efficacy	11-203
11.1.3 Learning Styles	11-206
11.1.4 Personality	11-208
11.1.5 Self-efficacy and Learning Style	11-209
11.1.6 Self-efficacy and Personality	11-210
11.1.7 Learning Style and Personality	11-210
11.1.8 ISkB	11-211

11.1.9 ISkB and Self-efficacy	11-212
11.1.10 ISkB and Learning Style	11-214
11.1.11 Odds Ratios	11-215
11.1.12 ISkB and Personality	11-217
11.1.13 Regression analysis	11-220
11.2 Qualitative	11-222
11.2.1 Category 1: Amount of Information	11-224
11.2.2 Category 2: Confidence	11-226
11.2.3 Category 3: Pertinence	11-228
11.2.4 Category 4: Revision of searching	11-231
11.2.5 Category 5: Satisfaction with searching	11-235
11.2.6 Category 6: Search strategy	11-237
11.2.7 Category 7: Sources used	11-240
Chapter 12 DISCUSSION	12-245
12.1 Quantitative element	12-245
12.1.1 Self-efficacy	12-246
12.1.2 Learning styles	12-247
12.1.3 Self-efficacy and learning style	12-247
12.1.4 Personality	12-248
12.1.5 Personality with self-efficacy and learning style	12-248
12.1.6 ISkB with self-efficacy and learning style	12-250
12.1.7 Linking in personality traits	12-253
12.2 Qualitative element	12-259
12.2.1 Use of the Qualitative Interpretive Categorisation (QIC) technique	12-259
12.2.2 Amount of information	12-259
12.2.3 Confidence	12-260
12.2.4 Pertinence	12-260
12.2.5 Revision of searching	12-261
12.2.6 Satisfaction	12-262
12.2.7 Search strategy	12-262
12.2.8 Sources used	12-263
12.2.9 Summary	12-264
12.3 Mixed element	12-266
Chapter 13 CONCLUSIONS AND RECOMMENDATIONS	13-269
13.1 Introduction	13-269
13.2 Literature review	13-270
13.3 Methodological approach	13-271
13.3 Main findings	13-273
13.3.1 Quantitative	13-273
13.3.2 Qualitative	13-278

13.3.3 Mixed	13-279
13.4 Recommendations	13-280
13.5 Contributions of this study	13-282
13.6 Limitations and further research	13-282
Chapter 14 REFERENCES	14-284
Chapter 15 APPENDICES	14-336
Appendix A: Mind Map for literature search	14-337
Appendix B: Selection of learning styles reviews	14-339
Appendix C: Letter of invitation	14-342
Appendix D: Participant information sheet	14-344
Appendix E: Consent forms	14-348
Appendix F: Interview schedule	14-351
Appendix G: Questionnaire	14-354

LIST OF FIGURES

Figure 1-1: outline of thesis	1-6
Figure 3-1: the aspects of the quantitative and qualitative research approaches ..	3-17
Figure 3-2: the aspects of the quantitative, qualitative, and mixed-method research approaches	3-19
Figure 3-3: the revised relationships within the research process when a pragmatic approach is utilised	3-22
Figure 4-1: communication model from Shannon and Weaver (1949 p98)	4-28
Figure 4-2: Wilson's (1999 p263) nested IB model (reproduced with publisher's permission)	4-33
Figure 4-3: Dervin's Sense-Making theory modified by Wilson (1999 p254) (reproduced with publisher's permission)	4-34
Figure 4-4: Wilson's 1981 model of Information Behaviour - updated by Wilson (1999) (reproduced with publisher's permission)	4-36
Figure 4-5: Representation of Kuhlthau's (1993) 6 stage model of the information search process.....	4-38
Figure 4-6: Ellis's (1989) model shown as a stage process version (from Wilson 1999) (reproduced with publisher's permission)	4-39
Figure 4-7: Bystrom and Jarvelin's (1995) task-based ISkB model (reproduced with publisher's permission).....	4-40
Figure 4-8: Foster's (2004, 2005) model of non-linear ISkB (reproduced with publisher's permission).....	4-42
Figure 4-9: Wilson's (Wilson and Walsh, 1996) model of ISkB (reproduced with permission of copyright holder).	4-44
Figure 4-10: Sonnenwald and livonen's (1999) model of IB (reproduced with publisher's permission).....	4-45
Figure 4-11: Niedzwiedzka's (2003) model of ISkB. (<i>Reproduced under Creative Commons</i>)	4-46
Figure 4-12: Godbold's (2006) model of IB (<i>Reproduced under Creative Commons</i>)4-47	
Figure 4-13: Spink and Cole's integrated HIB model. This version has been adapted from (Spink and Cole, 2006a and Spink et al., 2006).....	4-49
Figure 4-14: Urquhart and Rowley's (2007) model of student ISkB (reproduced with publisher's permission).....	4-50
Figure 4-15: Dervin's Sense-Making model adapted to the nurse-patient information need situation.....	4-80
Figure 4-16: the steps involved in the information literacy process with the inclusion of elements of reflection. Adapted from Craig (2009).....	4-88
Figure 6-1: Bandura's (1986) three core sets of Social Cognitive Theory (reproduced from BANDURA, A. 1986. <i>Social foundations of thought and action: a social cognitive theory</i> , Engelwood Cliffs, NJ, Prentice Hall, p. 24 and reprinted by permission of Pearson Education, Inc., Upper Saddle River, New Jersey).	6-108
Figure 6-2: Bandura (1977b) self-efficacy expectations (reproduced from BANDURA, A. 1977. <i>Social learning theory</i> , Englewood Cliff, NJ, Prentice Hall, p.79 and reprinted by permission of Pearson Education, Inc., Upper Saddle River, New Jersey).	6-112
Figure 7-1: the cognitive – learning continuum summarized from Coffield et al 2004a	7-130
Figure 7-2: representation of the two dimensions of Gregorc's Style Delineator (adapted from Guild 1998 pp92-93).....	7-133
Figure 7-3: Kolb's (1984) Learning Styles Inventory expectations (reproduced from KOLB, D. A. 1984. <i>Experiential learning: experience as the source of learning and development</i> , New Jersey, Prentice Hall, p.42 and reprinted by permission of Pearson Education, Inc., Upper Saddle River, New Jersey).	7-136

Figure 9-1: the methods used in the research	9-162
Figure 10-1: the Qualitative Interpretive Categorisation (QIC) framework in relation to Creswell's (2009 p185) seven step data analysis overview.	10-188
Figure 11-1: tree hierarchy of the nodal structure within the category for 'Amount of information'	11-224
Figure 11-2: tree hierarchy of the nodal structure within the category for 'Confidence'	11-226
Figure 11-3: tree hierarchy of the nodal structure within the category for 'Pertinence'	11-228
Figure 11-4: tree hierarchy of the nodal structure within the category for 'Revision of searching'	11-231
Figure 11-5: tree hierarchy of the nodal structure within the category for 'Satisfaction with searching'	11-235
Figure 11-6: tree hierarchy of the nodal structure within the category for 'Search strategy'	11-237
Figure 11-7: tree hierarchy of the nodal structure within the category for 'Sources used'	11-240
Figure 12-1: the relationship between learning styles (Surface, Strategic, and Deep), confidence with information literacy, and "level of understanding"	12-248
Figure 12-2: four potential profiles. Profiles ST1 and ST2 contain Advanced ILSE, but this was not a strong link with the Strategic learners hence the uncertainty.....	12-250
Figure 12-3: those information seeking micro-processes with strong links to learning styles and information literacy self-efficacy.....	12-252
Figure 12-4: the seven ISkB profiles. Profiles DE1, DE2 and DE3 are for the Deep learners; ST1 and ST2 are for the Strategic learners; and SU1 and SU2 are for the Surface learners.....	12-257
Figure 12-5: the five personality traits and their links with the information seeking micro-processes, learning styles and information literacy self-efficacy	12-258
Figure 12-6: the information search process	12-265
Figure 12-7: the information search process including the ISkB profile.....	12-267

LIST OF TABLES

Table 3-1: the differences between quantitative and qualitative research strategies (from Bryman (2008))	3-16
Table 3-2: the different aspects of the qualitative, quantitative, and pragmatic research approaches (source: Morgan (2007)).....	3-20
Table 4-1: summarizing eleven recent studies into the ISkB of various types of qualified nurses, nurse teachers and nursing students.	4-78
Table 5-1: Freud's stages of psychological development adapted from Hergenhahn and Olson (2003), Patterson and Watkins-Jr (1996); and Funder (2007).....	5-90
Table 5-2: Murray's list of forty-four variables (Murray, 1938 p144-149)	5-94
Table 5-3: Cattell's 16 surface traits (Cattell and Kline, 1977)	5-96
Table 6-1: self-efficacy core concepts adapted from Baranowski et al (2004 p169)..	6-109
Table 7-1: Dunn and Dunn's LSI groupings (from Coffield et al., 2004a p21)	7-132
Table 7-2: Honey and Mumford's Learning Styles Types - strengths and weaknesses (adapted from Honey and Mumford, 2006).....	7-137
Table 7-3: the defining features of Approaches to Learning and Studying, taken from Entwistle et al (2001 p109 and p112) and, Entwistle and Peterson (2004)	7-139
Table 7-4: the four areas of the ILS (adapted from Vermunt and Vermetten, 2004, Coffield et al., 2004a)	7-141
Table 9-1: the major mixed methods design types (adapted from Creswell and Plano-Clark, 2007)	9-158

Table 9-2: the overall research design framework in this study.	9-161
Table 9-3: the sample of students taking part in the quantitative analysis of the study.	9-165
Table 9-4: the participants taking part in the interviews	9-166
Table 10-1: the strengths and weaknesses of using questionnaires in research (Watson and Coombes, 2009).....	10-168
Table 10-2: the three core processes and eighteen micro-processes within Foster's ISkB model.....	10-170
Table 10-3: the Core Processes of Foster's non-linear information seeking model along with the two juxtaposed options developed for the questionnaire.....	10-171
Table 10-4: initial 'start list' of pre-determined categories used in the QIC process	10-181
Table 10-5 Comparison of QIC, Template analysis, and Grounded Theory	10-185
Table 10-6: the strengths and weaknesses of the critical incident technique (Aveyard and Neale, 2009).....	10-191
Table 10-7: the initial start list of categories, rationalisation, and which questions they relate to.	10-196
Table 11-1: Cronbach's alpha scores for the ASSIST.....	11-202
Table 11-2: Cronbach's alpha scores for the Mini-markers.....	11-203
Table 11-3: the relationship between information literacy self-efficacy and course. RM given but not analysed	11-204
Table 11-4: the relationship between information literacy self-efficacy and current year of course	11-204
Table 11-5: the relationship between information literacy self-efficacy and age of student	11-205
Table 11-6: the relationship between different learning styles and course. RM given but not analysed.....	11-206
Table 11-7: the relationship between different learning styles and current year of course	11-206
Table 11-8: the relationship between different learning styles and age of student ..	11-207
Table 11-9: the average personality scores of students at different stages of their course	11-208
Table 11-10: the relationship between mean personality score and age of student	11-208
Table 11-11: the relationship between self-efficacy level and different learning styles	11-209
Table 11-12: the relationship between self-efficacy level and mean personality score	11-210
Table 11-13: the relationship between different learning styles and mean personality score	11-210
Table 11-14: the number of students agreeing with the micro-process.....	11-212
Table 11-15: the relationship between the number of students agreeing with the micro-process and self-efficacy level.....	11-213
Table 11-16: the relationship between the number of students agreeing with the micro-process and learning style type	11-214
Table 11-17: an example contingency table used for calculating odds ratios....	11-215
Table 11-18: micro-processes most likely to be undertaken by students with different self-efficacy levels	11-215
Table 11-19: micro-processes most likely to be undertaken by students with different Learning Styles	11-216
Table 11-20: the relationship between students agreeing with the micro-process and mean personality score	11-217
Table 11-21: the relationship between students disagreeing with the micro-process and mean personality score	11-218

Table 11-22: single personality traits associated with micro-processes	11-220
Table 11-23: regression analysis showing relationships between the five personality traits and each ISkB micro-process	11-221
Table 11-24: codes referring to participants in the interviews	11-222
Table 11-25: the initial start list and final set of categories used in the QIC process	11-223

LIST OF ACRONYMS

ALSI	Approaches to Learning and Studying Inventory
ASI	Approaches to Studying Inventory
ASSIST	Approaches and Study Skills Inventory for Students
CIT	Critical Incident Technique
CPD	Continuing Professional Development
CSA	Cognitive Styles Analysis (Riding)
CSC	Classroom and School Context model
CSES	Computer Self-Efficacy scale
CSI	Cognitive Styles Indicator (Allinson and Haynes)
CTS	Computer Technologies Survey
CTSES	College Teaching Self-Efficacy Scale
EPQ	Eysenck's Personality Questionnaire
EVINCE	Establishing the Value of Information to Nursing Continuing Education
FFM	Five Factor Model
GEFT	Groups Embedded Figures Test
GP	General Practitioner
GSD	Gregorc's Style Delineator
HCP	Health Care Professionals
HEXACO	A six factor personality model
ICT	Information and Computer Technology
ILS	Inventory of Learning Styles (Vermunt)
ILSE	Information Literacy Self-Efficacy
ILSES	Information Literacy Self-Efficacy Scale
IPIP	International Personality Itinerary Pool
ISS	Internet self-efficacy scale
IT	Information Technology
JUSTEIS	JISC Usage Surveys: Trends in Electronic Information Services
KLSI	Kolb's Learning Styles Inventory
LSI	Learning Styles Inventory (Dunn and Dunn)
LSQ	Learning Styles Questionnaire (Honey and Mumford)
LSS	Learning Styles Survey
MBTI	Myers-Briggs Type Indicator
MSLQ	Motivated Strategies for learning Questionnaire
NEO-FFI –	NEO Five Factor Inventory
NEO-PI-R	Personality scale by Costa and McCrae
PBL	Problem Based Learning
PEPS	Productivity Environmental Preference Survey
QIC	Qualitative Interpretative Categorisation
RASI	Revised Approaches to Studying Inventory
RM	Registered Midwife/Midwifery
RN	Registered Nurse/Nursing
SCT	Social Cognitive Theory
SDL	Self Directed Learning
SDLRS	Self Directed Learning Readiness Scale

SRL	Self Regulated Learning
TEBS-Self	Teachers' Efficacy Beliefs System – Self Form
TES	Teacher Efficacy Scale
TSELI	Teachers' Sense of Efficacy for Literacy Instruction

Chapter 1 OVERVIEW AND INTRODUCTION

1.1 Background

Nurses handle information all the time – from patient counselling through recording of care to reflection on practice, with (following the advent of Project 2000 which made nursing a graduate profession) increasing emphasis on working in an ‘evidence-based’ manner. Evidence-based practice (or more specifically evidence-based nursing) is a process that has evolved over time from describing clinical decision making to guidance that informs decisions and has many ‘definitions’ (Bucknall and Rycroft-Malone, 2010). In a critical review of the literature Scott and McSherry (2009) identify thirteen separate definitions of evidence-based practice and evidence-based nursing with the main requirement that clinical decisions are made based on the best available evidence. Indeed nurses are impelled to base their practice on research (Spencer, 2011). Recently updated competencies for entry to the nursing register state that “all nurses must appreciate the value of evidence in practice, be able to understand and appraise research, apply relevant theory and research findings to their work, and identify areas for further investigation” (Nursing and Midwifery Council, 2010). In addition at the university where this research has taken place the assessment grading criteria for full-time undergraduate nursing students allocates 25% of the marks for written assignments to ‘use of literature as an evidence base’, with a progression in the highest grade from “some analysis and interpretation of appropriate literature” in year 1, to “varied, contemporary and well-referenced evidence base” in year 2, to “impressive depth and breadth of reading enhances discussion. Varied and contemporary evidence base” in year 3 (Anglia Ruskin University, 2011). This requirement for students to obtain more evidence for their work and to evaluate and critique this evidence as they progress through their course necessarily requires additional searching skills. With the growth of Web 2.0, nurses will need to work with fellow professionals and patients in different ways, and nursing students will need to acquire more sophisticated information seeking skills to cope with new roles.

Those demands impact on the curriculum in higher education, nursing educators and librarians. With a large student cohort of around 172,000 nursing students enrolled at higher education institutions in 2010/11 (Higher Education Statistics Agency, 2011), a validated profile of information behaviour in this group would inform design and evaluation of information support services for a diverse student group, composed of mature students as well as the school-leavers.

Information seeking behaviour research has centred on the creation of models; from factor relationship models (Wilson, 1981, Wilson, 1999), through sense-making models (Dervin et al., 2003), search process models (Kuhlthau, 1993), task based models (Bystrom and Jarvelin, 1995), to non-linear models (Foster, 2004); and on to integrated general models (Spink and Cole, 2006a). These models have been generated from a range of empirical studies on different types of users, but all aim to show how individuals orientate and 'go about' the act (or acts) of information seeking. All these models will be discussed at length, but do they apply to nurses and nursing students? Nurses are expected to practice in an evidence based manner, but many studies have shown that their preferred sources of information tend to be informal (Dee and Stanley, 2005, Tannery et al., 2007, Thompson et al., 2001b, Thompson et al., 2001a). In addition barriers to evidence-based practice are cited as poor IT skills and time pressures (Lathey and Hodge, 2001, McKnight, 2006). Academic institutions and library services have developed various information literacy initiatives in an attempt to improve the skill set of nurses (Henderson et al., 2011, Karshmer and Bryan, 2011, Hegarty and Carbery, 2010), but many of these are based on assumptions of what students should do, not what they do, why they do it, and whether the searching strategy is idiosyncratic. Factors that affect the way nursing students search may be as important as being taught how to search.

A range of studies has shown previously that personality traits impact on information seeking to varying degrees (Kernan and Mojena, 1973, Hertzum and Pejtersen, 2000, Halder et al., 2010). Learning style has also been found

to be a determining factor in the process (Palmer, 1991b, Palmer, 1991a, Tenopir et al., 2008). Both personality factors and learning style in combination have been investigated (Diseth, 2003, Diseth and Martinsen, 2003, Heinstrom, 2002, Heinstrom, 2006a) and these showed clear links between these aspects and also with the way individuals searched. Students with higher information literacy confidence levels have been found to be more positive about the search process (Franks and McAlonan, 2007, Kim and Sin, 2007); and a recent study has found links between personality and self-efficacy (Kwon and Song, 2011). Personality, learning style and self-efficacy with information literacy have all been shown to have a role to play in the success or otherwise of student information seeking, but no study has investigated the possible interactions of all three. Indeed the perspective of much of the research into IB has often been limited in terms of these factors and it is important to take a comprehensive, systematic approach to reviewing the literature on both the definition and development of the concepts; and their interactions with each other and IB. To this end a wide-ranging, inclusive review is necessary to ensure that a complete picture of these factors is attained.

It is therefore relevant to investigate these interactions and whether the three in combination create an overall student 'type' who searches for information in a particular way. This 'profile' if applied to a distinct group (in this case nursing students) would provide the opportunity for information professionals to better tailor instruction/tuition on searching skills/strategies to individual students (or smaller groups). It is also useful to know how nursing students utilise resources for resource allocation and subscriptions.

1.2 Aim

This research aims to produce an information seeking behaviour profile for nursing students.

1.3 Purpose statement

This mixed methods study aimed to produce an information seeking behaviour profile for nursing students. An embedded mixed methods design was used, a design in which one data set provides a supportive, secondary role in a study based primarily on the other data set. To collect data for the primary purpose of this study a questionnaire containing validated research tools was used, to test Foster's information seeking model, which predicts that individuals search using a range of different methods in a non-linear process, to determine whether any of personality, self-efficacy, or learning styles impacts on the information seeking behaviour of nursing students. A secondary purpose gathered qualitative interview data to explore the information needs and seeking processes of a sample of nursing students. The reason for collecting this secondary database was to provide support for the primary purpose.

1.4 Research questions

The research investigated three aspects: personality, self-efficacy, and learning style and mapped these to the information seeking behaviour of the student.

Quantitative

1. What is the relationship between personality, self-efficacy, learning styles, and information seeking behaviour?
2. What is the impact of differing personalities, self-efficacy levels, and/or learning styles on information seeking behaviour

Qualitative

3. Why do users search the way they do?
4. What are the preferred methods of information seeking?

Mixed-method

5. How do the qualitative findings enhance the understanding of the quantitative results?

1.5 Objectives

The following objectives were addressed:

Quantitative

- Determine whether 'different' students (type of course; stage of course) search differently.
- Identify (by literature review) how personality, learning styles, and self-efficacy are defined and applied to ISkB..
- Determine the role of personality, self-efficacy and learning style in the context of ISkB and how these act and interact on ISkB.

Qualitative

- Examine how nursing students perceive their ISkB and needs.
- Investigate the processes and methods nursing students utilise to find information.

Mixed-method

- Investigate how the qualitative data can be linked back to the quantitative data to better inform the production of an information seeking behaviour profile.

1.6 Outline of thesis

This mixed-methods study investigates whether personality, learning styles, and self-efficacy with information literacy impact on the information seeking processes employed by nursing students; and whether a viable information seeking profile can be generated from the findings.

The literature search (Chapter 2), for the literature review (Chapters 4-7) informed the empirical mixed methods methodology used for the research study as described in Chapter 3, with rationalisation for the strategies and approach. The thesis moves on to the discussion of information seeking behaviour at length (Chapter 4), analysing models and focusing on a range of elements that impact on the process. This is then applied to the health discipline and specifically onto nurses and nursing students. Personality, self-

efficacy, and learning styles are then discussed (Chapters 5, 6, 7 and 8) with an examination of the development of research tools and analysis of previous research findings. Ethical approval and a description of the sample used in the study forms Chapter 9. Chapter 10 covers data collection and here the development of the quantitative research tool and justification for the method used in the qualitative data collection is given. The study results and discussion are Chapters 11 and 12. The thesis ends with conclusions and recommendations (Chapter 13). This outline is provided in figure 1-1.

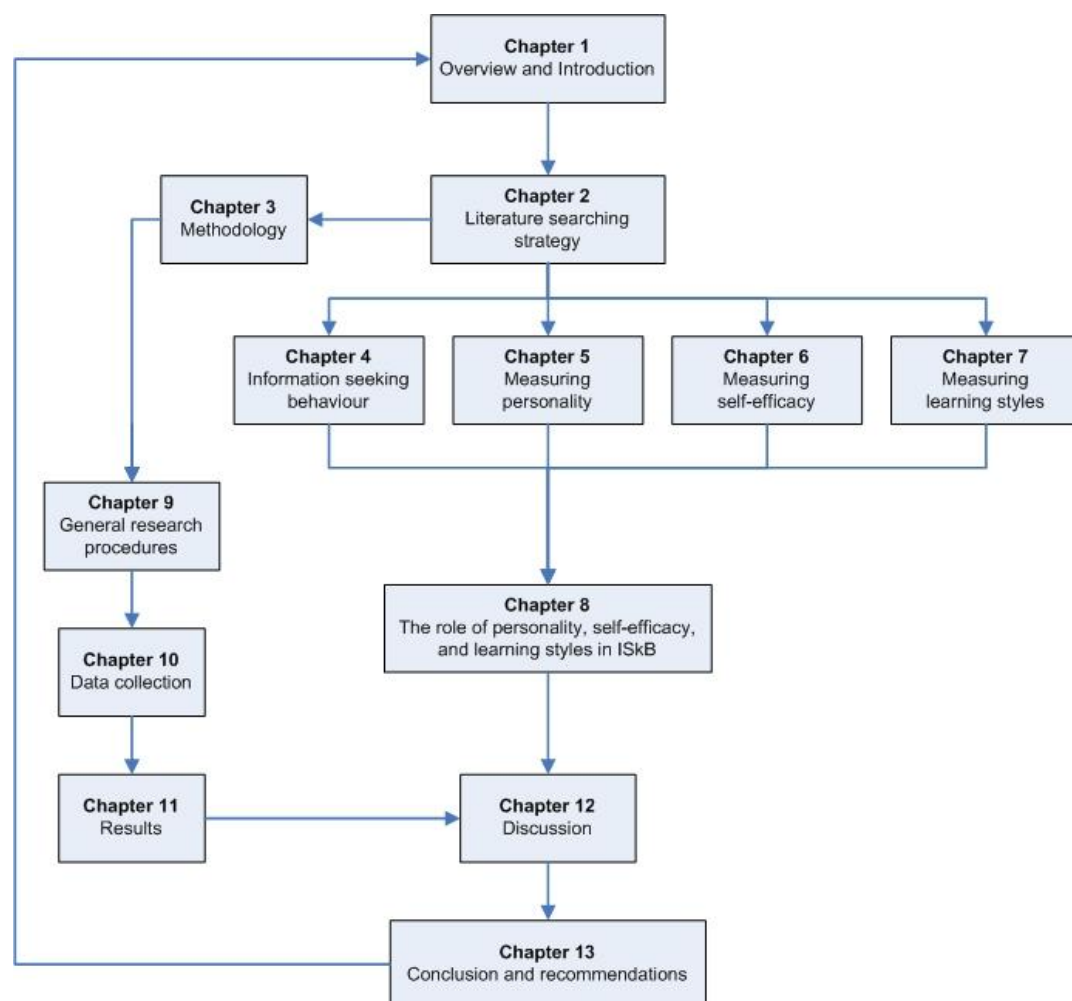


Figure 1-1: outline of thesis

The thesis adheres to the Harvard system of referencing as found on the EndNote bibliographic management system.

Chapter 2 LITERATURE SEARCHING STRATEGY

The literature search undertaken for this study took various forms. The bulk of the literature was obtained from bibliographic databases supplemented by browsing current issues of key journals (including utilizing electronic table of contents services), and ancestry searching (using reference lists of quality articles to locate further research).

The initial phase of the search concerned the construction of a Mind Map (Appendix A) which produced a range of keywords that could be used as search terms. This can be shown schematically below.

Education

- Health science
 - Nursing
 - Continuing
 - Diploma
 - Research-based
 - Midwifery
 - Graduate
 - Doctoral
 - Post-Doctoral
 - Masters
 - Baccalaureate
 - Post-RN

Education

- Learning methods
 - Cognitive styles
 - Learning styles
 - Health
 - Learning strategies
 - Health
- Experiential
 - Health
- Problem-based learning
 - Health
- Self-directed learning
 - Health

Professional practice

- Evidence-based nursing
- Research-based nursing

Research

- Disciplines
 - Midwifery
 - Nursing
- Mixed-methods

Efficacy

- Teaching efficacy
- Self-efficacy
 - Information literacy self-efficacy
 - Computer efficacy
- Confidence

Personality

- Traits
 - Big five factors
 - Health
- Other factor models

Motivation

- Motivation to learn
- Health

Data analysis

- Chi-square
- Odds ratios
- Regression
- Critical incident technique

Students

- Nursing
 - Graduate
 - Masters
 - Doctoral
 - Diploma
 - Baccalaureate
 - Post RN

Information science

- Literature searching
 - Information retrieval
 - Health
- Information seeking behaviour
 - Models
 - Information searching behaviour
 - Health
- Tasks
- Relevance
- Information literacy

Health
Informatics
Information needs
Health
Information systems
Databases
Health

(NB: Some of these terms have been rephrased to reflect the preferred terms in the CINAHL database)

It was important to begin searching using broad terms e.g.: education, learning, professional practice, as this led to the discovery of further more focussed, related terms e.g.: evidence based nursing practice. This serendipitous approach can be time consuming, but is vital to retrieve the maximum amount of relevant material. Once key headings are found a more targeted approach can then be employed to refine the search. Many of the chosen terms were combined using the appropriate linking Boolean or proximity operators. Limiting was rarely used as the topic covered a broad area and was not restricted to most recent literature.

Databases used to locate pertinent information were:

Health related:

British Nursing Index

CINAHL (Cumulative Index for Nursing and Allied Health Literature)

MEDLINE

Information studies related:

LISA (Library and Information Science Abstracts)

Education related:

British Education Index

ERIC

Science related:

Web of Knowledge

General:

ZETOC (British Library journal holdings)

Monographs were sought through the Aberystwyth University; Anglia Ruskin University, and from the British Library

The following journals were either browsed or had TOC alerts set up:

Advances in Librarianship

Bulletin of the American Society for Information Science and Technology

College and Research Libraries

Education for Information

Health Information and Libraries Journal

Information Processing and Management

Information Sciences

Information Society

Information Technology and Libraries

International Journal of Information Management

Journal of Academic Librarianship

Journal of Computer Information Systems

Journal of Documentation

Journal of Information Processing and Management

Journal of Information Science

Journal of Librarianship and Information Science

Journal of Nursing Education

Journal of the American Society for Information Science and Technology

Journal of the Medical Library Association

Library and Information Science Research

Library Quarterly

Library Resources and Technical Services

Medical Reference Services Quarterly

Nurse Education in Practice

Nurse Education Today

Nursing Education Perspectives

Reference Services Review

In addition keyword alerts were also set up via the British Library for the following phrases: information behaviour/behavior, information seeking behaviour/behavior, self-efficacy, personality, learning style(s), information literacy, digital literacy. Whilst these keywords were not exhaustive and could only be applied to the title of articles they did provide an additional method of locating articles not picked up through the TOC alerts. More in depth searching was conducted periodically to back up the alerts.

Chapter 3 METHODOLOGY

This section discusses the methodological foundations of the empirical elements of this study. It focuses on obtaining a more detailed understanding of the information seeking of undergraduate nursing students to help support their education and factors that impinge on that.

The theory underpinning any empirical research can take two forms: deductive or inductive. Using deductive theory research is conducted with reference to hypotheses (Bryman, 2008) and ideas are tested against observable empirical evidence (Neuman, 2011). Alternatively, in inductive theory the researcher reflects on what is taking place, starting with vague ideas and refining them into theoretical concepts (Neuman, 2011); in essence theory is generated from research (Bryman, 2008).

3.1 Philosophical perspective

Before embarking on an empirical research study, it is necessary to define both the ontological and epistemological viewpoint of the researcher.

Ontology which is the theory of the nature of social entities (Bryman, 2008) is concerned with understanding '*what is?*' (Crotty, 1998); whereas **epistemology** which is the study of how we know things (Bernard, 2000 p8) is concerned with understanding '*what it means to know*' (Crotty, 1998). As ontology relies on 'meaning', making sense of the world, it necessarily also relies on epistemology as the world only makes sense when "meaning-making beings make sense of it" (Crotty, 1998 p10). Thus from Crotty's viewpoint ontology and epistemology tend to merge together.

There are two extreme ontological positions: objectivism and constructivism. Although some commentators suggest many more categories, (e.g. Blaikie (2007) offers six different categories of ontological position: shallow realist, conceptual realist, cautious realist, depth realist, idealist, and subtle realist) simplifying to two extremes makes the differences clear.

Objectivism – social phenomena and their meanings have an existence independent of or separate from social actors (Bryman, 2008 p696); it adheres to the idea that there exists an objective reality and absolute truths (Sarantakos, 2005 p34).

Constructivism - social phenomena and their meanings are continually being accomplished by social actors (Bryman, 2008 p692) and are in constant state of revision; “focuses on the firm belief that there is in practice neither objective reality nor objective truth” (Sarantakos, 2005 p37).

(Constructivism is sometimes treated as synonymous with constructionism (Bryman, 2008), although others consider them to differ (Talja et al., 2005) with constructionism focussed more on language and constructivism on mental processes).

There are also two main epistemological positions: positivism and interpretivism. Again Blaikie (2007) provides six categories linked to the ontological positions, but the extreme positions better illustrate the relationship between ontology and epistemology.

Positivism – “advocates the application of the methods of the natural sciences to the study of social reality and beyond” (Bryman, 2008 p13). This position emphasises “discovering causal laws”, and “value-free research” (Neuman, 2011 p95). Positivism is often used synonymously with ‘quantitative research’ due to the methodology adopted in research (Sarantakos, 2005 p34). A derivative of positivism is ‘post-positivism’, which according to Creswell (2009) is the thinking after positivism that recognises that we cannot be ‘positive’ about claims of knowledge when studying human subjects, although the methods of research linked to this position are positivist. In essence post-positivism is positivism with a tip of the hat to interpretivism; it is ‘open’ to other means of inquiry (Clark, 1998).

Interpretivism – holds the alternative view to positivism. Interpretivism “respects the differences between people and then objects of the natural sciences” taking into account subjective meaning of social action (Bryman, 2008 p16). People construct meaning in natural settings and the researcher

sees a social setting from the point of view of the person being studied, social interactions (Neuman, 2011 p101). It is a “reflective assessment of the reconstructed impressions of the world” (Sarantakos, 2005 p39), creating a new unit.

The philosophical perspective of the researcher leads the strategy that will be undertaken in the research process; either quantitative or qualitative. These strategies are often likened to separate paradigms “organizing framework for theory and research that includes basic assumptions, key issues, models of quality research, and methods for seeking answers” (Neuman, 2011 p94); models that contain law, theory, application, and instrumentation within coherent traditions of scientific research (Kuhn, 1996 p10), or worldviews (Creswell, 2009). Within these paradigms the research methodology which is the translation of the ontological and epistemological principles into the way the research is conducted (Sarantakos, 2005 p30) can be defined. The methodology is not to be confused with research methods which are the “instruments employed in the collection of data” (Sarantakos, 2005 p30).

3.2 The quantitative strategy

The **quantitative** paradigm:

- what can be measured objectively?
- uses deduction – the testing of hypotheses
- collecting and analyzing objective (often numerical) data that can be organised into statistics.

Quantitative research is the “testing (of) objective theories by examining the relationship between variables” (Creswell, 2009 p4). These variables are measured in order to obtain data that can be analyzed with statistical tests. The preoccupation with measurement in quantitative research is because it allows the delineation of fine differences between people, it provides a consistent device for these distinctions, and it provides the basis for precise estimates of the level of relationships (Bryman, 2008). Measurement in this

way allows other researchers to replicate quantitative studies in order to verify results, and for results to be generalised to a wider population. This of course relies on initial results being valid (measured what it was supposed to measure) and reliable (measures are consistent) (see: (Bryman, 2008 pp: 149-153)).

3.3 The qualitative strategy

The **qualitative** paradigm:

- subjective data
- uses induction – researchers' inferences are fed back into stock of knowledge
- the perceptions of the people involved
- intention is to illuminate these perceptions and, thus, gain greater insight and knowledge.

Qualitative research is the exploring and understanding of the meaning individuals or groups ascribe to a problem (Creswell, 2009). It relies on the researcher interpreting the data, and constructing theory from initial (often vague) research questions. Researchers do not measure data – rather they look for relationships between elements of the data. Due to the subjective nature of the results in this method qualitative researchers need to address validity and reliability in order for the results to be accepted within the field. Whilst it is possible to use similar criteria as used for quantitative research, alternative assessment criteria developed by Guba and Lincoln are often used. Guba and Lincoln (1989 pp233-243) suggest there are two criteria for assessing a qualitative study: authenticity and trustworthiness.

Authenticity:

- does it fairly represent differing viewpoints?
- does it provide a better understanding of the social setting and of other members?
- does it encourage change?

Trustworthiness has four criteria

- credibility – getting confirmation from participants that the correct interpretation was reached
- transferability – collect rich accounts to apply in other settings
- dependability – keeping complete records
- confirmability – researcher acts in good faith to be true to the data

Other commentators suggest that no predetermined criteria are necessary to assess the quality of the research (Rolfe, 2006); that it is up to the individual researchers to ensure the rigour of the research by implementing verification strategies during the study (Morse et al., 2008); or that detailed communication of the research process is the key to trustworthiness (Chenail, 1995). The notion of rigour has also been debated with some researchers suggesting that a careful audit of the events using a decision trail is sufficient to assess the level of rigour (Koch, 2006), whilst others advocate a more prescriptive approach to rigour and validity (Long and Johnson, 2000, Whitemore et al., 2001). Similarly clear audit trails are used in quantitative systematic reviews of randomised controlled trials by Cochrane review groups. What is clear is that whichever position is taken, it must be justified.

The fundamental differences between quantitative and qualitative research are presented in table 3-1.

Table 3-1: the differences between quantitative and qualitative research strategies (from Bryman (2008))

	Quantitative	Qualitative
Role of theory in relation to research	Deductive	Inductive
Epistemology	Positivism	Interpretivism
Ontology	Objectivism	Constructivism

The overall philosophical underpinnings and research strategies between quantitative and qualitative research strategies is shown in the following diagram (figure 3-1).

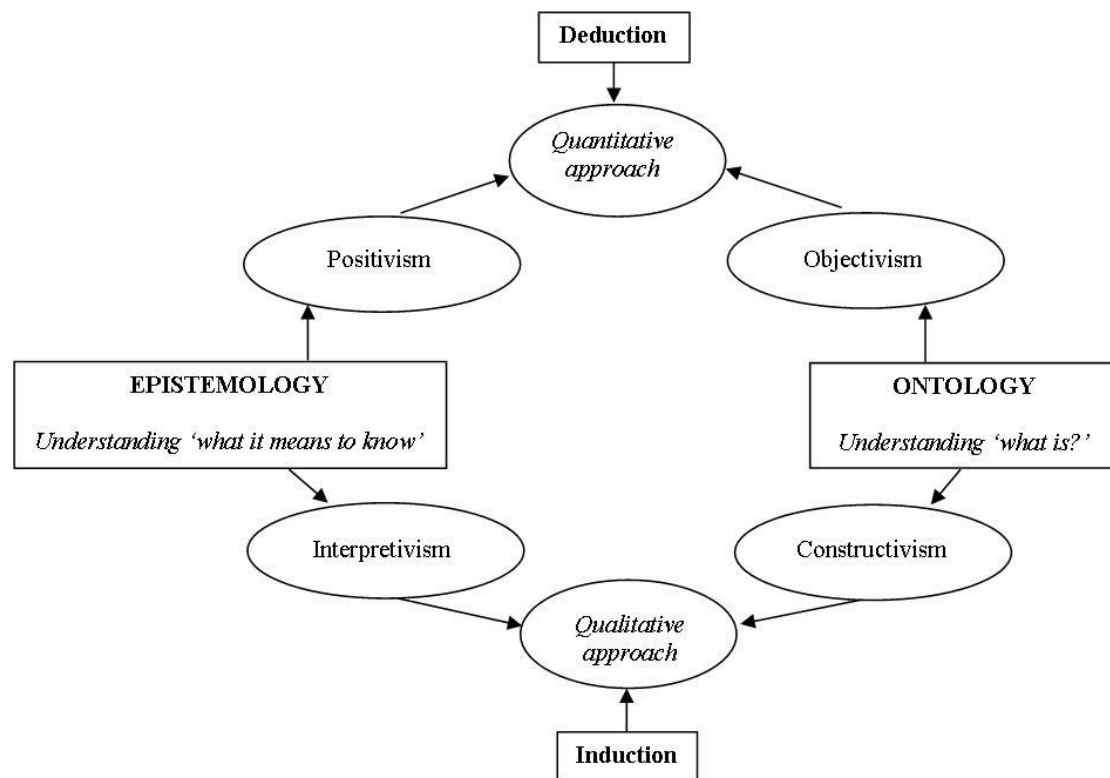


Figure 3-1: the aspects of the quantitative and qualitative research approaches

So far the two separate research strategies have remained separate entities. Increasingly, however, research adopts both strategies in the same study. This approach is the mixed (or multi) methods approach and is outlined below.

3.4 The mixed methods approach

Researchers using a mixed-methods approach view that the distinctive epistemological and ontological assumptions of quantitative and qualitative research are able to be fused, they are compatible (Bryman, 2008). According to Kuhn (1996) however, paradigms are incommensurable so if quantitative and qualitative approaches are separate distinct paradigms then mixing them together is not possible.

As many researchers have adopted this type of approach and the technique has been used in an ever increasing number of research projects (Lipscombe, 2008, Bryman, 2008), there appears to be some room for manoeuvre. The

use of mixed-methods enables researchers to ‘triangulate’ the results of one part of the study with another, in essence cross-checking using different methods (Bryman, 2008 p611). Bryman (2008) believes that there are two versions of the nature of quantitative and qualitative research: an epistemological version and a technical version. The epistemological version is essentially the paradigm argument. There are incompatible epistemological principles that make mixed methods impossible. Countering this is the technical version in which prominence is given to the strengths of data collection and analysis. The epistemological assumptions of quantitative and qualitative research are not fixed; research methods are perceived as autonomous. Creswell and Plano-Clark’s (2007) definition draws on this emphasis on data collection and analysis:

Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method; it focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (Creswell and Plano-Clark, 2007 p5)

This lengthy definition is useful because it encompasses both the underpinnings of the research (assumptions) and techniques used in obtaining data. A more succinct definition from Johnson and Onwuegbuzie (2004) that mixed-methods research is “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” emphasises the notion of combining strategies in some way, but steers clear of including the methodological assumptions.

The inclusion of this research approach into figure 3-1 is shown in figure 3-2.

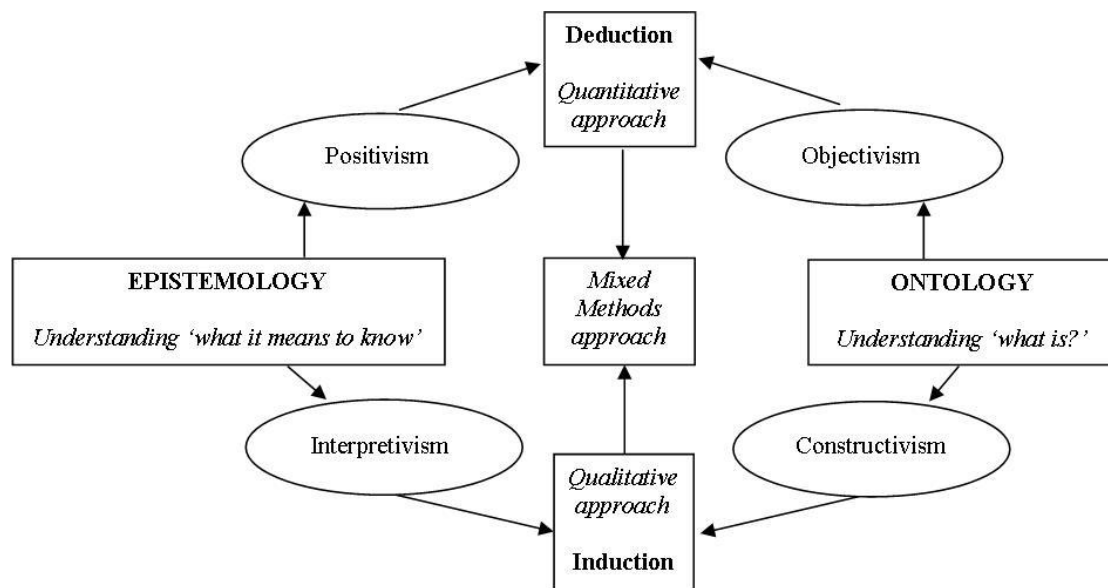


Figure 3-2: the aspects of the quantitative, qualitative, and mixed-method research approaches

Clearly when a challenge is made to a fundamental worldview some controversy ensues. As has already been suggested if the research strategies are not considered incommensurable, then there appears little to prevent them being used together. Indeed many commentators (Johnson and Onwuegbuzie, 2004, Gilbert, 2006, Lipscombe, 2008, Morgan, 2007, Denscombe, 2008, Johnson et al., 2007) agree that mixed methods is a legitimate strategy that can - in some cases - provide superior results than either quantitative or qualitative research alone (Johnson and Onwuegbuzie, 2004) and raise the notion that mixed-methods should in fact be considered a third paradigm thus negating the argument against merging competing paradigms (Johnson and Onwuegbuzie, 2004, Denscombe, 2008, Johnson et al., 2007). The idea of additional paradigms had in fact been extended with other commentators advocating five distinct traditions (Teddle and Tashakkori, 2009). Morgan (2007) justifies his view of mixed-methods being akin to a 'pragmatic' approach as during the design of research, data collection, and data analysis "it is impossible to operate in either an exclusively theory or data-driven fashion" (Morgan, 2007 p71). Teddle and Johnson (2009) concur that pragmatism is the philosophical partner for mixed-methods that embraces and synthesises ideas from both sides (quantitative and qualitative). Patton (2002) agrees that pragmatism – being adaptable and creative – is a valid approach as gathering the most relevant information

outweighs methodological purity. The pragmatic approach (table 3-2) relies on abductive reasoning that moves back and forth between deductive and inductive reasoning.

Table 3-2: the different aspects of the qualitative, quantitative, and pragmatic research approaches (source: Morgan (2007))

	Qualitative approach	Quantitative approach	Pragmatic approach
Connection of theory and data	Induction	Deduction	Abduction
Relationship to research process	Subjectivity	Objectivity	Intersubjectivity
Inference from data	Context	Generality	Transferability

In this way observations are converted to theories which are then assessed through action. Morgan believes that researchers in the quantitative and qualitative fields would benefit from looking for ‘points of connection’ between the two approaches. Morgan also emphasises ‘intersubjectivity’ – moving between objectivity and subjectivity, thus negating any problems with single ‘real worlds’ and individual interpretations of that world; and ‘transferability’ – can the knowledge gained be transferred to other settings or contexts without abstract arguments regarding generalisations (Morgan, 2007 p72)?. Morgan’s view of pragmatism appears to offer a plausible approach, but is it really tenable in terms of mixed-methods research?

3.5 Pragmatism or a ‘pragmatic approach’?

The notion of pragmatism is not new, originating at the end of the 19th and start of the 20th centuries through various philosophers including Peirce, James and Dewey, and taken on more recently (neo-pragmatism) by such thinkers as Rorty and Putnam (see: Mounce, 1996, Goodman, 1995).

Pragmatism (according to James) is concerned with facts and concreteness; and is in essence an amalgam of ‘competing’ theories and practices (James, 1995). Pragmatism has evolved and developed and there are many variations on James’ theme, but the underlying principle common to all pragmatists is the emphasis on “usefulness” (Rorty, 1999, Cornish and Gillespie, 2009).

Pragmatism is pluralist as it accepts the variety of competing interests and

forms of knowledge, allowing knowledge to be evaluated according to whether it works in relation to a particular goal (Cornish and Gillespie, 2009); focusing on what practical difference can be made, and whether any theory or idea is successful in accomplishing a desired effect (Baert, 2005, Plowright, 2011). This is all well and good, but so far this is pragmatic interpretation of findings – are they useful for a given interest?

In order for pragmatism to be relevant to the method or approach used to acquire knowledge, it is paramount that Morgan's (2007) and Patton's (2002) take on pragmatism – that it allows for shared meanings and joint actions; connecting theory and methods; and pursuing a desired end – be the founding premise of the research project at the outset. Once this view is endorsed the researcher must remain open-minded throughout so that any presuppositions and expectations can be affected by the research which can then change any informed view (Baert, 2004). The pragmatic approach is not the abstract pursuit of knowledge through enquiry, but the attempt to gain knowledge in the pursuit of a desired end (Morgan, 2007); and the acknowledgement that there is no one 'best' method in achieving this end (Baert, 2004). Indeed Morgan goes further to suggest that the pragmatic approach should devote "equal attention to studying both the connection between methodology and epistemology and the connection between methodology and methods" (Morgan, 2007); and as such the pragmatic approach impacts on all aspects of a research study, constantly influencing philosophical assumptions and the research process (figure 8-3).

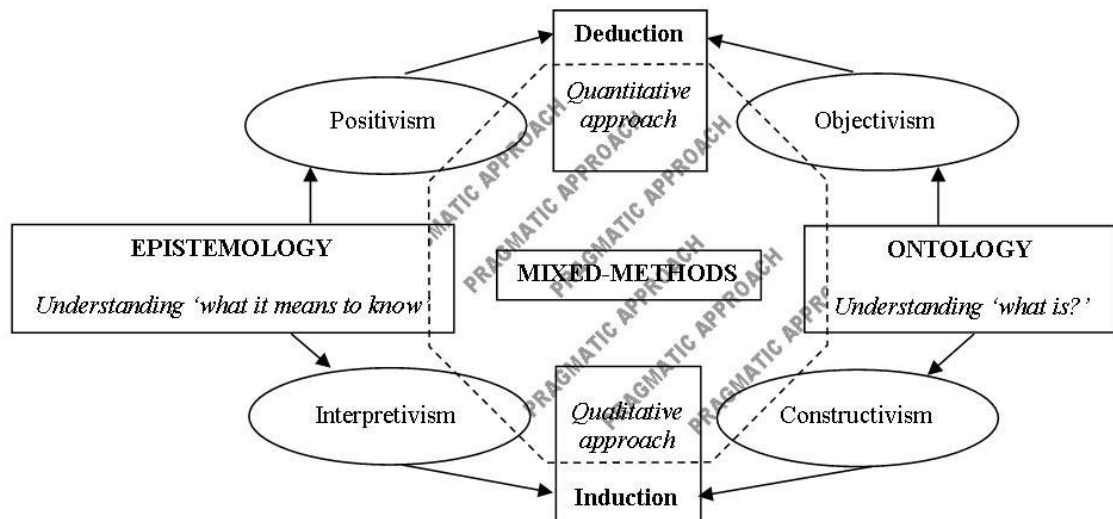


Figure 3-3: the revised relationships within the research process when a pragmatic approach is utilised

Figure 3-3 shows that whilst the mixed-methods research process still takes into account philosophical assumptions and alternative theoretical stances; these are peripheral to the central tenets of the two research approaches (qualitative and quantitative) which form the mixed-methods project and the core concept of the pragmatic approach that impacts on all aspects of the research process.

In sum the pragmatic approach recognises the validity of a variety of interests and perspectives; and that acquired knowledge is evaluated for whether it works in relation to a certain goal (Cornish and Gillespie, 2009). The pragmatic approach by its very nature then offers leeway and compromise in the research process without impinging on validity, and seen in this light, mixed-methods appears a viable approach to take.

3.6 Mixed-methods – for and against

As has already been suggested there are difficulties with mixed-methods if looked at from the viewpoint of paradigms. Sale et al (2002) argues that the quantitative and qualitative paradigms do not measure the same phenomena and thus cannot be combined for cross validation. They suggest that although researchers from the two paradigms often appear to study the same

phenomena, the way these phenomena are labelled relates to different things. In quantitative research the label refers to an 'external referent', in qualitative research it is a personal interpretation (Sale et al., 2002 p48), and as such the only way for mixed-methods research to exist is as a separate paradigm. This view (upheld by Morgan (see table 3-2)) is not shared by others. Giddings and Grant (2007) believe pragmatism as outlined by Morgan is an "ideological position available within any paradigm rather than a paradigm in its own right" (Giddings and Grant, 2007 p53), in essence research can be done in a pragmatic manner; although the traditional view of positivism and interpretivism is more dogmatic than pragmatic. Giddings and Grant also believe that what is being 'mixed' influences the understanding of the strategy. They argue that often it is only the methods employed that are mixed, rather than the methodology, and these are 'a-paradigmatic' in the sense that any given method can be used in either paradigm (Giddings and Grant, 2007 p56). Indeed mixing methods from this viewpoint would be feasible within a single paradigm. Giddings (2006) raises the issue of how 'mixed' the research is. She states that "mixed methods as it is currently promoted is not a methodological movement, but a pragmatic research approach that fits most comfortably within a postpositivist epistemology" (Giddings, 2006 p195) and backs up this assertion by claiming that mixed methods research "rarely reflects a constructionist or subjectivist view of the world. The majority of studies use the analytic and prescriptive style of positivism" (Giddings, 2006 p200). Whilst this may be true, it is only an observation and reflects the current state of research. Over the coming years this situation may reverse and interpretivism catches up. Johnson and Onwuegbuzie (2004) see no reason why mixed methods cannot have a dominant paradigm emphasising either qualitative or quantitative, or indeed for equal status to be given. Perhaps the most comprehensive 'dissection' of mixed-method research is in a recent commentary by Symonds and Gorard (2008) who eloquently state the potential benefits and difficulties before concluding that the notion of paradigms has no place in social science research. They start by listing the rationale for mixed methods as follows:

Epistemological rationale

- All methods and data types are classified within two distinct paradigms (quantitative and qualitative)
- Elements from these two paradigms can coexist in a single study; and that this requires a third category
- This third category should be a separate paradigm based on pragmatism

Empirical rationale

- The focus is on 'mixing' the different elements
- Using elements from competing approaches provides better quality data
- Thus mixed methods is an effective research method

They then go on to counter these rationales within six areas.

1. *Qualities of the data* – although the two paradigms are based on differing data qualities (either objective or subjective; closed category data or open-ended data), it is argued that closed category data requires human perception in order to be created (a notion underlying much classification). The participant must understand the question and the terminology in order to proffer the response. In addition what the researcher decides to include can either reduce or increase the amount of objectivity. As such if all methods and evidence can be equally subjective or objective, then there is no need for a third paradigm.
2. *Data collection tools* – in a similar manner both paradigms can use many of the same data collection tools (questionnaires, interviews, observation), it is quantifying or qualifying of the data that fits into a certain paradigm. So the assignment of data collecting tools into separate paradigms is based on 'common use' not their potential, as such mixed methods as a paradigm is not needed.
3. *Sampling* – large, potentially representative samples are linked to the quantitative paradigm, small non-representative samples to the

qualitative paradigm. It is argued however that small samples can be representative (30 out of 120 children at a primary school), and large samples may not be representative (2000 nurses out of the total within an industrialised country). As generalisations are not restricted to sample size, nor a specific paradigm; mixed methods cannot claim that it is mixing different types of data in accordance with one paradigm or the other.

4. *Type of data produced* – linked to the sampling issue, quantitative data is numeric, qualitative is anything else. But very often the ‘number’ started out as something different (words on a questionnaire) and got counted. Therefore justifying mixed-methods as using two types of data is flawed as there is no justification for numbers to have a separate paradigm in the first place.
5. *Validity* – although validity checks in quantitative research often uses statistical analysis, as has already been described qualitative research may use similar checks. So the idea that mixed methods would need separate validity checks is irrelevant.
6. *Method of analysis* – there does not appear to be an obvious distinction between the two paradigms on this point. Both use data that can be counted, displayed pictorially or in maps, and can use statistical analysis. As no method of analysis is fixed to a paradigm, the separation is artificial and does not support mixed methods.

It follows that both quantitative and qualitative research can be seen as not having fixed, countering positions and are in fact not polarised, a pragmatic notion. In this case there is no need for a third paradigm, as there is ‘none’ to start with. Symonds and Gorard whilst appearing to quash the very idea of mixed methods are actually stating that in the effort to get mixed-methods to ‘fit’ within the paradigm argument commentators are creating unnecessary boundaries and limitations within the research arena, a pragmatic notion. Symonds and Gorard (2008) contend that often two types of data are used without being mixed, and that these should be referred to as ‘multiple-method’

research the likes of which should publish results separately; 'true' mixed-method research should purposefully integrate multiple techniques to create a final set of data. This is not a pragmatic view as there is surely no compulsion to mix the data; knowledge can be created from different sets of data and used to answer different questions quite legitimately within a single study. If different questions are answered then there may be justification in publishing results separately to enable more focus be given to a particular dataset. This does not mean that a mixed-methods study has not taken place as throughout any such study the researcher has worked with a mixed-method, pragmatic mentality to acquire the data. If desired triangulating findings in a mixed-methods study can be successfully accomplished and techniques for this have been outlined elsewhere (O'Cathain et al., 2010).

Symonds and Gorard (2008) along with Giddings (2006) and Giddings and Grant (2007) contest the notion of a third paradigm, but whereas Giddings, and Giddings and Grant, argue that mixed methods is not the third paradigm, Symonds and Gorard are more radical in suggesting that paradigms as overarching categories do not stand up to rigorous investigation, itself a pragmatic notion. Bryman's (2008) view that mixed-methods research can take place within the 'technical' version of research in which the strengths of data collection and analysis are given prominence holds sway if the idea that qualitative and quantitative strategies are not considered paradigms in their own right. Of course this is counter to statements suggesting that mixed methods offers "a powerful third paradigm choice that often will provide the most informative, complete, balanced, and useful research results" (Johnson et al., 2007 p129). Symonds and Gorard (2008) are not against the use of multiple methods in research, just the idea that there need be paradigms at all and thus boundaries that need to be crossed. By the same token keen advocates of mixed methods believe it to be an expansive and creative form of research that is inclusive, pluralistic and complementary (Johnson and Onwuegbuzie, 2004). The essence of pragmatism is to not get side-tracked with philosophical arguments of legitimacy and notwithstanding the paradigmatic debate, the view here is that by using two separate methods within the same research project a deeper, richer understanding of the

phenomenon being studied could be attained in order to reach the desired goal of an ISkB profile.

Following the pragmatic approach the research can be flexible, adaptable, take on board countering views in the quest for a fixed goal. Indeed pragmatism - being pluralistic - is perhaps the only perspective that can be held by mixed-methods researchers as it enables competing methodologies and associated philosophies to be mixed.

Chapter 4 INFORMATION SEEKING BEHAVIOUR

4.1 Information

Before getting to grips with the notion of searching for information, it is worth investigating what is meant when one refers to something as 'information', as according to Shenton (2004) in any study addressing information behaviour an explanation of the way 'information' is understood within the context of the research allows the reader to better appreciate the nature of the phenomenon and the boundaries of the work (Shenton, 2004 p367).

Shannon and Weaver's (1949) classic communication model is often cited as the basic representation of the transmission of information between a source and its destination (figure 4-1).

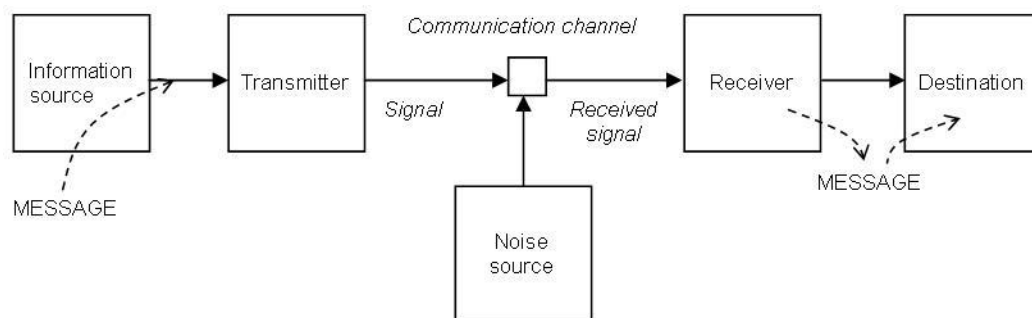


Figure 4-1: communication model from Shannon and Weaver (1949 p98)

In this model the message from the information source goes through a transmitter and communication channel to a receiver and ultimately the destination. For example in a conversation between two people the sender's brain is the information source, the acquirer's brain the destination, the sender's vocal system is the transmitter, and the acquirer's ear is the receiver. Unwanted additions to the message are occurring when the signal is received are deemed 'noise' (Shannon and Weaver, 1949). 'Meaning' in this context has no bearing on the term information as a message may contain

'gobbledegook', but still be transmitted in this model. Case (2007) agrees that meaning is not a necessary attribute of something regarded as information, as in his view information "can be any *difference* you perceive, in your environment or within yourself. It is any aspect that you notice in the pattern of reality" (original emphasis) (Case, 2007 p5). Bates (2006) goes much further suggesting that information is all encompassing and "includes all physical patterns of organisation, all biological patterns of organisation of life forms, and all constructed...patterns of organisation as extracted, stored, and used by living beings" (Bates, 2006 p1035).

Other researchers argue (Shenton, 2004 p370) that information must contain 'meaning' – messages without 'meaning' are not information. Does something need to be informative to qualify for the label of information? Losee (1997) believes that random or valueless messages (such as repeated and already understood messages) were not information to start with and therefore no information could be transmitted in this case. He goes on to proffer the following definition of information as being "produced by all processes and it is the values of characteristics in the processes' output that are information" (Losee, 1997). Losee's view is that what is contained within the message will determine whether it can be classified as 'information'.

Buckland (1991) using the Oxford English Dictionary (1989) as source suggests there are three principal uses of the word "information":

- a. information-as-process: when someone is informed, what they know is changed
- b. information-as-knowledge: used to denote that which is perceived in "information-as-process"
- c. information-as-thing: used attributively for objects, such as data and documents.

The recent edition of the Concise Oxford English dictionary however, offers just two definitions: "facts or knowledge provided or learned"; and "what is conveyed or represented by a particular sequence of symbols, impulses, etc." (Soanes et al., 2006 p730). In the latter case Buckland's information-as-

knowledge is broadly represented within the first definition, with information-as-process and information-as-thing merging into the second definition.

Buckland (1991) argues that information can be seen to be synonymous with evidence, suggesting that if something does not have the characteristics of evidence (denoting understanding, ability to change knowledge and beliefs) then it should not be considered information. He goes on to list the types of information that can be considered informational as: data, text and documents, objects, and events. But also counters by suggesting that potentially everything could be considered information and as such calling something information does not define it (Buckland, 1991). Lloyd (2007) agrees in part with Buckland that information must contain meaning to the individual encountering it, but suggests that this makes information a higher form than just 'data'. In essence what could be considered information to one person may be meaningless to another and as such information needs to hold some 'value'. As information contributes to a person's state of 'being informed' it therefore contains value (Saracevic and Kantor, 1997) and in this way the amount of information in any given situation may be person-specific and affected by external factors (Losee, 1997).

It is clear that defining information is a thorny issue; however for the purposes of this research information is regarded as something containing value to the individual encountering it – it must contain something that *informs* them. How information is acquired is further defined.

4.2 Information behaviour, Information seeking behaviour, and Information searching behaviour

The broadest term pertaining to the acquisition of information is *information behaviour* (IB). This has been defined as "...the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use" (Wilson, 2000 p49). This view "encompasses information seeking as well as the totality of other

unintentional or *passive* behaviours (such as glimpsing or encountering information), as well as purposive behaviours that do not involve seeking, such as actively *avoiding* information” (original emphases) (Case, 2007 p5). This holistic view includes obvious information gathering acts as face-to-face communication and actively searching sources for information, as well as passive reception via TV ads without any intention to act on the information given (Wilson, 2000). Davenport (1997) suggests that IB “refers to how individuals approach and handle information”, including: searching for it, using it, modifying it, sharing it, hoarding it, ignoring it. This view is not as all-encompassing as Case, and is more in line with the term *information seeking behaviour*.

Information seeking behaviour (ISkB) is what an individual does when they believe they have an information need. This need is the “recognition that your knowledge is inadequate to satisfy a goal that you have” (Case, 2007 p5) and requires some form of deliberate, intentional action to resolve. The definition of ISkB has a degree of agreement within the information science field. An early definition by Krikelas (1983) states that ISkB is “any activity of an individual that is undertaken to identify a message that satisfies a perceived need” (Krikelas, 1983 p6). This is in line with Case’s view of ISkB as the “conscious effort to acquire information in response to a need or gap in your knowledge” (Case, 2007 p5); whilst Wilson emphasises the aim of ISkB as “... the purposive seeking for information as a need to satisfy some goal “ (Wilson, 2000 p49) including the interaction with manual information systems (newspaper, library) or computer-based systems (Internet). More broadly speaking ISkB can be seen as the ‘active’ or ‘conscious’ element of IB (Spink and Cole, 2004b p657). ISkB is what takes place when an individual (or group) identifies an information gap and purposefully tries to fill it.

Information searching behaviour (IShB) is a subset of ISkB concerned with “...the ‘micro-level’ of behaviour employed by the searcher in interacting with information systems of all kinds” (Wilson, 2000 p49). This includes any interactions with the system such as ‘human computer interaction’ (use of mouse and clicks on links); and at the intellectual level (search strategies, or

choosing books from library shelf). This also includes mental acts such as judging relevance of retrieved data/information and the interactive elements between a user and an information system (Spink and Cole, 2004b p657) What distinguishes IShB from ISkB is the focus on processes and the support for these; it's the physical acts of looking for information (and how these manifest themselves) and does not incorporate where to look and why.

Research into the whole IB arena is broad and diverse with many competing research strategies and methods employed (Urquhart, 2011).

These 'information acquisition' concepts are frequently displayed as conceptual models with the greater degree of focus on the searching and seeking processes.

4.3 Models

Wilson's (1999) nested model (figure 4-2) suggests a relationship between IB, ISkB and IShB. IB is the umbrella term encompassing information seeking behaviour (the methods employed to discover and access information sources) and information searching behaviour (the interaction of users with information retrieval systems and resources).

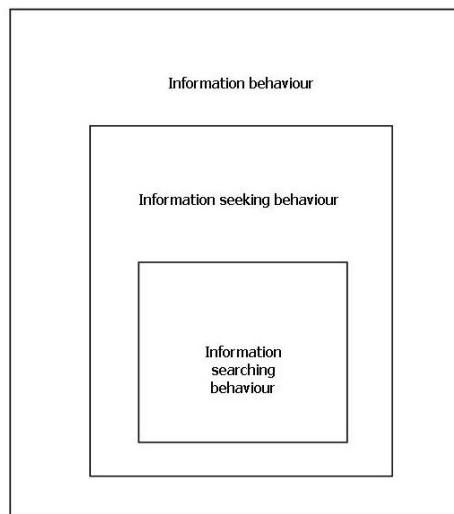


Figure 4-2: Wilson's (1999 p263) nested IB model (reproduced with publisher's permission)

4.3.1 IB Models

Research has tended to focus on the formulation of models for information seeking and searching processes, and although there are general models which attempt to conceptualise a broader view of information acquisition there is an apparent dearth of research into IB as defined earlier. There appears to be no complete model that includes passive information acquisition unless it is viewed within the context of serendipity or browsing. Nevertheless, broad models that include environmental and situational factors that impact on the information seeking process are useful in spite of this lack of completeness.

The next section focuses on a series of models that attempt to qualify the way individuals search for information. The list is not comprehensive but does provide a general feel for the different aspects of ISkB research. Some concentrate on single aspects within the ISkB process whilst others are more comprehensive in nature.

Dervin's Sense-Making

Although not strictly a model of IB, Dervin's Sense-Making theory [see: *Dervin et al (2003) for a compilation of documents on the topic*] has underpinned so much subsequent research into the IB field that it warrants discussion here. The sense-making approach is a generalisable methodology that can be used to study communication in any situation (Dervin, 2003 p277). Dervin's view is that individuals are continuously encountering and making sense of situations, but discontinuity can occur when 'gaps' arise. Bridging these subsequent gaps – the interpretation of the gap and methods sought and used – determines how the individual proceeds. The gap can be seen as both a barrier and a prompt to action depending on the perception of the individual (Godbold, 2006) with bridge construction occurring in many or few phases depending on the size of the gap (Savolainen, 2006a). Dervin depicted a sense-making triangle with 'Situation', 'Gap' and 'Use' at the three points, although Wilson's (1999) modified version appears more intuitive showing the process of 'gap encountering' (figure 4-3).

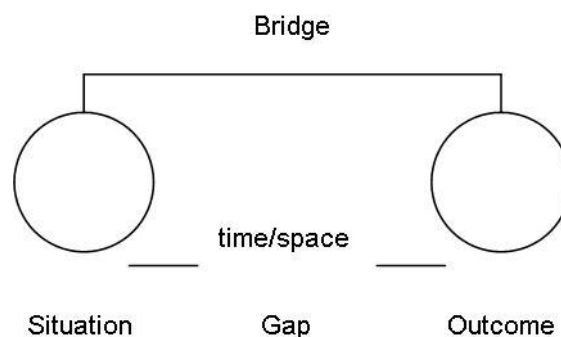


Figure 4-3: Dervin's Sense-Making theory modified by Wilson (1999 p254) (reproduced with publisher's permission)

The theory has evolved through the decades since its inception in the early 1970's with one of the main developments being the notion of 'verbing' (eg: Dervin and Frenette, 2003). The notion of changing from a focus on nouns to a verbing approach can be seen from Dervin's example of obesity. The nouning approach would define obesity as a physical condition leading to the potential for ill health; whilst in a verbing approach people would be making sense of their obesity from their own experience (Dervin and Frenette, 2003). Sense-Making as seen by the verbing example is a necessarily subjective approach, however, is not solely based within the qualitative research paradigm (Dervin, 2003).

Sense-Making theory does not claim to be an IB model and to deride its lacking in aspects such as serendipity and passive information acquisition, and its over emphasis on the 'individual', would be a disservice. The methodology offers a different perspective to information seeking research and will be revisited in the Integrated General Models section of this chapter.

4.3.2 Factor relationship models

Wilson's (1981) first ISkB model (although at the time he claimed it was not aiming to model the ISkB process) shows a set of factors that impact on information behaviour. The model was subsequently updated in 1996 (Wilson and Walsh, 1996) and modified in 1999 (Wilson, 1999) to indicate that an element of looping could take place in particular through the demands on systems and sources (figure 4-4).

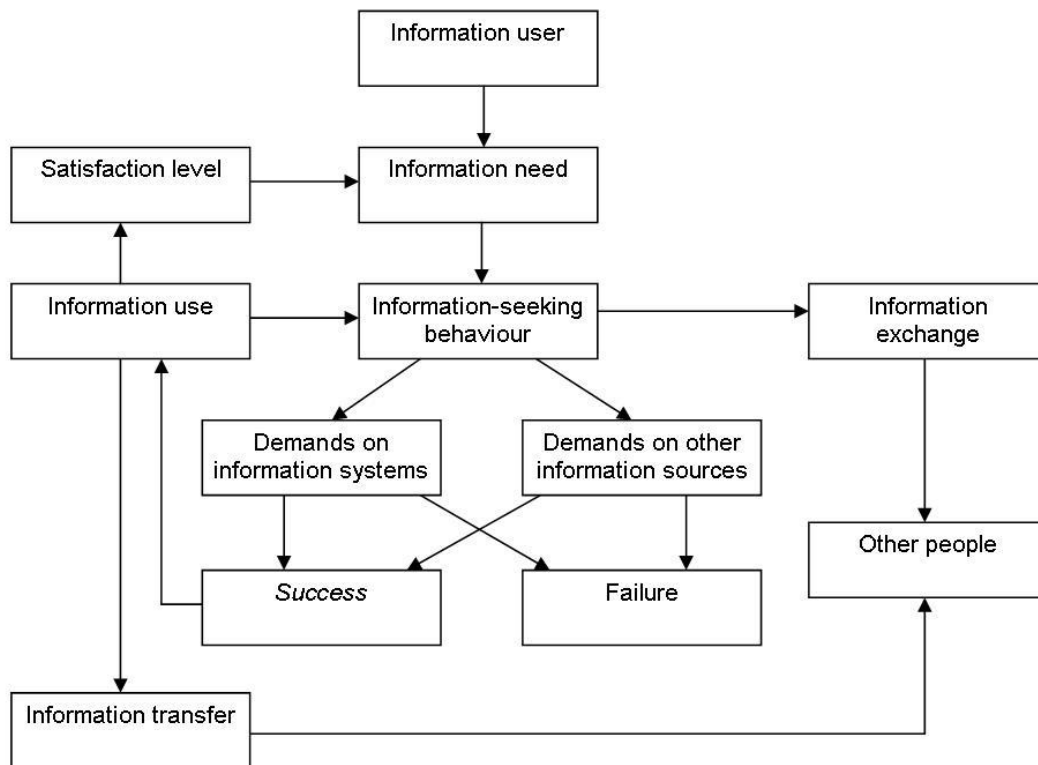


Figure 4-4: Wilson's 1981 model of Information Behaviour - updated by Wilson (1999) (reproduced with publisher's permission)

NB: the arrows between 'Information-seeking behaviour' and 'Demands on information systems', and between 'information-seeking behaviour' and 'Information exchange', and 'Information exchange' and 'Other people' were all initially double-headed.

Wilson's model shows that ISkB results from a perceived information need by a user and the possible routes taken to satisfy this need. This model shows aspects of ISkB as separate entities i.e.: Other people, and does not show an end point. 'Satisfaction level' could be construed as such a point, but if 'Other people' have been utilised, this is a 'dead end'. Wilson himself acknowledges that failure "...may be experienced when seeking information from other people" (Wilson, 1981 p4), but the only link to failure is through the two-way process back to ISkB in the original model and not at all in the updated version. It is also unclear to what extent 'failure' can be defined as 'give up'. When the user experiences 'failure', what do they then do? Could they not re-evaluate their 'need' and try again? The model which is clearly purposive in treating information 'as thing' does not allow for this and could be considered as a single information seeking process even though it is not stated as such.

Wilson's second model (Wilson, 1981) is an early attempt to quantify external influencing factors on the ISkB process. Here Wilson identifies that needs can

be physiological (water, shelter), affective (emotional), or cognitive (to learn), and that these are interrelated. These needs are in turn influenced by the individual's role and the environment. In terms of satisfying a need; ISkB will be affected by personal, interpersonal and environmental barriers. These barriers may result in incomplete satisfaction of the need (whether noticed or not by the seeker), or in fact prevent ISkB taking place at all. He allows for time-lags, serendipity, different types of information sources, and the personal characteristics of the information seeker. It is a useful model in terms of the expansion of external and affecting factors, but again the idea of a conscious need impinges on its value as a general model of IB.

Another often cited early ISkB model is that of Krikelas (1983), who in a similar manner to Wilson postulated ISkB in the context of a set of processes influenced by external factors. According to Krikelas's model (although his description doesn't correlate with this) there are two types of 'information acquisition'; information gathering, and information giving. For Krikelas information gathering concerns activities that result in information being acquired and stored for future use resulting from a "deferred need". Information giving, however, is the "act of disseminating messages" (Krikelas, 1983 p13). Krikelas somewhat confusingly also states that "activities associated with satisfying immediate needs are information-seeking behaviour" (Krikelas, 1983 p8), which is not shown in his model. Thus the model shows two aspects of IB in terms of needs requirement: deferred and immediate. Krikelas suggests that satisfying deferred needs could be both structured (keeping up to date with literature), and casual; but in either case it is still purposeful – a need must exist. If Information Giving is akin to ISkB, the model shows a series of steps that are taken in order to answer the initial query. Krikelas's model does not account for a poor search outcome and there is no feedback or looping in the process. The model also does not include any influencing element of environmental or personal factors that Wilson raised in his second model (Wilson, 1981). Although the intervening three decades has seen an increase in the ease of access to electronic resources, Krikelas's view that individuals find information from the most convenient place first (e.g.: people) still applies today (Stokes and Lewin,

2004, Julien and Michels, 2000, Lathey and Hodge, 2001, Haines et al., 2010).

4.3.3 Search process models

Kuhlthau's (1993) stage based search model is based on the progress from uncertainty to either satisfaction or disappointment in the IShB process (figure 4-5). It is a series of stages with each representing a task appropriate to move on to the subsequent stage; as such it is essentially a linear model. The process begins with an individual identifying a specific information need (initiation) at which time uncertainty is greatest. This stage is followed by 'selection', 'exploration', and 'formulation' akin to orientating oneself to the situation and problem at hand, and deciding on a course of action. It is only at the 'collection' stage that information retrieval in fact begins, with the individual actively gathering information. The final 'presentation' stage is the problem resolution phase resulting in satisfaction if the processes have gone well, and disappointment if they have not.

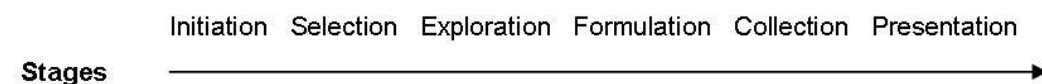


Figure 4-5: Representation of Kuhlthau's (1993) 6 stage model of the information search process

Kuhlthau's model was initially developed through research studies and has since been subjected to empirical research on library users (Kuhlthau, 1999) and through various case studies (see: Kuhlthau, 2004).

Ellis's (1989) model developed from empirical research using social scientists shows eight 'steps' in the ISkB process (figure 4-6). Although the model appears to show a series of ordered stages that form the complete ISkB process (in a manner similar to Kuhlthau); Ellis suggests that the components of the model can interact in different ways and that the model does not represent a set of phases that are consistently followed by all researchers. Thus Ellis's model is not directional, but it is hard to see how 'starting' and 'ending' could be anything other than the beginning and finish of the process.

Ellis's model has been subjected to empirical research (Ellis and Haugan, 1997, Ellis, 1993) and found that with different 'types' of searchers, the model was still valid.

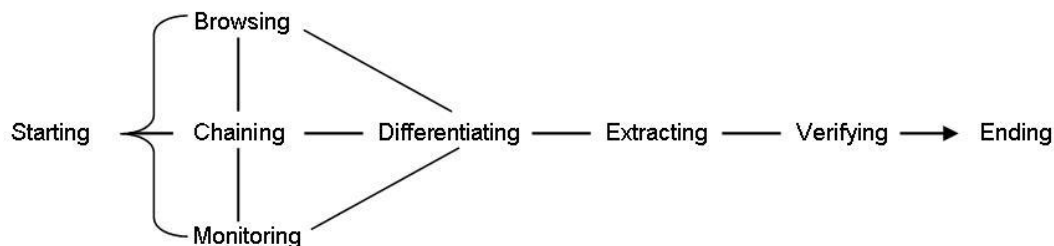


Figure 4-6: Ellis's (1989) model shown as a stage process version (from Wilson 1999) (reproduced with publisher's permission)

NB: Further research by Ellis (Ellis and Haugan, 1997) resulted in some changes to the terminology, although the essence of each process remained the same and no process was removed from the model. For example 'starting' was replaced with 'surveying' and 'differentiating' replaced with 'distinguishing'.

Despite the non-directional assertion of this model it is hard not to see similarities with Kuhlthau's model and indeed both have been merged in the past (Wilson, 1999). Recent research testing Ellis's model (Meho and Tibbo, 2003) supported the non-sequential nature of the model, but identified additional elements of networking, managing, synthesizing, and analysing within the ISkB process. Meho and Tibbo (2003) also found that these micro-elements could be grouped into four interrelated stages: searching, accessing, processing, and ending.

4.3.4 Task based models

Bystrom (2002), Bystrom and Hansen (2005) and Bystrom and Jarvelin (1995) suggest that the success or otherwise of the ISkB process depends on the complexity of the tasks involved in locating the desired information and that more sources are consulted when the information required is more complex. Bystrom and Jarvelin's model (figure 4-7) was developed following research on civil servants and has since been empirically tested and validated (Bystrom, 2002, Bell and Ruthven, 2004). This shift in focus from 'problems' to 'tasks' and the perceived difficulty of the tasks for the individual seeking the information impacts on the success of the search process (Case, 2007).

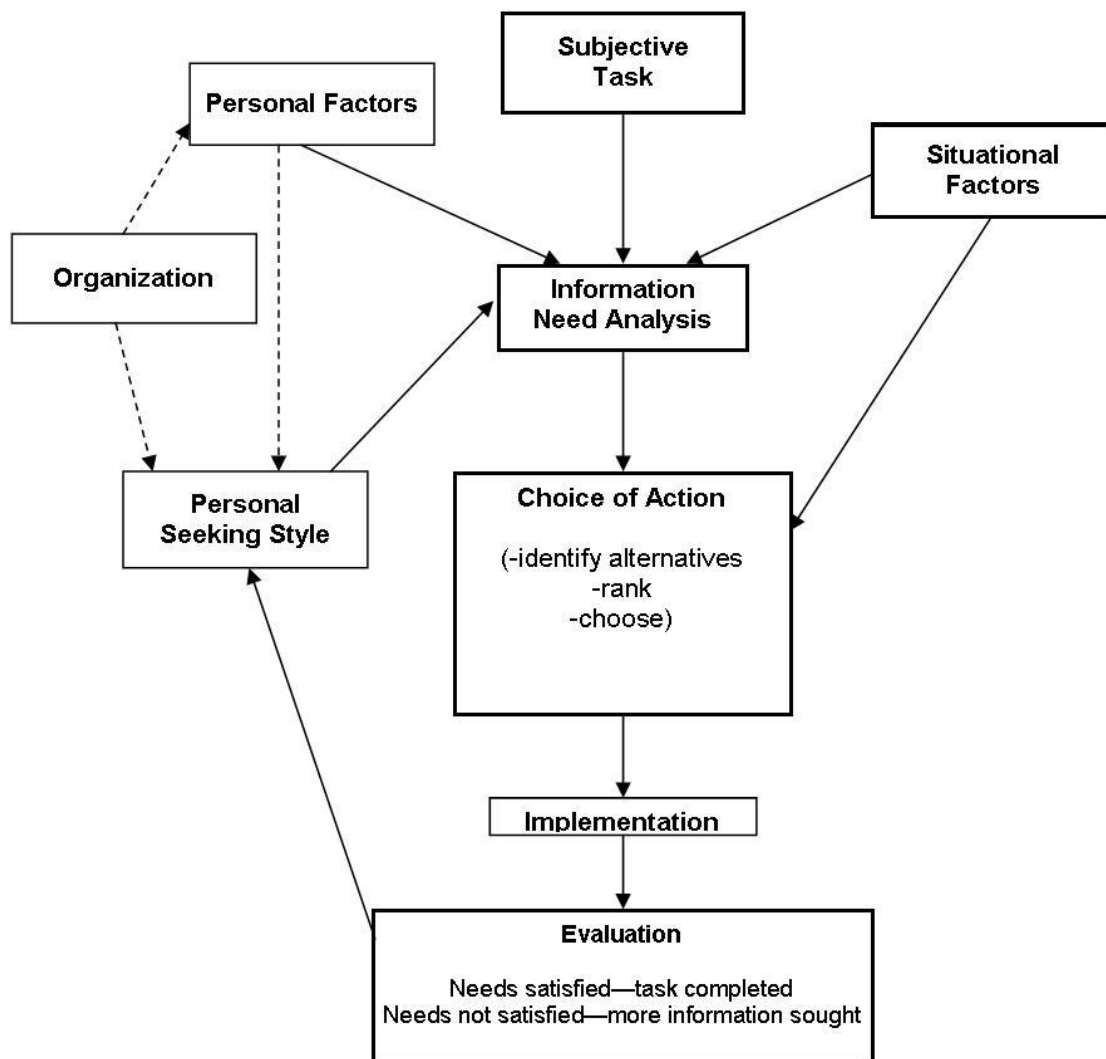


Figure 4-7: Bystrom and Jarvelin's (1995) task-based ISkB model (reproduced with publisher's permission)

The model is again directional in that it is a step-by-step process that relies on each step being completed before moving onto the next, but it encompasses feedback within its structure. This feedback mechanism is reliant on the evaluation of the search (whether; “completed”, “it’s impossible”, or “need more”) and the individual’s personal seeking style (Case, 2007). One individual might feel they haven’t enough information and carry on searching, whereas someone else with the same (or less) information may feel they have completed the task.

A second task-based model derived from an existing research base is that of Leckie, Pettigrew and Sylvain (1996). Three distinct professional groups

(engineers, health care professionals, and lawyers) were used to develop the model; however the model is intended to be generalisable across all professions. This model focuses on six distinct aspects: work roles, tasks, information needs, awareness, sources, and outcomes. In this model work roles influence tasks which in conjunction with information needs, then determine the way information is sought. Once again this is a directional model with a definitive starting point. Feedback is incorporated into the model depending on the outcomes of the search process and this is dependent on both the sources of information and the awareness of the individual that information exists.

4.3.5 Non-linear process model

Foster's (2004, 2005) non-linear model of ISkB was developed from natural inquiry research on 45 academics (figure 4-8). Foster's research showed that rather than having a 'chain' of events linked together in a particular direction, the ISkB process was in essence non-sequential involving a series of loops, feedback, and with differing start and end points. He describes the process as non-linear, holistic, dynamic and flowing (Foster, 2004 p235). From this analysis Foster developed a new model of ISkB clearly differing from early 'stage-based' models. This model is distinctly different to the sequential models highlighted thus far in that the behavioural patterns involved in ISkB are available to the searcher throughout the whole process in a manner analogous to an artist's palette (Foster, 2004). This model contained three Core Processes (opening, orientation, consolidation), within three levels of contextual interaction (cognitive approach, internal context, and external context). In identifying the Core Processes Foster was able to recognise and categorise eighteen separate 'micro-processes' in the ISkB process. The contextual interactions covered time, situational factors, personal factors, and cognitive factors; whereas the micro-processes of the model include: serendipity, refining, browsing, and monitoring; all seen within Ellis's and Kuhlthau's models. Foster suggests that all the stages and processes are linked in a "dynamic interplay" (Foster, 2004 p234)

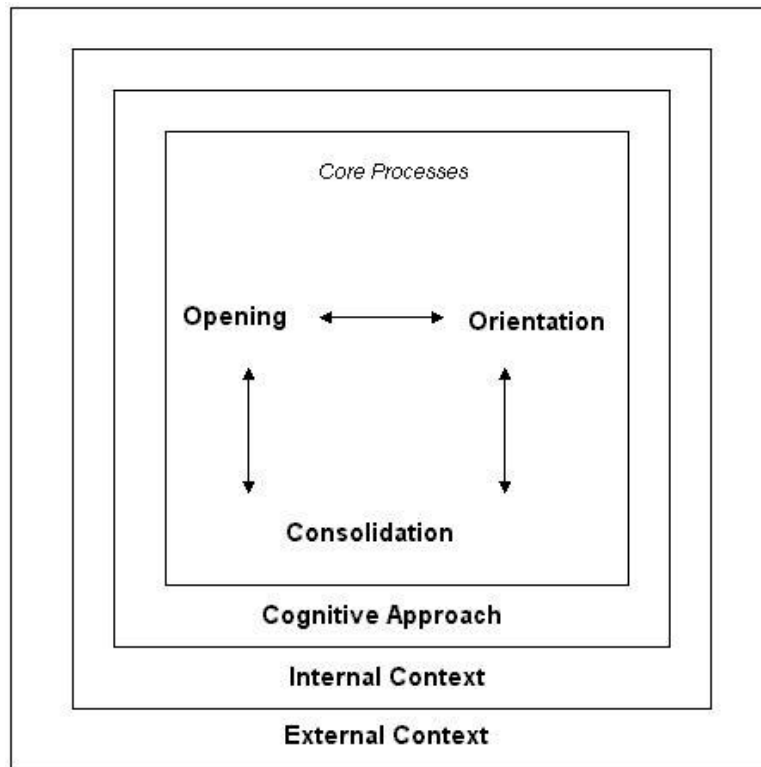


Figure 4-8: Foster's (2004, 2005) model of non-linear ISKB (reproduced with publisher's permission)

These micro-processes are distinct elements in their own right and lend themselves to individual study. In this context it is possible to investigate whether an individual does or does not prefer to do any single micro-process. As such these micro-processes were used to form the information seeking section of the questionnaire used in this research. These micro-processes and the way they have been utilised in the questionnaire are further discussed in the data collection section 10.1.1.

On-going research has redefined some of these processes in an interim publication (Foster et al., 2008). The research has renamed the internal and external contexts as intrinsic and extrinsic contexts respectively, with the addition of motivation to the intrinsic context. In addition micro-processes have been further refined (e.g.: Browsing which was initially defined as 'open' or 'selective' has now been defined in a narrower context; and Breadth exploration could be represented as a 'cline', or scale depending on how much was done during the search).

This concept of non-linearity also manifested from research on students (Bowler, 2009) which initially used Kuhlthau's essentially sequential model, but found the data did not fit. Bowler termed this 'genres of search' in which the "path towards the solution is not a single straight line, but a collection of different types of searches that are separate but related successive searches" (Bowler, 2009 p134). This differs from Foster's model as Bowler suggests separate searches, whereas Foster suggests different processes within an overall search process.

4.3.6 Integrated general models

The tendency still persists to concentrate on modelling the process of information seeking and the stages involved in finding information, rather than intervening factors external to the process and passive acquisition of information.

An early integrated model by Wilson and Walsh (1996) drew on the earlier models of Wilson already discussed in addition to incorporating further theories and mechanisms (figure 4-9). This is again a sequential model in which stages are completed in order to move on to the next. It also relies on certain theories and contexts affecting different individual stages of the process.

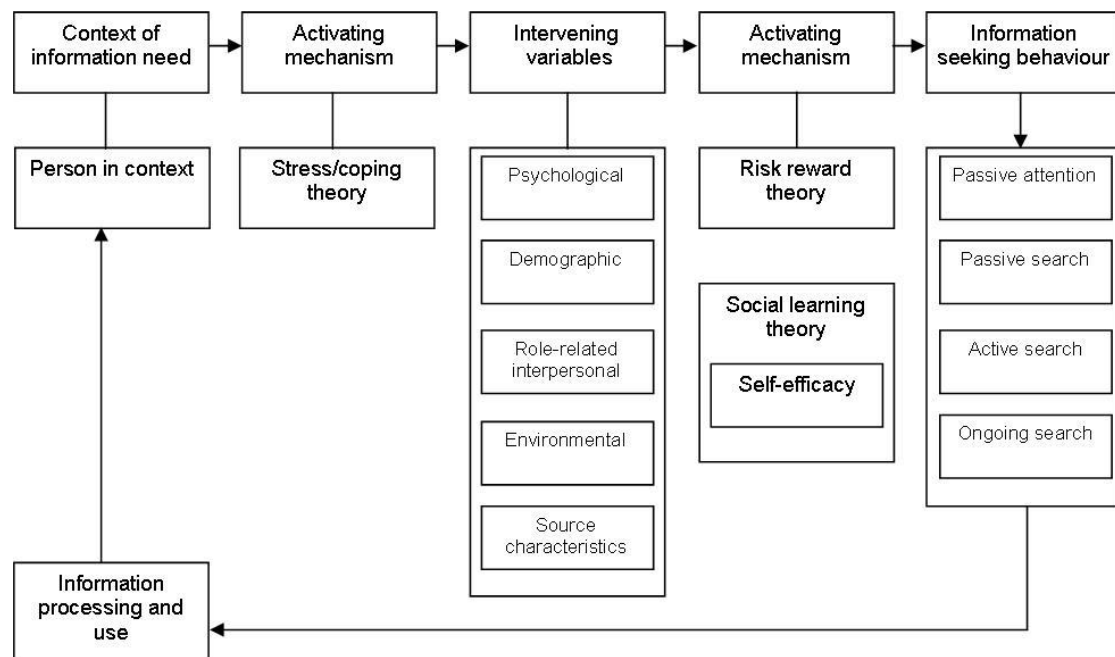


Figure 4-9: Wilson's (Wilson and Walsh, 1996) model of ISkB (reproduced with permission of copyright holder).

The model does incorporate aspects of passive information acquisition and in view of this and the additional variables, Wilson and Walsh (1996) suggest this model applies more generally to IB rather than ISkB. The authors do acknowledge that certain potential affecting factors (situation and personal) have not been incorporated into the model, but it can be seen as a 'kick-start' to the formulation of general information behaviour models.

Sonnenwald and livonen's (1999) model was perhaps the first clear attempt to produce a comprehensive Human Information Behaviour (HIB) model (figure 4-10). This model was derived from a meta-analysis of previous studies of information behaviour and includes five general facets in line with Ranganathan (1957, cited in Sonnenwald and livonen 1999 pp. 434-436): personality (who is doing the searching), matter (sources, technology), energy (the action taken), space (tasks, organisational), and time (constraint for the search). It contains fourteen separate categories within these five facets including: different lengths of time, goals, and social networks.

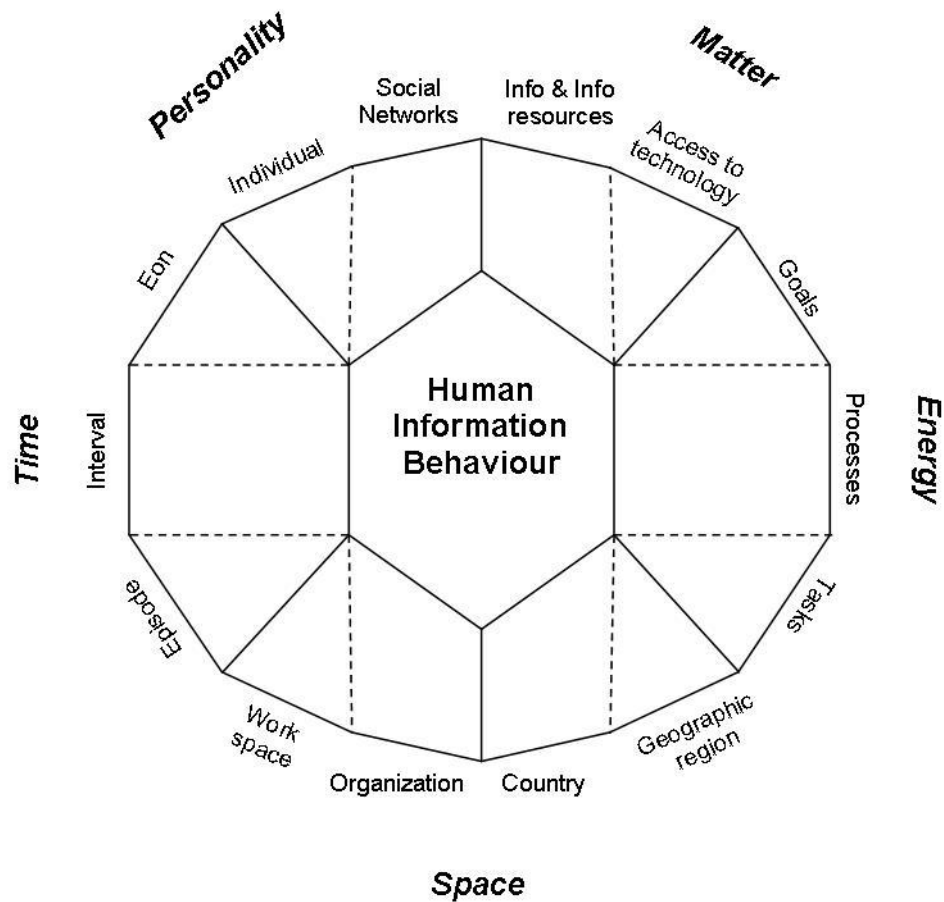


Figure 4-10: Sonnenwald and Iivonen's (1999) model of IB (reproduced with publisher's permission)

This model benefits from the inclusion of external factors, but conversely to the other models does not include elements of the search process. It is also limited by the vagueness of any interactions between elements and that it cannot be assumed that the same features would be repeated always and everywhere (Sonnenwald and Iivonen, 1999 p451). It is not clear whether any elements are sequential although clearly there is not a step-by-step process within the model. The model does, however, provide a framework of facets for general HIB research.

Following research on managers in the Polish health care system Niedzwiedzka's (2003) formulated a revised general model of Wilson's (1996) model that has already been described (figure 4-11).

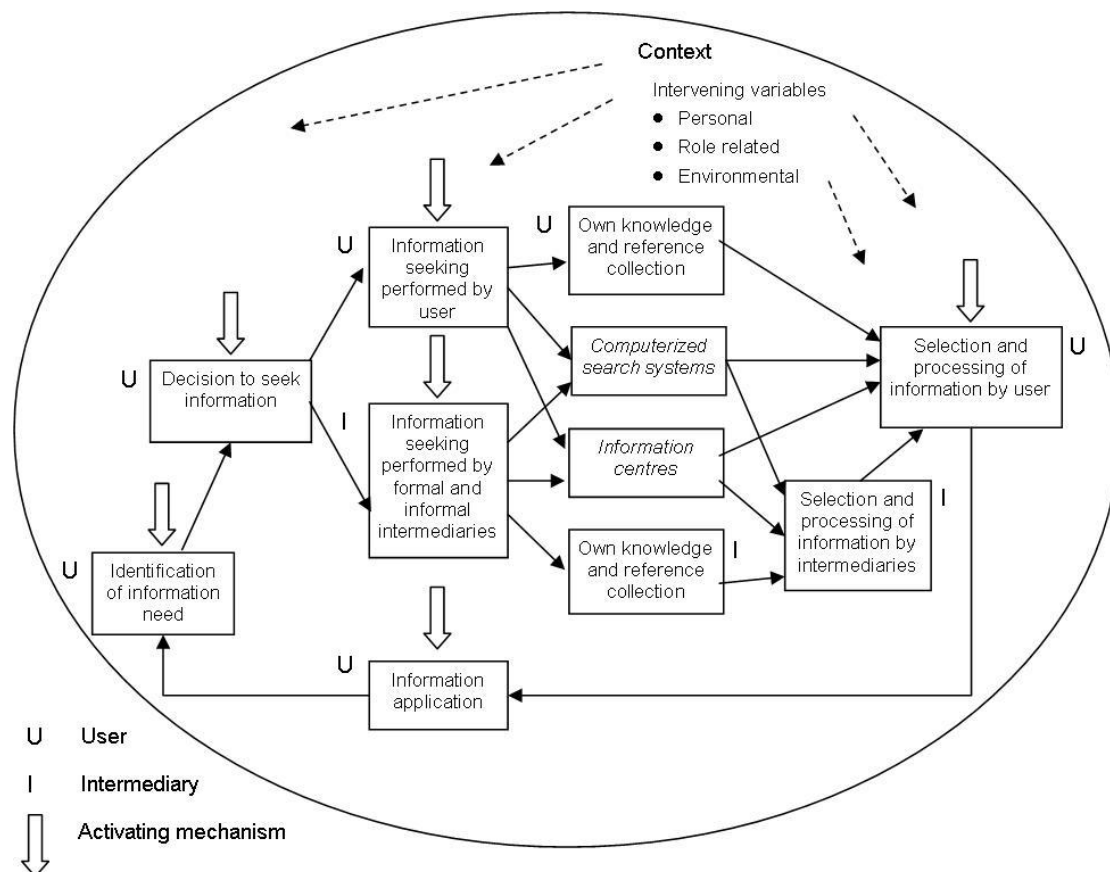


Figure 4-11: Niedzwiedzka's (2003) model of ISkB. (Reproduced under Creative Commons)

Niedzwiedzka's model still incorporates the cyclical nature of ISkB and includes activating mechanisms at various stages within the cycle. These mechanisms, however, now affect more stages and particularly those relating to information acquisition. The intervening variables now affect the whole process not just individual aspects of the cycle and thus they can influence the process at all stages. There are now two strategies open to the individual seeking information: personally, or using intermediaries. ISkB can include only one of these strategies (fully independent), both strategies (partially dependent), or only intermediaries (fully dependent). This model (acknowledged by Niedzwiedzka) is still incomplete in that ISkB does not necessarily follow a cycle (non-linearity), and that certain aspects of IB are not included (incidental information acquisition and information encountering). In view of this the model necessarily is limited to ISkB rather than IB in general.

Using previously proposed models of ISkB and IB, Godbold (2006) devised a model focussing on the 'information behaviour wheel' (figure 4-12).

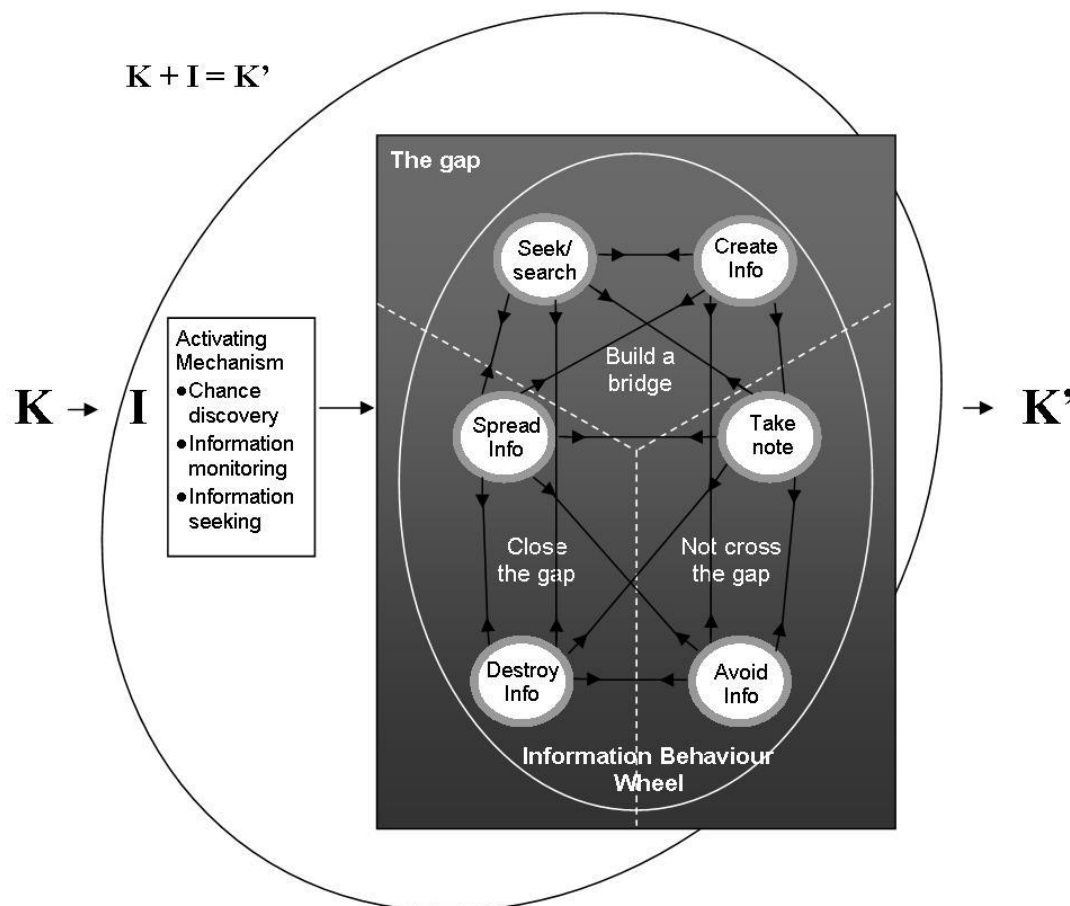


Figure 4-12: Godbold's (2006) model of IB (*Reproduced under Creative Commons*)

This model was formulated by looking critically at models by various authors (Wilson, Dervin, Kuhlthau, and Ellis in particular) in order to create a model that incorporated ideas from these but extended the overall concept to include aspects of multi-directionality (akin to Foster's non-linearity). Godbold's idea here is that an individual encounters an information gap (see: Dervin, 1999, Dervin, 1998) after experiencing one of three potential activating mechanisms: chance discovery, information monitoring, or information seeking. The individual then tries to either close the gap, build a bridge, or doesn't bother closing the gap (or a combination of the three) and following this their knowledge structure changes. Godbold also suggests that the gap may

appear larger or smaller, or that other gaps may appear within the information wheel whilst the individual is closing a different gap – resulting in looping and feedback mechanisms (Godbold, 2006). This model takes its main concepts from Dervin and Wilson's various models to provide a generalised model. It includes elements of feedback and non-linearity, and chance discovery. It does not however explicitly include the concept of passive information acquisition which by its very nature requires no effort on the part of the individual to undertake strategies to navigate a conceived 'gap' as no 'gap' necessarily exists. It could be envisaged that passive information acquisition bypasses the wheel still resulting in a changed knowledge state, but with no conscious attempt by the individual to close a gap.

Spink and Cole's (2006a) unified HIB theory is a comprehensive model that unifies four information seeking approaches: problem solving, sense-making, everyday life information seeking (ELIS) leading to a 'mastery of life' (see: Savolainen, 1995), and information foraging (see: Pirolli and Card, 1999), integrating these approaches and principles of evolutionary psychology into a perspective on the 'total human information condition' (Spink and Cole, 2004a) (figure 4-13). This model has been shown and discussed in various guises (Spink and Cole, 2004a, Spink and Cole, 2006a, Spink et al., 2006, Spink and Cole, 2006b, Spink and Currier, 2006) and is still evolving. The depiction here is a remodelled representation of these entities.

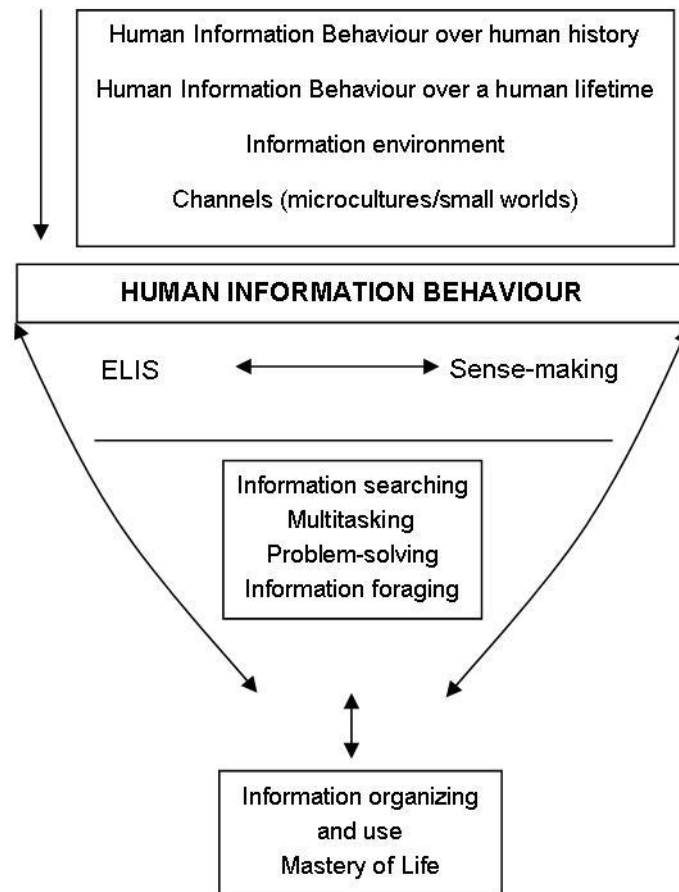


Figure 4-13: Spink and Cole's integrated HIB model. This version has been adapted from (Spink and Cole, 2006a and Spink et al., 2006).

The inclusion of ELIS and sense-making theories within the model increases the level of completeness within the context of HIB as these concepts include aspects of non-purposive information seeking (serendipity, browsing). Once again, however, a lack of provision for passive information acquisition is a limitation, the inclusion of which even non-overtly would enhance the model. A variation on this model (Spink and Heinstrom, 2011) depicts six levels and a range of dimensions within each. These levels correspond to:

- Evolutionary foundation
- Cognitive, affective and social behaviour
- Sub-processes
- Lifetime development
- Context
- Information grounds and worlds

In the model, the levels interact with each other to form a complete IB model, but there remains no overt inclusion of passive information acquisition.

One final model of IB discussed here is that of Urquhart and Rowley (2007) (figure 4-14). This model focuses on a single group (students) and is necessarily limited in that respect. It shows the factors (macro and micro) that impact on this specific group in respect to information behaviour and has been formulated in part from previous models (including: Kuhlthau, Wilson, and Foster) and also from research into the information seeking behaviour of college and University students within the UK. The model contains five macro-factors that impact to varying degrees on the six micro-factors. These micro-factors in turn impact directly on student information behaviour, and also on each other.

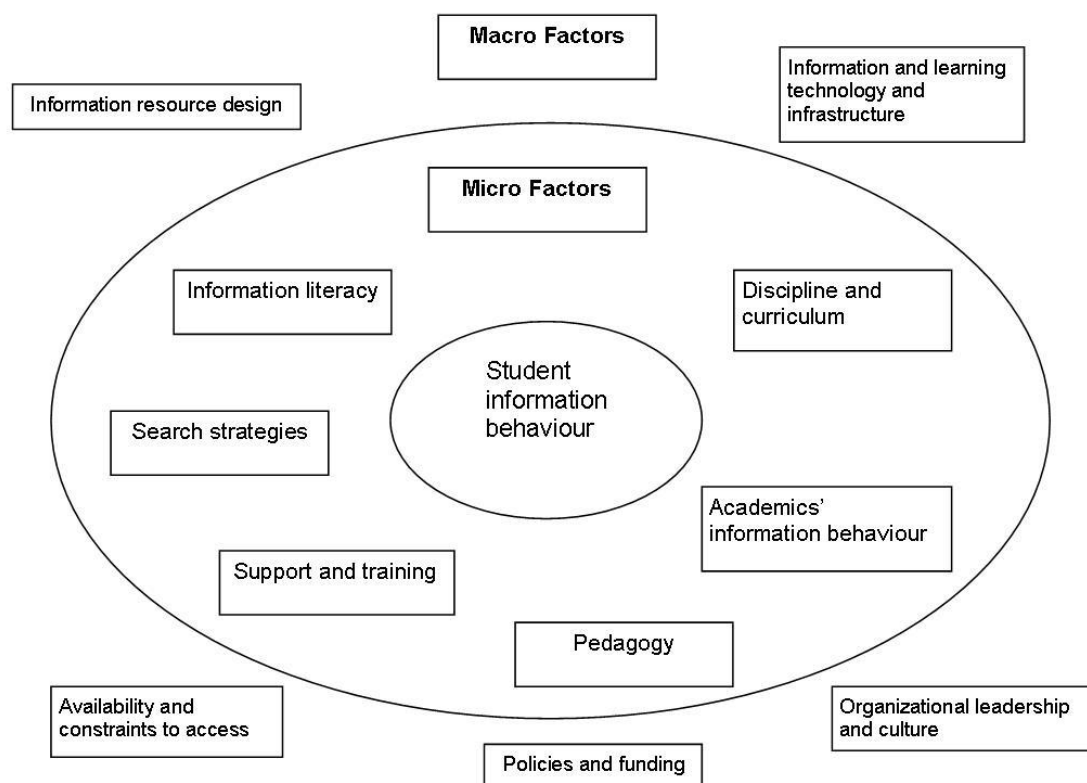


Figure 4-14: Urquhart and Rowley's (2007) model of student ISkB (reproduced with publisher's permission)

By showing the factors as separate disparate entities Urquhart and Rowley are not restricting the model to specific relationships or associations; in

essence any factor can influence or impact on any other, and a good level of one factor can be affected by poor levels of another (Urquhart and Rowley, 2007 p1196). The model does not go into detail regarding each factor, but the supporting evidence and rationale does describe what each factor is concerned with. Nevertheless, once again this model is focussed on the notion that information seeking is purposeful and does not include passive information acquisition. This may in part be due to the subject group used to produce the model, although it is difficult to see how any 'targeted' group would necessarily show evidence for passive information acquisition.

So, much work has been done with models of information seeking. The next section looks at some of the numerous concepts involved in information seeking.

4.4 Tasks

The study of tasks as a key concept within ISkB research generally takes the viewpoint of a 'worker' (Bystrom and Hansen, 2005, Vakkari, 1999). A task is either an abstract construction (defining an item of work and the requirements to fulfil it) or a set of actions (doing the item of work) (Bystrom and Hansen, 2005). Task-based models already described show the stages that take place when individuals attempt to accomplish tasks. At the start of the process individuals estimate the level of task complexity "on the basis of their knowledge of the task procedure and requirements" (Bystrom, 2002 p582), thus each individual may estimate the level of complexity differently (Jarvelin and Wilson, 2003). Prior knowledge is vital in determining what information is needed to accomplish a given task (Vakkari, 1999) and the perception of complexity is inherent within this. Clearly the more an individual is aware of the elements within the task, the better equipped he is in assessing the information requirements and processes for successful accomplishment, and criteria for relevant material (Vakkari, 1999 p826). As the individual undertakes the task, its structure becomes clearer and thus less complex (Vakkari, 1999), but what if the task actually becomes more difficult? Bystrom and Hansen (2005) suggest that complex tasks have a series of sub-tasks that must be accomplished to ensure a meaningful conclusion. They also suggest that the task may be completed unsatisfactorily and only retrospectively is it acknowledged to have been completed (Bystrom and Hansen, 2005 p1052). Bystrom and Jarvelin's (1995) empirical research that created the model already described was formulated using questionnaires and work diaries of 14 civil servants. Ninety-four work tasks were identified and 25 of these qualitatively analysed and divided into five separate categories: automatic information processing, normal information processing, normal decision, known-genuine decision, and genuine decision; in order of increasing complexity. The type of information needed to accomplish the tasks was also divided into three types: problem information (structure, properties, and requirements at hand), domain information (known facts, concepts, laws, and theories), and problem-solving information (how problems

should be seen and formulated). Bystrom and Jarvelin concluded that the more complex a task then: the complexity of information increases; the needs for domain and problem-solving information increase; general-purpose sources increase; success of information seeking decreases; the internality of channels decreases; and the number of sources increases (Bystrom and Jarvelin, 1995).

Bystrom's (2002) study on 39 municipal officers at two local government organisations in Finland used task diaries and interviews and subsequently analysed 78 tasks. These tasks were categorised with increasing levels of complexity as: automatic, normal, and decision. They were also classified by information type and information sources. She found that increasing levels of complexity showed a higher degree of use of other people as information sources rather than documentary evidence.

The application of task theory to web-based information searching has been studied (Kim, 2007) using thirty library and information studies graduates. In this study three different task types (factual, interpretive, and exploratory) were adopted within a real world scenario. Searching was investigated using screen capturing software with follow up interviews. Kim found that the interpretive task required more information search strategies to complete, with the exploratory task requiring the least. Kim hypothesised that individuals spent longer deciding the relevancy of information when the task was more complex (Kim, 2007).

A related concept to task theory is the notion of 'multi-tasking'. Multitasking was first mooted by Spink et al (2002) following four separate quantitative studies on web searching and library users. Multitasking includes searching for information related to one task and then switching to search for information related to a different task (Spink and Park, 2005) as well as more broadly involving a combination of cognitive and physical actions on multiple tasks concurrently or sequentially (Spink, 2004). Multitasking information searching tends to use more keywords and query formulation than single information tasks (Spink and Park, 2005). A case study of a single library user (Spink,

2004) using a diary, observations and interviews for data collection, found that the user switched between electronic searching, physical library searches, and browsing for successive information episodes. Spink hypothesises that the level of task switching may be due to the level of interest of the user and to the relevance of the information collected (Spink, 2004). Spink also noted that the user did not have a consciously reasoned or deliberate process of multitasking. A second study of multitasking in library use (Spink et al., 2007) on 96 public library users used a diary questionnaire and a grounded theory approach. They found that over 60% of the users engaged in multitasking visits, with 105 task-switching events. Users were also found to batch information tasks, develop new information tasks during the visit, and work concurrently on information problems (Spink et al., 2007 p183).

4.5 Situation/Context

From an individual information seeker's viewpoint, the situation at hand or context in which they find themselves at the specific moment in time when information is sought could have a key bearing on how the ISkB process takes place. As already alluded to Dervin's sense making model places great emphasis on the role of the situation or context in ISkB (Dervin et al., 2003) (section 3.3.1) and her model is further analysed in relation to nurses ISkB in section 3.12.4. Context and situation are addressed together in this section due to their clear link and although context and situation are sometimes used interchangeably e.g: (Allen, 1997) this is considered the most "primitive" view of the two terms (Johnson, 2003 p739). Cool (writing in 2001) suggests that there is no clear definition of situation within the IS field (Cool, 2001), but goes on to state that whilst contexts are frameworks of meaning; situations are the "dynamic environments within which interpretive processes unfold, become ratified, change, and solidify" (Cool, 2001 p8). Contexts can be seen as the "socially defined settings which information users are found" (Allen and Kim, 2000 p1) and within each context there can be many situations. The context is larger than the situation and different contexts may have different types of situations (Sonnenwald, 1999 p3). Information Seeking addresses the

situation at hand – that is a problem within a specific context (Kuhlthau, 1999), but should avoid considering a context as a single situation in isolation with no bearing on other situations. Context can be dynamic and information seekers are shaped by the context and also shape it (Courtright, 2007). Contexts are not fixed, they have boundaries that are malleable, flexible and subject to change (Sonnenwald, 1999 p3).

Early research by Clarke and James (1967) investigated the role of situation on ISkB and whether personality had an impact on the way 79 students searched for information. They used questionnaires to determine both the self-esteem levels and the opinions of the participants. Participants were then told they would either take part in a debate or a general discussion and that they could prepare by searching for information. Clarke and James found that self-esteem was directly related to how much information participants sought in relation to the type of upcoming situation. For the formal debate situation, those with low self-esteem sought more information, whilst for the less formal discussion those with high self-esteem sought more information. It appears the amount of social interaction (linked to the level of self-esteem) is a key factor in the amount of preparatory information seeking that is done.

Allen and Kim (2000) set up three experimental environments to test for any relationship between individual characteristics and ISkB of undergraduates in relation to information system design. They used Witkins GEFT (see Learning Styles chapter) to ascertain the cognitive styles of the participants and then asked the participants to perform factual and topical web-searches. Allen and Kim found that the type of search was not linked to cognitive style, but the way the participants searched, their ISkB, was partially linked to cognitive style. These authors suggest that motivation and problem-solving style may have provided more conclusive results. They also acknowledged that the laboratory based experiment design may have impacted on ISkB – in other words the situation was artificial.

Gorrell et al (2009) on-going study into the metacognition (self-awareness) of University members in the context of web-searching has initially found that

older people appear to have higher levels of metacognition but are less confident searchers overall. For disciplines, a range of significant differences were found in terms of level of planning, confidence, and memory.

A naturalistic, longitudinal study undertaken by Kelly (2006a, 2006b) over a 14 week period investigated the ISkB of 7 PhD students. This study was designed to allow different contexts and situations to take place, develop, or change over time. The participants kept records of their web-searching including: length of time on searches, how often they searched, and their navigation methods; and took part in regular face-to-face interviews. Kelly found significant relationships between high endurance tasks with both frequency and persistence; and usefulness with task and topic. Common tasks between participants had higher endurance than more subject-specific tasks, and these remained constant over time. Kelly's approach has merit in that longitudinal research allows for changes in ISkB to occur, but the short time period (14 weeks within the duration of a PhD) nullifies part of the context within which ISkB takes place. Kelly does acknowledge the difficulties in conceptualizing the notion of context, but fails to explicitly define the context within which her research takes place.

Internet searching (in relation to personal development) has also been investigated in terms of context by Kari and Savolainen (2007) on eighteen members of the general population in Finland. They used multiple methods to obtain data: primary interview, pre-search interview, observation during a web-search, post-search interview, and finally a telephone interview; and found eleven relationships between web-searching and the goals of personal development. Kari and Savolainen were then confident enough to reduce this to four generic relationships (incorporating all eleven initial relationships) between ISkB and context. These generic relationships are: detachment (no link between ISkB and context); unity (ISkB cannot be separated from context); direction (ISkB and context are separate but one acts on the other); and interaction (ISkB and context form a process of interaction between each other and back). These four generic relationships imply that context does not always overtly affect ISkB, but rather that there are a range of possibilities.

Kari and Savolainen's research does not take into account whether particular situations affect ISkB, nor do they acknowledge other potential affecting factors such as motivation.

An interesting concept has recently been developed termed the Person-In-Environment (PIE) framework (Sin, 2011). This framework manifest from structural equation modelling of library usage data collected from over 13,000 high school children and suggests that situation/context (along with personal differences) is a determining feature of IB.

4.6 Collaborative information behaviour

The notion of collaboration within the ISkB process has several strands, with the term used to describe differing aspects and elements of ISkB.

Collaborative Information Behaviour can be seen as all the activities and processes of individuals acting as group members, engaged in a collaborative problem solving process that involves ISkB (Hyldegard, 2006). This is in line with Hansen and Jarvelin's (2005) view of the concept of Collaborative Information Retrieval which focuses on the searching process.

Collaboration also exists both between individuals and between individuals and information resources (Sonnenwald, 1999). This latter type of collaboration has been further subdivided in a review by Foster (2006) who using an information science perspective highlights that algorithms generated by user searches (collaborative querying, filtering, and user navigation) aim to benefit other users in terms of saving time. Sonnenwald's view is that HIB is a collaborative process between the information seeker and information resources creating a 'solution space' or 'information horizon'. Fisher's theory of 'information grounds' relies heavily on the idea of information sharing. Information grounds are context rich information environments created when groups of people come together, enabling sharing of information to occur (Fisher et al., 2004). Spatial factors have a key role in ISkB, being prime indicators in both information horizons and information grounds (Savolainen,

2006b). In addition 'information sharing' has been described as an umbrella term encompassing the sharing of acquired information all the way to collaborative query formulation and retrieval (Talja, 2002).

It is clear that whatever the boundaries of the various terms, collaboration can be seen as beneficial in working through difficult stages of exploring and formulating (Kuhlthau, 1999), for either groups or individual information seekers.

Hansen and Jarvelin (2005) used a grounded theory approach to investigate whether collaboration occurred during work-tasks for nine patent engineers. Using onsite observations, semi-structured and open-ended interviews, and electronic diaries they analysed twelve sub-tasks over a two month period. Sub-tasks were used as the complete patent process can take up to two years to complete. They found that collaboration occurred in all twelve sub-tasks in various guises (e.g.: notes written and classified for others to access, colleagues asking for advice); with the task preparation and planning stage, and information retrieval task level containing the highest level of collaboration. The authors acknowledge the small sample may have an impact on any results and conclusions.

Prekop (2002) in a study of working groups in the Australian Defence Force identified seven distinct collaborative information seeking roles that were undertaken by participants. These roles: information gatherer, information referrer, information verifier, information seeking instigator, and information indexer were either assigned to or adopted by the members of the groups. This research used a 'team working' context to distinguish what went on during a collaborative process, rather than focussing on how individuals collaborate during their own ISkB.

Similarly, Hyldegard (2006) studied two small groups of students to identify activities and perceptions through the ISkB process in relation to Kuhlthau's ISP model. Using diaries and interviews she found that although social and collaborative factors affected the cognitive and affective experiences of the

group, they still acted individually. She also found that Kuhlthau's model appeared to discriminate for *individual* seeking rather than collaboration *per se*.

Multidisciplinary healthcare teams in the emergency department were investigated for collaboration (Reddy and Jansen, 2008, Reddy and Spence, 2008) using a naturalistic enquiry technique. In this environment information is needed quickly and accurate information essential. Reddy and Jansen (2008) found that three main 'triggers' were responsible for collaboration: lack of accessible information, complexity of need, and lack of expertise. From this research and a previous study on an intensive care unit (see: Reddy and Jansen, 2008), a model of collaborative information behaviour was developed (Reddy and Jansen, 2008) showing the differences between individual and collaborative information behaviour. Their model shows the relationship between seeking behaviour, the context, and the environment; with the complexity of the problem, number of agents, and interactions the key indicators to whether collaboration takes place or not. The authors acknowledge that complex problems do take place in individual searching, but collaboration necessitates a level of complexity in order to be initiated (in line with Kuhlthau, 1999). In a recent study Hertzum concluded that breakdowns in collaborative information seeking are a prime factor in the occurrence of medication incidents (Hertzum, 2010).

4.7 Enough information

Deciding when to stop searching and move onto another task is a key element within ISkB, but how does the searcher know when they have enough information? How and why do individuals make the decision that they have retrieved what they need to accomplish an information task? As Zach (2005) states "if determining the information need is the natural starting point of the ISkB process, then determining when the need is met should be the natural stopping point" (Zach, 2005 p24). Determining when to stop requires the searcher to reach a level of satisfaction with the search, but it is

impossible to consider all possibilities for every situation, so individuals make a choice to 'stop' searching. Simon (1956) termed this 'satisficing', stating that "organisms adapt well enough to 'satisfice'; they do not, in general, 'optimise'" falling short of 'maximizing' (Simon, 1956 p129). This view of decision making describes the point in ISkB when an acceptable amount of information is retrieved; translating into a judgment that the information is good enough to satisfy a need without performing a cost-benefit analysis (Prabha et al., 2007). Schmidt's view is slightly different as he argues that satisficing involves terminating the search for alternatives upon concluding that one has identified a satisfactory alternative (Schmidt, 2004 p43).

Agosto (2002) applied Simon's theory to the stopping criteria of twenty-two female adolescent students doing web-searches. The students took part in web-surfing sessions visiting preselected sites and freely surfing, and then participated in group interviews. Following the interviews Agosto was able to group responses within three types of constraint: time (imposed and self-generated), cognitive (information overload, textual overload, outcome overload), and physical (discomfort and exertion). The results only partially supported Simon's satisficing theory, however, as although satisficing takes place in decision making, students did not take the first satisficing option they encountered, and other stop rules (physical discomfort, time limits, boredom) resulted in searches being terminated before the location of a satisficing result (Agosto, 2002 p25). Prabha et al (2007) also used Simon's theory in research on seventy-eight academic library users using an online survey, telephone interviews, and focus groups. Thirty-one academic staff took part along with forty-seven students, and all were asked to recollect academic tasks that required searching for information. The quantitative stopping criteria for academic staff were time available, and fulfilling research needs; whilst for students it was that the required number of citations was retrieved, research questions were answered and time was limited. The qualitative stopping criteria for academics were more varied and included: all synonyms were searched; a representative sample of research was attained; repetition of information; exhaustive collection discovered; reviewers/publishers requirements were met. For students the qualitative stopping criteria was

more generally linked to sufficient information being gathered; the concept was understood; and repetition of information; obtaining the information they expected was also a factor found elsewhere (Spink et al., 2003). Prabha et al (2007) suggest that although students were aware that they could search endlessly and in great depth for information, they satisficed their information needs by sticking to the requirements of the assignment. They also state that academics rationally stop their search within the boundaries of identified constraints a factor again reflected by students in the [JUSTEIS](#) project which also found that shorter successful searches were rated more highly than longer successful searches (Spink et al., 2003). Similar conclusions were drawn in qualitative research of health service managers using a Critical Incident Technique by MacDonald et al (2011) which supported Simon's satisficing theory. It was found that the managers settled for the best decision under the circumstances rather than continue to search exhaustively. These participants were also challenged by 'information poverty' (not enough information), and to a lesser extent 'information overload' (too much information).

Zach's (2005) research on twelve art administrators using interviews and a Critical Incident Technique investigated 'stopping criteria' alongside levels of effort and satisfaction within ISKB. She found that participants continued searching until an arbitrary level of comfort was reached either consciously or subconsciously, and this level was directly related to the importance or complexity of the task. Time did play a role in when to stop searching, although it was not the primary factor. Zach also suggests that comfort and time conflict, but that the decision to move on was more dependent on reaching a comfort level that enabled the task to be completed even though more information would almost certainly be attainable if more time was spent searching. Berryman (2006, 2008) in two related studies using public policy workers as a sample and naturalistic enquiry as a method also found that deadlines and time constraints were considered less important than getting enough information to answer the question fully. More recently Connaway et al (2011) in a multi-method, multi-phase study of faculty staff and students at 44 educational establishments in USA found much evidence that convenience

was a key element in ISkB. The 'type' of convenience took many forms and included access to physical resources (a library) and electronic resources; and other factors impacted on this (time pressures).

4.8 Serendipity

The concept of serendipity – the chance finding of useful information – has become the focus of attention in recent years. Often neglected from ISkB models and research it is a means to discovery, creativity and, importantly, connection building (Foster and Ford, 2003). Sometimes indirectly discussed as related terms including 'incidental information acquisition' (Williamson, 1998) or 'opportunistic acquisition of information' (Erdelez, 2004), the investigation of serendipity is problematic due to its very nature of being both spontaneous and individualistic. Foster and Ford (2003) saw the emergence of serendipity as part of a wider research study into the ISkB of 45 academics. During interviews for the study they found that a number of researchers used the terms 'unplanned surprise', 'accident', and 'chance' to describe events within the ISkB process, thus requiring a separate category of serendipity to be created. Heinstrom's (2006b) research on 305 Masters students (also part of a wider research study) found that personality, learning style and emotional state affected the level of self-reported incidental information acquisition. Those students with an energetic personality, higher levels of motivation, and a positive emotional outlook tended to have higher incidental information acquisition.

Research on 202 older adults by Williamson (1998) using telephone diaries and interviews found that during routine conversations the participants often described incidental information acquisition occurring as an aside to the original purpose of the phone call or initial ISkB topic; participants acquired information unexpectedly when they were unaware that a 'gap' existed (Williamson, 1998 p31). A more specific type of finding information by chance is 'information encountering'. This phrase first coined by Erdelez (1997) is defined as occurring when "one is looking for information relating to one topic

and finds information relating to another one” (Erdelez, 1999 p1). Erdelez suggests that there is a continuum of ‘encountering’ along which individuals find themselves; and individual differences (in line with Heinström 2006) determine the likelihood of where someone finds themselves along it. At one end are the ‘non-encounterers’ who very seldom experience information encountering, then there are the ‘occasional encounterers’ and ‘encounterers’, with ‘super-encounterers’ who ‘bank’ on finding information this way at the opposite end (Erdelez, 1999). Erdelez proposed five stages to information encountering: noticing, stopping, examining, capturing, and returning (Erdelez, 2004), acknowledging at the same time that not all stages may appear in each episode. Erdelez (2004) attempted to investigate episodes of information encountering in a research study on ten business students. Using a controlled environment of a web search screen that included a ‘false drop’; students were asked to search for ‘surfboards’ with the ‘false drop’ being an article on ‘surfing’ the web. Analysis of an exit survey showed that nine students noticed the ‘false drop’, but none captured it during the test; thus no complete information encountering episode took place (Erdelez, 2004 p1021). This study highlighted the difficulty of setting up a controlled environment to investigate a spontaneous event. One final concept to touch upon that includes analysis of serendipity is ‘information grounds’. These are context rich information environments created when groups of people come together, enabling sharing and incidental acquisition of information to occur (Fisher et al., 2004) and identifying characteristics of these grounds may be easier than researching serendipity per se.

4.9 Information retrieval

From an information retrieval systems perspective effectiveness is often measured in terms of recall and precision (Park, 1993). According to Van Rijsbergen (1979) recall and precision measure “the ability of the system to retrieve relevant documents while at the same time holding back non-relevant ones” (145). This *objective* relevance which is dependent on algorithms, can be seen as a connection between a request and a document (Park, 1993).

From a HIB perspective it is *subjective* relevance that interests us; the judgement of an information seeker that determines whether a piece of information is relevant to them at that moment in time (Cosijn and Ingwersen, 2000). Subjective relevance is used to measure objective relevance, that is; results from searches are then checked for usefulness by information seekers. Ellis (1996 p25), however, states that these types of relevance judgements “represent an attempt to formalise, for purposes of measurement, an aspect of human intellectual ability and the problems which arise are those which derive from employing people as measuring instruments”.

The use of subjective relevance judgments to evaluate information systems has been the subject of debate since they were first used in the Cranfield tests of the 1960's. The Cranfield tests determined relevancy by pooling a test collection of documents and subjecting this database to hundreds of queries. Judges then scored the results for subjective relevancy. These tests confirmed the inverse relationship between recall and precision (Buckland and Gey, 1994) and that the effectiveness of information retrieval systems was lower than initially thought (Cleverdon, 1970). The Cranfield tests have since been challenged by Harter (1996) who argues that many documents deemed irrelevant were in fact relevant creating a pool of 'missed' documents and highlighting the difficulty of 'objectively' determining relevance. What is needed is a rounded definition of the concept of relevance.

4.10 Relevance

Schamber et al (1990 p773) three pronged definition of relevance states that relevance is a: multi-dimensional cognitive concept whose meaning is largely dependent on users' perceptions of information and their own information needs situations; a dynamic concept that depends on users' judgements of the quality of the relationship between information and information need at a certain point in time; and is a complex but systematic and measurable concept if approached conceptually and operationally from the users' perspective. This definition focuses not only on the information seekers notion

of what they need at that moment in time, but is also dependent on the situation the seeker finds themselves in. Ford (2004) agrees with Schamber et al and emphasises that relevance is "...a multifaceted phenomenon dynamically shifting over time, whereby a given piece of information may be differentially relevant at different stages in the sense-making process". In this sense multi-faceted or multidimensional refers to the perception and assessment of different users; and dynamic refers to how the perception of individual users change over time (Borlund, 2003). These concepts have been found in multiple studies (Greisdorf, 2003, Maglaughlin and Sonnenwald, 2002, Taylor et al., 2007, Vakkari and Hakala, 2000). Taylor (2012) agrees that relevance judgments are dynamic and change during the search process, with users becoming more discerning as the search progresses and valuing 'novelty' more highly. In his comprehensive review Saracevic (2007b, 2007a) asserts that relevance: is a relation, property, and measure; it has context, may change, has numerous manifestations; it is not given, it is inferred, created, or derived; it involves selection, interaction; and it follows intentionality (Saracevic, 2007a).

Cosijn and Ingwersen (2000) suggest that there are manifestations of relevance, and these include topical relevance (which leads to aboutness), cognitive relevance or pertinence (determined by information quality), situational relevance (leading to reduction of uncertainty), and affective relevance (resulting in a level of satisfaction). Xu and Chen (2006 p962) agree that relevance is an umbrella term, but suggest it to be the "perceived cognitive and pragmatic impact of the content of a document in relation to the user's problem at hand".

Whatever the difficulties with pinning down the definition of relevance, it is clear that some form of selection must take place within ISkB and determining whether something 'fits' into the requirements of a search necessarily involves a form of relevance criterion.

Spink et al (1998) reported the results of four separate studies into the notion of relevance, in particular how information seekers determine partially relevant

information. Students and academic staff performed their own online searches in three of the studies, whilst a mediated search was conducted in the fourth study. Search logs were captured and participants judged relevancy as high, partial or not relevant. For the first three studies significant relationships were found between partially relevant judgements with: changes in both end-user relevance criteria and end-user personal knowledge in study one; a change in user relevance criteria and the searcher's perception that user changed the question or relevance criteria in study two; and a change in end-user problem definition in study three. Partial relevancy was linked with new information generation and having less knowledge of a problem. In the fourth study Spink et al (1998) investigated the criteria used by information seekers to determine partial relevancy. They found that items that weren't specific or had multiple concepts, and those without enough information or dealt partially with the subject were all deemed partially relevant. New concepts or material that did not directly answer the question were also deemed partially relevant. Spink et al (1998) suggest that highly relevant material generally acts as a confirmation of what the information seeker (thinks he) knows, whilst partially relevant material may lead the searcher in new directions. A 3-D spatial model of relevancy was designed as a result of this incorporating relevance level, region and time (Spink et al., 1998).

A five-factor model of relevance was designed and tested using graduate and undergraduate students (Xu and Chen, 2006). Online searches in a controlled environment were carried out by 262 students on a range of topics with the browsing history then monitored. Each participant then chose two documents and evaluated these using a 24-item questionnaire. Items in the questionnaire related to the five factor model: topicality, reliability, scope, understandability, and novelty; along with relevance and prior knowledge. Xu and Chen (2006) found that topicality and novelty as determined through the questionnaire were the major underlying dimensions of relevance, with scope being the only factor without a significant relationship. Although this study relies on the robustness of the questionnaire design and doesn't make clear whether the chosen documents had to be relevant (indeed it intimates that this was not

necessary), it does provide a set of subjective concepts that can be measured statistically.

The possible changes in relevance judgements over time was investigated in an ethnographic and longitudinal study (two years) using two academics as a sample (Dirndorfer-Anderson, 2005). The research used participant-observer, and storytelling methods to collect data within the context of everyday information seeking and both academics were at the beginning of major research projects. Dirndorfer-Anderson found that judging relevance was used to determine the selection (or otherwise) of material and as a strategy to manage research. Triggers (key words) were looked for by the participants in the first instance to ascertain appropriateness. These triggers could take the form of single words, combinations, or even authors names, and aided the selection process by providing clues of the content of documents. She also found that understanding of a topic evolves during the course of searching, shaping, defining and refining the search process (Dirndorfer-Anderson, 2005). This analysis has merit in that it explores the dynamism of relevance rather than the traditional 'snapshot' approach.

Steinerova (2008) undertook phenomenographic research into how relevance relates to information use of twenty-one PhD students. Using semi-structured interviews and focus groups she found that the perception of relevance fell into three broad categories: value (reliability, validity, trustworthiness), utility (usefulness), and importance (relating to the core information and focus), and that there was a common set of criteria across different users. Differences existed between the print and electronic environment. Participants appreciated topicality, speed, linking and multimedia in the electronic environment, whereas readability and reliability were more appreciated in print sources. Within the electronic environment relevance is deemed non-linear, requires flexible navigation, and high visualisation. Steinerova developed concept maps indicating the facets within relevance that emanated from this research confirming the multi-dimensionality of relevance.

4.11 User studies

Whilst the previous section highlights specific aspects of ISkB and research that has been undertaken with those particular aspects in mind, the majority of research attempts to investigate the concept of ISkB 'in the round'; that is to try and identify how (often a cohort of) people look for information. As has already been discussed this can lead to the formulation of models and that research will not be repeated here. Both ISkB and IShB of users are well documented fields with source identification and utilisation a major part of this research. As previously defined; ISkB is what takes place when an individual (or group) identifies an information gap and purposefully tries to fill it; whilst IShB is the physical acts of looking for information. Logically, studies of ISkB may include elements of searching as indicated in Wilson's (1999) nested model and in the following sections ISkB will be reviewed with this in mind. Studies solely on the searching process (systems and resource use) will be reviewed separately within the IShB section.

This section will discuss the implications of the findings of a selection of research illustrating ISkB, with the focus being the search for health information, and the ISkB of health students, as these areas are directly linked to this study. The specific case of cancer information is however discussed as an example of a particular cohort of patient. Within healthcare there are two separate perspectives in terms of ISkB: the role of the healthcare provider; and the role of the patient, but there is also the interaction between these two groups. The key elements here are what do healthcare providers need to know and how do they find this information; and what do patients want to know? Much of the research undertaken to date has concentrated on the ISkB of doctors despite the greater numbers of nurses although studies of nurses are becoming more numerous (Case, 2007). In the work environment doctors tend to need information to diagnose and answer clinical questions, whereas nurses are focussed more on patient care (Case, 2007). Summarizing Virginia Henderson's definition of nursing Marriner-Tomey (2006) states that nurses are expected to view patients as individuals that require help towards

achieving independence, thus including the disclosure (or otherwise) of information.

The nurse's role in information giving is: focussed on patient care; deciding on what information is disclosed; and involves emotional care.

The key aspects of the patient's role in information seeking include: whether the patient is an 'expert' patient or a passive patient; the access to information (particularly the Internet); and the involvement of friends and family.

4.12 Information seeking behaviour

4.12.1 Searching for health information - The example of CANCER

Searching for health information can take different forms, and individuals have different motives for doing so. Studies of specific groups i.e.: the visually impaired (Beverley et al., 2007), ethnic groups (Courtright, 2005, Sligo and Jameson, 2000), and women (Warner and Procaccino, 2004, Rees and Bath, 2001, Urquhart and Yeoman, 2010) have added some degree of diversity to health ISkB research but as Lambert and Loiselle (2007) in their detailed review state much of the research centres on specific illnesses rather than on different populations and cultures. The example of cancer is relevant to this study as being a chronic (often terminal) condition cancer patients' ISkB may be affected in terms of anxiety and stress, and may include the involvement of individuals other than the patient. Nurses need to be able to support patients to help themselves and emotional support may be as important as support through factual education aimed at empowering the patient. The following studies have been selected to illustrate key points, but are only a few examples of a well-researched area.

Being diagnosed with a life threatening illness can be traumatic for patients and the information they receive from healthcare providers impacts on this experience. But not all patients want the same amount of information. Czaja et al (2003) interviewed 262 cancer patients to investigate what (if any)

information they sought on their condition. They were able to categorise the patients into those that want information and want to be actively involved in their medical care, others who want information but prefer to be passive in their health care, and yet others who rely totally on their doctor for all information and health care decision making. They found that older patients wanted less information, less involvement, were less proactive, and were less likely to seek a second opinion. They also concluded that 'passive patients' who preferred less information were characterised by a lower level of education, low familiarity with the medical system, and a low level of social support. The sample for this research was taken from previous studies conducted in 1993 so the conclusions found here need to be treated with caution due to changes in the information environment.

A separate but related dimension to the 'passive' patient is the notion of 'information avoidance'. This is particularly pertinent in relation to life threatening illness and has been explored by Leydon et al (2000) and Case et al (2005). Leydon et al (2000) interviews of seventeen cancer patients found that whilst some information was wanted by all patients, not all wanted to be continually updated about their illness at subsequent stages. Faith in the expertise of doctors, carrying on with a normal life, and an acknowledgement that limited information was inevitable at some stages all had a direct bearing on limiting their desire to seek further information. Again the information environment has moved on in the intervening years and it would be interesting to see whether patients in this situation would be satisfied with minimal information and a lack of empowerment. Case et al (2005) review and Brashers et al (2002) analysis on information avoidance in relation to genetic testing for risk of developing cancer and serious illness in general respectively suggest more research needs to be undertaken exploring this concept rather than focussing solely on active information seeking.

Information provision then is a tricky balancing act of making sure those patients that want information get it, whilst those that do not are not subjected to unnecessary provision. Being clear about how much information patients want is one thing, but providing it is another and the perceptions of both the

patient and other individuals involved in the patient's care may differ from that of the healthcare professional. Echlin's (2002) review on the ISkB of men with prostate cancer and their partners concluded that whilst healthcare professionals (HCPs) felt they provided all the necessary information to patients, the patients considered themselves under-informed. Echlin suggests that the time around diagnosis is when patients information processing abilities are low and information given may not be processed. After diagnosis ISkB is intensive with the partner the primary information seeker, but this leads in many cases to information overload and confusion. Rees and Bath (2000) investigated the information flow between patients and their partners and found that partners often sought information from health care professionals rather than the patient and that over time discussions on cancer diminished. This second point was also found by Bar-Tal et al (2005).

The ease of access to information does now mean that patients and their carers are more able to locate information, but use of the Internet in a recent study by James et al (2007) using interviews found that carers were more likely to be information seekers than patients with use of the Internet strikingly different (patients 4.8%; carers 48%). Interestingly both carers and patients thought the Internet was one of the most useful sources for information despite this discrepancy. Conversely information from doctors, whilst the top used source of information for both categories of participants, was a top ranked source in terms of usefulness for patients, but not for carers. This study did not include analysis on information avoidance which may have had an impact on these results.

This snapshot of research on a particular illness does illustrate that ISkB within healthcare is not individualistic. It involves more than one party and this in turn impacts on the way information is sought by HCPs.

4.12.2 HCPs

Being mindful of the points highlighted in the previous section how does this impact on the ISkB of HCPs? Key questions here concern the possible differences between types of healthcare professional and the settings in which they work, where information is sought, and perceived barriers and problems. HCPs in general will be discussed first followed by specific research investigating doctors and nurses.

So where do HCPs seek information? Well despite the advent of many electronic avenues of information, it has been found that HCPs are still consulting the same sources as they were years previously i.e.: colleagues and that keeping up to date with information was problematic due to the sheer volume of information available (McKnight and Peet, 2000). This view is echoed by Haines et al (2010) who following a small scale qualitative study of basic science researchers concluded that a network of individuals and approaching the search from a 'whole world' on the desktop perspective were preferred methods of information seeking rather than accessing library resources. Haines et al (2010) also found that non-linear searching was extensive, in line with Foster's (2004) model. Conversely, an investigation into the ISkB of 500 health scientists (Grefsheim and Rankin, 2007) identified that journals and databases were the most preferred source. Online resources were generally preferred (younger age groups more in favour than older groups), with barriers identified as lack of time, lack of awareness, and the perception that information was too difficult to find. These findings are generally in line with other research, but one distinct finding was that accessing the health library website was the preferred starting point rather than Google. The conclusion here is that researchers are more sophisticated searchers because they have to be.

Hospital staff are inclined to use sources other than colleagues for information gathering, but tend to prefer using Google rather than library subscribed databases (Hider et al., 2009). This study also found that nurses used

Medline more than CINAHL and that there was a strong desire from participants for further information skills training.

The focus on use of library and information services by healthcare workers has been well documented. Cooper and Urquhart (2005) reported research on both homecare workers (n=47) and clients (n=7) using interviews and observation methods respectively. They found that clients relied on homecare workers to suggest reliable and trustworthy information sources, but the workers only tended to use library resources in terms of coursework or training being inclined to use product information such as leaflets or shared experiences for everyday information gathering. Thus clients were dependent on the seeking and gathering skills of the homecare workers whether the workers were good information providers or not.

Doney et al (2005) investigated the use of the Internet and electronic databases of primary care staff (General Practitioners (GPs), nurses and managers). Results showed that GPs and managers used library resources the most, but that overall the use was low (30%). Use of the Internet was much higher (81%) despite 44% of respondents claiming that they did not have enough time to use it and that a lack of training was a barrier. GPs bemoaned a lack of time to access databases, but other groups suggested that lack of training was also a barrier. This lack of training (or perceived lack of proficiency) is an element of ISkB that affects not only the sources used for information gathering, but also whether information is sought at all. The nature of primary care is also a key factor here, with much of the day to day work routine for these workers and as such information seeking is perceived as unnecessary.

In an attempt to address this lack of proficiency Clinical Librarian services have been introduced in various parts of the UK. Analysing one such development Urquhart et al (2007) found that health care staff became more willing to search for information themselves although urgent or important searches were more likely to be delegated to the librarian. They also noted that the perception of information searching skill levels of the healthcare

workers went up even though many had no direct tuition from the librarian. This was in part due to a change in culture within health teams leading to increased information gathering. This research has implications for library services in the health field, but may be of potential benefit in other disciplines. Wessel et al (2006) small study of 46 clinical research coordinators concluded that they would benefit from tailored training from medical librarians on accessing electronic resources. Whilst this may be the starting hypothesis it is difficult to see how this conclusion can be reached as training was not tested by the research. Another more recent study found that clinicians were positive about the introduction of a Clinical Librarian citing improvement in patient care, time saved searching for information, and an improvement in access to information as advantages (Flynn and McGuinness, 2011). Harrison and Beraquet (2009) surveyed twenty six clinical librarians who stated that literature searching was the most important aspect of their role, and that developing a good rapport with colleagues and having a good working relationship with health professionals was desirable for success. A systematic review of 18 studies concluded that there is limited evidence of the effectiveness of Clinical Librarians as 'time savers', but that clinicians are happy with the service they receive (Brett et al., 2011).

So what of the barriers? The lack of searching skills has already been raised and has been found elsewhere in primary care workers (Andrews et al., 2005) and rehabilitation therapists (Kloda and Bartlett, 2009). Both of these studies also found that a lack of time was a hindrance and also that these healthcare workers preferred print resources to electronic sources with the authors suggesting a lack of awareness as a key factor. The implication of these two studies is that many facets of ISkB are not reliant on which type of health professional does the searching.

4.12.3 Doctors

ISkB research specifically on doctors focuses on barriers to searching and source utilisation. But do they differ from other HCPs? Both Davies' (2007)

and Dawes and Sampson's (2003) reviews concluded that in general doctors sought information from text sources and 'humans' first, and that a lack of time and limited searching skills hindered information gathering, clearly in line with research involving other HCPs. Gonzalez-Gonzalez et al (2007) observational study of doctors answering clinical questions again found that ISkB during the consultation centred on colleagues and in this case drug compendiums; ISkB after the consultation was more varied with use of books and journals used more. This is clearly a case of using the easiest and quickest option to obtain an answer – but may be partially explained by other research which found that junior doctors entering the workforce had 'forgotten' much of the instruction on database searching they had received during their training (Cullen et al., 2011). Use of physical library sources tends to increase with the introduction of a practice librarian (Urquhart et al., 2007) or the integration of clinical librarians into the medical team (Davies, 2009). Information skills training has also been found to be a key beneficial factor in improving the efficiency of literature searching (D'Alessandro et al., 2004). All these factors point to a lack of variation between doctors and other HCPs.

4.12.4 Nurses and nursing education

So do nurses and nursing students differ from other healthcare groups? Spenceley et al (2008) meta-analysis of thirty-two studies of the ISkB of nurses conducted between 1985 and 2006 found that overall peers were the top ranked source of information (in line with several studies of doctors), and other work colleagues were also extensively used. Palfreyman et al (2003) study comparing evidence-based practice of nurses with physiotherapists found differences between the two groups with nurses more likely to use informal sources; and an early study (Urquhart and Davies, 1997) also found that information on the ward, colleagues and personal information were the most used sources. This use of colleagues and non-research based information is counter to the notion of nursing as an evidence-based discipline and several studies investigating what hinders research utilisation found a variety of barriers including: lack of time, relevant skills, poor teamworking,

lack of access, and unclear goals (Andersson et al., 2007, Bostrom et al., 2008, Sitzia, 2002, Kajermo et al., 2008). Perhaps it is therefore unsurprising that with so many perceived barriers to evidence-based practice, the ISkB of nurses is affected.

Two specific themes will be addressed in more detail:

1. Use of colleagues within ISkB – who and why?
2. Perceived barriers to ISkB – what and why?

In order to address these two themes thirteen key research studies have been identified (table 4-1). These studies have been chosen from a larger pool to include a variety of research methods and types of participant to ascertain whether any differences between nurses were found. All thirteen studies address either the question of type of colleague consulted, or barriers to information seeking, or both of these. They all use trained nurses, student nurses or nurse teachers as participants in the research. Eleven of the selected studies addressed ISkB from the point of view of supporting clinical decisions in relation to improving patient care (the exceptions being Stokes and Lewin (2004) who examined curriculum delivery in relation to improving the student experience, and Duncan and Holtslander (2012) who investigated the search strategies employed by nursing students for an assignment). Research addressing specific use of tools (Randell et al., 2009a, Randell et al., 2009b), or focussing on the comparison between nurses and other HCP's (Palfreyman et al., 2003) is not included here. Of these thirteen studies eleven investigated the sources used in the ISkB process, with seven finding other nurses to be the most used source (Dee and Stanley, 2005, Lathey and Hodge, 2001, Tannery et al., 2007, Thompson et al., 2001b, Thompson et al., 2001a, McKnight, 2006, O'Leary and Mhaolrunaigh, 2012). As a range of nurse 'types' were studied, these results could be suggesting that nurses in general ask other nurses for information in preference to other HCP's; but what of the four other studies? Well, Stokes and Lewin (2004) in a similar manner found nurse teachers asked other nurse teachers which fits the hypothesis, but the three remaining studies appear not to support this notion. Both Cogdill (2003) and McCaughan et al (2005) found doctors were

consulted more often, whereas Hall et al (2003) study found community pharmacists to be top ranked as an information source. Why? What appears at first glance to be a conflict can in fact be harmonised if the emphasis is placed not on who is consulted, but who is doing the consulting and in which setting? In the studies where other HCP's are consulted, the nurse isn't ignoring other nurses in preference for somebody else, it's because the other HCP is a more convenient source. In the practice setting nurses are often working with or alongside a doctor and will use the doctors as an easily accessible information source. Ward based nurses are more likely to consult other nurses within their team because they are around at the time information is needed.

But why are nurses using colleagues for information seeking when they are expected to provide evidence-based practice? As has already been stated key barriers are lack of time and poor searching skills, and the five studies that investigated barriers in table 3-1 concur with this. If nurses do not feel they have time to search for documents or electronic sources, or have the perception that they won't find what they want even if they did, then it is not surprising that they turn to colleagues nearby for information. In addition using time to search and read research information is difficult in the work environment and could be viewed as ethically questionable (McKnight, 2006).

Table 4-1: summarizing eleven recent studies into the ISkB of various types of qualified nurses, nurse teachers and nursing students.

Study	Participants	Method	Research approach	Type of colleague consulted	Barriers to information seeking	Why was information sought?
Cogdill (2003)	Nurse practitioners	Questionnaire and interview	Mixed-methods triangulation	Supervising doctor	N/A	Perceived knowledge gap during or after patient interaction
Dee and Stanley (2005)	Clinical nurses and nursing students	Questionnaire, interview, and observation	Mixed-methods explanatory	Other nurses and students	N/A	To support patient care
Duncan and Holtslander (2012)	Nursing students	Interviews	Grounded theory	N/A	Selecting the right keywords for searching	For a class assignment
Hall et al (2003)	Community nurse prescribers	Interviews	Qualitative	Community pharmacists	N/A	Perceived knowledge gap during the prescribing process
Lathey and Hodge (2001)	Occupational health nurses	Questionnaire	Quantitative	Other nurses	Lack of time, and searching skills	To support practice decisions
McCaughan et al (2005)	Nurse practitioners and practice nurses	Interviews, observation, and documentary analysis	Case study qualitative	Practice doctor	N/A	For diagnosis
McKnight (2006)	Critical care nurses	Observation and interviews	Ethnography	Other nurses	Lack of time, and work environment not conducive	To support patient care
O'leary and Mhaolrunaigh (2012)	Trained nurses (range of specialties)	Interviews, questionnaire	Mixed-methods sequential exploratory	Nursing colleagues and nursing managers	N/A	To support patient care

Study	Participants	Method	Research approach	Type of colleague consulted	Barriers to information seeking	Why was information sought?
Secco et al (2006)	Paediatric nurses	Questionnaire	Descriptive survey	N/A	Difficulty obtaining relevant information	For clinical decision making
Stokes and Lewin's (2004)	Nurse teachers	Questionnaire	Soft systems methodology	Other nurse teachers	Lack of time and searching skills	To support the nursing curriculum
Tannery et al (2007)	General nurses	Pretest-posttest survey	Quantitative	Other nurses	N/A	To support clinical decisions
Thompson et al (2001b, 2001a)	Critical care and surgical nurses	Observation, documentary audit, and interview	Mixed-methods case study	Other nurses	N/A	For clinical decision making

The context of the nurse's role in ISkB in relation to patient care lends itself to the concept of sense-making (Dervin, 2003). As previously described Dervin's view is that individuals are continuously encountering and making sense of situations, but discontinuity can occur when 'gaps' arise. Bridging these subsequent gaps determines how the individual proceeds. For nurses in these studies a gap in knowledge related to 'patient care need' bridging and that is where the analysis of ISkB fits in (figure 4-15).

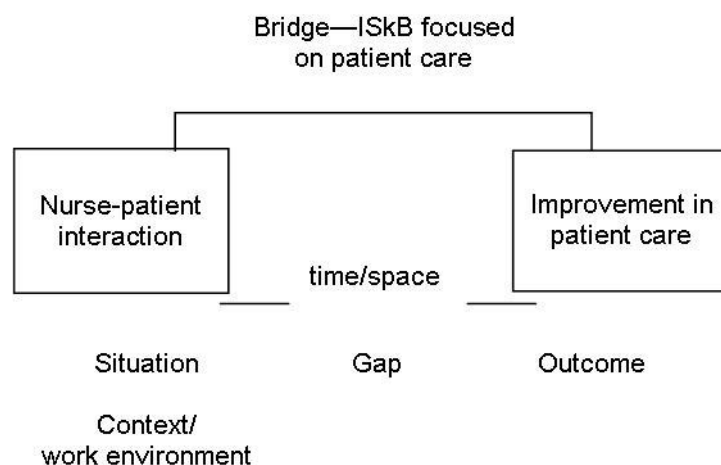


Figure 4-15: Dervin's Sense-Making model adapted to the nurse-patient information need situation

The 'situation' in this model is related to the nurse's personal work environment and it is within that context that ISkB takes place. Following nurse-patient interaction a gap in knowledge is discovered that is bridged most often by asking other nurses or HCP's (dependent on the context) with the desired outcome being an improvement in patient care. Despite the need for evidence-based practice within nursing, it is clear that bridging the gap involves personal knowledge and use of colleagues in the main. This is not as great a discrepancy as it seems. Nurses are encouraged to use reflection during their initial training and subsequent professional development as well as being encouraged to pass on knowledge to others (Nursing and Midwifery Council, 2008 pp51-58); and being able to think back to what has happened before links in with this. This emphasis on reflection impacts on nurses searching skills because as they are more used to discussing with colleagues than searching for information themselves this skill becomes less valued and as such the IShB of nurses is affected.

4.13 Information searching behaviour

In view of the current developments within information technology, the Internet and the availability of online information sources, the emphasis of IShB will be related to electronic environments. It is the case that the physical act of searching for information could include printed sources and other people, but the intricacies of the online search process are so fundamental today that it requires deeper analysis.

A series of articles (Nicholas et al., 2009, Nicholas et al., 2004, Nicholas et al., 2007b, Nicholas et al., 2003a, Nicholas et al., 2007a, Nicholas et al., 2006, Nicholas et al., 2003b) report the results of research into the use of the online resource environment using web log analysis and questionnaires to investigate the use of the digital resources by students and staff of universities, and the general public. Taking these articles separately; Nicholas et al (2007b) found differences in the use of resources at different academic institutions with research intensive universities recording the highest and most in depth levels of activity, as opposed to teaching universities. Nicholas et al (2004) used an online questionnaire hosted on a specific website, a postal questionnaire, and interviews; in conjunction with log analysis to investigate the use of Internet based health information by the general public. They found that the majority of searches were superficial and shallow, with individuals tending to move from site to site rather than delving into one site and coined this 'bouncing'. Nicholas et al (2004) postulate that it is the medium that drives this type of searching with its massive choice and availability; in contrast to resources available in libraries which are confined and limited – even if available electronically. This concept of 'bouncing' was further analysed (Nicholas et al., 2007a) with potential negative aspects being that it: suggests people don't immediately find what they want, provides evidence for poor searching skills and information literacy skills, and that there is too much information available. On the positive side, bouncing could be the result of effective retrieval due to search engine efficiency, with so much choice it is natural that there be an amount of checking and comparing, and it could be due to 'informed' searching as opposed to browsing.

Nicholas et al (2009) study compared the online searching of digital journal libraries and an e-book collection of students and staff. In terms of journals, they found that academic staff are more likely to use search facilities and view abstract page views than students; whilst students were the biggest users in terms of sessions undertaken and pages viewed. Students thus showed elements of the 'bouncing' concept for journal searching, but for e-books students tended to record longer sessions perhaps due to the 'appropriateness' of the resource. Other research into the use of online journals (Nicholas et al., 2006, Nicholas et al., 2003b) backs up this notion of users 'bouncing' quickly between sites and pages. Similarly, the large scale JUSTEIS project on trends in electronic information services (Urquhart et al., 2004, Urquhart et al., 2003b, Spink et al., 2003) found that students sought convenience and 'sufficiency for purpose', and were less concerned with information quality (although this varied between disciplines). The JUSTEIS project was also able to plot the rise of Google as a key tool in information gathering. Recent studies on students (Griffiths and Brophy, 2005), scientists (Jamali and Asadi, 2010), and academic researchers (Haglund and Olsson, 2008) using a variety of research methods all confirm that Google is preferred to electronic library resources due to its perceived ease of use and ability to locate relevant material quickly. These studies are all in line with Nicholas et al (2007a) description of the 'bouncer'.

So what of HCPs? As a specific group, do they differ in the way they search for information?

4.13.1 HCP's

HCP's (particularly doctors and nurses) are taken as a single group with any differences highlighted within the review. This is appropriate as several studies compare doctors and nurses within their research. The key theme here is whether information seeking is superficial (quick and dirty) and whether HCP's search in the manner found above. Within this, elements of searching skills and hindrances will also be discussed.

Use of online databases such as MEDLINE by HCPs has been found to increase after training programs (Byrnes et al., 2004, Wozar and Woroma, 2003), but the way these databases are searched is generally poor (Cullen, 2002, Koivunen et al., 2010, Morris-Docker et al., 2004) with advanced searching rarely used. Despite the apparent advantage of training programs nurses still tend to be self-taught (Gilmour et al., 2007). Koivunen et al study due to its currency is particularly pertinent. They used the 'novice to expert' competence levels determined by the European Computer Driving Licence (ECDL) course and found extremely low levels of information retrieval proficiency regarding nurses use of online databases with more than 75% having no skill at all; the Internet fared slightly better, but still showed low levels of proficiency with 'novice' being the highest percentage of participants. Koivunen et al did find higher proficiency for nurses under the age of 40, and for male nurses. It is clear that despite (or because of?) the range of online resources available to nurses, their searching methods and techniques are poor. Internet use has been found elsewhere to follow a similar pattern to database searching.

Verhoeven et al (2009) investigated the Internet use of twenty hospital nurses in the Netherlands in terms of their search strategies locating specific clinical guidelines. They identified basic search strategies and a reliance on tacit knowledge predominated. This research used simulated scenarios and participants were asked to verbalise their thoughts whilst searching in the presence of a test administrator. Verhoeven et al were able to categorise the initial search step as either 'teleporting' directly to a website, or 'orientating' themselves by reviewing information in a series of steps. Teleporting took place 40% of the time, whilst orientating took place in 60% of cases. In all cases of orientation, nurses accessed Google to begin their search with most (70%) entering a single word for their search. Following this basic search technique 68% then chose the first hit and no other to satisfy their query. Despite these basic search techniques, in 63% of cases the correct guidelines were found indicating both the power of Google to retrieve the 'right' information, and that familiarity with a convenient source on the Internet can

provide relevant information in most cases. Earlier studies of Internet use by doctors (Bennett et al., 2004, Casebeer et al., 2002, Cullen, 2002) found that the main use of the medium was for email and personal use rather than for searching for medical information. Barriers or hindrances while searching in both studies were too much information (also found in a recent study of nursing students by Bond (2009)) and problems searching. All three studies also found differences in gender with male doctors using the Internet more often and more secure in their searching skills than their female counterparts. Bearing in mind these studies were conducted at the start of the millennium and already doctors were bemoaning information overload, this view would very likely be exacerbated today.

Differences in searching between HCP's has been found elsewhere (Westbrook et al., 2004) using web-log analysis of a specific online information resource (in essence a virtual library) and questionnaires. Differences were found between doctors and nurses in terms of the use of the online resource with doctors significantly more likely to use it for clinical reasons (patient care) than nurses who were more likely to use it for personal education. Cobb's (2003) questionnaire study found that doctors' Internet use was primarily for literature searching (differing from Bennett et al (2004)), whereas nurses ranked searching for health information as the primary reason for using the Internet. Both doctors and nurses gave similar responses for the amount of Internet use in relation to continuing education, differing from Westbrook et al (2004). Despite these apparently counter results between the studies it is clear that online use has been (perhaps not surprisingly) steadily rising and the fractions of use of the Internet whilst differing tend to be by small amounts. Cobb did find a high use of email in her study – it just wasn't ranked first, whilst Bennett et al also found high use of the Internet for literature searching – but it was only ranked third. Indeed a recent review of the literature concluded that there were no significant differences between nurses and doctors and their use of the Internet, or between them regarding perceived barriers (Younger, 2010).

Whilst use of the Internet clearly contains elements of ‘bouncing’ (Verhoeven et al., 2009), perhaps more surprisingly similar techniques have been found in database searching. An analysis of use of a specific online resource by eight nurses (Wozar and Woroma, 2003) following instructional classes found that over the subsequent thirty days many searches of online databases were aborted and participants tended to look at several sections of the resource in a single session. Roberts (2004) used a written simulation exercise of the nurse-patient admission interview to determine differences between three types of student nurse in terms of their information seeking skills. She found little systematic searching for information with students tending to adopt a ‘shotgun’ (disordered) approach, although degree level students were more likely to search in a structured way than their diploma counterparts.

IShB in relation to electronic resources relies heavily on the information literacy skill set of the searcher. Whilst this will be revisited in the section on self-efficacy, some discussion is warranted here in relation to IShB

4.14 Information literacy

An information literate person is able “to recognise when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (Association of College & Research Libraries, 1989). This definition is widely quoted (Mokhtar et al., 2008) and it is easy to see why. It is both clear and to the point, and it also highlights the three main stages of information gathering (locate, evaluate, and use) which take place in relation to information literacy. From an electronic resources viewpoint; clearly those seeking information that are ‘IT savvy’ are in a better position to locate the right information to satisfy their need; whether they succeed or not is another matter. Pask and Saunders (2004) contend that whilst information literacy contains aspects of both computer skills and information searching skills, the two types of skills are necessarily different. Information literacy means many different things (Virkus, (2003)) – with differing degrees of emphasis on IT, digital, information, and media literacy although the need to ‘understand’ or


obtain a sense of meaning is paramount (Bawden, 2001). The use of the term literacy needs to be critiqued (Buschman, 2009); with Lloyd (2010) arguing that information literacy should be seen as more of a sociocultural practice informed by practice theory. Hoyer (2011) goes further suggesting that information literacy should not be restricted to an academic angle, but have a broader more 'social' focus.

The focus on information literacy within education has never been greater with much more delivery and access to information being in electronic form. The level of information literacy amongst students has been shown to be poor with a recent study discovering that 43% of students entering a single university were 'non-proficient' in information literacy (Gross and Latham, 2007) and whilst students may feel they have the necessary skills, this view is not always mirrored by librarians (Detlor et al., 2011). Indeed it has been shown that students do tend to overestimate their skill level in information literacy in self-report studies (Detlor et al., 2011, Gross and Latham, 2007, Gross and Latham, 2009, Gross and Latham, 2012, Ivanitskaya et al., 2006) a psychological phenomenon clearly documented by Kruger and Dunning (1999). Library services often use the term information literacy to describe their programmes to develop confidence and competence in searching and seeking information. Rather than simply doing generic instruction, trainers are now inclined to tailor their instruction to specific groups and assess the impact of the training (Dunaway and Orblych, 2011, Oakleaf, 2009a, Oakleaf, 2009b, Mery et al., 2011, Fain, 2011). Detlor et al (2011) found that students' expectations of information literacy training did not match those of the trainers, and in addition whilst students wanted to improve search skills trainers believed students should focus on identifying credible sources. Ivanitskaya et al (2006) using the Research Readiness Self-Assessment scale developed from previous research (Ivanitskaya et al., 2004) similarly found that students felt they had good information seeking and research skills, but that this was not borne out from the research study. Their searching techniques were found to be basic, and they were not able to judge the merit of websites and articles. In a study of university web-based information literacy tutorials Sundin (2008) examined the contrasting assumptions of library services about information

literacy suggesting four linked approaches (source, behavioural, process, and communication). There is increasing emphasis on information literacy understood not simply as the knowledge and skills of the individual, but as part of a community with more emphasis on people's communities of practice (Harris, 2008). O'Farrill (2010) suggests that in the workplace (in this case a medical environment) there should be more emphasis on the creation of meaning, sensemaking and effective information use as belonging to a situated practice. Literacy is thus increasingly seen as part of the situation in which people are (Elmborg, 2006) and ideas about steady progression in skills associated with information literacy – such as the seven pillars of information literacy model (SCONUL, 1999) – may need to be questioned.

In healthcare being both computer and information literate is vital in light of the reliance on timeliness and accuracy of information to support evidence-based practice. Training has been shown to improve the information literacy levels of trainee doctors (Garg and Turtle, 2003, Brown and Nelson, 2003); and in turn those with more computer experience are more confident in their ISkB (Kaltenborn, 1991). In addition, Ward et al (2008) whilst supporting the notion of training being beneficial also found that the attitude of healthcare staff to Information Technology (IT) was a factor. Within nursing education it has been found that competence with use of IT affects students' motivation to learn (Levett-Jones et al., 2009). The use of IT must be included within training and formal nurse education programs to ensure nurses enter the workplace with confidence and competence (Smedley, 2005). This view has been echoed with evidence gained through research in the late-1990's (Saranto and Leino-Kilpi, 1997) and early in the 21st century (Kaplan-Jacobs et al., 2003, Shorten et al., 2001, Wallace et al., 2000) of its benefit. In the UK the attainment of the European Computer Driving Licence (ECDL) (*subsequently replaced with the Essential IT Skills (EITS) programme in 2008*) was set as mandatory for all healthcare staff in 2001 as a basic IT skill requirement. This drove Cole and Kelsey (2004) to survey the information literacy skills of 497 post-registration nurses and they found low levels of skill in use of medical databases, and advanced search skills. McDowell and Ma (2007) in a nine year study between 1997 and 2005 showed that computer ownership amongst nursing

students had increased from 60% to 90% and with that more use of the Internet and e-mail; but use of databases continued to be low. They conclude that whilst students may enter nursing education with basic word processing and emailing skills, they must graduate with database, spread sheet, and statistical analysis skills (McDowell and Ma, 2007 p35). This view is relevant in terms of evidence-based practice, but as has already been discussed reflection is both encouraged and utilised more by nurses. The use of an information literacy framework that includes an element of reflection may be better suited within nurse education than simply suggesting that nurses should practice in an evidence-based manner. One such tool currently being developed (Craig, 2009) uses a seven stage model illustrating the stages of the information literacy process (figure 4-16). At each stage the student is encouraged to reflect on why they are doing what they are doing in a continuous process of enhancement of previous learning.



1. QUESTION	What do you need to know? Define question.
2. SOURCE	Where can you look for the information? Sources will include people as well as other materials. Maybe a key individual will know the answer.
3. FIND	Which words do you use during the search? Identify keywords.
4. EVALUATE	Have you found 'good' information? Has it answered your question?
5. COMBINE	Have you learned something new and useful from your search? Blend this with previous knowledge.
6. SHARE	Would other people find this information useful? How would you share it?
7. APPLY	How will you use the information? What is it useful for?

Figure 4-16: the steps involved in the information literacy process with the inclusion of elements of reflection. Adapted from Craig (2009)

This draft framework is useful in that it merges reflection within the search process and it also highlights key aspects of the research undertaken in this doctoral study particularly in terms of where nurses will look for information, how they structure their search strategy, sharing gathered information (collaboration), and appraising what they have found. This will be revisited in the methodology section.

Chapter 5 MEASURING PERSONALITY

Individual differences in personality can be traced back to the time of Hippocrates (McAdams, 1997) over 2000 years ago, but defining and measuring personality is still a contentious issue. In order to provide a working definition of personality it is necessary to look back into the history of the developing concept.

5.1 History

Since the beginning of the 20th century there has been an on-going debate into the realms of personality. Psychoanalytic theorists such as Freud saw personality as a whole.

Freud believed the mind to consist of the unconscious and consciousness. The unconscious is outside a person's awareness and includes a state of preconscious consisting of admissible material within the unconscious. Consciousness is transitory and has no memory. Material within the mind flows into the consciousness sense organ from the external world or from inner excitations (Patterson and Watkins-Jr, 1996)

Personality (according to Freud) can be divided into three parts often termed the id, the ego, and the superego (although some authors argue this is a mistranslation (Funder, 2007, Jacobs, 2003). In short, the id is concerned with the emotional and irrational part, the ego is rational, and the superego is the moral part of the mind (Funder, 2007). The ego mediates between internal and external pressures (Jacobs, 2003) forming compromises between the id and superego forces. The id is the seat of unconsciousness, the ego is unconscious most of the time, but some resides in the preconscious; and the superego is mainly unconscious (Patterson and Watkins-Jr, 1996)

According to Freud there are four separate stages in the mind's development: oral, anal, phallic, and genital (table 5-1).

Table 5-1: Freud's stages of psychological development adapted from Hergenhahn and Olson (2003), Patterson and Watkins-Jr (1996); and Funder (2007)

Stage	Description	Physical focus	Psychological themes	Adult character type
Oral Birth – 18 months	The baby is all 'id'. If needs are met to a reasonable degree then psychic energy will move along to the next stage. But if the parents are uncaring this can lead to mistrust of others; equally if parents are over caring the baby gets a shock when it doesn't get its own way.	Mouth, lips, tongue	Dependency	<ul style="list-style-type: none"> • Oral-receptive/incorporative (passive, trusting, optimistic) • Oral-sadistic (aggressive, argumentative, sarcastic)
Anal 2 nd year	The baby starts to try and control situations, testing boundaries. This stage is sometimes referred to as the 'terrible twos'. The ego starts to develop to rationally control the rest of the mind.	Anus, eliminative organs	Self-control, obedience	<ul style="list-style-type: none"> • Retentive character (obstinate, stingy, perfectionist) • Expressive/expulsive character (chaotic, defies authority, creative)
Phallic 2 – 6/7 years old	This is the stage where boys and girls realise they differ from each other. Freud called this 'identification'.	Penis	Love, sexuality, fear, jealousy	Phallic – either having a completely rigid moral code, or no moral code at all (asexual)
Latency period 6/7 – puberty	'Cooling off' period where children learn other things. A developmental breathing space.			
Genital Puberty - Adult	This stage corresponds to the source of new life, reproduction.	Genitals	Maturity	Genital character is well adjusted and balanced, unless 'fixated' at a previous stage..

Each stage provides a focus for psychic energy (libido) and has three aspects: a physical focus; a psychological theme; and an adult character type (Funder, 2007). If an individual has difficulty resolving issues that arise during any of these stages, that person will be psychologically scarred (Funder, 2007 p322).

5.1.1 Neo-Freudians

Following on from Freud several psychoanalysts continued to use similar methods to Freud but put less emphasis on three main areas:

- the importance of sex
- the unconscious – more on the conscious
- instinctual drives – more on interpersonal relations

Two of the main protagonists were Alfred Adler and Carl Jung.

Adler believed that social interest and positive relationships were more important than sex as a motivator and termed his theory 'individual psychology' (Hergenhahn and Olson, 2003). He also thought that everyone feels inferior as a child and the quest to overcome these feelings is the drive for adult behaviour. A child who feels weak or stupid will grow into an adult obsessed with being physically strong or smart – this he termed "organ inferiority". Adler did not believe that feelings of inferiority were bad, as a person in this state will be driven to accomplish something. Those that become overwhelmed with feelings of inferiority which then act as a barrier are said to have an 'inferiority complex' (Hergenhahn and Olson, 2003). Another postulate was the "masculine protest" which is the overcompensating behaviour of men (and women) to appear dominant (Funder, 2007 p378-9). Adler's final theoretical position stated that striving for superiority (as groups in society) was the fundamental fact of life. Individuals who concentrate on their personal superiority (being vain, domineering, arrogant) are deemed to have a 'superiority complex' (Hergenhahn and Olson, 2003).

Jung believed that all people share memories and ideas in a collective unconscious. Examples of this are basic images such as supreme beings or of snakes being sinister. Like Freud, Jung had a similar concept of the 'ego' as being the conscious part of the mind, but the two differed on their view of the nature of the libido, which according to Jung is concerned with both biological and spiritual needs (Hergenhahn and Olson, 2003). Jung also came up with the idea of the "persona" – a social mask people wear in public which is usually a fake. The persona may take over the individual who becomes obsessed with presenting this image (Funder, 2007 p379). Other Jungian terms include the "anima" and "animus" corresponding to the feminine side in men, and the masculine side in women respectively; and the idea of "introverts" and "extroverts". Jung also believed in four ways of thinking: rational, feeling, sensing, and intuiting. This thinking model has been developed into a personality/learning style instrument – the Myers-Briggs Type Indicator (see the Measuring Learning Styles chapter 7), in which the two attitudes (introvert and extrovert) are combined with the four ways of thinking, resulting in eight different types.

5.1.2 Early personality theorists

Psychoanalysis provided a rich base for finding out why people behave in a certain way from a developmental point of view. An individual's personality, although shaped by development and the environment, manifests itself in all situations. Examining why individuals 'do what they do' has been (and still is) a major research field. Three of the key personality theorists from the early 20th century who tried to measure personality were Gordon Allport, Henry Murray, and Raymond Cattell.

Allport viewed personality psychology as the study of the individual person and believed that personality was a combination of heredity and environment where if either was zero, there would be no personality (Allport, 1937). He also suggested that "the newborn infant *lacks* personality" (Allport, 1937 p107 original emphasis). He identified over 3000 possible traits believing each person

to be a unique whole, and he argued against clustering and factor analysis of traits in order to describe individuals. But as McAdams contends it is hard to see how a science of the person can assume uniqueness if it seeks lawfulness across persons (McAdams, 1997). Despite the contentious view of individuality, Allport did believe that factorial techniques would have value in characterizing groups. He also insisted that traits are ever changing and dependent on the environment at any given moment in time (Allport, 1937). Allport's concept of the *self* (which he termed the *proprium*) includes all the aspects of personality that make for inward unity (Allport, 1955 p40). These are: bodily sense, self-identity, ego-enhancement (self-seeking), ego-extension, rational agent, self-image, propiary striving (motivation), and the knower. Allport offered fifty definitions of personality from a variety of standpoints including: biosocial, psychological, sociological and philosophical. He did however suggest that overall "personality is the dynamic organisation within the individual of those psychophysical systems that determine his unique adjustments to his environment" (Allport, 1937 p48). He later amended this definition from 'unique adjustments to his environment' to 'characteristic behaviour and thought' (Allport, 1963). Allport believed that despite there being commonalities of type between individuals, the only way to study an individual is by focussing on that particular individual.

Murray coined the term 'personology' to describe the 'psychology of personality' which encompassed Freudian 'psychoanalysis', Jungian 'analytical psychology', and Adler's 'individual psychology' (Murray, 1938 p4). Murray theorised twenty manifest needs, eight latent needs, four internal factors, and twelve general traits, all essential to understand personality (table 5-2). These needs, factors and traits are forces that encourage individuals to transform "unsatisfying situations" (Murray, 1938). Murray also hypothesised the concepts of *press*, *thema*, and *unity thema*.

Table 5-2: Murray's list of forty-four variables (Murray, 1938 p144-149)

Manifest Needs	<i>Abasement</i>	
	<i>Achievement</i>	
	<i>Affiliation</i>	
	<i>Aggression</i>	
	<i>Autonomy</i>	
	<i>Counteraction</i>	
	<i>Deference</i>	
	<i>Defendance</i>	
	<i>Dominance</i>	
	<i>Exhibition</i>	
	<i>Infavoidance</i>	
	<i>Nurturance</i>	
	<i>Order</i>	
	<i>Play</i>	
	<i>Rejection</i>	
	<i>Seclusion</i>	
	<i>Sentience</i>	
	<i>Sex</i>	
	<i>Succorance</i>	
	<i>Superiority</i>	
	<i>Understanding</i>	
Latent Needs	<i>Repressed Abasement</i>	Passivity, masochism
	<i>Repressed Aggression</i>	Hate, Sadism
	<i>Repressed Cognizance</i>	Voyeurism
	<i>Repressed Dominance</i>	Omnipotence
	<i>Repressed Exhibitionism</i>	
	<i>Repressed Sex</i>	
	<i>Repressed Homosexuality</i>	
	<i>Repressed Succorance</i>	Anxiety of Helplessness
Internal Factors	<i>Ego Ideal</i>	Achievement drive, aspiration
	<i>Narcism and Superego</i>	Self-love, conscience
	<i>Superego Integration</i>	The socially demanded action is accepted
	<i>Superego conflict</i>	Asocial impulses are 'at war with the conscience'.
General Traits	<i>Anxiety</i>	Startledness, apprehension, worry
	<i>Creativity</i>	Develop ideas, produce art
	<i>Conjunctivity/Disjunctivity</i>	Co-ordination/disco-ordination of thought and action
	<i>Emotionality</i>	Emotion, affection, excitement
	<i>Endurance</i>	Persistence, perseverance
	<i>Exocathection/Endocathection</i>	Preoccupation with outer (exo); or inner (endo) events
	<i>Intraception/Extraception</i>	Intra = dominance of feelings, imaginative, romantic Extra = sceptical, 'down to earth', interest in facts
	<i>Impulsion/Deliberation</i>	Reaction time
	<i>Intensity</i>	Strength of effort, zest
	<i>Projectivity/Objectivity</i>	Project own sentiment onto others; or be detached
	<i>Radical/Conservative sentiments</i>	Defence of sentiments opposed to tradition, or rejection of new ideas
	<i>Sameness/Change</i>	Fixation, limitation, consistency; or instability, tendency to move around

A press is seen as a blocked or open gateway for the expression of a need: the beta-press is the individual's subjective perception of the situation; the alpha-press is the objective nature of the situation. A thema is the need-press interaction and the unity thema is the dominant pattern of thema which organises and gives meaning to the individual (McAdams, 1997). Murray's list of traits can be viewed as a set of personality factors that rely on the unity thema to be manifested.

Cattell (1950, 1943) attempted to reduce Allport's list of traits into clusters, first 171 then down to sixty by intercorrelating the reduced list, and finally to 16. Cattell distinguished between 'types' and 'traits'; whereby a person's type could be described as extrovert, introvert (as Jung), whereas traits would include descriptions such as 'sociable', 'treacherous', 'vain'. He suggested that there were 'continuous' types (e.g.: intelligent – unintelligent) in which there was a great degree of overlap between individuals; and 'species' types for which no (or very little) overlap could exist (e.g.: male – female). He also believed that traits took two distinct forms: surface and source. Surface traits are correlated observations of groups of people e.g.: people with more formal education may tend to watch more documentaries on television. Source traits cause behaviour and can influence surface traits. Cattell's working definition of personality was that "personality is that which permits a prediction of what a person will do in a given situation" (Cattell, 1950 p2). He goes on to suggest that "personality is ...concerned with all the behaviour of the individual, both overt and under the skin" (Cattell, 1950 p3). Cattell's sixteen source traits (Cattell and Kline, 1977) are listed in table 5-3.

Cattell's 'predictive' view counters Allport's 'ever-changing, individualistic' view. According to Cattell then, we can make a decent guess as to what an individual will do in a situation if we know what 'sort of person' they are, but not according to Allport as the environmental conditions of that situation may make our 'educated guess' meaningless.

Table 5-3: Cattell's 16 surface traits (Cattell and Kline, 1977)

TRAIT	Description	TRAIT	Description
SIZIA	Reserved, detached, critical, aloof, stiff	AFFECTIA	Outgoing, warm-hearted, easygoing, participating
LOW INTELLIGENCE	Dull	HIGH INTELLIGENCE	Bright
LOW EGO STRENGTH	At mercy of feelings, emotionally less stable, easily upset, changeable	HIGH EGO STRENGTH	Emotionally stable, mature, faces reality, calm
SUBMISSIVENESS	Humble, mild, easily led, docile, accommodating	DOMINANCE	Assertive, aggressive, competitive, stubborn
DESURGENCY	Sober, taciturn, serious	SURGENCY	Happy go lucky, enthusiastic, gay
WEAKER SUPER EGO STRENGTH	Expedient, disregards rules	STRONGER SUPER EGO STRENGTH	Conscientious, persistent, moralistic, staid
THRECTIA	Shy, timid, threat-sensitive	PARMIA	Venturesome, uninhibited, socially bold
HARRIA	Tough minded, self-reliant	PREMSIA	Tender minded, sensitive, clinging, overprotected
ALAXIA	Trusting, accepting conditions	PROTENSION	Suspicious, hard to fool
PRAXERNIA	Practical, down to earth, concerned	AUTIA	Imaginative, bohemian, absent minded
ARTLESSNESS	Forthright, unpretentious, genuine – but socially clumsy	SHREWDNESS	Astute, polished, socially aware
UNTROUBLED ADEQUACY	Self-assured, placid, secure, complacent, serene	GUILT PRONENESS	Apprehensive, self-reproaching, insecure, worrying, troubled
CONSERVATISM OF TEMPERAMENT	Conservative, respecting traditional ideas	RADICALISM	Experimenting, liberal, free thinking
GROUP ADHERENCE	Group dependent, a joiner, sound follower	SELF-SUFFICIENCY	Self-sufficient, resourceful, prefers own decisions
LOW SELF-SENTIMENT INTEGRATION	Undisciplined, self conflict, follows own urges, careless of social rules	HIGHER STRENGTH OF SELF SENTIMENT	Controlled, exacting will power, socially precise, compulsive, following self image
LOW ERGIC TENSION	Relaxed, tranquil, torpid, unfrustrated, composed	HIGH ERGIC TENSION	Tense, frustrated, driven, overwrought

All three of these theorists believe personality to be a complex phenomenon, difficult to pin down, but vitally important. As McAdams notes “for Allport, Murray and Cattell no single trait, need, attitude or sentiment is to be seen as the key to personality” (McAdams, 1997 p12).

If the view is that personality is extremely complex, can it at least be defined? According to Piedmont “personality can be defined as the intrinsic organisation of an individual’s mental world that is stable over time and consistent over situations” (Piedmont, 1998 p2). But is *personality* truly *stable* over time? Not according to the psychoanalysts Freud, Jung, and Adler, nor indeed from some empirical research (Helson et al., 2002, Helson and Wink, 1992). Is it truly *consistent* over situations? Not according to Allport, Murray or Cattell. A less restrictive definition is offered by Funder who suggests that personality is “an individual’s characteristic patterns of thought, emotion, and behaviour, together with the psychological mechanisms – hidden or not – behind those patterns” (Funder, 2007 p5). Funder’s definition is the consensual view that characteristics are ascribed to individuals, these characteristics are generally stable, and are psychological in nature (Saucier and Goldberg, 2003).

5.2 Measuring traits

How can personality be measured effectively? The early personality theorists Allport, Murray and Cattell ‘broke down’ the component parts of what they believed constituted personality into traits. Measuring these traits is done to predict behaviour and to understand behaviour (Funder, 2007), but having so many factors makes coming to sound conclusions about the personality of individuals or groups is still complex. A brief description of key developments in the attempts to group these traits in this area is given.

5.2.1 Two characteristics

Jack Block proposed a personality model encompassing just two characteristics: ego-control, and ego-resiliency. Overcontrolled individuals tend

to inhibit impulses to act, whereas undercontrolled individuals are more likely to act on impulses. Individuals with a high degree of ego-resiliency are able to adjust their level of impulse control depending on the situation; low ego-resiliency individuals are less able to do this (Funder, 2007 p199). According to Klohnen (1996) ego-resiliency has clear implications for an individual's adaptive capabilities in stressful or uncertain situations. Block's two characteristics are derived from the California Q-set 100 item personality inventory. Although research using Block's characteristics has been done with adults (Klohnen, 1996, Letzring et al., 2005); a fair amount of work has tended to focus on children and adolescents (Gjerde et al., 1986) and this in turn tends to concentrate on atypical children e.g.: clinic-referred children (Huey-Jr and Weisz, 1997); and adopted children (Juffer et al., 2004)

5.2.2 The 3 factor model

Hank Eysenck (drawing on Jung's theory in a similar mode to Cattell) used factor analysis to narrow down traits into groups. He believed that genetics (and biology) played a key role in the development of personality (Hergenhahn and Olson, 2003 p258) and that personality could be defined within initially two, then three superfactors: psychoticism, extraversion, and neuroticism (or PEN) (Hergenhahn and Olson, 2003). For Eysenck psychoticism represented creativeness, impulsiveness, self-indulgent; extraversion represented assertiveness, lively, dominant; and neuroticism represented anxiousness, being shy, moody (Eysenck, 1960). Tellegen has subsequently expanded Eysenck's model, but includes the higher order factors: negative emotionality (neuroticism), positive emotionality (extroversion), and constraint (psychoticism), along with eleven lower order traits (Ackerman and Heggestad, 1997, Funder, 2007).

5.2.3 Five Factor Model

The Five Factor Model (FFM) is by far the most commonly used model for measuring personality at the present time. Although the terminology for each

factor varies, the most often used terms are: Openness, Conscientiousness, Extroversion, Agreeableness, and Neuroticism, resulting in the acronym OCEAN. The FFM is sometimes distinguished from the 'Big Five' model (Saucier and Goldberg, 1996b), but for the purposes of this review both models are treated as synonymous.

An initial version of the FFM was developed from Cattell's list by Donald Fiske (Fiske, 1949). Fiske studied 128 male first year clinical psychology students by assessment via peers, personally and by staff members. He used 22 of Cattell's traits in a rating scale and factor analysed these into five recurrent factors: Social adaptability (A), Emotional control (N), Conformity (Conscientiousness), Inquiring intellect (O), and Confident self-expression (E). Fiske concluded that four of these factors recurred consistently through the research, but Social Adaptability was found to be a general factor. He also conceded the limitations of the study, namely that the participants were highly intelligent, had an interest in studying people, and had some psychology training. Nevertheless the results have had a major bearing on the subsequent research and debate of personality measurement.

Digman (1990) neatly summarises the subsequent separate robust, independent studies that appear to substantiate five factor model theories. He states that although the terminology of the factors differs, the overall *meaning* of certain factors is similar. For example: Extraversion is sometimes termed: surgency, power, assertiveness; and Openness is often termed intelligence (Digman, 1990 p423). It's not until the 1980's that more rigorous studies took place to create self-rating factor scales in order to measure personality. From here a whole clutch of self-rating scales have arisen including: Goldberg's International Personality Itinerary Pool (IPIP) (Goldberg et al., 2006); Costa and McCrae's NEO-PI-R (Costa and McCrae, 1985); the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) (Zuckerman, 2002); the Five-Factor Personality Inventory (FFPI) (Hendricks et al., 1999); the Big Five Inventory (BFI) (John et al., 1991, John and Srivastava, 1999); Saucier's Mini-Markers (Saucier, 1994); and the Ten Item Personality Inventory (TIPI) (Gosling et al., 2003).

In developing their 'NEO' scale, Costa and McCrae used Eysenck's Big Two E and N as a base, then included an openness to experience factor (Costa and McCrae, 1985). Further work resulted in the NEO-PI-R which included all five 'OCEAN' factors (Costa-Jr and McCae, 1995). The NEO-PI-R is a 240 item questionnaire that has two types of form for use as either self-report or observer-report and has been translated from English into 25 European languages and 15 other languages (Costa-Jr et al., 2002). A short version of the NEO-PI-R containing 60 items has also been produced and is generally termed the NEO Five-Factor Inventory or NEO-FFI. At the start of this century the NEO-PI-R had been used in over a thousand studies (Costa-Jr et al., 2002) and has shown high levels of validity in studies conducted by the instrument authors (McCrae and Costa-Jr, 1987, Costa-Jr and McCae, 1995); but also independently (Schinka et al., 1997, Major et al., 2006).

Goldberg began work on the International Personality Itinerary Pool (IPIP) (Goldberg et al., 2006) [initially 1981], in an attempt to categorise over a thousand trait terms into a smaller number of factors (John et al., 1988). Two versions of the IPIP were created with 100 and 50 items respectively. According to Goldberg et al (2006) the IPIP has been translated into 25 languages and has been utilised in over 80 studies. Whilst the 100 item IPIP was well used initially (Mowen and Spears, 1999, Saucier and Goldberg, 1996a); more research has subsequently focussed on the shorter 50 item IPIP (Guenole and Chernyshenko, 2005, Gow et al., 2005, Ployhart et al., 2001), with a general consensus of high validity and reliability. Saucier (1994) analysed the 100 item set and selected the highest loading factors to create a 40 item set of 'Mini-Markers'. This short scale has been found to have high validity when compared with the Big Five Inventory (Palmer and Loveland, 2004, DeYoung, 2006); with the NEO-PI (Olver and Mooradian, 2003); and with the IPIP (Dwight et al., 1998). Even shorter IPIP based scales have recently been developed with a 20 item 'Mini-IPIP' (Donnellan et al., 2006) and the TIPI (Gosling et al., 2003) showing potential when time and space are at a premium for researchers (Herzberg and Brahler, 2006).

Although the use of the 'Big Five' or FFM has been questioned (Block, 1995) (and Cattell refused to deviate from his list of 16) due to its over simplification of personality traits; this view has been countered by (Costa-Jr and McCrae, 1995, Goldberg and Saucier, 1995) who argue that the model is deemed comprehensive, not exhaustive. McAdams (1992) identifies limitations with the five-factor approach. He suggests that reliable ratings need to be simple, but they then lack context, and the scales also rely on how people rate themselves in relation to other people they know. Block (1995) points out that the traits that formulate the five-factors are not consistent across each itinerary. He notes that the trait 'warmth' falls within Extraversion for Costa and McCrae, but within Agreeableness for Goldberg; and that Impulsivity is part of Neuroticism for Costa and McCrae, but is within Extraversion for Goldberg. The Big Five structure, however, does not mean that personality differences can be reduced down to only five traits; rather they represent personality at a broad level as each dimension summarises a number of distinct characteristics (John and Srivastava, 1999 p105). The Big Five taxonomy captures the commonalities of personality description, providing an integrative descriptive model for personality research (John and Srivastava, 1999 p131). Overall, the five-factor model provides a useful set of very broad dimensions that characterise individual differences and when taken together they provide a good answer to the question of personality structure (Digman, 1990 p436).

5.2.4 The HEXACO model

The FFM dominated the personality assessment arena during the 1990's, but more recent research has centred on whether five factors is the optimum amount to gauge a true reflection of personality. Michael Ashton and Kibeom Lee in a series of research articles (Ashton and Lee, 2001, Ashton and Lee, 2005, Lee and Ashton, 2004) argue for a sixth factor in addition to the 'Big Five'. This 'Honesty-Humility' factor incorporates the traits of sincerity, fairness, greed avoidance, and modesty and forms part of the HEXACO model. This model resembles the FFM with the following dimensions: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C),

and Openness to Experience (O). As can be seen the Neuroticism dimension has been replaced with Emotionality. Although in the early stages of validation when compared with the IPIP (Lee et al., 2005) and with the NEO-PI-R (Lee et al., 2008) the extra sixth factor has been found to be useful and within different languages the sixth factor is also visible (Ashton et al., 2004b). A possible seven factor model has been raised as a potential tool with a HEXACO plus Religiosity factor (Ashton et al., 2004a); and an alternative six factor model with negative-Valence/Honesty, Agreeableness/Positive Affect, Prowess/Heroism, Introversion/Melancholia, Even Temper, and Conscientiousness has also shown promise (Saucier et al., 2005).

5.3 Use of personality scales in education

Research into personality within the student population has been well documented and has tended in recent years to focus on academic achievement, motivation, and possible links with learning styles.

Klinkosz et al (2006) used the Polish version of the NEO-FFI along with a Locus of Control scale to assess whether personality traits affected the academic achievement of 105 visually impaired students. They found that high levels of openness to experience were positively correlated with achievement. As the authors note despite being a fairly small sample of Polish students, the universality of the FFM allows a certain degree of generalisation about visually impaired students worldwide (Klinkosz et al., 2006 674).

Research by Farsides and Woodfield (2007) using the NEO-FFI on 329 university undergraduates found that openness to experience was a key factor in women achieving higher grades than men. They also note that conscientiousness was not positively related to higher grades despite a clear link between 'application' and overall marks. Farsides and Woodfield hypothesise that attendance at timetabled sessions (a key aspect of conscientiousness) may in itself not be the main factor related to grades, but

what takes place during the sessions themselves is (Farsides and Woodfield, 2007 p479).

The NEO-FFI was also used by Komarraju and Karau (2005) in conjunction with the Academic Motivations Inventory on 172 undergraduates to identify links between personality, motivation and ultimately course grades. They found that the more highly motivated students had higher levels of openness and conscientiousness, and these personality types (along with neurotics) had the higher grades.

Komarraju et al (2009) used the NEO-FFI along with the Academic Motivation Scale on 308 undergraduates again to determine causal links between personality and achievement. Conscientiousness was again found to be a good predictor of motivation and course grade. The same group of students were also investigated for any link between personality, learning style and academic achievement (Komarraju et al., 2011) and results showed positive links between conscientiousness, openness and agreeableness with higher academic achievement. They also found that openness was linked to deep processing of information.

The Hebrew version of the NEO-FFI was used by Rubinstein (2005) to identify differences between 320 students from four different faculties. He found that law students were less agreeable and open than all other students and more neurotic than natural science students although art students showed the highest level of neuroticism. Rubinstein also found that across all four faculties female students tended to be more conscientious and agreeable than male students.

Diseth (2003) on a sample of 315 students used Norwegian versions of the full NEO-PI-R with the Approaches and Study Skills Inventory for Students (ASSIST) to determine whether students with different personalities study in differing ways [see *Measuring Learning styles chapter for analysis of the ASSIST*]. Whilst noting that personality alone could not account for all the differences in learning styles, Diseth did conclude that strategic learners tended

to be more conscientious, with deep learners more open. Deep learners with open personalities also achieved higher grades in this research.

Eysenck's Personality Questionnaire (EPQ) was used by Jackson and Lawty-Jones (1996) in conjunction with Honey and Mumford's Learning Styles Questionnaire (LSQ) on 166 psychology students to ascertain the potential overlap between personality scales and learning styles scales [see *Measuring Learning styles chapter for analysis of the LSQ*]. They found that the Activist element of the LSQ was highly correlated with the Extraversion factor of the EPQ; and there was some correlation between Psychoticism and the Activist, Theorist, and Reflector types of the LSQ. Neuroticism was not linked to any LSQ element. These results are perhaps unsurprising as the method to examine correlations in this study involved breaking down the factors and elements into component parts.

Riding and Wigley (1997) also used the EPQ in a similar manner to Jackson and Lawty-Jones again looking for overlaps with learning styles, but this time in relation to Riding's Cognitive Styles Analysis [see *Measuring Learning styles chapter for analysis of this scale*]. Eysenck's IVE questionnaire measuring Impulsiveness, Venturesomeness and Empathy was also used. 340 further education students took part in the study which found that Neuroticism was linked with the Wholist-Verbaliser and Analytic-Imager dimensions of the CSA; Psychoticism was related to Wholists in general; whereas Extraversion did not correlate significantly with an individual cognitive style.

5.3.1 Medical education

Within medical education Goldberg's IPIP was used to ascertain whether personality had a role to play in the performance of 176 medical students over the five year degree (Ferguson et al., 2003). Results indicated that students with higher levels of conscientiousness did significantly better in preclinical assessment, but less well in the clinical setting. The Extraversion and Neuroticism aspects of Eysenck's EPQ in conjunction with a range of other

scales was used on 1044 medical students to compare the personalities of intakes in two different countries (Argentina and USA) (Rimoldi et al., 2002). The researchers used abbreviated versions of each scale to reduce the length of the overall questionnaire and factor analysis was administered to provide mean scores for the eight measures of: self-esteem, extraversion, general anxiety, test anxiety, neuroticism, locus of control, loneliness, and perception of stressful life events. Whilst having a shorter questionnaire does improve response rates it is debatable whether abbreviating so many scales would provide reliable and valid results. The researchers did conclude that Argentinean students were both more neurotic and extroverted than their counterparts from the USA (Rimoldi et al., 2002 p486). Lievens et al (2002) used the Finnish version of the NEO-PI-R to determine the role of personality in relation to academic achievement within a population of 631 medical students across three years of their studies. They found that these students scored highly for extraversion and agreeableness, with extraversion negatively linked to academic achievement in year 1, but positively so in years 2 and 3. As found elsewhere high levels of conscientiousness was positive in the pre-clinical years, but affected examination performance in later years (Ferguson et al., 2003).

5.3.2 Nursing

Studies of personality related to the nursing profession are not abundant, and a range of scales are used to measure the few studies that have taken place. Jackson's Personality Research Form was used to ascertain what personality traits were deemed desirable by practising nurses and whether there were any differences between associate degree nursing students and baccalaureate nursing students (Bradham et al., 1990). This research found that the traits considered most valuable by the nurses were those exhibited by the students, and no significant differences existed between both sets of students. The sample size was small (90 students) and Jackson's scale does not configure itself to the FFM. Another study using a non-FFM personality scale (Sand, 2003) aimed to explore the personality factors in a small sample of 51 female

nursing students and relate these to nursing competence and job satisfaction. Sand used the Cesarec Marke Personality scale (which is based on Murray's theory of Personology) and found that students with a high degree of empathy were well suited to their job and had fewer health problems; whereas the more 'hardy' students had a lower job satisfaction. Service-minded students gained the best appraisals initially, but had more health problems later on. Studies using FFM inventories have been undertaken recently. Hall-Lord and Larsson (2006) using three hypothetical cases of patient pain assessment along with Hendrick's FFPI found differences between student nurses and qualified nurses in their assessment of pain. Those participants over estimating pain tended to be more emotionally stable which the researchers believed was due to a higher level of empathy. There was no significant difference between the two sample groups.

The impact of personality in relation to job stress and burnout was researched by Zellars et al (2000) on a sample of 188 nurses using the NEO-FFI in conjunction with role conflict/stress/overload, and job burnout questionnaires. They found nurses with higher neuroticism scores reported higher levels of emotional exhaustion, whereas those with higher openness and extraversion scores reported greater personal accomplishment. Extraverts and those with higher agreeableness scores also showed lower levels of depersonalisation. Conscientiousness was not linked with burnout as the overall scores for this trait were high and with low variance, thus allowing little room for relationships to be identified in this small sample.

Eysenck's EPQ has been used in two separate recent studies (Warbah et al., 2007, McLaughlin et al., 2007) investigating the role of personality in nursing students' educational programs. Warbah et al (2007) used the EPQ in conjunction with general health and adjustment questionnaires to determine any associations with psychological distress within nursing education. They found that students with higher scores for neuroticism and lower scores for extraversion tended to encounter higher degrees of psychological distress and psychiatric morbidity and as such this type of student may be at greater risk of either dropping out of the course or encountering other health problems.

McLaughlin et al (2007) investigated whether personality had a role to play in both nursing students' attrition from nursing education programs and academic achievement. They used the EPQ in conjunction with an academic self-efficacy scale on a sample of 350 nursing students and found that those students with higher scores for psychoticism were more likely to withdraw from the course; whereas those with higher extraversion scores were more likely to achieve lower marks. The researchers suggest that high levels of psychoticism show apathy and a lack of empathy, and as such high attrition from nursing courses may be expected. They also suggest that extraversion may indicate that a student is easily distracted which could account for lower academic achievement. A further study on nursing students' attrition from nursing education programs was conducted by Deary et al (2003) on a sample of initially 168 students. This longitudinal study investigated the personality of students in each of the three years of their course using the NEO-FFI along with instruments for stress, health and burnout. The authors found that neuroticism was associated with most of the stress factors in the study, and that high levels of agreeableness and conscientiousness were associated with completing the course. These studies suggest that neuroticism/psychoticism has a negative impact on nursing students' education.

5.4 Suitability of the Mini-markers

As has previously been alluded to the Mini-Markers inventory is a reliable and valid tool when compared with Goldberg's 100 item scale (Dwight et al., 1998); Goldberg's 50 item scale (Palmer and Loveland, 2004); the BFI (DeYoung, 2006); and the NEO-FFI (Olver and Mooradian, 2003). The Mini-Markers has also been tested across cultures using English, Greek and Chinese versions on large cohorts of undergraduate students (Nye et al., 2008) with promising results. The ease of use, brevity, and simplicity of the scale make it a valuable assessment tool when questionnaire space is limited (Dwight et al., 1998, Palmer and Loveland, 2004).

Chapter 6 MEASURING SELF-EFFICACY

Self-efficacy as hypothesised by Bandura (1977b) is now used as an indicator of the confidence an individual has in their own ability to perform certain tasks.

6.1 Development of the concept

The concept of self-efficacy is one of the central constructs of Bandura's Social Cognitive Theory (SCT) (Bandura, 1986) *{initially termed Social Learning Theory (Bandura, 1977b)}* and indicates a person's self-belief in achieving a certain goal. Before discussing self-efficacy it is necessary to diverge and note where this concept 'fits' into the SCT model.

SCT is concerned with a range of concepts that fit into three core sets: behavioural, environmental and personal (Bandura, 1986 p24) (figure 6-1).

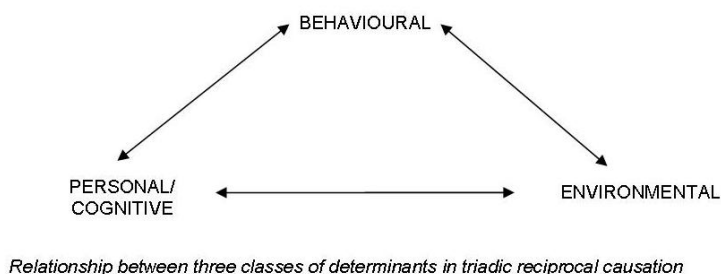


Figure 6-1: Bandura's (1986) three core sets of Social Cognitive Theory (reproduced from BANDURA, A. 1986. *Social foundations of thought and action: a social cognitive theory*, Engelwood Cliffs, NJ, Prentice Hall, p. 24 and reprinted by permission of Pearson Education, Inc., Upper Saddle River, New Jersey).

Bandura suggests these three factors influence each other depending on the circumstances, individual involved and the activity; and that the strength of the influence will vary. It emphasises that future behaviour is affected by a person's cognition (Baranowski et al., 2004).

These core concepts have been summarised in table 6-1:

Table 6-1: self-efficacy core concepts adapted from Baranowski et al (2004 p169)

<i>Environment:</i>	Factors external to the person physically
<i>Situation:</i>	Perception of the environment
<i>Behavioral capability:</i>	Knowledge and skill to perform a given behaviour
<i>Expectations:</i>	Anticipatory outcomes of a behaviour
<i>Expectancies:</i>	The values that the person places on a given outcome
<i>Self-control:</i>	Personal regulation of goal-directed behaviour or performance
<i>Observational learning:</i>	Behavioural acquisition that occurs by watching the actions and outcomes of others' behaviour
<i>Reinforcements:</i>	Responses to a person's behaviour that increase or decrease the likelihood of reoccurrence
<i>Self-efficacy:</i>	The person's confidence in performing a particular behaviour
<i>Emotional coping responses:</i>	Strategies or tactics that are used by a person to deal with emotional stimuli
<i>Reciprocal determinism:</i>	The dynamic interaction of the person, the behaviour, and the environment in which the behaviour is performed; consider multiple avenues to behavioural change, including environmental, skill, and personal change.

But self-efficacy is more than just 'confidence' per se. Bandura defined self-efficacy as being: "concerned with judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982 p122). His later definition included the important additional notion of performance; thus: "people's judgments of their capabilities to organise and execute courses of action required to attain designated types of performances" (Bandura, 1986 p391). This is significant because it now takes into account the perceived outcome of the action and whether that action is within their range of capabilities. Thus self-efficacy is a person's belief in their own ability to achieve (or otherwise) an outcome through their own behaviour.

His initial research (Bandura, 1977a) centred on snake-phobic participants perceived expectations of coming into contact with a snake at varying levels of threat. Participant modelling interventions were used to determine whether this would affect expectations. Bandura found that self-efficacy predicted subsequent performance as measured at different points in treatment in 92% of the total assessment tasks (Bandura, 1977a p211).

A task based analysis by Locke et al (1984) testing 209 undergraduates' belief (before and after training) on how many uses they could think of in one minute for different objects supported Bandura's (1982) discovery that past performance is a key factor. They also found that self-efficacy affects performance directly and indirectly (Locke et al., 1984).

Other researchers (Shell et al., 1989, Shell et al., 1995) have examined self-efficacy in academic settings and found that it is more potent than outcome expectancy alone. They also supported Bandura's assertion that higher self-efficacy was related to improvement in cognitive performance (Shell et al., 1995 p395); and academic writing (Shell et al., 1989 p96).

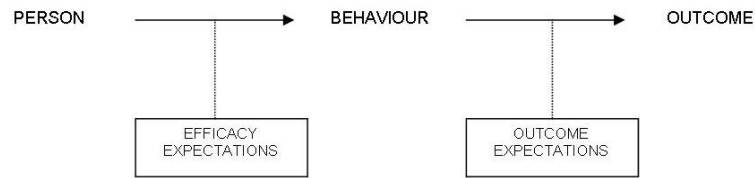
But isn't self-efficacy synonymous with self-esteem? Both concepts rely on 'confidence' and individuals that believe themselves to be highly capable, significant and worthy are more likely to predict higher success with tasks (Gardner and Pierce, 1998). Well, the same authors acknowledge the link, but go on to state that self-efficacy relates to a belief in one's own ability to perform certain tasks; whilst self-esteem is a self-perception of one's own competence, worth and value (Gardner and Pierce, 1998 p50). Hoban and Hoban (2004) in an analysis of self-esteem and self-efficacy state that they do "not believe that one must have high self-esteem to have high self-efficacy, or vice-versa, even though that might be the ideal" (Hoban and Hoban, 2004 p22). Research by Chen et al (2004) using the General Self-Efficacy scale and Rosenberg's Self-Esteem scale on a sample of undergraduate students and customer service representatives found that how individuals judge their own capabilities produces certain consequences; whereas how they feel about themselves leads to different consequences.

While commonalities exist between an individual's self-efficacy and self-esteem (and indeed locus of control [see Rotter 1954 below] and their motivation to perform a task) sufficient differences exist to allow them to be studied as isolated traits (Judge et al., 2002). Gist et al (1991) describe the differences as: self-efficacy being a judgement about task capability, self-esteem a trait reflecting individual characteristics, and locus of control a belief about the

causal relationship between actions and outcomes. It is also apparent that self-efficacy beliefs usually affect cognitive functioning through the joint influence of motivational and information-processing operations (Bandura, 1989 p1176). Self-efficacy also differs from self-concept in that it is task specific whereas self-concept is more global and less context dependent (Pajares and Miller, 1994). Bong and Skaalvick (2003) consider self-concept to indicate a perceived ability to achieve, whereas self-efficacy is confidence to achieve. In addition Kurbanoglu (2009) makes a direct link between confidence and high self-efficacy beliefs. Recent research by Ferla et al (2009) concluded that both represent different constructs particularly in relation to academic achievement.

People's perceptions of their self-efficacy will likely influence the types of anticipatory scenarios they construct and reiterate for themselves (Bandura, 1989 p1176). People will likely avoid activities or threatening situations that they perceive to exceed their coping skills, but behave assuredly in situations which they perceive are manageable (Bandura, 1977a p194). Further, those with high self-efficacy will expound greater effort to the demands of the situation and are likely to try and overcome obstacles that present themselves (Bandura, 1982 p123). Self-efficacy is a motivational construct influencing choices, reactions, amount of effort/persistence, coping and goal attainment (Gist and Mitchell, 1992). Self-efficacy is also partially determined by a person's previous success (or otherwise) with tasks and can also change in light of subsequent achievements or failures (Kurbanoglu, 2009).

Bandura made a clear distinction between efficacy expectations and outcome expectations. In his view outcome expectancy is a person's estimate that something they do will lead to a certain outcome; whilst an efficacy expectation is a person's conviction that they can successfully execute the behaviour necessary to achieve that outcome (figure 6-2). The difference here is that a person can believe that doing something will lead to a particular result, but question if they could do the action (Bandura, 1977b p79).



Representation of relationship between efficacy expectations and outcome expectations.

Figure 6-2: Bandura (1977b) self-efficacy expectations (reproduced from BANDURA, A. 1977. *Social learning theory*, Englewood Cliff, NJ, Prentice Hall, p.79 and reprinted by permission of Pearson Education, Inc., Upper Saddle River, New Jersey).

6.2 Problems with the concept of self-efficacy

The concept of self-efficacy as defined by Bandura (1977b) is not without its dissenters. Eastman and Marzillier (1984) challenge Bandura's initial experiments as being too task specific at a micro-level and that the number of possible outcomes of the experiment for the participants limited. They argue that Bandura has "over-simplified" the variables involved in any change in behaviour and that beliefs about outcomes are situation specific (Eastman and Marzillier, 1984 p227). Despite this Eastman and Marzillier (1984 p228) state "there is no doubt that people's assessment of their personal competence can be very powerful and accurate determinants of their future behaviour".

Kirsch (1985) contests Bandura's research with the main disagreement centring on the similarity of the concept of self-efficacy as defined by Bandura with Rotter's Social Learning Theory (Rotter, 1954). Rotter's theory does show some similarities to Bandura's in that modes of behaving are learned within the social setting, but Rotter believes that each person has a locus of control that is either inherently internal (success is determined by themselves) or external (success is determined by luck, or others); conversely Bandura's theory is more situation specific. Rotter also asserts that experience of situations is directly related to an individual's expectancy (Rotter, 1975) ; which is in line with Bandura. Bandura (2006 p309) himself counters any similarity thus "locus of control is concerned, not with perceived capability, but with belief about outcome contingencies – whether outcomes are determined by one's actions or by forces outside one's control". Kirsch's main objection would appear however to be concerned with the method of measuring self-efficacy, not whether self-efficacy is a viable

construct. Other authors (Gist et al., 1991, Strauser et al., 2002) note that the two are not identical, emphasising that self-efficacy centres on the perception of ability. Whilst an individual with an internal locus of control believes success and failure is under their own control, those with an external locus of control believe they don't have control over outcomes (Fazey and Fazey, 2001).

An early comparison of Rotter's and Bandura's theories by Haines et al (1980) investigated the persistence with tasks of volunteering University students. They found that whilst Rotter's Internal-External scale was supported with higher degrees of internality associated with longer persistence; efficacy expectations did not alter between successful and failure groups. In addition persistence was not enhanced by increasing self-efficacy. This study was small scale (40 subjects), but it does suggest that persistence and failure at tasks may be areas which are debatable with respect to self-efficacy and must be borne in mind. Shell and Husman (2001) examined the relationship of both locus of control and self-efficacy (along with causal attributions and future time perspectives) amongst undergraduates in respect of their achievement and studying and found that self-efficacy correlated with academic achievement considerably more than locus of control.

Research utilising the concept of self-efficacy is wide and varied but beyond the scope of this research. Here the application of self-efficacy within academic settings and particularly with reference to Information Technology and information seeking will be discussed.

6.3 Academic settings

According to Pajares (2002) a student's academic performance is influenced by their self-efficacy in a number of ways. Self-efficacy beliefs influence students' choices, determine how much effort is expended on activities, how long they persevere, how resilient they will be in adversity, and how much stress and anxiety they will experience (Pajares, 2002 p116).

6.3.1 Autonomous learning

For the purpose of the discussion here, autonomous learning encompasses the commonly used terms self-regulated learning (SRL) and self-directed learning (SDL). Whilst both terms have been used synonymously within the literature various definitions exist for both. Autonomous learning is important in the context of nurse education (in particular with the current emphasis on problem-based learning and evidence-based healthcare) and for information seeking in general. Students are expected to do these tasks away from the classroom environment.

SRL according to Pintrich and de Groot (1990) includes students' management of effort, metacognitive strategies for planning and monitoring their cognition and cognitive strategies for learning, remembering and understanding. Whilst Pintrich and de Groot's definition does not explicitly refer to self-efficacy, the results of their research on the relationship between academic performance, motivation and SRL implies that "student involvement in self-regulated learning is closely tied to students' efficacy beliefs about their capability to perform classroom tasks" (Pintrich and de-Groot, 1990 p38). Winne (1995) states that SRL students set goals in order to sustain their motivation, are aware of what they know and select strategies "based on predictions about how each is able to support progress toward chosen goals" (Winne, 1995 p173). It is easy to see the implicit link between SRL and self-efficacy from this statement.

An alternative definition by Zimmerman (1989) is more explicit in the role of self-efficacy in SRL. He states that SRL involves "the use of specified strategies to achieve academic goals on the basis of self-efficacy perceptions" (Zimmerman, 1989 p329). Pajares (2002) is of the belief that "students with high self-efficacy engage in more effective self-regulatory strategies" (Pajares, 2002 p117).

The relationship between self-efficacy and a person's self-regulation has been well researched and generally supports the definitions cited above. Fazey and Fazey (2001) state that "for learners to be self-determined or autonomous, they must have a sufficiently high self-perception of competence to be prepared to

risk short-term failure at a task which they feel is important” (Fazey and Fazey, 2001 p347). Pintrich (1999) summarizing several studies believes that students who “believe they can learn and are confident in their skills are more likely to report the use of self-regulatory strategies” (Pintrich, 1999 p467).

Knowles (1975) in a classic work believes SDL is the opposite of teacher-directed learning, emphasising that self-directed does not necessarily mean learning on your own, groupwork away from teacher involvement can also be considered SDL.

Garrison (1997) goes further and states that SDL is an approach where “learners are motivated to assume personal responsibility and collaborative control of the cognitive (self-monitoring) and contextual (self-management) processes in constructing and confirming meaningful and worthwhile learning outcomes” (Garrison, 1997 p19). It is clear from this definition how self-efficacy might interrelate with SDL in relation to personal responsibility and indeed Kohns and Ponton (2006) recently tested the Triangle Model of Responsibility with respect to SDL. O’Shea’s (2003) literature review on self-directed learning within nurse education found most studies used the Self Directed Learning Readiness Scale (SDLRS) as their instrument of choice despite concerns over its reliability and validity (O’Shea, 2003 p66). The SDLRS does not address self-efficacy, but a recent study by Ponton et al (2005) saw the development of the Appraisal of Learner Autonomy scale which measures learners’ self-efficacy for SDL, but this is a new scale and needs validating.

This area will be revisited in the next chapter on Learning Styles.

A recent study into the role of self-efficacy and SRL doesn’t necessarily tally with what might be expected. Braten et al (2004) used a modified version of the Motivated Strategies for learning Questionnaire (MSLQ) to test whether self-efficacy beliefs and self-regulated strategies had any effect in relation to performance goals. Using post-secondary students they found that self-efficacy beliefs were environmentally and context dependent. In some instances those students who believed they could learn and do well (high self-efficacy) showed

lower levels of self-regulated strategies – they didn't want to be perceived as being 'dumb'. The same study showed that those with a low self-efficacy belief felt duty bound to increase their strategic effort relative to the high self-efficacy believers in order to keep up (Braten et al., 2004 p242). The overall results of this study were inconclusive, but some self-efficacy role was nevertheless apparent.

Shell and Husman (2008) in a study of 397 undergraduates found a correlation between high self-efficacy and SRL in students who showed strategic methods; with low self-efficacy correlated with low strategy use in respect to SRL. They also found knowledge building was linked to high self-efficacy. This study whilst highlighting the relationship between high self-efficacy and strategic SRL also found that links between SRL and locus of control and motivation exist. Nevertheless self-efficacy was considered an important construct in SRL.

There can be little doubt that self-efficacy, whether in the direct defined sense as purported by Bandura or not, has an effect on people's perceptions of future success on certain tasks and is therefore a viable concept to investigate.

6.3.2 Academic motivation

Achievement in education has been linked to students' motivation to attain certain goals (Elliott and Dweck, 1988, Braten et al., 2004, Schmidt et al., 2006, Sins et al., 2008, Schunk, 1984); with some of these studies indicating a link with self-efficacy (Schunk, 1984, Sins et al., 2008, Braten et al., 2004).

Self-regulated students must have a degree of motivation to learn. A student that lacks motivation is more likely to be poor at acquiring knowledge as they will not be prepared to put in the necessary commitment or effort. It is currently considered that motivation can take three different forms, and is context and task dependent. Some authors argue for sub-divisions (Vallerand and Bissonnette, 1992, Vallerand et al., 1992, Ryan and Deci, 2000a), but still maintain the three overall forms.

Intrinsically motivated people act for fun or challenge (Ryan and Deci, 2000a). They are prepared to perform tasks because they want to, not because they are forced to do so. “Intrinsic motivation to act has its genesis within the individual and is congruent with the individual’s sense of self and purpose” (Fazey and Fazey, 2001 347). Ryan and Deci (2000a) go further to suggest that whilst agreeing that intrinsic motivation does exist within the individual, it is also apparent between individuals and activities. Intrinsically motivated individuals are also considered to perform better academically and be more creative (Ryan and Deci, 2000a). Extrinsic motivation is regarded as doing something in order to achieve an outcome: a means to an end. Individual behaviour is value driven by the benefits of the necessary actions (Lin, 2007).

Although it is clear that doing something for a separable outcome requires extrinsic motivation, the outcomes may be different for the same task. Ryan and Deci (2000a) cite the example of students doing homework due to potential parental sanctions or because it has some instrumental value to the student. Amotivation is the state of lacking an intention to act (Ryan and Deci, 2000a). Amotivated individuals are neither extrinsically nor intrinsically motivated and do not perceive contingencies between outcomes and their own actions (Vallerand et al., 1992). Ryan and Deci (2000a, 2000b) propose a self-determination continuum of motivation with amotivation and intrinsic motivation at the poles. In between extrinsic motivation is divided into: external regulation, introjection, identification and integration with each category showing increasing levels of behaviour emanating from one’s self.

So how does motivation relate to self-efficacy in academic settings? Early work by Bandura and Schunk (1981) on the mathematical self-efficacy of primary school children suggested that perceived self-efficacy accompanied high performance attainments and perseverance with tasks. Multon et al (1991) in a meta-analysis of 39 separate studies similarly concluded that academic behaviour and self-efficacy are related in ways that support Bandura’s general theory. Pintrich (1999) in a summary of several research projects focussed on school and college pupils and found that “self-efficacy was strongly related to academic performance including examinations, lab reports, papers and overall

final grade” (Pintrich, 1999 p465). Reviewing the literature at the turn of the century Zimmerman (2000) concluded that self-efficacy shows “convergent validity in predicting diverse forms of motivation” (Zimmerman, 2000 p89). More recent empirical research appears to be less decisive regarding the link between self-efficacy and academic performance. Choi (2005) in a study of 230 undergraduates found that academic self-efficacy was not a significant predictor of academic performance. In addition, Camgoz and Tektas (2008) in a study of 261 university students found no relationship between self-efficacy and academic attributional style (explanation of causes of events). Both these studies used general self-efficacy scales: Choi the General Self Efficacy Scale (Sherer et al., 1982); Camgoz and Tektas the General Perceived Self-Efficacy Scale (Schwarzer and Jerusalem, 1995), whereas more task-based instruments may have been more appropriate. Another study using 165 university distance learning students (Wang et al., 2008) did show a positive relationship between self-efficacy and academic results.

A recent study by Jungert and Rosander (2010) discovered that students on a course reliant on problem-based learning had higher self-efficacy beliefs regarding their ability to perform well in the course than those on the course without problem-based learning suggesting that elements of problem-based learning provide a means of enhancing self-efficacy. McLaughlin et al (2007) found that in a study of 384 nursing students, high self-efficacy (from an occupational perspective) was related to higher academic achievement; and Usher and Pajares (2006) established that academic achievement was related to self-efficacy in 468 pupils of varying ethnicity. Overall researchers have tended to support Bandura’s theory that self-efficacy is positively related to an individual’s achievement.

6.4 Development of research tools

Tools for measuring self-efficacy are numerous (particularly health related) but less specific scales include: the Generalized Perceived Self-Efficacy Scale (Schwarzer and Jerusalem, 1995) [originally 1981, but regularly updated]; the

General Self Efficacy Scale (Sherer et al., 1982); and the New General Self Efficacy Scale (Chen et al., 2001). The General Self-Efficacy scale in particular has been rigorously tested for validity (Sherer and Adams, 1983, Woodruff and Cashman, 1993, Tipton and Worthington, 1984, Bosscher and Smit, 1998) and is now considered a reliable measure of self-efficacy. All three of the scales were compared by Scherbaum et al (2006) who concluded that each are psychometrically sound, but that the New General Self Efficacy Scale has a slight edge over the older scales. More specific scales are required to ascertain the self-efficacy in particular settings or for explicit tasks because “if the purpose of a study is to achieve explanatory and predictive power, self-efficacy judgments should be consistent with and tailored to the domain of functioning and/or task under investigation” (Pajares, 1996 p550).

For the purposes of the literature review here efficacy scales in relation to teaching and computing/information technology are discussed, as well as the small field of information literacy scales.

6.4.1 Efficacy in teaching

Teacher efficacy scales are numerous and varied and include the Teacher Efficacy Scale (Gibson and Dembo, 1984); the Ohio State Teacher Efficacy Scale (Tschannen-Moran and Hoy, 2001); Ashton Efficacy Vignettes (Ashton et al., 1982); and the Teacher Efficacy Scale (short form) (Hoy and Woolfolk, 1993). *[See (Tschannen-Moran et al., 1998, Labone, 2004) for reviews of these and other scales.]*

Gibson and Dembo's (1984) scale in particular has been regularly used in teacher efficacy research (Hoy and Spero, 2005, Henson, 2001, Gordon and Debus, 2002), but this along with the previously mentioned scales endeavours to investigate teachers' efficacy in differing contexts. The Gibson and Dembo scale includes such statements as: “if students aren't disciplined at home, they aren't likely to accept any discipline”, and “teachers are not a very powerful influence on student achievement when all factors are considered”. These types

of statements are not querying an individual's self-efficacy beliefs about achieving outcomes at particular tasks – thus the scale does not test self-efficacy. This is an important point as it is not examining teacher's beliefs in their own actions; rather it is finding out generally what teacher's believe to be their 'lot'. Self-efficacy scales need to include questions that ask "how certain/confident are you..."; they need to be phrased in a way that asks "can do" rather than "will do" (Bandura, 2006 p308); and they certainly need directing at the self. The Gibson and Dembo scale hints at collective efficacy a concept researched elsewhere (Caprara et al., 2003, Goddard et al., 2004) which is a more aggregated construct focussing on an individual's perception of a group situation. It can also take the form of 'group capability' and questions such as "our school is capable of overcoming successfully the various difficulties that may arise" are typical of this type of research. These authors still acknowledge the role of self-efficacy as a precursor to collective efficacy and note the merits of examining both group and self-efficacy.

6.4.2 Teacher Self-efficacy scales

Efficacy scales focussing specifically on teachers' self-efficacy are becoming more prominent and five are discussed here. All the scales have been developed very recently and as such have not been rigorously tested.

The Classroom and School Context (CSC) model of teacher self-efficacy (Friedman and Kass, 2002) was developed in order to include the academic environment and the teacher as an individual. The authors argue that these aspects are missing from previous scales despite Bandura's assertion that teachers' efficacy beliefs should include areas outside of the classroom (Bandura, 1997). The 33 item scale is divided into two parts: the classroom context (19 items); and the school context (14 items). The final version of the CSC was settled on using factor analysis from an initial 45 item scale that was tested on 555 teachers. This scale has merits in that it addresses the individual's efficacy within the organisational context and manages to maintain the integrity of self-efficacy. The CSC shares some similarities with the College

Teaching Self-Efficacy Scale (CTSES) (Prieto, 2006) a 51 item scale that merges individual contexts with organisational contexts in the main part of the scale. The CTSES is interesting in that the items are scored for 'confidence in ability' and also 'how often do I'. Whilst confidence can easily be seen to 'fit' with self-efficacy, how many times one does something is less obvious. The CTSES also requires responders to respond on a six point scale which is not the optimum type of scale for self-efficacy. Bandura's Teacher Efficacy Scale (TES) [*initially formulated during the 1990's*] (Bandura, 2006) is a 28 item list of statements of confidence. This scale is divided into 6 sections covering: decision making, instruction, discipline, parental involvement, community involvement, and school climate. The TES clearly covers the individual's self-efficacy in respect of the organisation and environment. The CSC differs from both the TES and the CTSES in that it includes an examination of how teachers feel they will be able to overcome particular obstacles that may present themselves in the classroom. The TES and CTSES whilst still task focussed are more general in their analysis.

A new and interesting teacher self-efficacy scale is the Teachers' Efficacy Beliefs System – Self Form (TEBS-Self) (Dellinger et al., 2008). The TEBS-self was developed as the authors contested that existing teacher efficacy scales did not cover the concept of self-efficacy (or at least don't overtly do so). Scales were either developed using Locus of Control as a basis, or examined teacher's efficacy – not self-efficacy. This 30 item scale comprises both individual and organisational components, but disappointingly only has a four point response scale rather than the 0-100% recommended scale format. The TEBS-Self again includes some aspects of the three previously described scales and only rigorous research utilizing these scales will determine the effectiveness of each.

A final scale has been developed very recently with the specific intention of investigating teacher's self-efficacy for literacy instruction (the Teachers' Sense of Efficacy for Literacy Instruction – TSELI) (Tschannen-Moran and Johnson, 2011). Due to the contemporary nature of the scale it has not yet been used elsewhere and judgment must be necessarily delayed, but it does show promise owing to the particular nature of the scale itself. The scale included elements of

existing teacher self-efficacy scales to allow for comparison and correlation and was tested on 648 teachers. Key findings indicate that teachers with high self-efficacy for literacy instruction do not necessarily have high levels of self-efficacy for general instruction and vice-versa; suggesting information literacy instruction to be a separate construct.

6.4.3 Efficacy in computing

The information searching process today is highly dependent on the searcher's ability to use computers. Accessing and using online databases and electronic journals is a necessary function for students, in particular within healthcare due to the emphasis on evidence-based medicine. Computer anxiety could be perceived to have a bearing on students' self-efficacy with the search process and it is therefore prudent to investigate this link further. The role of computer self-efficacy in relation to academic settings has been well researched.

User's self-efficacy has been researched within the context of Information and Computer Technology (ICT) using general self-efficacy scales (Karavidas et al., 2005, Beas and Salanova, 2006), but more usually is investigated using specific computer/IT self-efficacy scales.

Although now slightly dated the initial Computer Self-Efficacy scale (CSES) developed by Murphy et al (1989) has been well used in the field. This 32 item scale (although one item was missing from the original published article) was developed from research using 414 students and nurses and is divided into 3 sections: beginner level, advanced level and mainframe computer skills. The scale is worded in such a way that the items are still fairly relevant 20 years later despite advances in information technology. This scale has been used in its original form by Harrison et al (1997) using 776 university employees. This research found a direct relationship between self-efficacy and performance with computer-related tasks: higher self-efficacy with increased computer-related task performance; lower self-efficacy with decreased task performance. The researchers believed that these results clearly supported Bandura's theory.

The CSES has also been used in a modified form by Khorrami-Arani (2001) who published initial findings of a longitudinal study using 105 secondary school pupils and found a relationship between self-efficacy and computer confidence. No follow up to this research has yet been published. The CSES was used by Karsten and Roth (1998) in a pre-test/post-test study using 148 information systems students. They found that high self-efficacy scores were positively related to the acquisition of future computer skills. In other words the more self-efficacious students felt – the greater their desire to acquire more skills. Langford and Reeves (1998) used the CSES along with 6 other tools to test 127 business students and found (amongst other results) that students expecting to do well or who had previous computer knowledge had a higher computer self-efficacy belief. Similar results were obtained by Torkzadeh and Koufteros (1994); and by Zhang and Espinoza (1998) who used the CSES to partially develop their own Computer Technologies Survey (CTS) which they tested on 296 computing students. The CSES has also been used more recently in a modified form (Chou and Wang, 2000), and in conjunction with other tools variously (McIlroy et al., 2007, Barbeite and Weiss, 2004, Paraskeva et al., 2008).

Another computer self-efficacy scale was developed by Compeau and Higgins (1995) as they deemed that current (at that time) research (Gist et al., 1989, Hill et al., 1987) was not task-based. This 10-item scale was first tested using 1020 management personnel and found that self-efficacy was an important factor in shaping participants behaviour. It was found that high self-efficacy was directly related to more enjoyment from computers, more use and less anxiety (Compeau and Higgins, 1995 p203). A recent study (Saleem et al., 2011) used this scale along with a personality scale to assess the impact of a self-checkout library system and found that higher computer self-efficacy was positively linked to extraversion, conscientiousness and openness. This scale, perhaps due to its brevity, has often been used in conjunction with other scales for experience, anxiety and anger (Wilfong, 2006, van-Braak and Tearle, 2007, Johnson, 2005, Shih, 2006); technology readiness (Lai, 2008); or in the development of new scales (Eastin and LaRose, 2000, McFarland and Hamilton, 2006, Downey and

McMurtrey, 2007). When used the scale has been found to be valid and reliable.

Both of these scales along with several other 'single-study' and general scales were initially reviewed in the late nineties (Marakas et al., 1998).

Recently, Hsu and Huang (2006) developed an Internet self-efficacy scale incorporating Web2 elements, and this type of scale may be required to meet the ever changing dynamics of this medium; and Vekiri and Chronaki (2008) constructed a computer self-efficacy scale to investigate the relationship between gender, parental help and computer self-efficacy within Greek primary schools. Wang and Wang (2008) brought computer self-efficacy research up to date by developing and validating a 45 item 'mobile computer' self-efficacy scale.

Another Internet self-efficacy scale (ISS) initially developed by Tsai et al (2001) after research on a sample of high school students and subsequently used and modified (Tsai and Tsai, 2003, Wu and Tsai, 2006) shows promise as a research tool. It has also been used on teachers (Kao and Tsai, 2009), but all the research has been performed in Taiwan.

General computer self-efficacy scales are useful in determining users' confidence in the operation of computers; their fears and attitudes towards technology, but IT is only one aspect of information seeking behaviour. More targeted self-efficacy scales are required to investigate the full range of tasks within ISkB; including those that do not relate to IT.

6.4.4 Efficacy in information seeking and information literacy

The majority of self-efficacy in information seeking has been undertaken in relation to electronic searching using a variety of tools and measures (Monoi et al., 2005, Ren, 2000, Debowski et al., 2001, Wood et al., 2000, Yi and Hwang, 2003, David et al., 2006) with the main emphasis on information literacy skills.

The research methodology of choice tends to be a pre-test – post-test design with differences in perceived levels of self-efficacy investigated after some form of instruction or training. Electronic searching for information is a key facet of the ISkB process, but whilst this research generally supports the notion that self-efficacy increases after training, the fact that only electronic searching is being investigated is too narrow in terms of general ISkB. Chiou and Wan's (2007) study of 136 college students found that in terms of Internet searching a negative task experience greatly decreased self-efficacy, whereas a positive task experience only moderately increased self-efficacy. More recently Zhu et al (2011) found that the benefits of Internet information seeking for students with low academic self-efficacy were much greater than for students with higher academic self-efficacy, and this positively affected academic performance. They found that when self-efficacy reached a critical point the benefits of performing more searches diminished and concluded that more Internet searching is not beneficial to those with high academic self-efficacy.

A scale that encompasses many more aspects of the information seeking process has been developed by Kurbanoglu (2003, 2006). Kurbanoglu developed the Information Literacy Self-Efficacy Scale (ILSES) from the viewpoint that information literacy includes:

- a. Recognizing when information is needed
- b. Initiating search strategies
- c. Evaluating, synthesizing and using information both ethically and legally
- d. Communicating and sharing results of problem solving

And importantly this is across the range of information formats.

(Kurbanoglu et al., 2006 p730)

6.5 Suitability of the Information Literacy Self-Efficacy Scale (ILSES)

The ILSES incorporates not just the information searching and seeking aspects of information literacy, but also aspects of utilizing what has been found; in

essence writing an assignment. The ILSES was initially developed (in Turkish) through research on 179 undergraduates at Hacettepe University, which aimed to explore any correlation between students' perceived self-efficacy in information literacy and computer literacy (Kurbanoglu, 2003). The ILSES used in the research has since been refined and validated (Kurbanoglu et al., 2006) in a five phase study. A 40-item scale initially tested on 372 teachers was tested for internal consistency and achieved a Cronbach's alpha score of 0.84. Discrimination indices then enabled 12 items to be removed which yielded a Cronbach's alpha score of 0.92. Principle component analysis was then used to further reduce the scale to 17 items (Cronbach's alpha 0.82). The two shortened scales (28 and 17 items) were translated into English and both English and Turkish versions tested on 47 undergraduate students. Both scales achieved high internal consistency (0.91 for the 28 item version; 0.81 for the 17 item version). The conclusion of this testing is that the 28 item scale is highly reliable and the 17 item version reliable. The reduced 17 item scale lends itself to any analysis of basic, intermediate and advanced information literacy skills research and Kurbanoglu concluded that the 17 item scale is recommended in research that approaches "information literacy skills regarding to their complexity levels based on learning principles" (Kurbanoglu et al., 2006 p738).

Since the development of the ILSES, primary research has been conducted (Uslel, 2007) that utilises a modified version of the scale. Uslel (2007) investigated the information literacy self-efficacy of 1702 student teachers using the ILSES. She reduced the 28 item scale to 20 items although it is not clear why 8 items were removed as the resulting Cronbach alpha score was slightly reduced to 0.90. The resulting 20 items were grouped into 4 separate areas: analysis and evaluation of information; using ICT and searching; citing resources; and using the library. Uslel found that student teachers had a high level of information literacy self-efficacy and that their ICT use increased with experience. Small scale research on the information and computer literacy of 68 teachers also used the 28 item ILSES in conjunction with a computer literacy scale, and follow up interviews (Erdem, 2007). Erdem found that there was a link between the two literacy scores with teachers tending to either have high scores on both scales, or low/moderate scores on both.

Although it would have been possible to investigate the potential benefit of refining the 28 item scale, Kurbanoglu ascertains that the “17 item refined scale, which can be used to determine subjects’ self-efficacy levels for information literacy, exhibits high reliability without excessive length” (Kurbanoglu et al., 2006 p734). This is particularly worthy as in this research where several tools were used in the development of the overall questionnaire. It should be noted that permission to use the 17 item ILSES research tool was granted by Serap Kurbanoglu.

Chapter 7 MEASURING LEARNING STYLES

Learning Styles are frequently used to test how students prefer to learn, but there is no single definition of a learning style and indeed the term is often used synonymously with thinking styles, cognitive styles and learning modalities (BECTA, 2005); or with motivational styles, learning orientations and learning conditions (Coffield et al., 2004a). Evans (2010) contends there are differences and offers yet a further category of 'approaches to learning'. There is some debate as to the benefits of using learning styles at all (Pashler et al., 2008) as they are seen to potentially stereotype or pigeonhole students (Scott, 2010, Riener and Willingham, 2010) and the merit of many learning styles tools will be discussed critically in the following sections. Many writers distinguish between learning styles and cognitive styles, and the main themes debated are considered in the following sections.

7.1 'Learning' styles or 'cognitive' styles?

Although some researchers offer no distinction between the terms 'learning style' and 'cognitive style' (Severiens and Dam, 1994, Liu and Ginther, 1999) others discuss the perceived difference at length (Peterson et al., 2009, Evans, 2010). Riding and Rayner (1998) suggest that cognitive styles are an individual's preferred and habitual approach to organising and representing information (Riding and Rayner, 1998 p8). The same authors contend that learning styles refer to differences in preference for instruction and include psychological and intellectual differences as well (Riding and Rayner, 1998 p51). Cognitive styles according to Riding (2002) are automatic and constant; a view echoed by Witkin et al (1977). Ford and Chen (2001) describe cognitive styles as preferred modes of information processing, whereas learning styles are cognitive styles entailing information processing taking place specifically in a learning context (Ford and Chen, 2001 p6); further Riding and Cheema (1991) state that cognitive style is a bipolar dimension whilst learning style includes many elements that are not 'either-or' extremes. Yukhina (2007) makes the distinction that cognitive style deals with cognitive activity rather than content,

whereas learning style is broader and combines fixed qualities with characteristics open to modification. She goes on to suggest that a further learning strategies category exists that is more fluid and dynamic, can change from task to task and crucially – can be learned and developed (Yukhina, 2007 p9). The notion of the term ‘learning strategies’ has also been muted as the preferred description for ‘learning styles’ per se (Riding and Rayner, 1998). The third category of ‘approaches to learning’ identified by Entwistle et al (2001) and described as an interaction between the learner and the task (Peterson et al., 2009) can be seen in terms of a learning strategy.

For the purposes of this research study no distinction is necessary although an idea of how these types of tools have been developed and the rationale behind them is desirable.

7.2 Development of research tools

It has been suggested that the idea that individuals learn differently originates from ancient Greece philosophers (Atherton, 2002, Guild, 1998). Within the last century however many varied tools have been developed that attempt to investigate the differences.

Although all Learning Styles tools attempt to measure a similar thing – the different ways students prefer to learn – the types of tools are varied. Curry’s Onion Model (Curry, 1983) is an often cited base for distinguishing between tools which shows three related layers.. Coffield et al (2004a) argue it is unclear what each layer represents as it lacks clarity. The model also does not discuss why the three types are shown in this schematic way rather than as separate entities. Curry believes that the outer layer refers to instructional preference of which the student has little control; the middle layer is the informational processing style which the student has more control; and the inner layer is the cognitive personality style which is the approach to thinking that is used by the student (Curry, 1983). The original three layer model from 1983 has since been

changed to include an additional 'Social Interaction' layer between the instructional preference and information processing style layers

Neatly summarised by Swanson (1995), at the core of the onion are styles relating to personality traits and instruments here assess the role of personality on the acquisition of information. The next layer is concerned with the assimilation of information intellectually, and is followed by the extra social interaction layer which addresses student interaction. The outermost layer contains instruments encompassing the learning environment, and as such the students' preferred mode of learning (Swanson, 1995 p5).

Coffield et al (2004a) reconfigured this model into a continuum of 5 distinct types, within which they were able to categorise 51 distinct learning styles tools. This continuum reflects Yukhina's views regarding the differences between cognitive and learning styles/strategies (Yukhina, 2007) and is represented in figure 7-1.

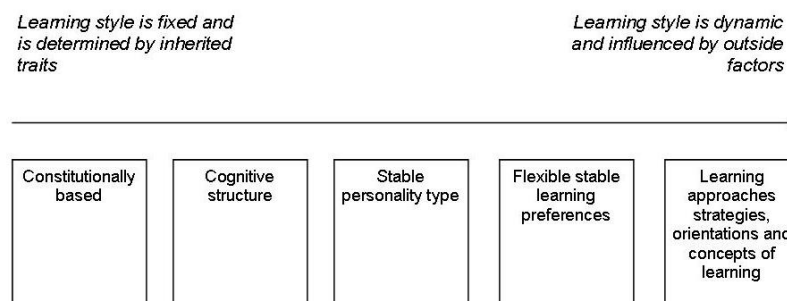


Figure 7-1: the cognitive – learning continuum summarized from Coffield et al 2004a

This classification is useful in that it provides a set of foci within which different ideas can be presented and also provides groupings of similarly structured scales for comparison. Coffield et al (2004a) suggest that the continuum is based on the extent to which individuals' learning styles are considered fixed: the further to the left the more the scale developers believe that genetics and inherited traits determine an individuals' style. At the right hand end of the continuum are the more 'dynamic' instruments which pay heed to motivation, environment, culture and teaching. These instruments observe the importance

of social factors in cognition as pertained within the social development model of Vygotsky (Cole et al., 1978). In general terms the cognitive styles are to the left and the learning strategies are to the right. For the purposes of the research here, discussion will concentrate on instruments within the final two types: flexible stable learning preferences; and learning approaches strategies, orientations and concepts of learning although a brief discussion of cognitive styles follows.

7.2.1 Cognitive-based styles

The 'clutch' of cognitively focussed styles has origins in psychology (Guild, 1998). Key instruments that warrant further discussion are Dunn and Dunn's Learning Styles Inventory (LSI) and Gregorc's Style Delineator (GSD) which fall within Coffield's constitutionally based group; Riding's Cognitive Styles Analysis (CSA) and Witkin's Field-Dependence-Independence which fall within the cognitive structure group; and the Myers-Briggs Type Indicator (MBTI) from the stable personality group.

DUNN AND DUNN

The Dunn's Learning Styles Inventory (LSI) is a 104-item self-report questionnaire versions of which can be used for primary and secondary school children (Rayner and Riding, 1997, Cassidy, 2004). An adult version of the questionnaire (the Productivity Environmental Preference Survey – PEPS) was also developed (Coffield et al., 2004a). The LSI contains a range of elements that are grouped within five major stimuli: environmental, emotional, sociological, physical and psychological (Coffield et al., 2004a) although the fifth stimuli which was not part of the early model is not measured. The following table (7-1) summarises the groupings of factors in the LSI.

Table 7-1: Dunn and Dunn's LSI groupings (from Coffield et al., 2004a p21)

Variable	Factors			
Environmental	Sound	Temperature	Light	Design
Emotional	Motivation	Responsibility	Persistence	Structure
Physical	Modality preferences	Intake	Time	Mobility
Sociological	Learning groups	Support from others	Working alone/with peers	Motivation from parent/teacher

The LSI is a widely used instrument in particular within the American education system (Guild, 1998, Coffield et al., 2004a) and according to some authors has high predictive validity (De Bello, 1990). Others, however dispute the model's validity (Coffield et al., 2004a).

The main positives of the LSI are that it: affirms that students can learn if their preferences are catered for, encourages the respect of difference, encourages flexibility, encourages discourse. The negative is that student preferences are fixed - they do not change over time or in different situations which can lead to stigmatisation (Coffield et al., 2004a).

GREGORC

Gregorc's Style Delineator (GSD) is a 40 item self-report inventory involving the ordering of word sets (Cassidy, 2004). Analysis of these sets gives rise to an individual's predisposed learning style.

Gregorc believes there are two dimensions of mind function which determine the way individual's grasp and arrange information. The 'perceptual' dimension which is made up of a continuum with abstract and concrete at the poles is concerned with the way the mind 'sees' things and individuals tend to prefer one over the other (Guild, 1998). The 'ordering' dimension is concerned with the way individuals arrange information – either: linearly and methodically (sequentially) or tangentially and non-linearly (random) (Swanson, 1995) (figure 7-2).



Figure 7-2: representation of the two dimensions of Gregorc's Style Delineator (adapted from Guild 1998 pp92-93).

From these dimensions four distinct patterns of style are possible: concrete sequential; abstract sequential; abstract random; and concrete random.

The GSD has merit in that it is a simple to administer instrument, but there is no version that is applicable for students and doubts have been raised as to its clarity and validity (Coffield et al., 2004b), and the lack of empirical correlation (Riding and Rayner, 1998).

RIDING

Riding's Cognitive Styles Analysis (CSA) is an electronically administered instrument consisting of 88 statements/sets of pictures divided into 3 categories: verbal-imagery (48 statements), wholist (20 pairs of geometric figures), and analyst (20 sets of shapes). The participant's reaction times to statements and questions are then monitored (Peterson et al., 2003b).

Riding believes there are two basic dimensions of cognitive style: the wholist-analytic dimension – concerned with organising information; and the verbal-imagery dimension concerned with the representation of information (Riding and Rayner, 1998). Individuals are inclined to one type or the other.

Despite some evidence to suggest the CSA is valid and reliable (Riding, 1997); it has come under increasing criticism in recent times with concerns over the validity of the wholistic-analytic dimension (Davies and Graff, 2006) and with the

reliability of the instrument (Coffield et al., 2004a, Peterson et al., 2003b, Peterson et al., 2003a, Redmond et al., 2007, Parkinson et al., 2004).

WITKIN

Witkin's Field dependence-independence model has its origins in the late 1940's (eg: Witkin, 1949), but is described later in great depth by the same author (Witkin et al., 1977). The model is made up of three separate tests: rod and frame, body adjustment, and group embedded figures. Both the rod and frame test and the body adjustment test aim to determine an individual's perception of their orientation in space. In the rod and frame test individuals are placed in a darkened room with an illuminated square frame and movable rod. The frame is tilted variously and the individual is expected to move the rod to the vertical. Individuals that take cues from the frame (thus believing the rod to be vertical when it isn't) are field-dependent; those that ignore the frame (and turn the rod to the vertical) are field-independent. The two poles are along a continuum with varying levels of dependency. Similarly the body adjustment test takes place in a darkened room (which can be tilted) with the individual placed in a tiltable chair which they are expected to move to the upright. As with the rod and frame test, individuals taking cues from their surroundings are more field-dependent; those ignoring the surroundings are more field-independent. In the group embedded figures test individuals are asked to find a simple shape within a more complex shape. Those that find the shape quickly are more field-independent; whilst those who take longer (or even fail to find the shape) are more field-dependent.

Of these three tests the Group Embedded Figures Test (GEFT) lends itself most readily to educational research and has been used to ascertain field dependence (Noble et al., 2008, Zhang, 2004). Some authors have questioned whether the GEFT measures 'style' or is linked to intellectual or perceptual ability (Zhang, 2004, McKenna, 1983, Cassidy, 2004, Armstrong, 2000).

MYERS-BRIGGS

The Myers-Briggs Type Indicator (MBTI) was originally developed in the early 1960's, but subsequent versions in the 1980's and 1990's are most often used (Coffield et al., 2004a). The standard MBTI is a 93 item questionnaire (there are also 126 and 50 item forms) relating to four bipolar discontinuous scales which attempts to apply Jungian theory in various settings (Coffield et al., 2004b, Swanson, 1995, Li et al., 2008). The four dimensions are: Extraversion (E) to Introversion (I); Sensing (S) to Intuition (N); Thinking (T) to Feeling (F); and Judging (J) to Perceiving (P). Individuals are then assigned dimensions depending on their responses leading to one of 16 preferred personality types e.g.: ESTJ, INTJ, etc. The MBTI is used extensively (Coffield et al., 2004b, Sears et al., 1997, Bayne, 1997), but although there is some positive evidence to its reliability (Tzeng et al., 1984) and validity (Carlson, 1985) there are issues with reliability of the scale due to its dichotomous nature in which individuals are 'forced' to one side or the other when there may be little difference in scores (Coffield et al., 2004b). There is also an issue whether the MBTI is able to track any style changes over time (Salter et al., 1997). Although Bayne (1997) has countered many of these criticisms in a comprehensive review of the test doubts remain.

7.2.2 Learning-based styles

The set of learning focussed styles is more concerned with the teaching, curriculum, motivation and how students develop strategies to deal with them (Coffield et al., 2004b). Of the many key instruments, the following are discussed: Kolb's Learning Styles Inventory (KLSI), Honey and Mumford's Learning Styles Questionnaire (LSQ); and Allinson and Hayes's Cognitive Styles Indicator (CSI) which fall within Coffield's flexibly stable learning preferences group; and Entwistle's Approaches to Study Skills Inventory for Students (ASSIST) and Vermunt's Inventory of Learning Styles (ILS) from the learning approaches and strategies group.

KOLB

Kolb's Learning Styles Inventory (KLSI) (1984) is a widely influential model (Duff and Duffy, 2002) that acted as a forerunner to other models; in particular Honey and Mumford's LSQ, and Allinson and Hayes's CSI (Sadler-Smith, 1999, Coffield et al., 2004b). The KLSI itself is characterised by earlier models (Lewin, Dewey and Piaget) all of which had similar four stage cycles (Kolb, 1984). The model is founded on Jungian theory (Kolb, 1984, Loo, 2004), although this has been disputed elsewhere (Garner, 2000). Kolb's model is illustrated below in figure 7-3:

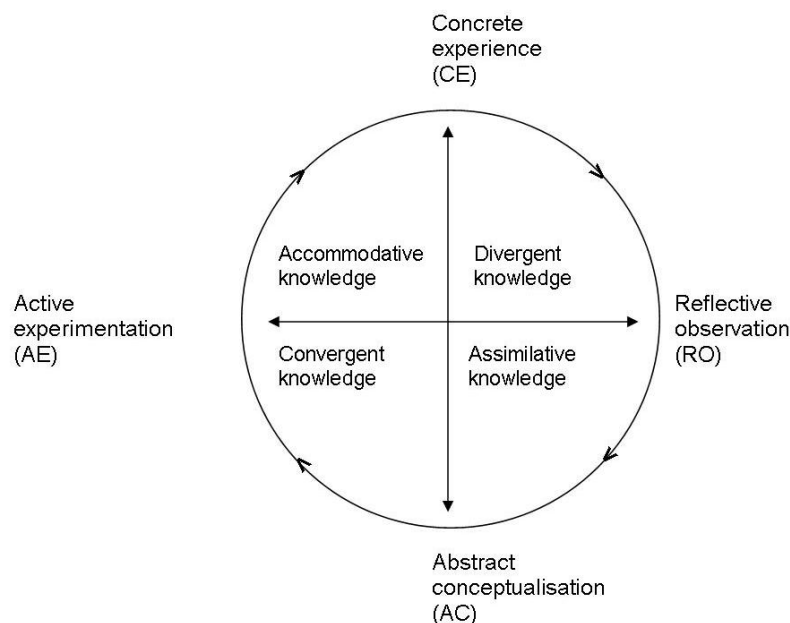


Figure 7-3: Kolb's (1984) Learning Styles Inventory expectations (reproduced from KOLB, D. A. 1984. *Experiential learning: experience as the source of learning and development*, New Jersey, Prentice Hall, p.42 and reprinted by permission of Pearson Education, Inc., Upper Saddle River, New Jersey).

The KLSI contains 12 short statements regarding learning situations for which respondents must rank four sentence endings. These four sentence endings correspond to the four learning styles: converging (abstract, active), diverging (concrete, reflective), assimilating (abstract, reflective), and accommodating (concrete, active) (Duff and Duffy, 2002, Coffield et al., 2004a). The KLSI has been used extensively (Loo, 1997, Lu et al., 2007, Yamazaki, 2005), but the reliability of the tool is a contentious issue. Metallidou and Platsidou (2008) found the reliability acceptable in recent research with teachers, but Coffield et al (2004a) review much research to the contrary. The validity is also questioned

by Coffield et al (2004a) Koob and Funk (2002), with an analysis by Garner (2000) particularly damning.

HONEY AND MUMFORD

Honey and Mumford's Learning Styles Questionnaire (LSQ) is similar to Kolb's model in that there are four dimensions. In the case of the LSQ these are: Activist, Reflector, Theorist, and Pragmatist. The model was developed as a result of earlier research with the KLSI which showed a lack of clarity. The current LSQ is an 80 item questionnaire (a shorter 40 item version also exists) that determines an individual's learning style. Each style is afforded 20 items within the questionnaire for this purpose (Honey and Mumford, 2006) and the strengths and weaknesses of each style are summarised below in table 7-2:

Table 7-2: Honey and Mumford's Learning Styles Types - strengths and weaknesses (adapted from Honey and Mumford, 2006)

Style	Strengths	Weaknesses
Activists	Flexible, ready for action Enjoys new situations Embraces change	Irrational Takes risks Rushes into action Gets bored easily
Reflectors	Careful, thoughtful, thorough Good listener Doesn't jump to conclusions	Slow at decision making Unassertive Cautious Holds back from participation
Theorists	Logical, rational, objective Disciplined Can see the whole picture Asks questions	Dislikes uncertainty Doesn't think laterally Dislikes subjectivity
Pragmatists	Businesslike Practical Likes testing new things	Task oriented Impatient Rejects anything without an application

The LSQ is a well-used instrument (Duff and Duffy, 2002, Coffield et al., 2004a) and appears to have an acceptable reliability rating (Coffield et al., 2004a, Goldfinch and Hughes, 2007). Initial research found that the LSQ outperformed the KLSI on aspects of validity (Allinson and Hayes, 1988), but more recent research has expressed concern with its validity (Coffield et al., 2004b). Duff and Duffy (2002) used 388 undergraduates from business (224) and health studies (164) to test the psychometric properties of the LSQ and thus whether it

could be used as an alternative to the KLSI. They found that the LSQ had “limited reliability and validity for this population” (Duff and Duffy, 2002 p159) and was therefore not considered a viable alternative to the KLSI. Questions also persist as to whether the LSQ is a measure of learning style or of personality (Furnham, 1992, Jackson and Lawty-Jones, 1996).

ALLINSON AND HAYES

The Cognitive Styles Indicator (CSI) is a 38 item instrument that aims to measure a single dimension along a continuum with intuition and analysis at either pole (Allinson and Hayes, 1996). This unitarist view has been contested by Hodgkinson and Sadler-Smith (2003) who proposed that analysis and intuition are better represented as interrelated, but separate facets. This system has received support elsewhere (Coffield et al., 2004a) and has been utilised in recent research (Evans and Waring, 2006, Evans and Waring, 2008). The CSI contains 21 statements pertaining to the analytical perspective and 17 statements on the intuitive perspective. These statements are scored as true, uncertain, or false (Evans and Waring, 2008, Coffield et al., 2004a). The CSI was developed as it was deemed measures (at that time) of cognitive style were either cumbersome and awkward to administer to large groups, had reliability and validity issues, or were untested (Allinson and Hayes, 1996). The CSI has had favourable reviews (Hodgkinson and Sadler-Smith, 2003) and was the only learning styles instrument to meet all of the internal consistency, test-retest reliability, construct validity, and predictive validity targets in Coffield et al (2004b) substantive review. What is lacking is empirical research in the educational field as the CSI is geared towards business and was not initially intended for pedagogical purposes (Coffield et al., 2004b).

7.2.3 Learning approaches strategies, orientations and concepts of learning

ENTWISTLE

Entwistle and colleagues first developed the Approaches to Studying Inventory (ASI) a 64 item questionnaire with shorter 30 and 18 item versions in the early

1980's. It has since undergone a range of changes and has spawned the Revised ASI (RASI) and the Approaches to Study Skills Inventory for Students (ASSIST) in the mid-1990's and the Approaches to Learning and Studying Inventory (ALSI) in 2004 (Entwistle and McCune, 2004). Entwistle's initial research in the late 1970's drew upon earlier work by Marton and Saljo (1976) who coined the terms 'deep' and 'surface' in relation to learning approaches; and Biggs whose Study Process Questionnaire of the late seventies has since been revised (Biggs et al., 2001). From this Entwistle extended the approaches to include a 'strategic' type and the 60 item RASI included an 'apathetic' type. The development of the ASSIST merged the surface and apathetic types, and the three are summarised below in table 7-3:

Table 7-3: the defining features of Approaches to Learning and Studying, taken from Entwistle et al (2001 p109 and p112) and, Entwistle and Peterson (2004)

Deep approach	<i>Seeking meaning by:</i>
<i>Intention is to understand ideas for yourself</i> <i>Has an interest in course content</i>	Relating ideas to previous knowledge/experience
	Looking for patterns and underlying principles
	Checking evidence and relating it to conclusions
	Examining logic and argument cautiously and critically
	Being aware of understanding developing while learning
	Becoming actively interested in the course content
Surface approach	<i>Seeking meaning by:</i>
<i>Intention is to cope with course requirements</i> <i>Has a lack of purpose and confidence</i>	Treating the course as unrelated bits of knowledge
	Memorizing facts and carrying out procedures routinely
	Finding difficulty in making sense of new ideas presented
	Seeing little value or meaning in either courses or tasks set
	Studying without reflecting on either purpose or strategy
	Feeling undue pressure and worry about work
Strategic approach	<i>Seeking meaning by:</i>
<i>Intention to achieve the highest possible grades</i> <i>Has a determination to do well</i>	Putting consistent effort into studying
	Managing time and effort effectively
	Finding the right conditions and materials for studying
	Monitoring the effectiveness of ways of studying
	Being alert to assessment requirements and criteria
	Gearing work to the perceived preferences of lecturers

Entwistle and Peterson (2004) suggest there is a continuum of level of understanding with a limited understanding corresponding to the surface approach and a thorough understanding corresponding to the deep approach; somewhere in between lies the strategic approach. The ASSIST took into

account course design, workload and environmental issues which were not accounted for in the RASI (Coffield et al., 2004a) and was developed as a response to the 'misuse' of the ASI (Tait et al., 1998). It became clear that the ASI was being used to identify students in difficulty, monitor teaching interventions and explore the effects of teaching on students approaches to studying; whereas the initial intention was to investigate the interrelationships between study habits and to describe the ways students carried out academic tasks (Tait et al., 1998). It is a 66 item instrument (although a shorter 18 item version is also in use) in which students have to rate how much they agree with statements pertaining to their learning.

In its various forms the ASI is a widely used instrument in the education field (Duff and McKinstry, 2007) and the same authors identify nine separate studies that found either high or moderate reliability of the RASI (Duff and McKinstry, 2007). Sadler-Smith's (1996) study of 245 business students also found good reliability of the RASI. The internal consistency and construct validity of the ASSIST is considered acceptable by Coffield et al (2004b), but they question its reliability. The shorter 18 item version is however considered a reliable instrument by others (Heinstrom, 2006a).

The ALSI is yet to be used extensively in the field due to the fact it has only recently been formulated.

VERMUNT

Vermunt's Inventory of Learning Styles (ILS) was developed in the early 1990's following a series of qualitative interviews and is a 120 item, 5 point Likert scale questionnaire measuring four separate areas of student learning (Vermunt and Vermetten, 2004); although there is shorter 100 item version that has been used in research (Boyle et al., 2003). The four areas are summarised in table 7-4 below:

Table 7-4: the four areas of the ILS (adapted from Vermunt and Vermetten, 2004, Coffield et al., 2004a)

Parts of the ILS	Sub-scale
<i>Processing strategies (cognition)</i>	<ul style="list-style-type: none"> • Deep processing: relating and structuring; critical processing • Stepwise processing: memorizing and rehearsing; analysing • Concrete processing
<i>Regulation strategies</i>	<ul style="list-style-type: none"> • Self-regulation: learning process and outcomes; learning content • External regulation: learning process and learning outcomes • Lack of regulation
<i>Conceptions of learning</i>	<ul style="list-style-type: none"> • Construction of knowledge • Intake of knowledge • Use of knowledge • Stimulating education • Cooperative learning
<i>Learning orientations</i>	<ul style="list-style-type: none"> • Personally interested • Certificate oriented • Self-test oriented • Vocation oriented • Ambivalent

The ILS is becoming popular and has been used extensively (Boyle et al., 2003, Vermunt and Minnaert, 2003, Vermunt, 2005, Vermetten et al., 1999, Vermetten et al., 2002, Busato et al., 2000, Busato et al., 1999, Vermetten et al., 2001).

The ILS is specifically aimed at university students (Vermunt and Vermetten, 2004) which restricts its relevance in other contexts (Coffield et al., 2004a), but it has been found to be both reliable and valid (Coffield et al., 2004a, Boyle et al., 2003).

7.2.4 Summary

As has already been identified by Coffield et al (2004a, 2004b) there are over 70 well known learning styles that have been developed since the start of the 20th century. Of these 13 were considered worthy of further analysis, but only one instrument was able to meet the four reliability and validity criteria that were deemed important by Coffield. If we take these criteria as being the most important drivers of whether a learning style instrument is applicable in the field, then clearly more work needs to be done.

An earlier review by De Bello (1990) compared eleven learning style instruments including the Dunn and Dunn, Kolb, and Gregorc models, but the

review lacks any defining conclusions about the models: indeed the author suggests that reliability and validity information is better found in even earlier reviews. De Bello (1990) does conclude that “all children have individual learning styles” and that “treating every child in the classroom the same way is not responding to their styles” (De Bello, 1990 p219), but does not steer the author in any way to choosing which model to use to assess this.

In a similar manner, Swanson (1995) discussed six learning style instruments including the Witkin, Myers-Briggs, Kolb, and Gregorc models, but again failed to conclude in any way the merits or otherwise of the models. In her defence, the main aim of this review was to look at the link (if any) between culture and learning style, although again there are no definitive conclusions as to the best instruments to use to assess this phenomenon.

Wilson (1998) in an article sub-titled ‘Review of the literature on learning styles’, again only discusses a selection of instruments. The Dunn and Dunn, Gregorc, Myers-Briggs, and Witkin models are all highlighted, but in no great depth and with no deliberation of validity or reliability. Again there are no conclusions as to the merits of each model.

Thompson and Crutchlow (1993) in a ‘critical review’ of the literature in relation to nursing education conclude that Kolb’s model is an “effective way to capitalise on the experiential strengths of non-traditional students while forcing them to improve their analytical skills” (Thompson and Crutchlow, 1993 p39). This is a classic case of fitting a model to a situation with little regard for the actual merits of the model.

So despite the existence of apparent reviews on learning styles, the Coffield review is by far the most comprehensive and rigorous to date and as such the results cannot be ignored. It is clear that some may find the conclusions unpalatable – others may feel justification for particular instruments; but when choosing a learning style instrument for empirical research – the Coffield review must be acknowledged. With no other comprehensive assessment of learning

styles instruments, the Coffield review remains the key reference for learning style research.

A summary of some of these literature reviews is given in Appendix B.

An attempt to unify existing learning styles models was made by Cleverly (1994). He included Witkin's model along with three other related models to form an 'eclectic' model of learning styles that he considered appropriate for use with nursing students. This bipolar model had analytical and creative dimensions within a consolidated framework, but did not provide any tools for use. Coffield et al (2004b) believe such integration and consolidation of learning styles instruments in general is unlikely due to their autonomous development, financial incentives, and the ease of use of existing instruments.

7.3 Learning styles in nurse education

Within nursing education, several of the research instruments highlighted here have been utilised.

By far the most often utilised instrument – whether due to its apparent comparability to the holistic approach to nursing or its simplicity – is Kolb's Learning Style Inventory (KLSI).

Laschinger and Boss (1984) used the KLSI to investigate differences between undergraduate nursing students at different stages of their course at two separate study locations. They found that the majority of students had concrete learning styles, but that the percentage of students with this style appeared to increase over the duration of the course.

The KLSI was used by Hodges (1988b) who failed to find any significant differences in learning styles between nursing students, nurse teachers and ward sisters. The study sample was small and heavily skewed towards students.

Hodges (1988a) combined the KLSI with the Myers-Briggs Type Indicator in a study aimed at investigating a raft of characteristics of nursing students. She confirmed earlier assertions that nurses tend to be more 'concrete' than 'abstract', and determined via the MBTI that they are more 'sensing', 'feeling' and 'judging'. Unfortunately, the study sample was very small (n=93), and was based on convenience.

A Post-test Only Control Group design was used by Ramprogus (1988) on a very small sample of first year nursing students (n=54) to determine their learning styles. He found that the majority (52%) of the sample had no apparent preference in style to which he termed 'Allrounders'. Acknowledging previous research that found student nurses to be more 'concrete' Ramprogus suggests this may be due in part to students acquiring this style as they progress through the course (Ramprogus, 1988 p63).

Sutcliffe (1993) aimed to utilise the KLSI in a study investigating whether subject area affects learning style, but had poor response rates to the questionnaire (5 out of 30). As a result she then conducted semi-structured interviews with the 30 participants; however it is unclear from the methodology and findings how the KLSI was then used to find out the learning styles of the participants. She does conclude that learning styles do indeed vary according to subject area, and that teachers and students ought to try and discuss how a harmonious approach to teaching sessions could be incorporated.

Stutsky and Laschinger (1995) in a study of 37 baccalaureate nursing students found that the learning styles of the students changed significantly pre and post a preceptorship experience. They found that before the experience the students tended to be more 'abstract', but after the experience they were more 'concrete'. Overall however, the authors contradicted the notion that nursing students were more 'concrete'. The authors used the 1985 version of the KLSI, but when they measured the learning styles of the nursing students with the 1978 version, more students were categorised as 'concrete' – in line with previous research.

The KLSI was used by Cavanagh et al (1995) on 166 undergraduate nursing students prior to any teaching sessions on their course. They found the majority (54%) were concrete learners, with slightly more divergers (28%) than accommodators (26%). The researchers tested for any relationships between learning style with age, gender, previous employment, or educational qualifications and no significant relationship was found.

In a correlation study, Colucciello (1999) used the KLSI in conjunction with the California Critical Thinking Disposition Inventory to determine the relationship (if any) between critical thinking and learning style. Using a convenience sample of 100 baccalaureate nursing students Colucciello found that the highest percentage of students (31%) were accommodators (concrete-abstract); which is in line with previous studies that suggest nurses are more 'concrete'. Colucciello also found positive significant links between critical thinking self-confidence and Kolb's reflective observation facet; but that Kolb's abstract conceptualisation was negatively linked with analyticity and self-confidence.

Baker et al (2007b) investigated the impact of problem-based learning on a nursing curriculum within a master of science programme. Using a pre-test post-test design the researchers found that of the 29 students who took part eleven appeared to change their learning style over the course of the programme, tending to move 'up' the cycle from accommodating to diverger, then assimilator, and on to converger. Baker et al did not find evidence that supported the notion that nurses tend to be concrete learners, but it was a very small sample of specific students.

An adapted version of the KLSI (the Learning Style Survey - LSS) was used to find out if learning style was related to 120 undergraduate nursing student's aptitude for concept maps by Kostovich et al (2007). It is unclear why the KLSI needed to be adapted for the research particularly as the LSS had a low test-retest reliability score (Kostovich et al., 2007 p228) in this study. Due to the low reliability of the research instrument, the conclusion that no link was found

between learning styles and performance with concept maps must be treated with caution.

Research in Korea (An and Yoo, 2008) on 724 baccalaureate nursing students across the four year programme using the KLSI found the highest percentage overall (43%) to be divergers, followed by accommodators (37%). Both of these learning styles are 'concrete' which backs up previous research studies on nursing students.

Honey and Mumford's LSQ has also been well used in research with the questionnaire's authors presenting statistics suggesting that both nurse tutors and student nurses tend to be activist-reflector types although they do not state from where they have arrived at this conclusion (Honey and Mumford, 2002).

Dux (1989) researched the learning styles of 119 post-registration nursing students along with 13 nurse teachers using the LSQ. She found that the tendency within the student group was toward the activist and reflector types whilst teachers were more evenly balanced. As the teaching group was so small the two cannot be compared.

Astin et al (2006) used the LSQ to find out the learning style of trained nurses. They studied 137 female MacMillan nurses and found that the reflector and theorist types were most apparent. Similarly, Hussein-Rassool and Rawaf (2008) used the LSQ to determine the learning styles of 110 undergraduate nursing students in the second year of a mental health pathway and they also found that the reflector type was dominant.

More recently Fleming et al (2011) compared the learning styles of a cohort of undergraduate nursing students at two stages in their course: first year and third year. They found that whilst the reflector type was preferred by 69% of the participants in the first year, this reduced to 57% in year three; and that the number of pragmatists had increased significantly.

All four of the above studies using the LSQ have found varying degrees of tendency towards the reflector type within different samples of the nursing population.

The MBTI was used by Anderson (1998) to investigate whether matching the learning style of recently qualified nurses with that of their preceptor (mentor) made a significant difference to their satisfaction with the program. She found that matching of the extroversion/introversion type was the most significant factor relating to satisfaction, but her study sample was very small (51 participants). Li et al (2008) also used the MBTI to investigate the learning styles of 425 students on the undergraduate nursing degree program in Taiwan. They found that the majority of students were 'introverted' and 'sensing' which they attributed to the impact of Chinese culture. In a second study using the same scale Li et al (2011) again found a predominance of 'sensing' students, but found no significant differences between the learning styles of nursing students from different age groups.

LaMothe et al (1991) investigated the learning styles of 186 nursing students within an overall sample of 433 students using Dunn and Dunn's PEPS. The authors also took the opportunity to test the instrument for reliability and validity, and found that the scale met their minimum reliability rating (0.70) in 3 of the 4 subscales: environmental (0.83); physical (0.74); and psychosocial (0.70). The sociological subscale had a low reliability rating of (0.58). Notwithstanding these scores LaMothe et al suggest that nursing students prefer more flexibility in the learning environment, but conversely also prefer structure in their lessons.

Witkin's GEFT was used by Noble et al (2008) to investigate the field dependence of students within 10 health science programs. The sample consisted of 876 students, of which 320 were enrolled on nursing courses. When compared to other health care programs the authors found that nurses (with the exception of the health information management students) were the most field dependent, but that there were variations depending on which nursing program was being studied.

7.4 Use of the ASSIST in research

As the ASSIST is the inventory chosen for this research project, some analysis of its use in both health (including nursing students) and non-health related fields is warranted.

In an early study of nursing students, Lapeyre (1992) used the Lancaster Inventory version of the ASSIST to investigate the learning styles of 55 nurse undergraduates. The validity of the results of this study is limited not only due to the very small sample but also due to the convenience sampling method used. Nevertheless the study did indicate an applicability of the inventory.

A more rigorous study (although not using nurses) was conducted by Entwistle et al (2000). In this study the ASSIST was used to ascertain whether there were any significant differences between students within three different educational contexts. The researchers sampled 1284 students from six British universities, 466 students from a technological university in Scotland, and 219 from a disadvantaged South African university. Entwistle et al found that there were similar levels of deep, surface and strategic learners between the three groups in spite of the spread of subject areas and cultures. Subsequent research investigating ways of thinking and teaching across different subject disciplines concluded that whilst students have similar learning styles that they should be taught using distinct teaching methods that reflect the subject itself (Entwistle, 2005).

Two studies on psychology students (Diseth and Martinsen, 2003, Diseth, 2003) aimed to ascertain whether there was a link between academic achievement and learning style with the latter incorporating personality as well. Diseth and Martinsen (2003) studied 192 students (both male and female) using the ASSIST and an achievement inventory and found that the surface and strategic learning styles were linked to achievement, but the deep approach was not. This result was partially corroborated by Diseth (2003) who discovered in a

study of 310 students that the surface and deep approaches were correlated with achievement. In this study Diseth (using a personality inventory (Costa and McCrae, 1985)) also found relationships between the deep approach with openness, the surface approach with neuroticism, and the strategic approach with conscientiousness. These same relationships have been found more recently by Swanberg and Martinsen (2010) who also found a link between the surface approach and extraversion.

Cowan et al (2004) used the ASSIST to ascertain the learning styles of care home workers enrolled on National Vocational Qualification courses. A pretest-posttest study of 76 candidates showed that they were predominantly of a deep or strategic approach before the course and this remained the case after the course. There was however a significant increase in the score for the deep approach after the course.

Another study of psychology students (Ridley, 2007), found that the learning styles of 77 students were directly linked to their assessment marks. This study also investigated whether any ethnicity factors were apparent in students learning styles and found that the white students had an overall higher tendency to be deep or strategic compared to the black ethnic group. This sample was extremely small however to make generalisations.

A mixed-method study utilizing a pretest-posttest design and interviews and using the ASSIST along with another judgements on networked learning scale was performed by Buckley et al (2010). This study on a sample of 236 first-year undergraduate students for the quantitative aspect and nineteen for the qualitative part investigated perceptions of blended learning. They found a weak relationship between deep and strategic approaches to learning with degree of contentment with the blended learning environment, endorsing previous findings (Goodyear et al., 2005).

All these studies used the standard length ASSIST, but shorter versions of the scale have also been utilised.

Heinstrom has used the short version of the ASSIST in two separate studies. A study of 305 masters' students across a range of disciplines at a Finnish university (Heinstrom, 2002) investigated the link between learning style, personality and information seeking. In this study the reliability of the short ASSIST was found to be deep (0.66), surface (0.63) and strategic (0.67). She found that students with a deep approach to learning were positively linked with the personality trait of 'openness', whilst strategic learners were either extravert or conscientious. The surface learning style was positively linked with neuroticism and negatively linked with extraversion, openness, agreeableness and conscientiousness. She also found that deep learners put in a great deal of effort and sought high quality information, whilst strategic learners were characterised by wide and thorough information seeking. They sought information from many different sources, retrieved information by chance and found it easy to judge information critically (Heinstrom, 2002 p158). The surface learners were not thorough in their searching, and reported problems with relevancy judgements. They were also negatively correlated with good study results.

Heinstrom (2006a) used the shorter 18 item version of the ASSIST in her study of 574 secondary school students. She aimed to ascertain any link between information seeking and learning style within this sample. As the scale was developed for university students she adapted the wording and then tested the reliability. Scores for the three types were acceptable (deep 0.61, strategic 0.65, surface 0.72). The results indicated that most students scored highly on two types, so Heinstrom removed those students from the analysis and only studied those who scored highly on a single type. She did this to enable her to correlate the learning style with the information seeking analysis. The final sample included: 31 strategic learners, 28 deep learners, and 30 strategic learners. These students then took part in an open instruction that required them to answer questions about their current research project. She found that strategic learners tended to report that they aimed for high achievement whilst the deep learners showed a high level of interest in the topic they were researching. Surface learners tended to look for easy answers and avoided spending time and effort on the project.

Diseth et al (2006) researched the potential link between course experience, approaches to studying, and academic achievement using a 24 item version of the ASSIST on 476 undergraduate psychology students. The original 52 item ASSIST was reduced by removing one of the 13 subscales (monitoring effectiveness) and reducing the number of items for each subscale from four to two. Diseth et al (2006) analysed previous research using the 52 item scale (Diseth, 2003) and found that reliability, factor structure and predictive validity were good even if the items were reduced in this way (Diseth et al., 2006 p160). Good teaching was linked positively with deep and strategic learners, and negatively so with surface learners. They also found that clear goals and standards were linked with strategic learners, whilst appropriate workload was linked with deep and surface learners. All learning styles were linked (not significantly) to examination grade. More recently Diseth (2011) used a short 8 item version of the ASSIST in conjunction with self-efficacy to study and goal orientation scales on 177 undergraduates and found that students with a high level of self-efficacy mastery had a deep learning strategy whilst those with avoidance motives showed a surface approach to learning.

Speth et al (2007) tested the reliability of the shortened 18 item ASSIST on a study of 446 agricultural science students. They also found acceptable levels of reliability: deep 0.65, strategic 0.70, and surface 0.75. They followed this with an analysis of the course evaluation comments of one group of students within the sample in order to test validity. They found that deep learners made comments pertaining to seeking meaning and relationships among ideas, whilst strategic learners commented on the relationship between time spent and achievement gained. The surface learners commented that they liked repetition of facts and easy access to information.

7.5 Autonomous learning in nurse education

As has already been alluded to, autonomous learning or self-directed learning (SDL) is important in the context of nurse education with the current emphasis on problem-based learning and evidence-based healthcare. Students are

expected to search for information away from the classroom environment and this may have an impact on the way they prefer to learn. SDL is a new concept to many students and may not be consistent with their learning experiences or preferred learning style (Carpio et al., 1999). As Garrison notes “self-directed learning is consistent with a collaborative constructivist view of learning that encourages students to approach learning in a deep and meaningful manner” (Garrison, 1997). The work of Baker et al (2007a, 2007b) on the impact of problem-based learning (PBL) on the learning styles of Master’s students found that key aspects of their learning styles changed over the duration of the course. Whilst acknowledging that a causal relationship could not be assumed, the results did hint at some possible effect of PBL on style.

7.6 Critical thinking in nurse education

Learning style may also impact on the ability of nursing students to think critically. Critical thinking has been variously defined but according to Simpson and Courtney (2002 p91) is “a process, an orientation of the mind, and includes both the cognitive and affective domains of reasoning”. It is a process that develops over time and requires self-awareness, knowledge, and practice (Brunt, 2005), with Fero et al (2009) study of over two thousand nurses finding that more experienced nurses were better able to act appropriately in critical situations in practice. Earlier work by Adams (1999) (supported latterly (Worrell and Profetto-McGrath, 2007)) found little evidence that the way nurses are taught improves their critical thinking ability, suggesting that it is experience in practice that is most beneficial as they encounter novel situations regularly (Staib, 2003). An ability to think critically has also been found to be positively correlated to lower levels of anxiety in nursing practice (Suliman and Halabi, 2007), and in relation to libraries generally (Kwon et al., 2007).

7.7 Suitability of the ASSIST

As has clearly been shown, the ASSIST has been found to be reliable and valid. It has been developed primarily for use in the education sector and according to

Coffield et al “on the grounds of robustness and ecological validity, we recommend that the concepts developed by Entwistle and others, of deep, surface and strategic approaches to learning...be adopted for general use in post-16 learning...” (Coffield et al., 2004b p51). The 18 item version has also been found to be reliable when used in primary research and due to its length is ideal when used in combination with other scales and questionnaires (Heinstrom, 2002, Heinstrom, 2006a).

Permission to use this research tool was granted by Noel Entwistle.

Chapter 8 THE ROLE OF PERSONALITY, SELF-EFFICACY AND LEARNING STYLES IN ISkB

Much has been reviewed in the previous four chapters regarding information seeking, personality, self-efficacy, and learning styles and that will not be covered again here. It is however reasonable to tie in what has been investigated in terms of the relationships between the three factors of personality, self-efficacy, and learning styles with information seeking and the justification for using the scales and Foster's model in questionnaire development.

To sum up the effect (if any) of an individual's personality, self-efficacy, or learning style on the way they search for information, it is necessary to take a step back and look at what has already been discussed. Within academic settings the role of personality and learning style has been well documented (Busato et al., 1999, 2000, Duff et al., 2004, Komarraju and Karau, 2005, Pulford and Sohal, 2006, Bidjerano and Dai, 2007, Komarraju et al., 2009, Komarraju et al., 2011, Vermetten et al., 2001, Zhang, 2003, Diseth, 2003, Swanberg and Martinsen, 2010) as contributory factors to motivation to learn and success. Results from these studies suggest that Conscientiousness and to a lesser extent Openness have positive relationships to successful learning. In addition a series of articles (Caprara et al., 2004, Caprara et al., 2008, Caprara et al., 2011) found a strong relationship between Openness and high self-efficacy with academic achievement amongst adolescents. Well before the development of the Five Factor personality model relationships between personality and ISkB were being mooted (Kernan and Mojena, 1973, Clarke and James, 1967) with more contemporary analysis by Limberg (1999), Butler (2000), Hertzum & Pejtersen (2000) reiterating the link. More recently Heinstrom's (2003) analysis of the effect of personality on the ISkB of postgraduate students (which is a key pointer to this research) confirmed that Conscientiousness and Openness are directly related to the effort and breadth put into information seeking, and with good study results. She also found that introverted and highly neurotic students were more likely to experience time pressures; whilst Extravert students tended to search informally and look for

new information rather than that which confirmed pre-existing ideas. Halder et al (2010) obtained similar results in their study of 600 university students with Openness positively correlated to broad information seeking and the ability to overcome obstacles in the search process. Malliari et al (2011) - whilst concluding that personality traits were not a significant factor in information seeking - did find links between these traits and searching techniques and modifying searches. They found that individuals with a critical/quarrelsome persona were better able to use advanced searching techniques (for example Boolean operators), whereas uncreative/conventional individuals were less able to do this nor were they able to modify their searches. In addition disorganised/careless individuals were negatively associated with modifying their searches. Bawden and Robinson's (2011) recent chapter on 'information styles' summarises many studies that investigated the role of learning styles, self-efficacy, and personality in terms of information-related behaviour and includes a discussion of part of the research in this thesis (latterly published (Stokes and Urquhart, 2011)).

Palmer's (1991b, 1991a) study of the ISkB of scientists using the LSQ found activists searched for information in an enthusiastic and eclectic manner; whilst reflectors were systematic and methodical. Tenopir et al (2008) very small scale study hinted that (from Kolb's LSI) convergers searched for shorter periods of time and paused more than those with an assimilator style. As previously alluded to Diseth (Diseth, 2003, Diseth and Martinsen, 2003, Diseth, 2011) found a link between Conscientiousness and Strategic learners; and between Openness and Deep learners. Students showing the Openness trait and Deep learning style were also more likely to achieve higher grades. These results are confirmed by Heinström (2002, 2006a) who also concluded that Surface learners did not search thoroughly and tended to attain lower marks.

Being anxious is an element of Neuroticism that can affect the way individuals search (Heinström, 2002). Research into library anxiety (Jiao and Onwuegbuzie, 2004, Onwuegbuzie and Jiao, 2004, Kwon et al., 2007) has shown that high levels of anxiety can impede the search process in particular with the availability of new and potentially unfamiliar technology in the library

setting. Thus being confident in one's own ability to successfully complete an information seeking task has relevance. In addition it has been found that individuals with higher confidence tend to be more positive about the sources they use to locate information (Kim and Sin, 2007). This idea of 'confidence' impacting on information seeking was also found in a small scale study of nursing students (Franks and McAlonan, 2007) which found that 62% of students had low confidence using the library catalogue and around a third of students had low confidence in using computers, databases, the Internet and libraries in general. A recent study by Kwon and Song (2011) found significant relationships between the personality traits Extraversion, Conscientiousness, and Openness with a higher degree of self-reported competency with information evaluation tasks amongst college students (similar to results elsewhere (Saleem et al., 2011)); but only Conscientiousness and Openness were linked to competency with developing search strategies. Onwuegbuzie and Jaio (2004) suggest that the role of self-perception in terms of self-efficacy is of import in information seeking. Self-efficacy has been researched within academic settings (Pajares, 1996), but more so with respect to information technology (Compeau and Higgins, 1995, Eastin and LaRose, 2000, David et al., 2006). Liang and Wu's (2010) study of nurses web-based learning found a direct relationship between high Internet self-efficacy and the motivation towards web-based learning; in addition nurses with longer service were less motivated towards this type of learning possibly due to their unfamiliarity and confidence with the way it is delivered.

In terms of questionnaire development three validated scales (Mini-markers, ASSIST, and the ILSES) and questions based around Foster's non-linear model of information seeking formed the bulk of the questionnaire. Taking the validated scales first, one key aspect that all three contained was their brevity. In order to construct a questionnaire that investigated four different elements each segment had to be kept as brief as possible otherwise the whole questionnaire would have been too cumbersome to complete. Thus the short forms of the ASSIST and the ILSES, and the complete Mini-markers scale enabled the construction of a questionnaire of manageable length. Other factors considered in the selection of the ASSIST were the fact it had been used

previously in a similar study and that it is targeted at the specific population used in this study. The ILSES was considered appropriate as it is the only scale for self-efficacy that is specifically focussed on information literacy. And the Mini-markers was used in part for its simplicity which it was hoped would enable respondents to fill that section in without difficulty and quickly.

The use of Foster's model to create statements could be considered more contentious. Justification can however been seen when it is considered that each process within the model is a separate entity and could thus be measured in isolation from the other processes. In essence one does not rely on another. Other models of information seeking tended to be more akin to either a stage by stage process or were more ambiguous about what specific processes were (potentially) being performed. Additionally by investigating what processes participants preferred to do would better enable profiles to be generated as different elements of Foster's model could be included in different profiles.

In order to tailor resources to the requirements of users, a valid profile of their searching and seeking behaviour is essential. Not only will it provide insights into the types and levels of preferred resources, it will also direct the methods and procedures employed to instruct users within information skills and literacy training.

Chapter 9 GENERAL RESEARCH PROCEDURES

According to Creswell and Plano-Clark (2007) the “combination of qualitative and quantitative data provides a more complete picture by noting trends and generalisations as well as in-depth knowledge of participants’ perspectives” (Creswell and Plano-Clark, 2007 p33). Mixed-method research designs can take a variety of forms with the quantitative and qualitative phases being equal or one more dominant, and be concurrent or sequential

Mixed methods designs have been described as “conducting a quantitative mini-study and a qualitative mini-study in one overall research study” (Johnson and Onwuegbuzie, 2004 p20); although this would be dependent on the researcher being confident that both studies stand up to validity and reliability tests. For example, conducting a mini-quantitative study may mean obtaining a smaller sample which would have implications for data analysis. There are several ‘types’ of mixed methods design.

Bryman (2008) lists 16 rationale for combining methods, but the main designs are categorised more simply by Creswell and Plano-Clark (2007) in table 9-1.

Table 9-1: the major mixed methods design types (adapted from Creswell and Plano-Clark, 2007)

Design	Example variants	Timing and weight	Mixing
Triangulation	Convergence, data transformation, validating quantitative data	Concurrent – usually equal	Merge the data during the interpretation or analysis
Embedded	Embedded experimental or, embedded correlational	Concurrent or sequential – not equal	Embed one type of data within a larger design
Explanatory	Follow-up explanations, or participant selection	Sequential: usually quantitative (dominant) followed by qualitative	Can use initial data to develop secondary set
Exploratory	Instrument development, or taxonomy development	Sequential: Usually qualitative (dominant) followed by quantitative	Can use initial data to develop secondary set

This research is predominantly quantitative, as the questionnaires are based mostly on pre-validated instruments (learning style, personality) and this applies to a lesser extent to the information literacy self-efficacy instrument. The information seeking behaviour questions were based on Foster's qualitative research. Overall, the approach fits mostly under the explanatory mixed methods design type, but due to ethical constraints not completely so (see below). It is assumed that the exploratory mixed methods design may apply to the part of the research where the interviews explored why participants search in particular ways in relation to Foster's model. Johnson et al (2007) state that "quantitative dominant mixed methods research is the type of mixed research in which one relies on a quantitative, post-positivist view of the research process, while concurrently recognizing that the addition of qualitative data and approaches are likely to benefit most research projects" (Johnson et al., 2007 p124).

This research is also using a concurrent design as participants for both stages of the study are selected from the same sample. This was done to help in comparison and synthesis and to prevent introducing any personal characteristics or other factors that may confound the comparison (Creswell and Plano-Clark, 2007 p119). In addition it simplified ethical issues and consent gathering.

Due to the need to provide the research ethics committee with an interview schedule at the start of the study, and with all participants remaining anonymous, specific explanatory research where results from the questionnaire are later investigated in interviews with the individuals concerned was not possible. The interview schedule was therefore devised in a way that focussed on key aspects of Foster's model in an attempt to target possible areas of interest that may arise from the questionnaire results. As the schedule was semi-structured, this allowed some flexibility during the interview process. This process ruled out any specific attempt to triangulate the methods to confirm the results of the quantitative analysis or to use an explanatory technique to follow up results. As such an embedded strategy was employed to answer different

research questions. The resulting design was thus a quantitative dominant mixed method study using a concurrent embedded approach which incorporates elements of the explanatory and exploratory designs. Creswell (2009) states that by using an embedded strategy “a researcher can gain broader perspectives as a result of using different methods as opposed to using the predominant method alone” (Creswell, 2009 p214-215). Creswell (2009) summarises the usefulness of this type of strategy in that it allows either the comparison of the two data sources or for them to reside side by side as “two different pictures that provide an overall composite assessment of the problem” (Creswell, 2009 p214). He goes on to suggest that the researcher can use this approach to address different research questions as is the case in this study and summarises the attractions and limitations of this strategy as follows:

Attractions:

- Data can be collected simultaneously
- Advantage of using both types of data
- Researcher gains differing perspectives from the two methods

Limitations:

- Data needs to be transformed in some way to allow integration
- If data is compared, discrepancies may occur
- Unequal status between the methods leads to disadvantages when interpreting the results

As previously stated, by addressing different research questions integration of the data is reduced, and little comparison is required; and by specifying research questions for each method a separate focus is provided allowing analysis to be concentrated on each type of data (table 9-2). Qualitative research tends to use small samples in order to gain in depth information which can be obtained from this type of interview data (Creswell and Plano-Clark, 2011 p174).

Table 9-2: the overall research design framework in this study.

Research strategy	<i>Concurrent embedded mixed methods (quantitative dominant)</i>	
Research questions	<ul style="list-style-type: none"> • What is the relationship between personality, self-efficacy, learning styles, and information seeking behaviour? • What is the impact of differing personalities, self-efficacy levels, and/or learning styles on information seeking behaviour? 	<ul style="list-style-type: none"> • Why do users search the way they do? • What are the preferred methods of information seeking?
Methodology	<i>Quantitative</i>	<i>Qualitative</i>
Methods/tools	<i>Questionnaire</i> : developed from Foster's model, and including pre-validated scales for personality, learning styles, and self-efficacy	<i>Interviews</i> : semi-structured and using Critical Incident Technique as basis for schedule
Analysis	Descriptive and inferential statistical analysis	Qualitative Interpretative Categorisation (QIC)
	<i>Mixing</i>	
Research question	<ul style="list-style-type: none"> • How do the qualitative findings enhance the understanding of the quantitative results? 	

The research tools and the QIC analysis are described in detail in the data collection section (chapter 10) - stages 1 and 2 respectively.

The methods are shown schematically in the following diagram (figure 9-1).

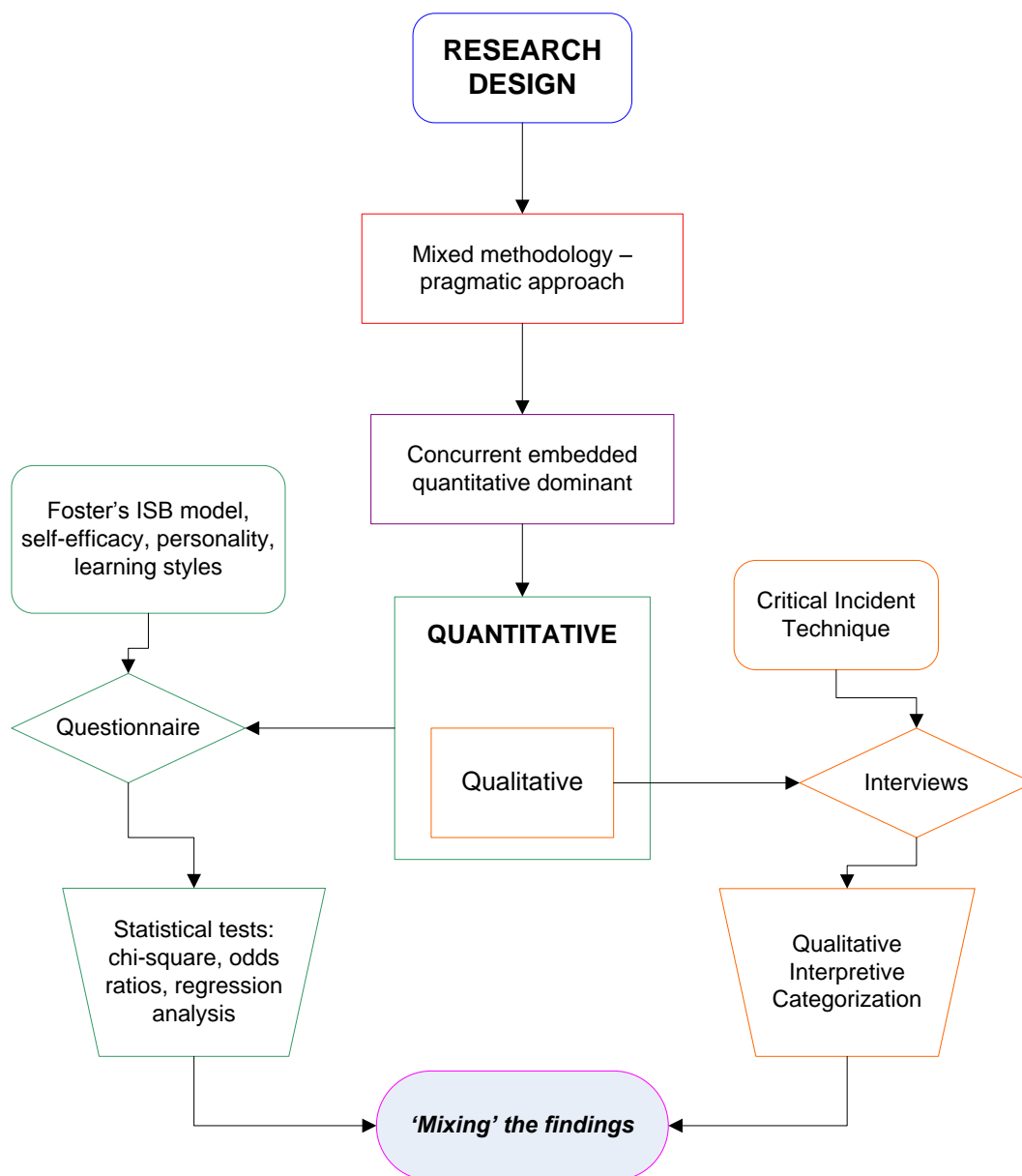


Figure 9-1: the methods used in the research

9.1 Ethical approval

Ethical approval for this research was sought and granted by the following:

Cambridgeshire 3 Research Ethics Committee
Faculty of Health and Social Care, Anglia Ruskin University

And the Research and Development departments of the following NHS organisations:

Cambridge University Hospitals NHS Foundation Trust
Cambridgeshire and Peterborough PCT
Cambridgeshire and Peterborough Mental Health Partnership NHS Trust
Hinchingbrooke Health Care NHS Trust
Lincolnshire PCT
Norfolk and Norwich University NHS Trust
Norfolk and Waveney Mental Health Partnership NHS Trust
Norfolk PCT
Northampton General Hospital NHS Trust
Northamptonshire PCT
Papworth Hospital NHS Foundation Trust
Peterborough & Stamford Hospitals NHS Foundation Trust
United Lincolnshire Hospitals NHS Trust

The Arts and Humanities Research Council funded a period of the part-time studentship.

9.1.1 Access arrangements

In order to gain access to the students, all lecturers known to be conducting sessions with students within a six month timeframe at a single site were contacted and asked to allow the researcher to approach the students in the classroom environment. Students were then given a letter of invitation (Appendix C) and information sheet (Appendix D) detailing the study. Allowing a

period of reflection of one week (or when the students were next on site) the researcher again went into the classroom and handed out consent forms (Appendix E) for both the questionnaire and interviews (schedule in Appendix F) and the questionnaire (Appendix G) itself. The researcher remained in the classroom until all students who wanted to take part had completed their questionnaire. The completed questionnaires and consent forms were then collected in by the researcher. This process allowed students time to decide whether or not to take part, did not necessitate students taking part in both aspects of the study, and facilitated the collection of consent.

9.2 Sample

The sample is health students enrolled on courses at a Higher Education Institution. This includes students on the Registered Nursing (RN) and Registered Midwifery (RM) courses, three groups of nurses taking Continuing Professional Development (CPD) courses, and a group of health students on the Masters programme.

Quantitative

More than 250 individuals were asked to participate for the quantitative analysis (in view of the data analysis requirements). The sample is a snapshot of several cohorts at different stages in their programme. Table 9-3 details the participants that were approached and those that took part.

All students on the three year RN programme based at the research site were approached to take part (with lecturer approval gained). The difference in numbers is due to the increase in the intake at the site and student attrition. Very few students on the RM course were based at the research site, and in the data analysis these are often merged with the RN students. Four CPD modules (that had lecturer approval for the research) fell in the timeframe of the research, one was the Dissertation module and there were two mentorship modules. A single group of Masters students also took part.

Table 9-3: the sample of students taking part in the quantitative analysis of the study.

Group	Year	Discipline	Asked	Completed
Registered Nursing (RN)	1	<i>Adult</i>	67	56
		<i>Child</i>	3	2
		<i>Mental Health</i>	5	4
		<i>Learning Disabilities</i>	3	2
Total			78	64
Registered Nursing (RN)	2	<i>Adult</i>	51	38
		<i>Child</i>	3	2
		<i>Mental Health</i>	2	1
		<i>Learning Disabilities</i>	0	0
Total			56	41
Registered Nursing (RN)	3	<i>Adult</i>	32	31
		<i>Child</i>	2	2
		<i>Mental Health</i>	3	1
		<i>Learning Disabilities</i>	0	0
Total			37	34
Registered Midwifery (RM)	1		4	3
	2		4	1
	3		3	3
Total			11	7
Continuing Professional Development (CPD)		<i>Dissertation</i>	7	6
		<i>Mentorship</i>	56	29
Total			63	35
Masters (MSc)			16	13
Total			16	13
Overall			261	194

This sample yields confidence intervals (margins of error) of 7% (Creative Research Systems, 2012) (using a population of 172,000 full and part-time nursing students enrolled at UK institutions 2010/11 (Higher Education Statistics Agency, 2011)).

Qualitative

The sample for qualitative research was selected, randomly, from the sample used in the quantitative analysis. Twenty students were contacted by email to take part in the qualitative analysis. Only four students responded positively, so the remaining 16 were emailed again and seven more were willing to take part making a total of eleven participants for the qualitative analysis. Qualitative researchers tend to prefer to sample purposefully for research as participants

can be selected that have experience of the phenomenon that is being explored (Creswell and Plano-Clark, 2007 p112). As the quantitative sample provided the pool for selection for the qualitative sample (to prevent the introduction of personal characteristics that might hinder any data comparison (Creswell and Plano-Clark, 2007 p119)), and these were anonymous it was not possible to purposefully select a representative sample of students with different demographics. The eleven participants for the interviews were as follows (table 9-4):

Table 9-4: the participants taking part in the interviews

Course	Number of participants
Registered Nursing Year 1	3
Registered Nursing Year 2	4
Registered Nursing Year 3	2
Registered Midwifery Year 1	0
Registered Midwifery Year 2	0
Registered Midwifery Year 3	0
Continuing Professional Development module	1
Masters	1

The qualitative sample although not fully representative (proportionally more 2nd year nurses, fewer CPD students), did provide a range of participants.

Obtaining participants from the all three years of the undergraduate programme was useful in that there are different expectations of what students should be attaining in terms of acquiring and analysing information (Anglia Ruskin University, 2011) (see also section 1.1)..

9.3 Participant forms

A participant information sheet (Appendix D) was produced outlining the participant's involvement in the study should they wish to take part. This information sheet was slightly amended after discussion with the NHS Cambridgeshire 3 Research Ethics Committee.

Consent forms (Appendix E) for both parts of the study (quantitative and qualitative) were produced and approved by the Cambridgeshire 3 Research Ethics Committee. Both consent forms were given to all students approached

for the study at the time of completing the questionnaire. There was no compulsion for any participant to sign both forms, thus participants could consent to take part in solely the questionnaire part of the study, solely the interview part, in both; or indeed decide to not take part at all.

The next chapter discusses the data collection methods and techniques used in the research.

Chapter 10 DATA COLLECTION

10.1 Stage 1: quantitative

The research questions tackled in the quantitative part of the study are:

1. What is the relationship between personality, self-efficacy, learning styles, and information seeking behaviour?
2. What is the impact of differing personalities, self-efficacy levels, and/or learning styles on information seeking behaviour?

The following objectives were identified:

1. Determine whether 'different' students (type of course; stage of course) search differently.
2. Determine the role of personality, self-efficacy and learning style in the context of ISkB and how these act and interact on ISkB.

The method used to address the objectives is through a questionnaire. In this case a cross-sectional (snapshot) survey was employed to collect information from participants once, describing the population of interest at the time of the survey (Watson and Coombes, 2009). This took place in 2008-9.

The main strengths and weaknesses of using questionnaires are given in table 10-1 below.

Table 10-1: the strengths and weaknesses of using questionnaires in research (Watson and Coombes, 2009)

Strengths	Weaknesses
Easy to conduct and understand	Once distributed any errors cannot be corrected
Can obtain large amounts of data from large samples	May lack depth
Low costs	Response rates can be low
Relatively non-intrusive (anonymity can be ensured)	
Data collection and analysis are robust to bias	

These weaknesses have been addressed by performing a pilot study to check for errors or ambiguity, the use of interviews to obtain additional information, and the data collection method of getting participants to complete the questionnaire onsite and hand back to the researcher at the same time.

10.1.1 Development of questionnaire

The research tools identified earlier form the basis of the research questionnaire. To reiterate the validated research tools are Gerard Saucier's Mini-Markers, ASSIST (short version) and ILSES. Being validated enhances validity and reliability. The Mini-Markers and ASSIST tools have been reproduced in their entirety, whereas the ILSES has been slightly modified to better represent the sample used in the study. *The changes to the ILSES are as follows. The original ILSES states: 'This scale has been prepared to determine your level of efficacy on issues related with the information (to find, use, and communicate information)'. This was changed to: 'This scale has been prepared to rate your competence on some information skills'. The original ILSES also began with the prefix statement 'I feel confident and competent to...'; which was changed to 'I can...'. It was deemed necessary to replace the term 'efficacy' as this may have led to some confusion amongst participants.*

10.1.2 Foster's model

Foster's research showed that rather than having a 'chain' of events linked together in a particular direction, the ISkB process was in essence non-sequential involving a series of loops, feedback, and with differing start and end points. He describes the process as non-linear, holistic, dynamic and flowing (Foster, 2004 p235). From this analysis Foster developed a new model of ISkB clearly differing from early 'stage-based' models. This model contained three Core Processes (opening, orientation, consolidation), within three levels of contextual interaction (cognitive approach, internal context, and external context).

In identifying the Core Processes Foster was able to recognise and categorise eighteen separate ‘micro-processes’ in the ISkB process. These are given in Table 10-2 below.

Table 10-2: the three core processes and eighteen micro-processes within Foster’s ISkB model.

See Foster (2004) for a full description of these processes

Opening	Orientation	Consolidation
Breadth exploration	Problem definition	Knowing enough
Eclecticism	Picture building	Refining
Networking	Reviewing	Sifting
Keyword searching	Identifying keywords	Incorporation
Browsing	Identifying the shape of existing research	Verifying
Monitoring		Finishing
Chaining		
Serendipity		

These micro-processes were used to develop the ISkB section of the questionnaire used in this research. Each micro-process (apart from Finishing) was used to formulate two juxtaposed questions; one in line with the concept of the micro-process, the other contradicting this. It was deemed that ‘Finishing’ did not lend itself to this type of analysis as it was clear that this was equivalent to the end of the information seeking process and therefore could not have two juxtaposed statements as options. The use of this type of dichotomous question (requiring a ‘one or the other’ response) is associated with enhanced reliability and reproducibility (Eaden et al., 1999)

The respondents were asked to select which of the two statements they tended to do the most during their information seeking process.

The Core Processes and juxtaposed options for the respondents are outlined in the following table (10-3):

Table 10-3: the Core Processes of Foster's non-linear information seeking model along with the two juxtaposed options developed for the questionnaire.

Opening	Definition	Options
Breadth exploration	Conscious expansion of searching, start broad and then narrow down	<p>a. I tend to start my search broad and then narrow down later</p> <p>b. I prefer to try and find exactly what I want straight away, then broaden my search out if necessary</p>
Eclecticism	Accept and store information for later use, combines active, passive and serendipitous acquisition	<p>a. If I come across information that looks interesting, but isn't immediately useful – I store it for later use</p> <p>b. I ignore information that isn't readily needed</p>
Networking	Conferences, social, colleagues, department groups	<p>a. I use my social network (friends, colleagues) to obtain information</p> <p>b. I tend to search for information on my own and don't consult with friends and colleagues</p>
Keyword searching	Databases, e-journals, Internet, browsing a key concept, choice of keywords an issue	<p>a. I think searching specific databases is important</p> <p>b. I think the information will turn up somehow regardless of how much time I spend locating the right source</p>
Browsing	Generally used to change a focus/topic	<p>a. I often keep scrolling through most of my search results long after selecting some pertinent articles.</p> <p>b. I don't bother scrolling through my results after selecting some pertinent articles.</p>
Monitoring	On-going process to update sources already found. Use websites, TOCs	<p>a. I regularly keep track of key journals and authors by accessing new issues and editions</p> <p>b. I always perform a search to find new information</p>
Chaining	Ancestry citation searching	<p>a. I often check the reference list of key articles for additional sources</p> <p>b. I don't tend to use other article's reference lists as information sources</p>

Serendipity	Associated with Breadth Exploration, Eclecticism, Networking	<p>a. I feel that I can often find useful information whilst looking for something else.</p> <p>b. I do not feel that I can often find useful information whilst looking for something else.</p>
Orientation	Definition	Options
Problem definition	Define focus and boundaries	<p>a. I think defining my focus and boundaries are important</p> <p>b. I don't consider defining a focus as being a major consideration in information searching</p>
Picture building	Mind-mapping concepts	<p>a. I often use mind mapping to build a picture of my search concepts</p> <p>b. I tend to start searching with keywords rather than building a picture of a search strategy</p>
Reviewing	Use existing knowledge and sources to determine current situation	<p>a. I tend to use my existing knowledge and sources to determine the current situation in my topic area</p> <p>b. I don't consult previously obtained information to determine the current state of existing knowledge</p>
Identify keywords	Finding suitable terms	<p>a. I think finding suitable terms is important in a search</p> <p>b. I think I can get the information I need without worrying too much about keyword selection</p>
Identify shape of existing research	Identifying key names, articles, latest opinion. Selecting sources (relevance)	<p>a. I judge the relevance of information by its relationship with key articles, authors and latest opinion</p> <p>b. I determine whether information is relevant by looking at the title or abstract</p>
Consolidation	Definition	Options
Knowing enough	Sufficient material	<p>a. I am usually able to decide when I have enough information for an assignment.</p> <p>b. I usually find it difficult to assess when I have enough information for an assignment.</p>

Refining	Deciding on boundaries	a. I can easily define boundaries for a database search. b. I find it difficult to define boundaries for a database search.
Sifting	Selecting, pruning (relevance)	a. I check articles for relevancy regularly during a search. b. I tend to get lots of articles before checking them for relevancy.
Incorporation	Pause and assemble collected material	a. I tend to do my research in stages in order to collate my retrieved material. b. I tend to collate my retrieved material when I have completed searching.
Verifying	Limited to accuracy of references	a. I like to check the accuracy of key articles by searching for original sourced references b. I tend to take the information presented in an article at face value
<i>Finishing</i>	<i>Stage before closure</i>	<i>NOT INCLUDED</i>

The non-linearity aspect of Foster's model is not assessed in this research, it is the elements within the model that are under scrutiny in terms of which students do them, and whether personality, self-efficacy or learning styles impact on this.

10.1.3 Research Tools

Personality - Mini-Markers

This is a 40 item self-report personality scale listing single descriptive terms. The respondent is asked to score each term on a scale from one to nine with one being completely inaccurate and nine completely accurate. The 40 items are compiled into 5 groups of eight terms corresponding to the Big Five personality factors. The scores for each term are added within the respective group and divided by eight to give a score for each factor. The scale is not used to determine whether individuals are a particular personality type i.e.: extravert; as it is possible to score high (or low) on all five dimensions, but is used to

compare between individuals or groups within each dimension. The reason for this is the way the scale is set up and scored. Extraversion, Agreeableness, and Conscientiousness have four positive and four negative terms; whereas Neuroticism has two positive and six negative terms, and Openness six positive and two negative terms. The implication of this is that Neuroticism scores are generally lower than the scores for the other four dimensions; and Openness scores generally higher. By comparing within the dimension this discrepancy does not apply. Further, Saucier termed 'Neuroticism' as 'Emotional Stability' and the score from the test indicates how emotionally stable an individual is. Thus the more negative the score – the less emotionally stable. The Mini-Markers inventory is a reliable and valid tool when compared with other personality scales such as: Goldberg's 100 item scale (Dwight et al., 1998); Goldberg's 50 item scale (Palmer and Loveland, 2004); the Big Five Inventory (DeYoung, 2006); and the NEO-FFI (Olver and Mooradian, 2003). The Mini-Markers has also been tested across cultures using English, Greek and Chinese versions on large cohorts of undergraduate students (Nye et al., 2008) with promising results. The ease of use, brevity, and simplicity of the scale make it a valuable assessment tool when questionnaire space is limited (Dwight et al., 1998, Palmer and Loveland, 2004).

Self-efficacy - Information Literacy Self Efficacy Scale (ILSES)

The short 17 item version of the ILSES contains statements regarding the confidence or perceived proficiency of the respondent regarding a range of information literacy tasks. These tasks cover Beginner level, Intermediate, and Advanced. Each statement is scored by the respondent from one to seven with one being no confidence at all to complete the task and seven being extremely confident. The overall score is then used to determine the overall level of self-efficacy of the respondent. Beginner level constitutes scores of 17-51 inclusive; Intermediate is 52-85; and Advanced is 86-119. This relatively new scale has been used to test student teachers self-efficacy. Uslel (2007) investigated the information literacy self-efficacy of 1702 student teachers using the ILSES. She reduced the 28 item scale to 20 items although it is not clear why 8 items were

removed as the resulting Cronbach alpha score was slightly reduced to 0.90. Although no research has been found that uses the shortest 17-item version of the ILSES, Kurbanoglu ascertains that the “17 item refined scale, which can be used to determine subjects’ self-efficacy levels for information literacy, exhibits high reliability without excessive length” (Kurbanoglu et al., 2006 p734).

Learning Styles - *Approaches to Study Skills Inventory for Students (ASSIST)*

The short 18 item version of the ASSIST contains statements regarding how students prefer to study. The statements cover the three learning styles types of: deep, strategic, and surface. Each statement is scored by the respondent on a four point scale with one corresponding to strongly disagree and four corresponding to strongly agree. The 18 statements are compiled into three groups of six statements corresponding to the three learning styles and scores are summed together to determine the style of the respondent. A higher composite score for a single style means an individual is that type; when scores are level the individual is deemed to have a mixed style. Although the longer length version of the ASSIST is most widely used the short versions of the ASSIST have also been used in primary research and been found to be valid and reliable (Heinstrom, 2006a, Speth et al., 2007). The scale has also been found to be reliable and valid elsewhere (Coffield et al., 2004a).

PILOT STUDY

A small pilot study was undertaken in order to test the face validity of the questionnaire. 20 students were asked to fill in the questionnaire and note any concerns or difficulties. The results were generally favourable with the only minor concern being the overall length of the questionnaire. As has been previously stated the scales for personality, self-efficacy and learning styles are already at their minimum so reducing the questionnaire further would potentially compromise the results. Also, to ensure the maximum potential of the study it is necessary for all participants to complete all three of these scales to enable the

maximum possible analysis. It was therefore decided that the questionnaire should remain in its entirety for the study.

10.1.4 Data analysis – statistical tests used in quantitative analysis

The data generated from the questionnaire are analysed using SPSS 16 software with the following three tests used to produce inferential statistics.

Chi-square

The Chi-square test is used to compare observed numbers with expected numbers on two or more groups. and is used on categorical data (Munro, 2005). Observed data should not be 'too small' – generally values of less than five may cause validity issues (Jordan et al., 1998, Field, 2009). Null hypotheses (stating that there is no significant difference between the expected and observed result) for this test are listed within the results section (11.1.2, 11.1.3, and 11.1.5).

Odds Ratios

The odds ratio is the probability of an event happening divided by the probability that the event will not happen (Munro, 2005), or put another way it's the ratio of the odds of something happening in one group compared to another (Field, 2009); in essence the likelihood of an individual with a certain trait performing an event or not. Contingency tables are used to generate the data for the equations – an example is given in the results section (11.1.11).

Binomial logistic regression analysis

Logistic regression is an extension of the odds ratios and is used to investigate whether particular variables affect the probability of an outcome. Binomial (or binary) logistic regression is applied when the dependent variable is dichotomous – that is, has only two different possible values (Munro, 2005). In this case this measure is used in the ISkB analysis in which the respondent states whether they most often do a micro-process or do not do it.

10.2 Stage 2: qualitative

The research questions tackled in the qualitative part of the study are:

1. Why do users search the way they do?
2. What are the preferred methods of information seeking?

The following objectives were identified:

1. Examine how nursing students perceive their ISkB and needs.
2. Investigate the processes and methods nursing students utilise to find information.

The qualitative analysis synthesises elements of the work of Burnard (1991), Miles and Huberman (1994) and Sandelowski (2000, 2010) and the Critical Incident Technique (1954) to provide an overall technical framework of analysis. This is detailed further on in the chapter, but before that some justification for this approach must be given.

So why bother 'blending' techniques? What is the rationale? Why not use a pre-existing data analysis technique of one of the 'traditional types' of qualitative research for example: grounded theory or phenomenology?

Well, these methods don't 'fit'. In fact no single method of qualitative analysis does fit this research. There is little point trying to 'shoehorn' a method into line to fit the research. Both grounded theory and phenomenology contain aspects that are either not possible to do in this case or irrelevant. For example to do grounded theory justice requires constant collection of data to form a theory which was not possible due to the ethical restriction of producing an interview schedule; equally phenomenology being concerned with the 'lived experience' would focus on how students 'felt' about information seeking rather than what they actually did. Some elements of grounded theory are to be found in this blended approach (e.g.: the use of diagrams and the building of categories within a framework), but other elements are not (e.g.: the use of a start list) (Corbin and Strauss, 2008). The research here does not take an 'anything goes'

approach, rather it blends from a pragmatic methodological perspective various well known approaches to data collection and analysis to generate a framework that can be applied in situations where the researcher is constrained by ethics and time pressures.

The research could be considered to fall within the compass of 'generic qualitative research' which is defined as exhibiting characteristics of qualitative endeavour, but rather than focussing on a known methodology they either: combine several methodologies or approaches, or claim no methodological viewpoint (Caelli et al., 2003). The research also could be deemed 'basic interpretive' (Merriam, 2002) in which data are "inductively analysed to identify recurring patterns or common themes that cut across the data" (Merriam, 2002 p7). Having no defined boundary for the 'type' of research method used in the research reflects Sandelowski's (2010) view that efforts to define and generalise do not necessarily capture the variations in the actual practice of methods; and that there is no perfect execution of any method as methods are always accommodated to the real world of research practice and due to this are reinvented. Indeed as Patton (2002) states "because each qualitative study is unique, the analytical approach will be unique" (Patton, 2002 p433). The lack of 'definition' in the research method lends itself to the pragmatist view of research outlined earlier in the chapter which relies on abductive reasoning moving back and forth between deduction and induction (Morgan, 2007). Having no clear canonical path also allows flexibility in the application of methods to appropriately answer research questions (Chamberlain, 2000) preventing methodolatry - the overemphasis on selecting and describing methods that overtake the 'story' being told (Janesick, 2000). Avis (2003) goes further to suggest that methodological theory can be overemphasised to the detriment of the research process and that method should not be used to justify production of evidence that "closes off critical scrutiny of the evidence by locating it as internal to a particular methodological theory" (Avis, 2003 p1004). This is in line with Miles and Huberman's pragmatic statement that any method that produces "clear, verifiable, credible meanings from a set of qualitative data – is grist to our mill" (Miles and Huberman, 1994 p3). As such it is felt that the development of a 'blended' framework is justified for this research study.

10.2.1 Data analysis and the use of pre-determined categories

As the method used to address the objectives was through semi-structured interviews, it was important to follow a clear, framework of data collection to enhance the robustness of the study. Burnard's (1991) stage by stage method of data analysis for semi-structured interviews was used as a base for this study. His method assumes that semi-structured interviews are recorded in full and the whole recording is transcribed, which is the case here. Close reading and note taking is then followed by open coding and immersion in the data. Stages 4 and 5 cover category development and reduction. Stages 6 to 14 are not appropriate for this study as they cover using colleagues to verify categories (there is only one researcher in this study) and the process of highlighting, cutting and pasting printed transcripts which was performed using the computer software package NVIVO8. Although many commentators advocate the use of reliability checks by peers as a method of enhancing rigour (Cohen and Crabtree, 2008, Tobin and Begley, 2004) it could be construed that as the analysis is necessarily interpretive then different individuals will likely interpret that dataset differently. Other researchers suggest that the provision of sufficient detail in the theoretical and analytical decision making process and representation of as much of the data as possible is sufficient to provide reader verification (Chenail, 1995, Conostas, 1992, Horsburgh, 2003, Koch, 2006). As Piper (2004) states "verification hinges on the reader being able to see how the text was constructed and not on shared interpretation" (Piper, 2004 p156). Burnard's initial five stages however do offer a systematic method of analysis.

Miles and Huberman's (1994) qualitative analysis approach (sometimes termed 'transcendental realism') has been well summarised elsewhere: transcendental realism (eg: Bhaskar, 1989, Tesch, 1990); and the Miles and Huberman approach (Punch, 2005, Tesch, 1990 - who summarized their earlier work). This approach focuses on three components that take place concurrently throughout the analysis:

- Data reduction: this component encompasses the way the data (transcript) is analytically coded (reduced) without losing the context. It is a “form of analysis that sharpens, sorts, focuses, discards, and organises data...that conclusions can be drawn” (Miles and Huberman, 1994 p10).
- Data display: this moves the analysis forward with the use of displays (diagrams, charts, models). It runs alongside the data reduction component as part of the analysis, and in addition forms part of the data reduction.
- Drawing conclusions: again this component happens continuously throughout the process. Early conclusions may be vague but need to be verified during the analysis.

As there are specific research questions to address - predetermined categories were developed to encourage the researcher to ‘look out’ for or ‘hone in on’ particular aspects within the data – providing initial focus. Miles and Huberman advocate a provisional start list of categories generated from the research questions (Miles and Huberman, 1994 p58), a strategy often used in the health sciences (Creswell, 2009 p187), and supported elsewhere (Constas, 1992). It allows for an initial organizing framework but care is needed to ensure data is not forced into these categories (Bradley et al., 2007). The use of pre-determined categories is also a key element of another method of analysis – template analysis (King, 2004). In template analysis the initial template is constructed from the interview guide which itself draws upon the literature and the researcher’s own experience, rather than from research questions. The start list is precisely that – a start list. It is not considered (until the research project is completed) to be a final list, acting rather to allow groupings to develop or become evident throughout the coding process. If some chunk of data fits into a category then fine, but if there is no category relevant for the chunk of data either a new category is formed (necessarily modifying the start list) or the chunk is left temporarily ‘free’. Further coding may then identify a category for this ‘free’ chunk of data and so the start list is then modified. This aspect of the

analytical process is similar in intent to both template analysis and the constant comparison method used in grounded theory.

The initial start list is given in table 10-4.

Table 10-4: initial 'start list' of pre-determined categories used in the QIC process

Initial Start list
Amount of information
Confidence
Critiquing
Relevancy
Satisfaction with searching
Searching techniques
Sources used

This start list was generated from the research questions and interview schedule and is further discussed in section 10.2.5.

Classifying data into discrete groups using hierarchical cluster analytic techniques is suited to research where the number of groups is not certain; and its exploratory nature allows relationships and principles between the groups to manifest through the research (Beckstead, 2002). Using predetermined categories also lends itself to the development of taxonomic structures (Bradley et al., 2007) to classify multifaceted phenomena according to a set of conceptual domains. Morse and Richards (2002) offer three styles of presenting taxonomic structures: line diagram, outline form, or box diagram. In a similar vein, dendrograms/tree hierarchies for clustering of concepts from specific to general can be used, a process that not only highlights the relationship between concepts but also how they have been grouped. Dendrograms in the traditional sense of the word tends to describe computer generated representations from content analysis and depict quantitative results (Beckstead, 2002), however they can be used as a means of purely depicting a hierarchical display rather than quantification and to make this distinction can be termed 'tree hierarchies'. This clustering can form part of the data display component of the analysis. The data reduction component in Miles and Huberman's strategy is similar in technique to Burnard's stages 3-5 in which categories are developed and

streamlined. (*The use of tree hierarchies in the analysis is further described in sections 10.2.2 and 10.2.6*).

The data analysis also embraced the manner of qualitative descriptive studies (also termed ‘thematic surveys’ (Sandelowski and Barroso, 2003, Sandelowski, 2010)) which use a method of analysis that entails the presentation of the facts in everyday language, whilst allowing a level of interpretation of the data; and are amenable to obtaining straight and largely unadorned answers to questions of relevance to practitioners (Sandelowski, 2000). It explores the meanings, differences, and perceptions of phenomena, seeking to capture the holistic view (Miller and Crabtree, 1999). The analysis stays close to the data with the emphasis on the description of themes (Sandelowski and Barroso, 2003), stopping short of explaining how patterns have formed. In this method Sandelowski suggests that data collection (usually via semi-structured interviews or focus groups) is directed toward discovering the ‘who, what, and where, of events and experiences’ (Sandelowski, 2000 p338), and for this content analysis the preferred technique. It is also suggested that a ‘targeted event’ be employed as a focus; and that pre-existing codes (or a framework for analysing the data (Sandelowski, 2010)) can be used as long as they are modified during the course of the analysis. The development and modification of codes reflects both Burnard’s, and Miles and Huberman’s techniques of data reduction and clustering. The outcome of the study should then be presented in descriptive summaries.

10.2.2 Methodological development - Qualitative Interpretative Categorisation (QIC)

It is clear that these three separate strategies have similarities particularly within the category forming data phases of the analysis, and all three feed into the overall method of analysis for this research. The methodology has emerged and evolved from the synthesis and blending of methods and led to the development of a composite data analysis framework. The research method for this phase is essentially qualitative description as described by Sandelowski, but emphasises the use of a ‘start list’, data reduction and clustering; and Miles and Huberman’s

data display techniques to better detail the process of analysis. It also makes use of Burnard's specific stages of interview transcript analysis and employs a degree of interpretation and explanation of findings. Although it is not deemed necessary to 'name' this blended method, for ease of reference it is termed Qualitative Interpretative Categorisation (QIC). Expressing the method in this manner emphasises that the analysis is through interpreting what has been transcribed, whilst at the same time highlighting the importance of 'clustering' and data reduction. There are, however, similarities between elements of the QIC process and other methods of analysis as previously mentioned. The main two methods employing coding frameworks are template analysis and the use of the constant comparison method in grounded theory. Is the QIC process sufficiently different from these methods to warrant development?

Taking grounded theory first, whilst it is true that the development of theory is through constant comparative analysis by use of a specific coding scheme, it starts from uncovering the conceptual scheme in a contextual way without the use of a predetermined theoretical framework (Lansisalmi et al., 2004). The categories and their qualities are generated from the data rather than being directed by hypotheses or preconceptions (Hallberg, 2006); differing from QIC where the categories are directed from research questions. Corbin and Strauss state that "it is impossible to know prior to the investigation what salient problems or relevant concepts will be derived from this set of data" (Corbin and Strauss, 2008 p35-6) and come from a realist standpoint, whereas from QIC's post-positivist, pragmatic viewpoint it is possible to set questions for the interview that at least aim to provide useful information in relation to research questions whilst acknowledging that the scope or indeed the nomenclature of categories may change. Grounded theory also advocates unstructured interviewing and theoretical sampling in which different participants may be asked different questions depending on previously analysed data. QIC uses semi-structured interviews with the Critical Incident Technique (CIT) to provide context for the participant. Diagramming is an element of grounded theory, but any depiction of relationships is not necessarily in a 'nodally' structured format, differing from the tree hierarchies that are used to display the nodal structure in QIC. Finally, grounded theory tends to be written up as an analytical story

based around diagrams and memos that were generated from the analysis. In QIC writing up revolves around discussions of each tree hierarchy.

Template analysis is a “group of techniques for thematically organising and analysing textual data” developed by Nigel King (King, 2004) in which an initial template is constructed from the interview guide to aid the researcher in the analytical process. The template can be formed either at the start of the analysis or after some transcripts have been analysed and includes both higher order and lower order codes. This differs from QIC in which the start list is generated before analysis begins and only contains the highest level codes. This is deemed a simpler method to employ. During analysis the template is revised in line with the interpretation of the data and parallel coding is permitted whereby codes may be present in more than one place within the template. QIC also relies on the revision of the start list, but parallel coding is not permitted. During analysis using QIC data is displayed in tree hierarchies and these are modified and restructured depending on what manifests from the data. It is the tree hierarchies that are altered (and if necessary the start list) to prevent parallel coding. The key difference here between template analysis and QIC is the use of the tree hierarchies to depict the relationships between codes. In template analysis it is the template that is modified – there are no diagrams or pictorial displays. All codes are in a single template. In QIC each tree hierarchy is a representation of a single category from the start list showing all relevant lower level codes. This visual representation of relationships is perhaps more conducive for researchers with a post-positivist viewpoint. King advocates that writing up of thematic analysis can, in a similar manner to QIC be based around the main themes. Table 10.5 summarises these main points.

Table 10-5 Comparison of QIC, Template analysis, and Grounded Theory

QIC	Template Analysis (King, 2004)	Grounded Theory (Corbin and Strauss, 2008, Glaser, 1965)
Complete technical framework for qualitative research analysis	Not a single clearly delineated method Limited to coding stage	Structured methodological process using theoretical sampling Attempts to build theory through constant comparison
Post-positivist	King positions himself nearer the phenomenological end of the spectrum	Realist?
Semi-structured interviews using the CIT to provide context	Semi-structured interviews preferred. Analysis of textual data	Advocate unstructured interview.
Initial categorisation from research questions for start list The start list is the top level categories only. Data display by tree hierarchies. Proximity of codes to each other equates to their similarity – the closer the more similar. Each tree hierarchy represents a top level category.	Initial template constructed from interview topic guide, which itself draws on some or all of the following sources – academic literature, the researcher's own experience, and exploratory research Codes organised hierarchically with groups of similar codes clustered together to produce more general higher order codes. Depicts all relevant categories/codes in a single template	“preference not to begin our research with a predefined theoretical framework or set of concepts” (Corbin and Strauss, 2008 p39) Open coding and constant comparative analysis to build categories for further analysis
Note taking and close reading		Memos used as part of the analytic process
Reflection on reading, organising data into themes according to start list Filling out categories with themes, reorganisation	Modifications may include insertion, deletion, changing scope, changing higher order classification	

Modifications may include revision of start list		
<p>Checking coherence of themes within revised categories</p> <p>Clustering</p> <p>No parallel coding. Data goes into one place only. If it does not fit, then the start list/ tree hierarchy is changed.</p>	Parallel coding allowed in different codes at same level	
<p>Development of tree hierarchies via data clustering</p> <p>Further modification of categories using tree hierarchies</p> <p>Assembly of final set of categories and tree hierarchies</p>	Modifications may include insertion, deletion, changing scope, changing higher order classification	<p>Diagrams – to organise data, record relationships, and help explain findings. (Corbin and Strauss, 2008 p125)</p> <p>Depiction NOT in nodal structure format.</p>
<p>Writing up takes the form of separate discussions of each tree hierarchy which represents the structure of a single top level category.</p> <p>Much raw data given.</p>	<p>Presentation – writing up is a continuation of analysis and presentation</p> <p>Advises a set of individual case studies, or an account structured around the main themes, or thematic presentation of the findings</p>	Clear analytical story based on memos and diagrams.

The tree hierarchies used in QIC indicate the nodal structure gained from the analysis. They are not generated mathematically and therefore the nodes depicted are not quantified. What they do show are the relationships between nodes both at different levels and within the same level. Nodes at the same level that are closer in proximity to each other in the tree hierarchy are interpreted as being *more similar* than those further apart. In this way the tree hierarchy represents more of a taxonomic structure of the nodes in which the relationship between all nodes can be ascertained. This type of visual display makes the generation of categories simple and transparent.

The contention is that although some elements of other qualitative data methods are apparent in QIC, it is the case that no individual strategy is completely unique at every stage of the process. In QIC however, there are sufficient differences (table 10.5) from any single qualitative research method to warrant its development. In addition QIC is a complete framework for the analysis of data generated by semi-structured interviews devised for researchers who are constrained either by time pressures, or the need to produce interview guides for ethical consideration. It has been developed as a systematic way of dealing with interview data obtained alongside survey data for practitioners with a post-positivist, pragmatic viewpoint.

The complete data analysis framework can be shown schematically using Creswell's (2009) data analysis process overview as a base (figure 10-1). In this framework Creswell suggests that although the steps are presented as linear, the process is in fact interactive and the steps are interrelated. Creswell also suggests that his general framework should be blended with the specific research strategy steps. Thus to better represent this aspect and to show the additional detail necessary to clarify how the data analysis took place, the framework has been adapted and modified.

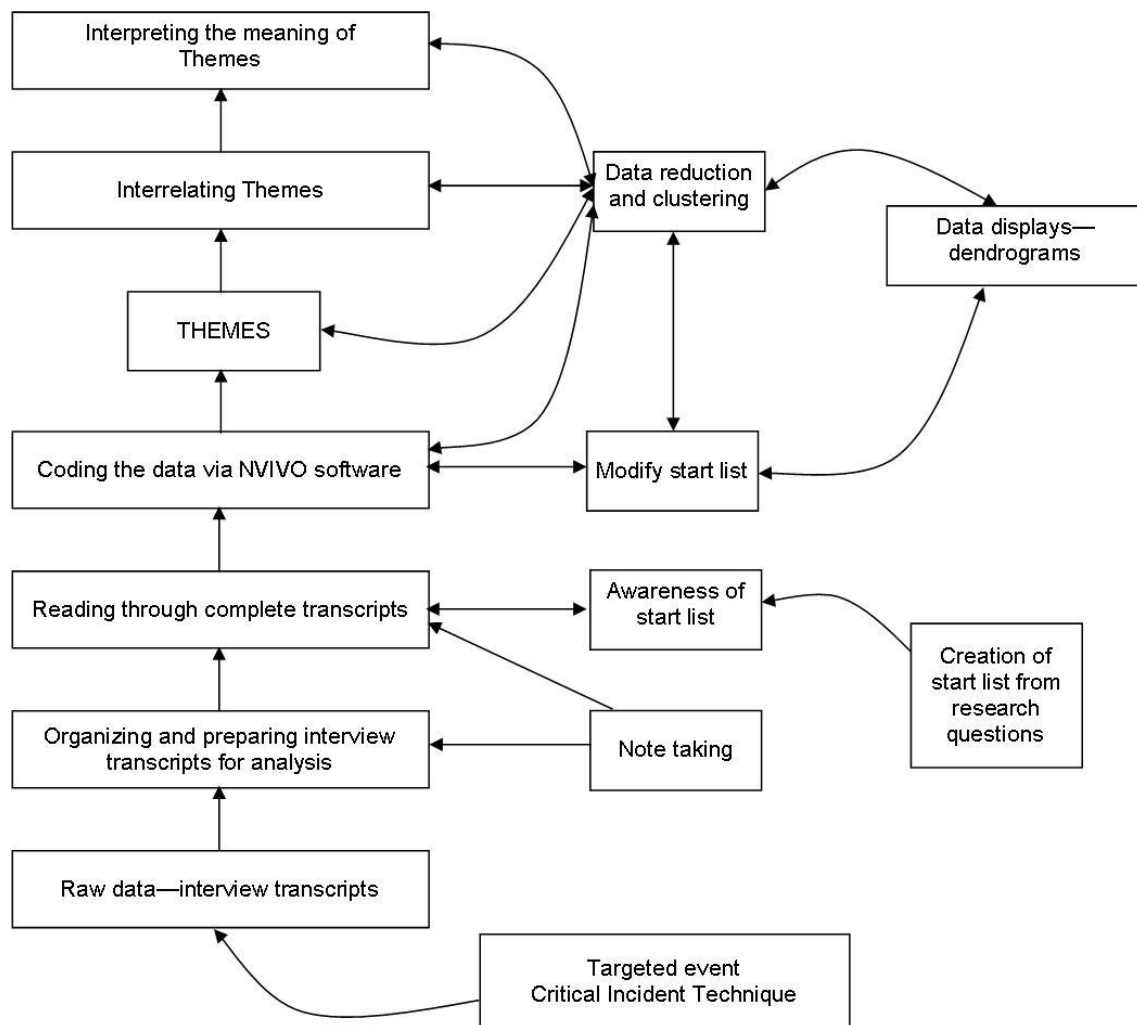


Figure 10-1: the Qualitative Interpretive Categorisation (QIC) framework in relation to Creswell's (2009 p185) seven step data analysis overview.

Note: Creswell's general steps are summarised on the left of the figure.

The blending of Creswell's general data analysis framework with the QIC process provides a complete technical framework for the qualitative research analysis undertaken in this study. Reflection on this process is provided later in this chapter.

The starting point for data collection is the use of a Critical Incident.

10.2.3 Critical Incident Technique (CIT)

The CIT is a systematic, inductive method that involves collecting descriptions of events and behaviours. Once collected they are grouped and analysed using some form of contextual, content or thematic analysis (Aveyard and Neale, 2009). The CIT was originally developed by Flanagan (1954) as part of the US Army Air Forces Psychology Program to describe successful and unsuccessful bombing missions. An 'incident' is "any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act" (Flanagan, 1954 p327); whilst to be 'critical' "an incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects" (Flanagan, 1954 p327).

Critical incidents can be collected by a variety of methods (questionnaires, record keeping, observation), but "the face-to-face interview format is the most satisfactory data collection method for insuring that all the necessary details are supplied" (Kemppainen, 2000 p1265). In the late 1990's the JUSTEIS projects used this method to examine the uptake of electronic information sources (Urquhart et al., 2004, Urquhart et al., 2003a); and it has also been used in information seeking in higher education (Al-Muomen, 2009, Al-Muomen et al., 2012). It has been used in hospitality research (Callan, 1998); service research (Gremier, 2004); medical faculty (Tenopir et al., 2004), and medical research (Bradley, 1992). The CIT, however, is well suited to nursing research as it relies on reflection; and interviewing is aligned to the oral culture of nursing practice (Schluter et al., 2008). It is therefore not surprising that it has been used readily in this field. The EVINCE project (Urquhart and Davies, 1997) used the CIT to examine the patterns of information need amongst hospital and community nurses; and it has been used to capture the experiences of nurses from differing areas (Keatinge, 2002, Perry, 1997). CIT has also been used to determine the quality of nursing care from both the nurse and patients perspective (Norman et al., 1992, Redfern and Norman, 1999); and to explore the spiritual needs of

patients (Narayanasamy and Owens, 2001). Within nursing education the CIT has been used to explore student nurses' perceptions of language awareness (Irvine et al., 2008), and the meaning of empowerment for nursing students within their clinical areas (Bradbury-Jones et al., 2007).

According to Flanagan (1954) there are five steps involved in conducting a CIT:

Stage 1: Give a clear statement of what is being investigated

Stage 2: Specify inclusion criteria

Stage 3: Collect data

Stage 4: Analyse the data

Stage 5: Interpret the data

In this study a clear statement is given at the start of the interview outlining the aspects that are under exploration. Supplementary probes attempt (if necessary) to elicit additional information if the participant appears hesitant or the response is lacking in detail. The interviews were tape recorded and transcribed in full into NVIVO8 software for analysis. NVIVO was used as the researcher was familiar with the software and felt that despite the relatively small dataset it would be useful to have the analysis saved and available in an electronic format. This would also aid with the reproduction of quotes for any discussion. Software is a powerful tool to aid the examining of relationships and although it cannot make a judgement itself, computerisation allows the researcher to work efficiently with coding text and is worthwhile in all but the smallest projects (King, 2004).

The strengths and weaknesses of this technique are given in table 10-6.

Table 10-6: the strengths and weaknesses of the critical incident technique (Aveyard and Neale, 2009)

Strengths	Weaknesses
Objective – concerns actual events	Identification of incidents can be problematic
Flexible – can be adapted to meet needs of study	Incidents may lack detail
Can reveal 'hidden' areas	The participant may omit information that reflects badly on himself
The participant nominates an event meaningful to them, not the researcher	Boundaries of the CIT can be blurred
Suited to obtaining information that may be overlooked by other methods	

Because the incident is chosen by the interviewee, and it is based on real events, this allows areas not considered by the interviewer to be explored. In addition Chell (2004) notes that as incidents are 'critical' this aids recall, and the CIT provides a 'focus' for the researcher to probe and which the interviewee can concentrate upon (Chell, 2004 p48). The potential weaknesses of the method need to be addressed by the interviewer and the development of the interview guide is paramount to this. Giving a clear indication of the type of incident that is appropriate at the start of the interview and probing in a manner to elicit and develop key points must be addressed within the interview. This research uses semi-structured interviews rather than structured interviews as it aids the interviewer by allowing questions not listed in the guide to be asked (Bryman, 2008), and gives the interviewee more scope to respond thus permitting flexibility. According to Bernard (2000) semi-structuring is best when an interviewee is only to be interviewed once as it ensures all the key points are covered. A related technique - explicitation - tends to rely on unstructured interviewing and concern for in depth detail of the event (Urquhart et al., 2003a), which would not have been appropriate here due to the need for an interview schedule.

10.2.4 Development of Interview Guide

Question (1) CRITICAL INCIDENT TECHNIQUE

Please tell me about one entire project from a title or area through to completion: Please tell me about the activities and places that you look as you progress through a literature search. By all means take a moment to think back to where you were and who you consulted about this.

(Possible probes: a. At the beginning – what did you think about the title, where did you start, who did you ask?

b. Once you are a little further what did you do?

c. A little later in your research perhaps when you had done some searching or worked for a while on the topic. Were there any problems that you encountered?

d. As your work progresses and towards completion of your research? How did you cope with any difficulties – or how do you know you'd done as much as you could?)

This question addresses both qualitative research questions and is set out in such a way to allow the interviewee to describe in as much detail as possible a situation they can recall and are familiar with. The probes may be used to encourage and explore extra dimensions.

Question (2) Do you feel that you changed the way you search from the beginning of your search and as you move through? How did your priorities change?

(Supplementary: if in 2nd or 3rd year or has studied before – Has your level of confidence to do a search changed over time? If it has gone up/down, why do you think that is?)

This question is concerned with whether the search strategy has developed as students become more familiar with information seeking techniques. Again both research questions may be addressed here.

Question (3) How does this search compare with other searches you have done before or after this time? If you searched differently in the past, why do you think you changed? If you now search differently – why have you subsequently changed?

(If you use the same strategies and activities, can you describe them for me? If you use different strategies and activities, can you describe them for me? How do the activities you describe fit in with your overall strategy of information-seeking?)

Following on from the previous question, here more emphasis is placed on the first research question. Investigating whether students have changed their strategy may lead to why they did so.

Question (4) Where would you look for information? And who would you ask – and why?

(Information sources/types e.g., Databases (which ones?), OPAC, Library Shelves, Web, fellow students) Do you tend to have a set of resources that you usually try first – or does this depend on what you need to do?

Here the sources of information are explored to provide a rounded view of why specific strategies are employed. It is possible that knowledge of different sources is linked to the way searches are conducted.

Question (5) How do you identify new or useful information sources?

(When looking at a range of sources, how do you decide which ones will be useful? How do you decide which results are relevant?) Can you remember any Eureka moment when you found something that was really useful at that point?

This question addresses both research questions investigating the methods used to find information. The relevancy criteria used by a student may have bearing on the preferred methods and why they search in a particular way.

Question (6) When are you satisfied that you have enough information and can therefore move on to a new question, activity or different way of searching?
How do you judge when enough is enough?

*(Probe: quantity, match with perceived needs for assignment
(expectations of number of references, type of references, try to tease out how any interpolation is done, any critique of the information in the items retrieved, putting it all together.)*

Determining when a student has 'completed' a search may be linked to search strategies and sources. Students who feel they need more information may change their search strategy or employ additional sources.

All the interviews were transcribed in their entirety onto MS Word and then imported into NVIVO8 software for analysis.

10.2.5 Coding

As previously stated the interviews were set up with the aim of addressing specific research questions. The structure of the interview guide along with the use of a critical incident allowed a degree of flexibility for both the researcher and the participant.

Coding can be seen as both the activity that starts the analysis, and the analysis itself (Punch, 2005), aiming to bring parts of documents together allowing them to be reviewed and the topic developed (Richards, 2005 p86). Codes – attached to chunks of data – are used to assign meaning to data and enable these chunks to be organised and retrieved (Miles and Huberman, 1994).

The purposes of qualitative coding are numerous, although not all these points will be relevant to every research project:

1. Reflect on what segments say about a category
2. To gain insights into relationships between categories
3. Develop theories about the relationships
4. Enable comparisons between cases
5. Fine tune categories into different dimensions with repeat coding
6. Search for blends or combinations of categories
7. Compare how different researchers interpret the data

Adapted from Richards (2005 p87)

The QIC method places more emphasis on the creation and 'fine tuning' of categories which necessarily includes the examination of relationships between codes in the data displays. Only Richards' final point is irrelevant in this study as a single researcher coded the transcripts.

The start list of predetermined categories was generated both from the two research questions and the interview schedule which itself was derived from the research questions (table 10-6).

Research question 1 (RQ1): Why do users search the way they do?

Research question 2 (RQ2): What are the preferred methods of information seeking?

Interview question 1 (IQ1): CRITICAL INCIDENT TECHNIQUE

Please tell me about one entire project from a title or area through to completion: Please tell me about the activities and places that you look as you progress through a literature search. By all means take a moment to think back to where you were and who you consulted about this.

Interview question 2 (IQ2): Do you feel that you changed the way you search from the beginning of your search and as you move through? How did your priorities change?

Interview question 3 (IQ3): How does this search compare with other searches you have done before or after this time? If you searched differently in the past, why do you think you changed? If you now search differently – why have you subsequently changed?

Interview question 4 (IQ4): Where would you look for information? And who would you ask – and why?

Interview question 5 (IQ5): How do you identify new or useful information sources?

Interview question 6 (IQ6): When are you satisfied that you have enough information and can therefore move on to a new question, activity or different way of searching? How do you judge when enough is enough?

Table 10-7: the initial start list of categories, rationalisation, and which questions they relate to.

Name of category	Rationale for category	Relates to?
Amount of information	What is the amount of information a student needs to move on to something else, or start the assignment?	RQ1, IQ1, IQ6
Confidence	Are students more or less confident now than before?	RQ1, IQ2, IQ3
Critiquing	Do students critique articles or take them at face value?	RQ1, RQ2, IQ6
Relevancy	How do students determine what is or isn't relevant?	RQ1, RQ2, IQ5
Satisfaction with searching	Why are students either satisfied or dissatisfied with their search?	RQ1, RQ2, IQ6
Searching techniques	What techniques to students employ in their searches?	RQ1, RQ2, IQ1, IQ2, IQ4,
Sources used	What sources are used to find information?	RQ1, RQ2, IQ1, IQ4, IQ5

10.2.6 Data analysis – reflecting on the QIC process

General reflection

The need for an interview schedule to be produced before the survey data was collected this invariably meant that there would be limitations. Purposeful sampling and exploring findings from the survey were not possible and this meant that certain types of analysis could not be undertaken. There was no possibility of exploring key findings from the survey and as such the qualitative aspect of the research became embedded within the quantitative aspect of the mixed-methods framework at the outset.

The start list provided a structured framework for me to attach data. For me it was very useful to have something already set up before I began my analysis. I don't think I would have been able to open code with a blank canvas.

The use of the CIT as a targeted event that the participant was familiar with worked very well. Participants were able to talk about their own personal experience and this provided rich data. It also put the participant at ease as they were relating something that they had done, rather than what they might do in the future or in a hypothetical situation.

I used NVIVO because I was familiar with the software having used it in workplace projects previously. I also felt more comfortable cutting and pasting electronically than manually and wanted to be able to access the analysis from different locations with ease. I felt that NVIVO would assist with category development and refinement, although as it turned out I manually created the tree hierarchies within MSExcel. I also wanted to reproduce chunks of quotes in my discussion chapter and having the data neatly 'housed' in relevant categories assisted with this greatly.

Data display using the tree hierarchies was also useful in that it focussed the mind to the way codes were related to each other. By displaying the data in this way throughout the analysis, categories could be easily and quickly redefined

and modified. Creating the tree hierarchies in a taxonomic manner whereby codes closer in proximity to each other were more similar also aided the conceptualisation of relationships between the codes, both in terms of the hierarchical structure (between levels) and within levels.

Reflection on stages

Stage 1: After collecting the raw data (performing the interviews), each interview was listened to in its entirety. During this process notes were taken to provide thoughts and ideas relevant to the start list of codes.

Reflection: these notes were useful not only in assisting the compilation of the start list of categories, but also in the initial identification of possible sub-categories.

Stage 2: The transcripts were typed up and uploaded into the NVIVO8 software package for analysis. All the transcription was undertaken by me to obtain a 'first look' at the data. This enabled me to reflect on my start list of codes for later in the process.

Reflection: transcribing the interviews from tape was occasionally problematical as interviewees sometimes 'mumbled' or spoke quietly. I often had to rewind and replay small sections of the tape to ascertain the exact words used. In a couple of cases no matter how many times I repeated a section I could not understand some of the words, but was able to generate some meaning of the statement from the words around the 'problem' word. Two interviewees had accents that were difficult to understand (Scottish and Eastern European), and those interviews required great care to transcribe. More note taking took place at this stage.

Stage 3: Once transcribed, each interview was read through to get a sense and reflect on the general overall meaning. This procedure again fed into my start list of concepts.

Reflection: reading through gave me the chance to correct spelling mistakes that I had made, but I did not change sentences to make them grammatically correct. These errors were left as a true reflection of the interviewees' statements. More note taking took place at this stage.

Stages 4 and 5: Coding and generating themes. As already stated I began with a start list of categories that gave me a framework to slot data into. Each transcript was then coded for specific concepts with this start list of general categories in mind. Once all eleven transcripts were first coded these specific codes were categorised within the general categories. These categories formed the initial areas of theme generation.

Reflection: It became apparent after four transcripts were coded that Searching Techniques needed to be re-categorised within a broader heading of Searching Strategies which would include Problems with searching. A new category of "Revision of searching" was created to encompass changes in searching as the search progressed. Subcategories were also created that pooled similar concepts together within the broader headings.

Stage 6: Representation of themes. Once coding had begun, nodes were clustered into similar groupings within the start list of categories. These were then 'displayed' using tree hierarchies which were modified and enhanced as coding continued.

Reflection: It was important not to 'force' nodes into the start list of categories and as already stated the initial list was altered early in the process. The tree hierarchies provided a means of displaying the relationships between nodes which was extremely useful during the research process.

Stage 7: Interpretation – see Results section.

PILOT STUDY

One nurse who had recently graduated agreed to take part in a pilot study to test face validity of the interview schedule. No changes to the schedule were deemed necessary, but it did enable the researcher to mould supplementary questions and probes for the interviews. The transcript of the pilot interview was not included in the study as the nurse was no longer a student.

Chapter 11 RESULTS

11.1 Quantitative

Of the 194 students completing the questionnaire in full the vast majority were on the three year RN/RM programme (n=139), with 35 doing a CPD module, 12 on the Masters course, and 7 were undergraduate midwifery students. Overall there were 72 first year students, 44 second years, and 43 third years. Those doing the modules were not classed as in a particular year as the modules were less than a year in length. Student age was broken down as follows: 31 were 20 years old or under, 75 were between 21 and 30, 46 between 31 and 40, 35 were 41-50, and 7 were 51-60. The following tables show the breakdown of self-efficacy, personality and learning styles in respect of these three criteria.

Note: as so few RM students took part in the study, the results for this group are not analysed in depth but are still given in the 'course' tables below. The group is included within the 'current year of course', and 'age of student tables'. Likewise the oldest age group (51-60 years), the Beginner level of information literacy self-efficacy, and the 'Allrounder' learning style type also had very low totals but are included in the tables for completeness.

11.1.1 Scale reliability

In order to test for scale reliability Cronbach's alpha was performed using SPSS on the ILSES, ASSIST and Mini-Markers. It tests the internal consistency and can be used on likert type scales (Lobiondo-Wood and Haber, 2010).

Cronbach's alpha shows the extent of 'communalities' of items in a test (Cortina, 1993). The resultant score is between 0 and 1 with 0.70 or higher considered acceptable, although for complex constructs such as personality scores lower than this are also acceptable (Foster, 2001, Kline, 2000). Scales with several factors should apply Cronbach's alpha to each of the subscales separately (Cronbach 1951, cited in Field, 2009 p675, Rattray and Jones, 2007).

Self-efficacy

The ILSES was tested as a single construct of 17 items and the resulting Cronbach's alpha score was 0.928 which is very good and compares well with scores obtained during original scale development (Kurbanoglu et al., 2006).

Learning style

The ASSIST was tested as three separate constructs of 6 items each for deep, strategic and surface styles (table 11-1).

Table 11-1: Cronbach's alpha scores for the ASSIST

ASSIST	Alpha
Deep	0.630
Strategic	0.682
Surface	0.684

The results whilst appearing marginally low are in line with other research that utilised the smaller scale (Speth et al., 2007, Heinstrom, 2006a).

Personality

In order to perform the Cronbach's alpha on the Mini-markers scale – the negative items are reversed scored ($r_item = 0 - item$) to make all scores 'positive'. This scale was tested as five separate constructs of 8 items each for extraversion, agreeableness, conscientiousness, emotional stability, and openness.

Table 11-2: Cronbach's alpha scores for the Mini-markers

Mini-Markers	Alpha
Extraversion	0.772
Agreeableness	0.776
Conscientiousness	0.791
Emotional Stability	0.739
Openness	0.610

The results for this scale (table 11-2) are good (although the openness score is slightly low), and are comparable to other studies (Olver and Mooradian, 2003).

The research questions tackled in the quantitative part of the study are:

1. What is the relationship between personality, self-efficacy, learning styles, and information seeking behaviour?
2. What is the impact of differing personalities, self-efficacy levels, and/or learning styles on information seeking behaviour?

The following objectives were:

1. Determine whether 'different' students (type of course; stage of course) search differently.
2. Determine the role of personality, self-efficacy and learning style in the context of ISkB and how these act and interact on ISkB.

11.1.2 Self-efficacy

Students' level of self-efficacy with information literacy and course is given in tables 11-3, 11-4 and 11-5. More than two thirds of the participants were on the RN programme thus the distribution was not normal and in addition some numbers were very small. As a result no chi-square analysis was undertaken.

Table 11-3: the relationship between information literacy self-efficacy and course. RM given but not analysed

		RN Diploma/Degree	RM <i>Diploma/Degree</i>	Postgraduate Masters	CPD module	Total
Information literacy self-efficacy	Beginner	2	0	0	6	8
	Intermediate	50	2	1	10	63
	Advanced	87	5	12	19	123
Total		139	7	13	35	194

Very few respondents (n=8) considered themselves novices in respect of information literacy self-efficacy (ILSE), with the majority (n=123) being 'Advanced'. Those undertaking a module had the highest percentage of 'Beginners' (17%), whilst of those on the Masters programme only one student was not 'Advanced'. This may be due in part to students over estimating their information skills proficiency; a phenomenon found elsewhere (Detlor et al., 2011, Gross and Latham, 2007).

NULL hypothesis 1.

H₀: There is no significant difference between students with differing levels of ILSE in terms of their stage of course

ALTERNATIVE hypothesis 1.

H₁: There is a significant difference between students with differing levels of ILSE in terms of their stage of course

Table 11-4: the relationship between information literacy self-efficacy and current year of course

		Module	First year	Second year	Third year	Total
Information literacy self-efficacy	Beginner	6	2	0	0	8
	Intermediate	10	26	10	17	63
	Advanced	19	44	34	26	123
Total		35	72	44	43	194

It would be expected that as students' progress through their studies they would become more confident in their information literacy skills (SCONUL, 1999). The results in this study do not however bear testimony to this (table 11-4). The highest percentage of Advanced ILSE students was for those in the second year of their course. This could be due to students gaining confidence from year one to year two, but when they start year three and begin their dissertation and

research modules they lose confidence in their ability. A chi square test of the association between level (year one, two, three and CPD) and ILSE (beginner and intermediate merged into one group) showed no significant relationship (chi-square 5.225, $p=0.156$, 3 degrees of freedom); thus null hypothesis 1 is supported, and alternative hypothesis 1 rejected.

NULL hypothesis 2.

H_0 : There is no significant difference between students with differing levels of ILSE in terms of their age.

ALTERNATIVE hypothesis 2.

H_1 : There is a significant difference between students with differing levels of ILSE in terms of their age.

Table 11-5: the relationship between information literacy self-efficacy and age of student

		20yrs and under	21-30	31-40	41-50	51-60	Total
Information literacy self-efficacy	Beginner	1	1	3	2	1	8
	Intermediate	9	26	10	15	3	63
	Advanced	21	48	33	18	3	123
Total		31	75	46	35	7	194

In general terms younger students consider themselves more efficacious than the older students (found elsewhere in a study of midwives (Hillan et al., 1998)). The age group 31-40 has the highest percentage of Advanced ILSE students (72%), but both under 20's (68%) and the 21-30 age group (64%) also have large majorities of Advanced ILSE students. A chi square test of the association between age and ILSE (beginner and intermediate merged into one group) showed no significant relationship (chi-square 5.077, $p=0.279$, 4 degrees of freedom); thus null hypothesis 2 is supported, and alternative hypothesis 2 rejected.

11.1.3 Learning Styles

Students' learning styles and course are given in tables 11-6, 11-7 and 11-8. Again as more than two thirds of the participants were on the RN programme (and several cells had low scores) – no chi-square analysis was undertaken.

Table 11-6: the relationship between different learning styles and course. RM given but not analysed

		RN Diploma/Degree	RM <i>Diploma/Degree</i>	Postgraduate Masters	CPD module	Total
Learning style	Deep	33	2	4	10	49
	Strategic	56	0	6	14	76
	Surface	24	2	0	2	28
	Mix	23	3	2	6	34
	Allrounder	3	0	1	3	7
Total		139	7	13	35	194

For learning style; the largest fraction of students was Strategic learners (39%), with 25% Deep, and 14% Surface. A total of 41 students had no single learning style, 34 were classed as 'Mix' (two scores the same) and 7 were 'Allrounders' (all three scores the same). RN students had a high level of Surface learners (17%), postgraduates had a high level of Strategic learners (46%), and CPD students had a high level of Deep learners (29%).

NULL hypothesis 3.

H₀: There is no significant difference between students with differing learning styles in terms of their stage of course

ALTERNATIVE hypothesis 3.

H₁: There is a significant difference between students with differing learning styles in terms of their stage of course

Table 11-7: the relationship between different learning styles and current year of course

		Module	First year	Second year	Third year	Total
Learning style	Deep	10	16	9	14	49
	Strategic	14	31	15	16	76
	Surface	2	7	11	8	28
	Mix	6	16	8	4	34
	Allrounder	3	2	1	1	7
Total		35	72	44	43	194

The highest percentage of Strategic learners for any individual year were first year students (43%), with third year students having the highest percentage of Deep learners (33%). Second years showed the highest percentage of Surface learners (25%). Those without a clear learning style (Mix and Allrounder merged) declined across the three year programmes from 25%, to 20%, then to just 12% in year three – possibly indicating that students take some time to find their own style. The differences here are slight – a chi square test of the association between level (year one, two, three and CPD) and learning style (mix and allrounder merged into one group) showed no significant relationship (chi-square 11.917, $p=0.218$, 9 degrees of freedom); thus null hypothesis 3 is supported, and alternative hypothesis 3 rejected.

NULL hypothesis 4.

H_0 : There is no significant difference between students with differing learning styles in terms of their age

ALTERNATIVE hypothesis 4.

H_1 : There is a significant difference between students with differing learning styles in terms of their age

Table 11-8: the relationship between different learning styles and age of student

		20yrs and under	21-30	31-40	41-50	51-60	Total
Learning style	Deep	6	17	13	11	2	49
	Strategic	13	31	17	13	2	76
	Surface	5	12	5	5	1	28
	Mix	7	14	9	3	1	34
	Allrounder	0	1	2	3	1	7
Total		31	75	46	35	7	194

As a percentage within each year Deep learners become more numerous (from 20% up to 31%) as students become older (up to age 51-60), with Strategic learners declining (slightly) across the same year ranges. This suggests that older students may be prepared to spend more time doing intensive searching rather than planning their search. A chi square test of the association between age and learning style (mix and allrounder merged into one group) showed no

significant relationship (chi-square 3.081, $p=0.995$, 12 degrees of freedom); thus null hypothesis 4 is supported, and alternative hypothesis 4 rejected.

11.1.4 Personality

As the Mini-markers is used to investigate comparative levels of personality rather than indicating that an individual is a certain personality type, the average score for the five personality types was calculated to see which students had higher or lower levels of each type (tables 11-9 and 11-10). Neuroticism is replaced by the phrase 'Emotional Stability', and the more negative the score – the less emotionally stable is the individual/group (see section 10.1.3).

Table 11-9: the average personality scores of students at different stages of their course

Course	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
RN year 1	0.502	2.275	1.600	-1.707	3.474
RN year 2	1.003	2.470	1.625	-1.863	3.561
RN year 3	0.700	2.037	1.504	-1.779	3.349
Masters/CPD	0.862	2.010	1.794	-1.727	3.424

Average personality scores for the three different year groups of RN students were compared to the combined Masters/CPD group (table 11-9). First year RN students were the least Extravert, with third years the least Conscientious. For Openness second years scored highest, and third years the lowest. Second year students were also the most Extravert and Agreeable, but the least Emotionally Stable. The combined Masters/CPD group were the most Conscientious. In all cases the differences appear slight.

Table 11-10: the relationship between mean personality score and age of student

Age	Mean Personality score				
	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
20yrs and under	0.649	2.379	1.604	-1.931	3.495
21-30	0.813	2.318	1.552	-1.825	3.497
31-40	0.864	1.853	1.649	-1.815	3.315
41-50	0.557	2.311	1.707	-1.460	3.553
51-60	0.517	2.196	1.607	-1.232	3.464
Overall	0.742	2.212	1.613	-1.752	3.462

The three younger age groups show higher levels of Extraversion (table 11-10) but lower levels of Emotional Stability compared to the older age groups. The 31-40 age group are the least Agreeable and Open than any other group. The 41-50 age group have the highest Conscientiousness and Openness scores.

The results for the individual factors of ILSE, learning style, and personality indicate that no single factor seems to be making a difference across the levels of the course, although the numbers within each level are relatively low – making demonstration of small but significant changes difficult.

Accordingly, to examine the interactions the analyses were conducted on the entire group.

11.1.5 Self-efficacy and Learning Style

NULL hypothesis 5.

H₀: There is no significant difference between students with differing levels of ILSE in terms of their learning styles

ALTERNATIVE hypothesis 5.

H₁: There is a significant difference between students with differing levels of ILSE in terms of their learning styles

Table 11-11: the relationship between self-efficacy level and different learning styles

		Learning style			
		Deep	Strategic	Surface	Mix/Allrounder
Self-efficacy	Beginner	0	3	2	3
	Intermediate	11	24	13	15
	Advanced	38	49	13	23
Total		49	76	28	41

Crosstabulation of ILSE and learning style (table 11-11) shows that the ratio of Intermediate and Advanced ILSE students is 1:1 for the Surface learning style, but students with the Deep learning style were far more likely to be associated with Advanced levels of ILSE. A chi square test of the association between learning style and ILSE (beginner and intermediate merged into one group)

indicated that there is a significant association between Deep learning style with Advanced ILSE, and Surface learning style with Intermediate/Beginner ILSE (chi-square 8.684, $p=0.034$, 3 degrees of freedom); thus null hypothesis 5 is rejected, and alternative hypothesis 5 is supported.

11.1.6 Self-efficacy and Personality

Table 11-12: the relationship between self-efficacy level and mean personality score

		Mean Personality score				
		Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
Self-efficacy	Intermediate/Beginner	0.317	2.012	1.294	-1.903	3.266
	Advanced	0.988	2.327	1.798	-1.666	3.576

For personality types, the Intermediate/Beginner ILSE students have lower scores for all five of the personality traits than Advanced ILSE students (table 11-12). Thus, the Advanced ILSE group are associated with higher levels of Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness.

11.1.7 Learning Style and Personality

Table 11-13: the relationship between different learning styles and mean personality score

		Mean Personality score				
		Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
Learning Style	Deep	0.906	2.117	1.449	-1.969	3.804
	Strategic	0.683	2.329	1.933	-1.633	3.423
	Surface	1.031	2.009	1.232	-1.799	2.862
	Mix	0.533	2.415	1.625	-1.695	3.577
	Allrounder	0.107	1.430	0.768	-1.625	3.357

Crosstabulating Learning Style with Mean Personality score (table 11-13) shows that Deep learners are the most Open, but score lowest for Emotional Stability; suggesting a link between preparedness to explore/perseverance and intelligence (using Fiske's (1949) description of Openness as being akin to level

of intellect). Strategic learners are the most Conscientious and Emotionally stable (disregarding Allrounders) which partially supports Heinström's (2003) research; indicating that these learners are more deliberate or organised with their search. Surface learners are the most Extravert, but the least Conscientious, Agreeable (disregarding Allrounders) and Open, suggesting that Surface learners may be less inclined to work diligently as they may lack the required attitudes, or do not see the need to work in particular ways. Students with a Mixed Learning Style scored highest for Agreeableness. The results for the Allrounders are hard to interpret (possibly due to very small numbers), with comparatively low scores for Extraversion, Agreeableness, Conscientiousness, and Openness, but a high score for Emotional stability.

The above findings will be used in later analysis, but models to predict behaviour based on certain characteristics need to be informed by the qualitative analysis as well as some practical considerations of the type of tests that would be feasible to conduct on a regular basis with students.

11.1.8 ISkB

The number of positive responses for each micro-process is given in table 11-14. It shows that fourteen of the eighteen micro-processes are agreed with by more than 50% of the students, with a maximum of 87.6% of students agreeing with the positive Serendipity statement. Reviewing, Identify Keywords, and Problem Definition also all score more than 80% positive. Identify Shape of Existing Research, Breadth Exploration, Picture Building and Monitoring are the only micro-processes that fewer students agree with the statement than disagree. Monitoring is the micro-process undertaken by the fewest students (21%). The inference here is that particular micro-processes appear to be generally more important in terms of ISkB than others and that students use a range of different strategies in their ISkB.

Table 11-14: the number of students agreeing with the micro-process

ISkB micro-process agreed	Number	Percent
Serendipity	170	87.6
Reviewing	169	87.1
Identify Keywords	169	87.1
Problem Definition	168	86.6
Keyword Searching	155	79.9
Eclecticism	146	75.3
Chaining	143	73.7
Browsing	140	72.2
Incorporation	131	67.5
Knowing Enough	125	64.4
Sifting	115	59.3
Verifying	111	57.2
Networking	107	55.2
Refining	99	51.0
Identify Shape of Existing Research	76	39.2
Breadth Exploration	74	38.1
Picture Building	72	37.1
Monitoring	41	21.1

11.1.9 ISkB and Self-efficacy

Table 11-15 shows that in terms of student numbers; the five micro-processes: Reviewing, Problem Definition, Serendipity, Identifying Keywords, and Keyword Searching, were top ranked for both Beginner/Intermediate and Advanced ILSES students albeit in a different order. Serendipity and Reviewing are the joint highest ranked micro-processes for the Beginner/Intermediate group, with Identify Keywords the highest ranked micro-processes for the Advanced group.

Table 11-15: the relationship between the number of students agreeing with the micro-process and self-efficacy level

The micro-processes are ranked with the highest number at 1

	Numbers of students	
RANK	Beginner/Intermediate	Advanced
1	= Serendipity and Reviewing	Identify Keywords
2		Problem Definition
3	Problem Definition	Serendipity
4	Identify Keywords	Reviewing
5	= Keyword Searching and Eclecticism	Keyword Searching
6		Chaining
7	Browsing	Eclecticism
8	Chaining	Browsing
9	Incorporation	Knowing Enough
10	= Verifying and Networking	Incorporation
11		Sifting
12	Knowing Enough	= Verifying and Refining
13	= Sifting and Identify Shape of Existing Research	
14		Networking
15	= Refining and Picture Building	Breadth Exploration
16		Picture Building
17	Breadth Exploration	Identify Shape of Existing Research
18	Monitoring	Monitoring

The lowest ranked micro-processes were also similar for both ILSES levels with Monitoring lowest, and both Picture Building and Breadth Exploration in the lowest four micro-processes. The only difference within the lowest four micro-processes is that Refining is joint 15th for the Beginner/Intermediate group; and Identifying the Shape of Existing Research is 17th for the Advanced group. There are some other differences in the ranking of other micro-processes e.g.: Knowing Enough is ranked 9th for the Advanced group but only 12th for the Beginner/Intermediate group. The significance (if any) of these differences is apparent following the odds ratio analysis (*section 11.1.11*).

11.1.10 ISkB and Learning Style

Table 11-16 shows that in a similar manner to the ILSE results, the top five ranked micro-processes (number of students agreeing with the statement) in terms of the three main Learning Styles were again: Reviewing, Problem Definition, Serendipity, Identifying Keywords, and Keyword Searching, for all Learning Styles (except for Surface learners for which Networking was fifth ranked, and for Strategic learners Eclecticism was joint fifth ranked). Again the micro-processes were ordered differently with Deep learners scoring Identify Keywords highest; Strategic learners scoring Problem Definition highest; and Surface learners scoring Reviewing the highest.

Table 11-16: the relationship between the number of students agreeing with the micro-process and learning style type

The micro-processes are ranked with the highest number at 1

RANK	Numbers of students		
	Deep	Strategic	Surface
1	Identify Keywords	Problem Definition	Reviewing
2	= Serendipity and Reviewing	Serendipity	Identify Keywords
3		= Identify Keywords and Keyword Searching	Serendipity
4	Problem Definition		Problem Definition
5	Keyword Searching	= Reviewing and Eclecticism	Networking
6	Browsing		Chaining
7	Chaining	Chaining	Eclecticism
8	Sifting	Knowing enough	= Keyword Searching and Browsing
9	= Eclecticism and Incorporation	Incorporation	
10		Browsing	Incorporation
11	= Networking and Knowing Enough	Sifting	Knowing Enough
12		Verifying	Verifying
13	Verifying	Refining	Picture Building
14	=Breadth Exploration and Refining	Identify Shape of Existing Research	Breadth Exploration
15		Networking	= Sifting and Identify Shape of Existing Research
16	Picture Building	Breadth Exploration	
17	Identify Shape of Existing Research	Picture Building	Refining
18	Monitoring	Monitoring	Monitoring

The lowest ranked micro-processes were similar for all three learning styles types: Monitoring was the lowest for each style with Breadth Exploration and Identifying the Shape of Existing Research both ranked in the bottom five for all three styles. There was more variation between styles for other micro-processes than the results for ILSE e.g: Sifting is ranked much higher for Deep learners than Surface learners, Problem Definition ranked much higher for Strategic learners than either Deep or Surface learners, and Networking ranked much higher for Surface learners than either Deep or Strategic learners. These and other differences are apparent with odds ratios (*section 11.1.11*).

11.1.11 Odds Ratios

Odds ratio analysis was undertaken to investigate the likelihood of students with particular ILSE levels or Learning Styles performing the micro-processes as part of their ISkB strategy (tables 11-18 and 11-19). The odds ratio is calculated using the following formula:

$$(a*d)/(b*c)$$

This formula is composed using a contingency table (an example is given in table 11-17).

Table 11-17: an example contingency table used for calculating odds ratios

	Performs micro-process	Does not perform the micro-process
Advanced ILSE	a	b
Not Advanced ILSE	c	d

From the odds ratio calculations, the following micro-processes were identified as those most likely performed by students with different ILSE levels (table 11-18) and learning styles respectively (table 11-19). Other micro-processes had odds of less than 1.5:1.

Table 11-18: micro-processes most likely to be undertaken by students with different self-efficacy levels

Self-efficacy*	ISkB process		
	Opening	Orientation	Consolidation
Advanced	Keyword Searching Chaining	Problem Definition Identify Keywords	Knowing Enough Refining Sifting
Intermediate/Beginner	Monitoring	Identify Shape of Existing Research	

* Only odds of higher than 1.5:1 are shown in this table.

Only Monitoring and Identifying the Shape of Existing Research are most likely performed by Beginner/Intermediate level ILSE students in comparison to the Advanced ILSE group, suggesting a keenness to stick with what they know. The Advanced ILSE group are more likely to think about their search (Problem Definition) and work out search strategies (use of keywords). They also appear to prefer to build or adapt their searches as they progress (Chaining), but at the same time be able to define boundaries (Refining), and check they are on the right track (Sifting). Confidence in their results (Knowing Enough) also fits within the Advanced ILSE group.

Table 11-19: micro-processes most likely to be undertaken by students with different Learning Styles

Learning Style*	ISkB process		
	Opening	Orientation	Consolidation
Deep	Breadth Exploration Networking Browsing	Identify Keywords	Sifting
Strategic	Eclecticism Keyword Searching Serendipity	Problem Definition Identify Shape of Existing Research	Knowing Enough Refining Sifting Verifying
Surface	Networking	Reviewing	

*Only odds of higher than 1.5:1 are shown in this table.

Deep learners are more likely to perform Breadth Exploration, Networking, Browsing, Identify Keywords and Sifting. Whilst Breadth Exploration, Networking, Browsing, and Sifting fit neatly into this group; Identify Keywords would be more akin of Strategic learners who would plan their search.

Strategic learners thought of in terms of those wanting to achieve good assignment grades may well see the benefit of Serendipity (ensuring nothing is missed) and Eclecticism (collecting methodically); despite these processes appearing to be suited to Deep learners. Getting the search right initially by noting the importance of Keyword Searching, Problem Definition, and Identifying the Shape of Existing Research also fits.

They would also be expected to have a better idea of when their search is complete (Knowing Enough), be better able to define boundaries (Refining), and check they are on the right track (Sifting). Verifying is not so obvious unless it is viewed in terms of wanting the most accurate information following the search

and checking what has been collected. Both Networking and Reviewing are most likely performed by Surface learners, which is to be expected as these processes require less planning and searching.

11.1.12 ISkB and Personality

As it is not possible to tabulate the personality scores in terms of student numbers who 'are' a particular trait, mean personality score was used to rank which micro-process had the highest mean score for each trait for those that agreed/disagreed with the statement (tables 11-20, 11-21).

Students *agreeing* with the micro-process statement

Table 11-20: the relationship between students agreeing with the micro-process and mean personality score

The micro-processes are ranked with the highest mean personality score at 1.

	Mean Personality score				
RANK	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
1	Knowing Enough	Reviewing	Sifting	Identify Shape of Existing Research	Browsing
2	Chaining	Sifting	Verifying	Knowing Enough	Picture Building
3	= Refining and Verifying	Knowing Enough	Knowing Enough	Refining	Sifting
4		Serendipity	Reviewing	Identify Keywords	Knowing Enough
5	Incorporation	Identify Keywords	Refining	Chaining	Networking
6	Networking	Keyword Searching	Keyword Searching	Networking	Verifying
7	Reviewing	Eclecticism	Identify Keywords	Sifting	Reviewing
8	Identify Keywords	Problem Definition	Problem Definition	Reviewing	Serendipity
9	Serendipity	Verifying	Chaining	Keyword Searching	Keyword Searching
10	Identify Shape of Existing Research	Refining	Identify Shape of Existing Research	Incorporation	Incorporation
11	Breadth Exploration	Networking	Incorporation	= Serendipity and Problem Definition	Chaining
12	Sifting	Chaining	Serendipity		Refining
13	= Problem Definition and Keyword Searching	Browsing	Eclecticism	Eclecticism	Identify Keywords
14		Incorporation	Networking	Verifying	Problem Definition
15	Picture building	Identify Shape of Existing Research	Breadth Exploration	Browsing	Eclecticism
16	Browsing	Breadth Exploration	Browsing	Monitoring	Breadth Exploration
17	Eclecticism	Picture Building	Picture Building	Breadth Exploration	Identify Shape of Existing Research
18	Monitoring	Monitoring	Monitoring	Picture Building	Monitoring

Whilst Knowing Enough ranks highly in all personality types, Monitoring scores low for all personality types. Other results, however, showed much more variation than for either self-efficacy or learning style. Browsing and Picture Building are the top two ranked processes for Openness, but are ranked no higher than 13th for any other trait. All five personality types have a different top ranked ISkB micro-process: Extraversion-Knowing Enough; Agreeableness-Reviewing; Conscientiousness-Sifting; Emotional Stability-Identify Shape of Existing Research; and Openness-Browsing.

Students *disagreeing* with the micro-process statement

Table 11-21: the relationship between students disagreeing with the micro-process and mean personality score

The micro-processes are ranked with the highest mean personality score at 1.

RANK	Mean Personality score				
	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
1	Eclecticism	Picture Building	Browsing	Browsing	Problem Definition
2	= Browsing and Monitoring	= Monitoring and Breadth Exploration	Monitoring	Picture Building	Eclecticism
3			Picture Building	Breadth Exploration	Identify Shape of Existing Research
4	Picture Building	Identify Shape of Existing Research	Eclecticism	Monitoring	Monitoring
5	Breadth Exploration	Browsing	Breadth Exploration	Eclecticism	Identify Keywords
6	Sifting	Incorporation	Networking	Verifying	Breadth Exploration
7	Keyword Searching	Chaining	Serendipity	Incorporation	Refining
8	Identify Shape of Existing Research	Networking	Identify Shape of Existing Research	Problem Definition	Chaining
9	Problem Definition	Refining	Incorporation	Sifting	Incorporation
10	Networking	Verifying	Refining	Keyword Searching	=Picture Building and Verifying and Keyword Searching
11	Refining	Eclecticism	Chaining	Serendipity	
12	Verifying	Sifting	Verifying	Networking	
13	Incorporation	Problem Definition	Knowing Enough	Identify Shape of Existing Research	Networking
14	Knowing Enough	Knowing Enough	Sifting	Refining	Knowing Enough
15	Chaining	Keyword Searching	Keyword Searching	Reviewing	Serendipity
16	Serendipity	Identify Keywords	Problem Definition	Chaining	Sifting
17	Identify Keywords	Serendipity	Identify Keywords	Knowing Enough	Reviewing
18	Reviewing	Reviewing	Reviewing	Identify Keywords	Browsing

As would be expected in the majority of cases the number of students disagreeing with the micro-process statement in terms of personality score is now reversed. The exact rankings are however not completely inverted in every case suggesting ambiguous demarcation of the trait. So while Reviewing and Browsing which were top ranked micro-processes for Agreeableness and Openness respectively they are now ranked lowest; Knowing Enough and Sifting which were top ranked for Extraversion and Conscientiousness are now ranked 14th for each trait; and Identify Shape of Existing Research which was top ranked for Emotional Stability is now ranked 13th for this trait. Monitoring, Browsing, Eclecticism, Breadth Exploration, and Picture Building are now the top five ranked micro-processes for Extraversion, Conscientiousness and Emotional Stability; with Agreeableness ranking Identify Shape of Existing Research 4th and Eclecticism down in 11th. Openness again appears to differ more than the other traits with Problem Definition top ranked and as already mentioned Browsing is ranked lowest.

To check for anomalies, the personality scores (for the five traits) for students who did indicate they performed a micro-process were compared with the personality scores (for the five traits) for students who did not perform the process. These scores were then ranked. The column rankings were then checked to ascertain whether a single trait stood out one way or the other (table 11-22). For example, when examining the average personality scores for students who said they did perform Breadth Exploration with average personality trait scores for students who said they did not perform Breadth Exploration, Extraversion was the only personality trait with a higher score for those who did the process than those who did not. Conversely for Serendipity, Conscientiousness was the only personality trait with a higher score in terms of students disagreeing with the statement. This type of comparison was repeated across all the micro-processes.

Table 11-22: single personality traits associated with micro-processes

Personality trait	<i>Higher personality score for a single trait when students agree with the statement</i>	<i>Higher personality score for a single trait when students disagree with the statement</i>
Extraversion	Breadth exploration	
Agreeableness	Eclecticism	Chaining Incorporation
Conscientiousness		Serendipity
Emotional Stability		
Openness	Browsing	Problem definition Reviewing Identify keywords

Three of the micro-processes had positive associations with personality traits: Extraversion-Breadth Exploration; Agreeableness-Eclecticism; and Openness-Browsing. Agreeableness was negatively associated with Chaining and Incorporation, and as already mentioned Conscientiousness was negatively associated with Serendipity. In addition, Openness was negatively associated with Problem definition, Reviewing, and Identify keywords.

11.1.13 Regression analysis

Binomial Logistic Regression was performed to check for any significant relationships between the five personality traits and the ISkB micro-processes (table 11-23).

Table 11-23 confirms aspects of the descriptive analysis of mean personality scores for each ISkB micro-process (tables 11-20, 11-21) which indicates that the highest ranked micro-process for mean score for Agreeableness (Reviewing), highest two ranked micro-processes for Conscientiousness (Sifting and Verifying), and the top ranked micro-process for Openness (Browsing) are all positively related to a significant level. In addition regression analysis shows that Picture Building and Identifying the Shape of Existing Research (ranked fifteenth and seventeenth) for students disagreeing with the micro-process are significantly negatively related to Agreeableness.

Table 11-23: regression analysis showing relationships between the five personality traits and each ISkB micro-process

Italics indicate a negative relationship, and bold indicates a significant relationship

ISkB process	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
Breadth Exploration	0.416	<i>0.085</i>	0.633	<i>0.215</i>	0.998
Eclecticism	<i>0.129</i>	0.299	<i>0.812</i>	<i>0.915</i>	<i>0.655</i>
Networking	0.405	<i>0.710</i>	<i>0.536</i>	0.467	0.553
Keyword Searching	<i>0.779</i>	0.827	0.113	<i>0.733</i>	<i>0.997</i>
Browsing	<i>0.832</i>	<i>0.500</i>	<i>0.291</i>	<i>0.473</i>	0.016
Monitoring	<i>0.581</i>	<i>0.075</i>	<i>0.127</i>	0.645	<i>0.604</i>
Chaining	0.129	<i>0.156</i>	0.386	0.375	0.948
Serendipity	0.099	0.110	<i>0.301</i>	<i>0.798</i>	<i>0.909</i>
Problem Definition	<i>0.898</i>	0.908	0.063	<i>0.622</i>	<i>0.367</i>
Picture Building	0.604	0.004	0.722	<i>0.199</i>	0.123
Reviewing	0.245	0.045	0.098	<i>0.268</i>	<i>0.657</i>
Identify Keywords	0.264	0.561	0.326	0.186	<i>0.422</i>
Identify Shape of Existing Research	0.643	0.029	0.580	0.140	<i>0.600</i>
Knowing Enough	0.174	<i>0.949</i>	0.321	0.329	0.786
Refining	0.465	<i>0.468</i>	0.443	0.502	<i>0.927</i>
Sifting	<i>0.656</i>	<i>0.942</i>	0.016	<i>0.643</i>	0.492
Incorporation	0.192	<i>0.284</i>	0.828	0.931	0.904
Verifying	0.424	<i>0.281</i>	0.020	<i>0.351</i>	0.719

11.2 Qualitative

The eleven students that took part in the semi-structured interviews are referred to within the text according to table 11-24.

Table 11-24: codes referring to participants in the interviews

Course/Stage of course	Code
RN 1 st year	I-1 K-1 L-1
RN 2 nd year	D-2 H-2 M-2 V-2
RN 3 rd year	E-3 L-3
Masters	G-MSc
CPD module	S-CPD

Each interview took place at a single site in a single location at different times during 2009, with the duration ranging from just over 15 minutes to almost 25 minutes. The interviews were taped, subsequently listened to a single time, and transcribed in full. The QIC process of analysis (*detailed in the Methodological development section 10.2.2*) was then followed to identify any underlying themes in relation to the objectives identified at the outset and the qualitative research questions:

Research questions

3. Why do users search the way they do?
4. What are the preferred methods of information seeking?

Objectives:

3. Examine how nursing students perceive their ISkB and needs.
4. Investigate the processes and methods nursing students utilise to find information.

Categories

The initial start list of categories showed minimal amendments with only three significant alterations (table 11-25). It became clear early on in the analysis that a separate category for 'Searching differently' was required and as such a new category of 'Revision of searching' was created. This category pulled some data from the 'Search techniques' category which was becoming overloaded with separate search strategies. Changes in the search process as the search progresses remained within the 'Search techniques' category, but the category was renamed to the broader 'Search strategy' to better indicate that the data within included the initial search and the follow up. In addition the 'Critiquing' category was excluded as this was generally a 'Yes/No' response from the participants and did not yield any significant further information.

Table 11-25: the initial start list and final set of categories used in the QIC process

Initial Start list	Final categories
Amount of information	Amount of information
Confidence	Confidence
Critiquing	
Relevancy	Pertinence
	Revision of searching
Satisfaction with searching	Satisfaction with searching
Searching techniques	Search strategy
Sources used	Sources used

Within the 'Search strategy' category an initial sub-category of 'Problems with searching' appeared to be mainly keyword searching and could be included within 'Satisfaction with Searching' as this had a sub-category of 'Keywords'. This then became 'Keyword selection'. In addition 'Relevancy' became a sub-category within the broader category 'Pertinence' to better indicate the precise bearing of the retrieved document in relationship to the information need. Creation and utilisation of nodes took place throughout, but it was the use of the tree hierarchies that enabled these to be grouped as each transcript was analysed. Tentative groups could be 'firmed up' with additional analysis of transcripts.

The following sets of results are laid out in separate categories each with a tree hierarchy indicating the nodal structure within the category.

11.2.1 Category 1: Amount of Information

Description: this category contains nodes pertaining to the student's perception of the quantity of information needed for an assignment with nodes grouped into sub-categories of: before commencing the assignment, during the writing up of the assignment, and in the final stages of the assignment (figure 11-1). This category differs from 'Revision of searching' which covers searching for *different* information/topics or a different *method* of searching.

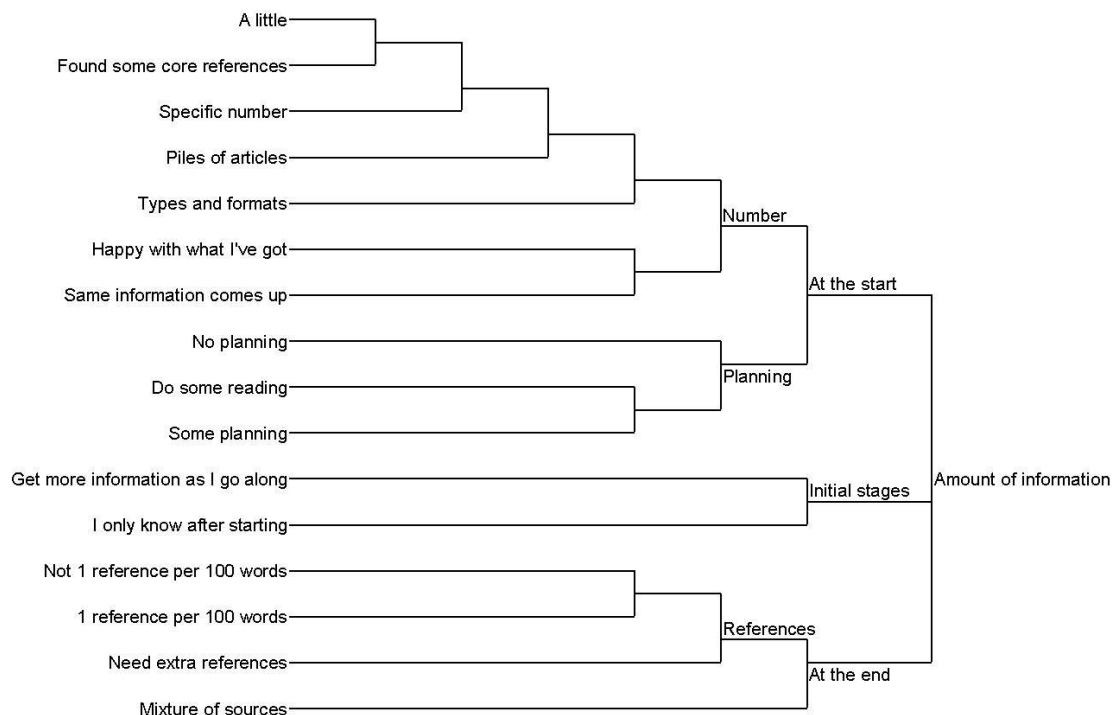


Figure 11-1: tree hierarchy of the nodal structure within the category for 'Amount of information'

What became clear from the interviews was a difference between the amount of information needed at the start of the assignment as opposed to at the end. There was more emphasis on getting a few quality references in order to get going, but then a feeling of needing to have plenty of references at the end – more quantity.

Indeed most (not all) students felt they needed to have a ratio of one reference per a hundred words. All four second year students gave clear statements to this effect encompassed by D-2:

"We got told in the first year by somebody that you're supposed to have one per every hundred words you write. So therefore we get so het up over 'I've got to have forty references' or whatever"

Student D-2

The three first year students gave differing emphasis to the amount of information they needed at the end of their assignment. I-1 was keen to have a mixture of sources, K-1 wanted ten references per a thousand words, but L-1 did not believe that it was necessary to have this ratio:

"...depends on how much information each reference provides you with. Sometimes you could get by on say ten references, sometimes you might need thirty for the same words for your assignment. So no hard and fast rule like one reference for every hundred words, nothing like that"

Student L-1

Only one student (L-3) specifically stated that she only knew whether she had a reasonable amount of information after she started the assignment and that she collected more as she went along, although others did make clear they performed supplementary searches after starting. This notion was linked with having a few main references to begin with by G-MSc and K-1:

"I think when you've found your core pieces that give you your major focus; you then have to get feeder papers that will feed into how your project develops"

Student G-MSc

"I want to start an assignment with five or six to start me going. I then tend to go back to get some more references I need"

Student K-1

11.2.2 Category 2: Confidence

Description: confidence here describes whether a student's level of confidence in relation to searching for information has changed over time (figure 11-2). For first year students it only covers from assignment to assignment within that year, for other students it includes confidence levels over different years as well as different assignments.

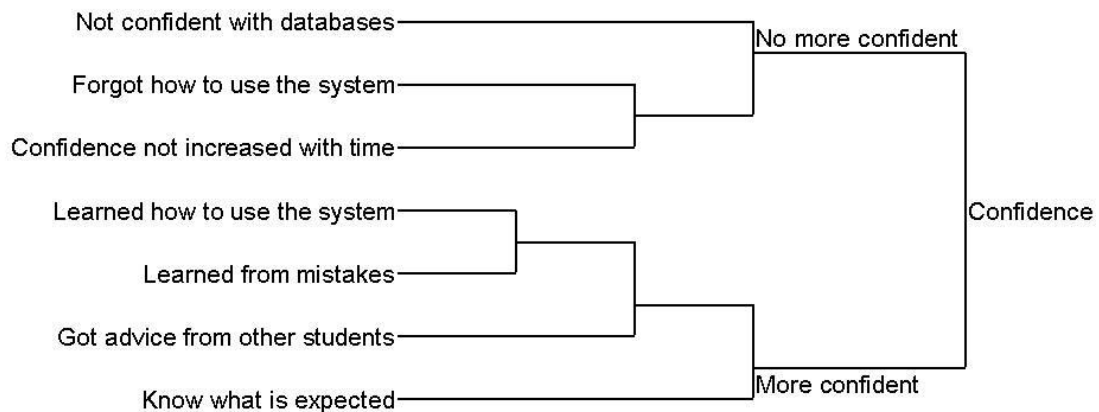


Figure 11-2: tree hierarchy of the nodal structure within the category for 'Confidence'

Although it would probably be expected that students would become more confident with searching for information as they progress with their studies, this is not always the case. Most students interviewed here did state they were more confident now than earlier in their course, for example:

"I am [more confident] with the digital library, when I first started that was just sort of way over my head about what I was meant to be doing. Now I've used it more I'm getting a bit better"

Student H-2

"It has and I'd certainly anticipate a change coming soon. Initially it was all very new to me and just seeing what...a totally different language. But a couple of students who are very confident offered advice and guidance. So that helps. But it isn't as scary as you first think"

Student V-2

Some students however, still had concerns which generally revolved around forgetting how to use the system or a lack of familiarity.

“Not particularly [more confident], but then I don’t do them regularly. I mean I haven’t done one for five years. So I did two together which was quite good, but then I haven’t done one for five years and I kind of like forgotten most of what I’d done.”

Student S-CPD

“I did get more confident, then I seem to have lost it in the last assignment we did. It seems to have tailed off slightly and I think that was because I don’t know – I think I lost the plot slightly.”

Student D-2

These results show that whilst the notion of progression of information literacy through a course is apparent, the idea that this is a ‘universal’ concept should be treated with caution.

11.2.3 Category 3: Pertinence

Description: the Pertinence category contains nodes pertaining to how a student would decide if a piece of information was useful for their assignment. Sub-categories formed from these nodes were for information direct from the article, within or about the article, and for other criteria (figure 11-3).

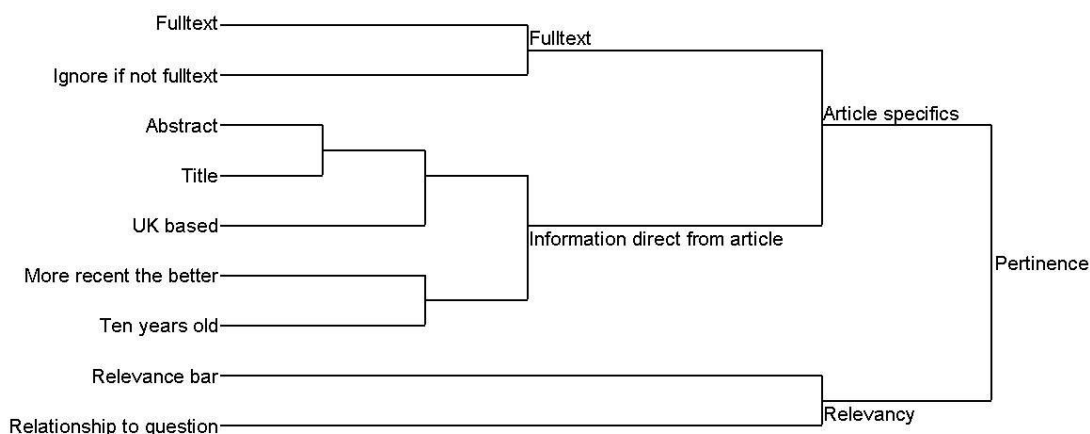


Figure 11-3: tree hierarchy of the nodal structure within the category for 'Pertinence'

Most of the respondents identified various elements that were important in deciding whether something would be pertinent to their assignment, and didn't initially state that they had a specific one element that was clearly most important.

"E-3: Probably a combination of the title of the article and the age, because occasionally you'd get some over ten years old and I tend to look at those last.

.....

E-3: I'd probably skim through the abstract and then the article as well and if I think it's got a lot of information in I'd download it and print it off and read it in more depth."

Student E-3

Three students did identify the 'relevance bar' (a small bar to the left of the summary information of an article within the digital library) as being something they checked for relevancy:

"I'd look at the list and I'll read obviously what the header is on the first screen and also look at the little green box and see how relevant it is, the box on the right hand or left hand side, and look at the relevancy. If it's got a tiny wee mark then I'll tend to sort of hold back on it, I'll look through them and if I really like something or I think I might like it I put it in my basket and then go back to it."

Student M-2

Additional probing in the interview however, often resulted in the availability of fulltext being the factor that held sway after initially looking at other elements. The following sections being typical:

"Interviewer: OK, so assuming you've done your search on the digital library, and you've got a list of hits, how do you identify which ones are going to be useful?"

H-2: What in the results bit? Just read the title.

.....

H-2: Yeah. And I look at the date obviously because if it's way out of date then no.

Interviewer: What if the fulltext isn't there?

H-2: Then I start again unless there is another way to find it.

Interviewer: What is most important, the title and date or the fact you can get fulltext?

H-2: What is most important to me? If I can't get the fulltext."

Student H-2

"G-MSc: I tend to look at the first twenty that spring up because they are the most up to date.

.....

G-MSc: Yeah the most recent come up first. Then I look at full text.

Interviewer: What's the most important thing, date?

G-MSc: Er, no full text."

Student G-MSc

What appears to be happening is that students initially check elements such as the title and date, before checking the fulltext availability, and then in most cases the ease of getting the fulltext 'trumps' any initial usefulness of the article. As such the availability of fulltext can be considered as the most important element. As Connaway et al (2011 p187) state "information-seekers frequently defined convenience as complete access to resources, beyond merely discovering and identifying them".

11.2.4 Category 4: Revision of searching

Description: Revision of searching as already stated differs from 'Amount of information' in that it covers a *change* of search and why the change took place rather than *quantity* of information. This category also includes whether the Critical Incident search differs from other searches the student has undertaken (figure 11-4).

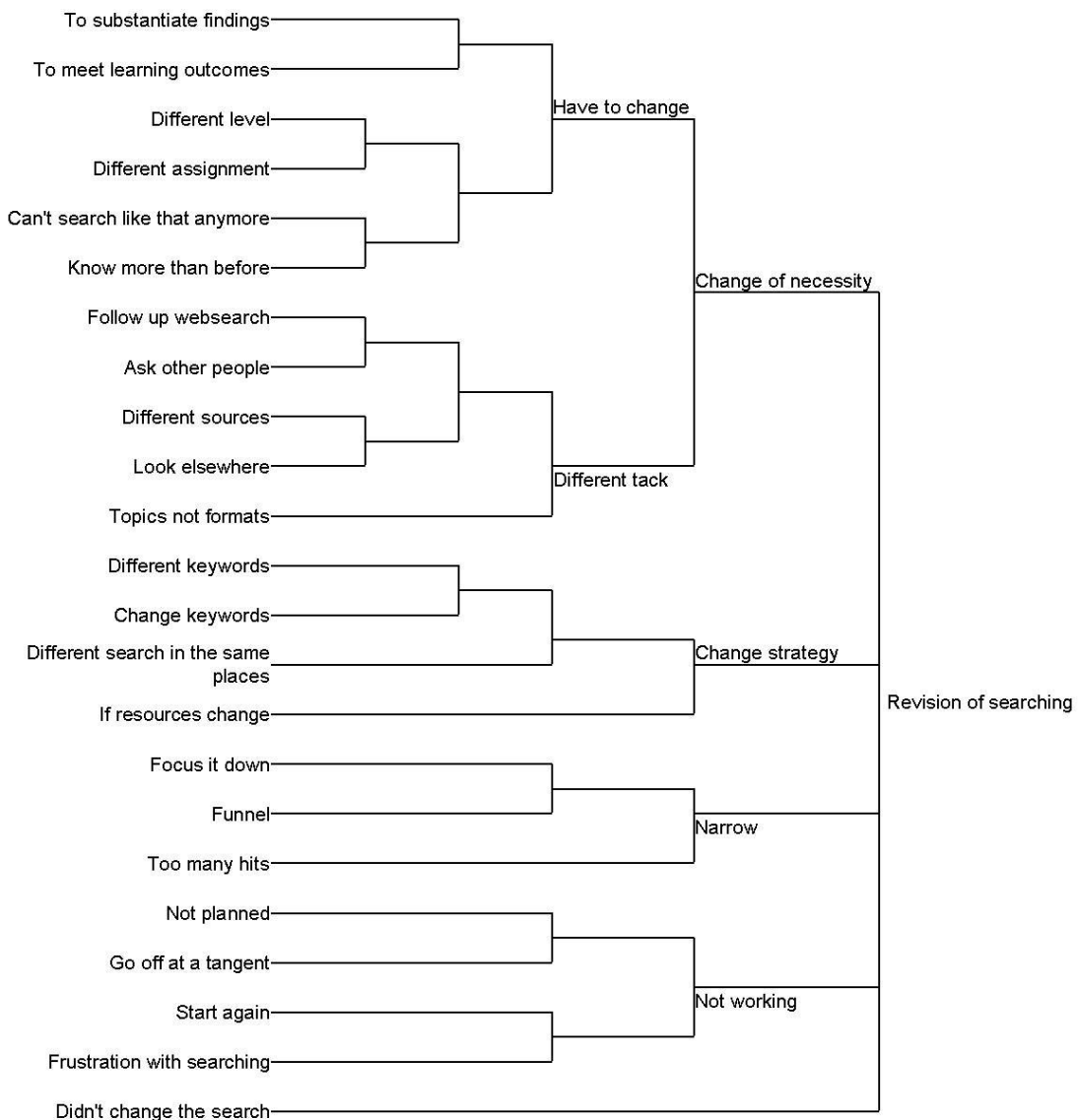


Figure 11-4: tree hierarchy of the nodal structure within the category for 'Revision of searching'

Changing the search was done for a variety of reasons, but always in an attempt to get the 'right' information. All students (except G-MSc who stated that she did a digital library search and then focussed it down within the same

databases) had tried different search strategies at some stage with some students initially searching for books and then moving on to journal articles:

“Where I am now (second year) it would be articles. When I first started it would have been books.”

...

“well one you get better marks for them because they are more relevant and are primary resources that have research for themselves rather than, and articles can be more useful to what I want to find now.”

Student H-2

“I’d say at the beginning part would be more about books and just general information and then that would lead onto journal articles a little bit later on.”

Student V-2

“Well, we had quite extended reading list for the first one because...I think I didn’t use different varieties of literature I only used books, now I know that you can use books, digital library, electronic resources.”

Student I-1

Other students did the opposite and started their search looking for journal articles and only when this did not locate the relevant information did they turn to books:

“that one I didn’t use many books for, but if I’m not finding much in the journals I’ll turn to books or maybe I’ll ask someone else if they’ve managed to find anything – where they’ve looked for it”

Student D-2

“...if I’m not getting the information I want from journals I’ll go to books there... probably Internet first then books.”

Student L-1

Searches that 'fail' or retrieve too much information also lend themselves to a revised search with students highlighting the need to change keywords and to focus their search.

"Yeah, because my essay progresses and I know more what I'm focussing on and I narrow the search down."

Student K-1

"I mean sometimes I find that I'd be looking for something and it'd throw up about 100 articles and you might only pick two, but you still had to read through it all and think about it."

Student E-3

The final aspect of this category was changing the terms used to locate information. Five students specifically stated that they changed keywords in an attempt to refine their search epitomised in the following:

"It depends what words I put in to the journal search. You're allowed to put two words in so I put two words in and do the search and if you don't get very good results or the results are too broad I put two more words in to narrow it down and use different categories."

Student L-1

"Yeah, probably. I don't know if I change my technique, just change how I word it and different areas I choose to look at different aspects."

Student H-2

"I'm more selective with the words that I use."

Student K-1

What is apparent here is that students tried to 'improve' their searches in order to locate more relevant information, whether because they feel they have to or because they believe there should be something better out there to find.

11.2.5 Category 5: Satisfaction with searching

Description: this category contains nodes describing whether the student was satisfied with the way the search went. It includes any problems encountered (dissatisfaction) and why the student was satisfied (figure 11-5).

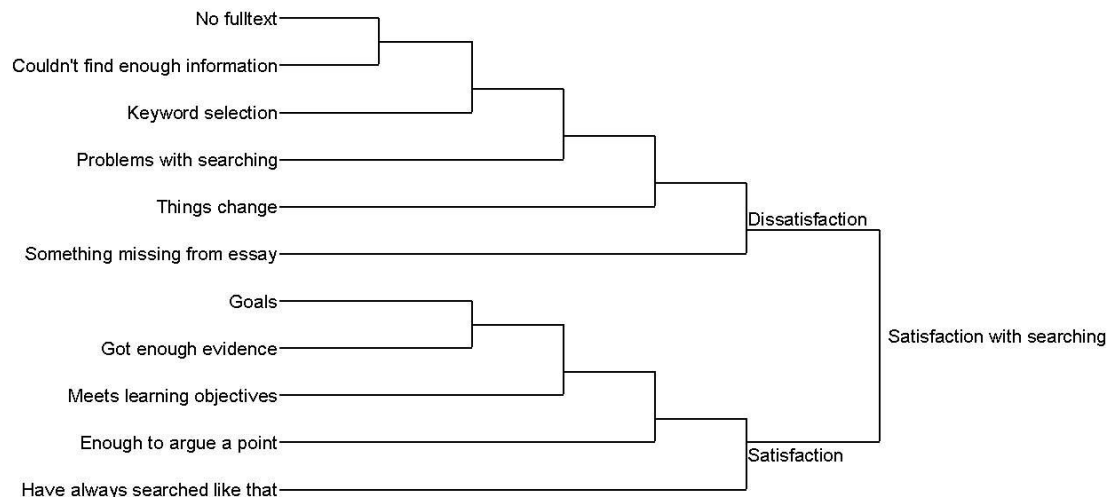


Figure 11-5: tree hierarchy of the nodal structure within the category for 'Satisfaction with searching'

This category revolves around whether students have enough information to move on to something else. Generally students were satisfied at the point where they can back up some facet of their assignment or to argue a point – but they found it hard to quantify how much this would be:

“So until I go through the information I pull off and if I find some really good articles that have good examples that relate to what I want to know, once I’ve got a few I can compare and contrast and can argue it.”

Student D-2

“H-2: When I’ve got enough evidence to back up what I’m trying to say.

Interviewer: And how do you know that?

H-2: When I’ve got a few things.”

Student H-2

“I don’t know it comes from guess work I suppose. If you’ve got five to ten pieces that you’re quite happy with then you move on. Sometimes you can have

two or three pieces and you think ‘That’s great, that’s all I need’ and then move on. It just depends on how much information that you pick up from each search.”

Student L-1

There was a range of specific issues that created dissatisfaction with searches, although three students cited not getting fulltext as a problem. For example:

“Interviewer: Any particular problems you encounter as you go along?

K-1: Only that it gives you literature that you want and then you can’t actually get it.

Interviewer: So access to the articles?

K-1: Yeah. You need a password or something.

Interviewer: And how do you cope with that?

K-1: Just find another one.

Interviewer: You just ignore it at that point?

K-1: Yeah.”

Student K-1

Other issues focussed on difficulties with the search or the amount of information being insufficient:

“...I mean I didn’t think it was enough information because we had to choose a life limiting illness and we had to choose like policies local and national and I didn’t think it was enough policies in relation to the essay.”

Student I-1

Satisfaction is linked to getting the right information at the right time, but the amount of information needed to reach this point is ambiguous. Many different specific issues can result in dissatisfaction with searching.

11.2.6 Category 6: Search strategy

Description: the 'Search strategy' category concentrates on how the student performed the Critical Incident search. It includes what they did first, and how they followed up the search. It does not enter into the specifics of what sources were used other than if clarification was sought from other individuals (figure 11-6). This differs from the 'Sources used' category in this respect.

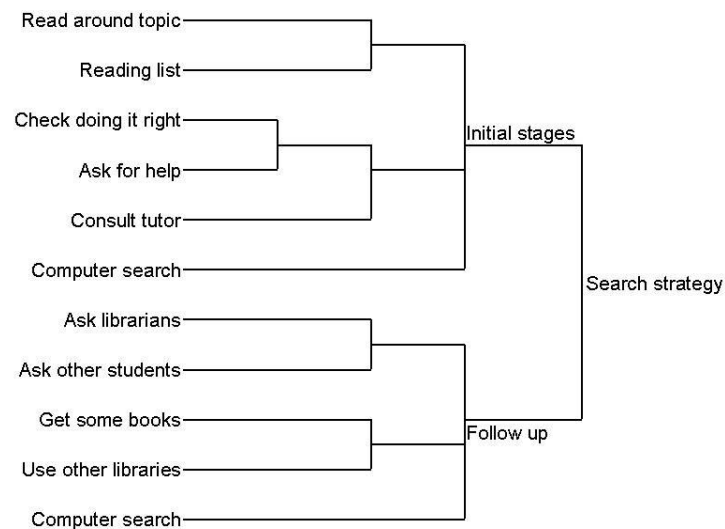


Figure 11-6: tree hierarchy of the nodal structure within the category for 'Search strategy'

There was a range of responses highlighting various different initial aspects of the literature search. Some students went directly to the computer; others read around first or checked the reading list, whilst others wanted some guidance or security that what they thought they were looking for was correct. Some students did not specify any follow up – usually sticking to a computer search. In general for those students who had not started with a computer search the follow up was to do this, but there was no consistent approach between all the students. For example G-MSc and I-1 both followed up with computer searches, but started their search differently:

“So my main aim was basically to start reading literature around that topic which then focussed me more on what I needed to find.”

...

"Then I went onto the computer and library databases and obviously spoke to the librarians for support."

Student G-MSc

"... I always check with the tutor if this is appropriate, because I don't want to go and research this big project if it's not relevant to the work."

...

"... then I go to the library and research and see if there is enough information available. I go on the digital library and check on the official websites like NHS and directgov and Department of Health something reliable."

Student I-1

Similarly, M-2 eventually got round to a computer search, but only after borrowing books and asking library staff for help:

"I took the full maximum possible amount of books you can get three times and I got eight books as half of them were not properly what I needed. They were good but they were for bibliography rather than usable. I then spoke to library staff about how to work the computers properly and got a lot of stuff hunting through the journals."

Student M-2

The students starting with a computer search is encompassed by L-3, although S-CPD asked for help from library staff before starting her search:

"Mine was basically computer searching. I'd use Google Scholar and cross reference that with Anglia Ruskin's OPAC to see...if I look for journals I go on Google first as it gave me the wider options then I'd look for those journals I thought were of use in the OPAC to see if I could obtain them first."

Student L-3

"... the first thing I would do would be to ask for some help as to how to do it. I know there is CINAHL and MEDLINE but I'd need someone to tell me if I'm

going for fulltext which ones I can get off the computer and which ones I couldn't, if I had to pay for them, that sort of thing."

Student S-CPD

Overall, there was no clear set method behind how to start or follow up a search for information which must be taken into account during information skills training.

11.2.7 Category 7: Sources used

Description: this category includes all the places students look for information and is ultimately grouped into: physical sources, specific Internet sites, people, and named subscribed sources (figure 11-7).

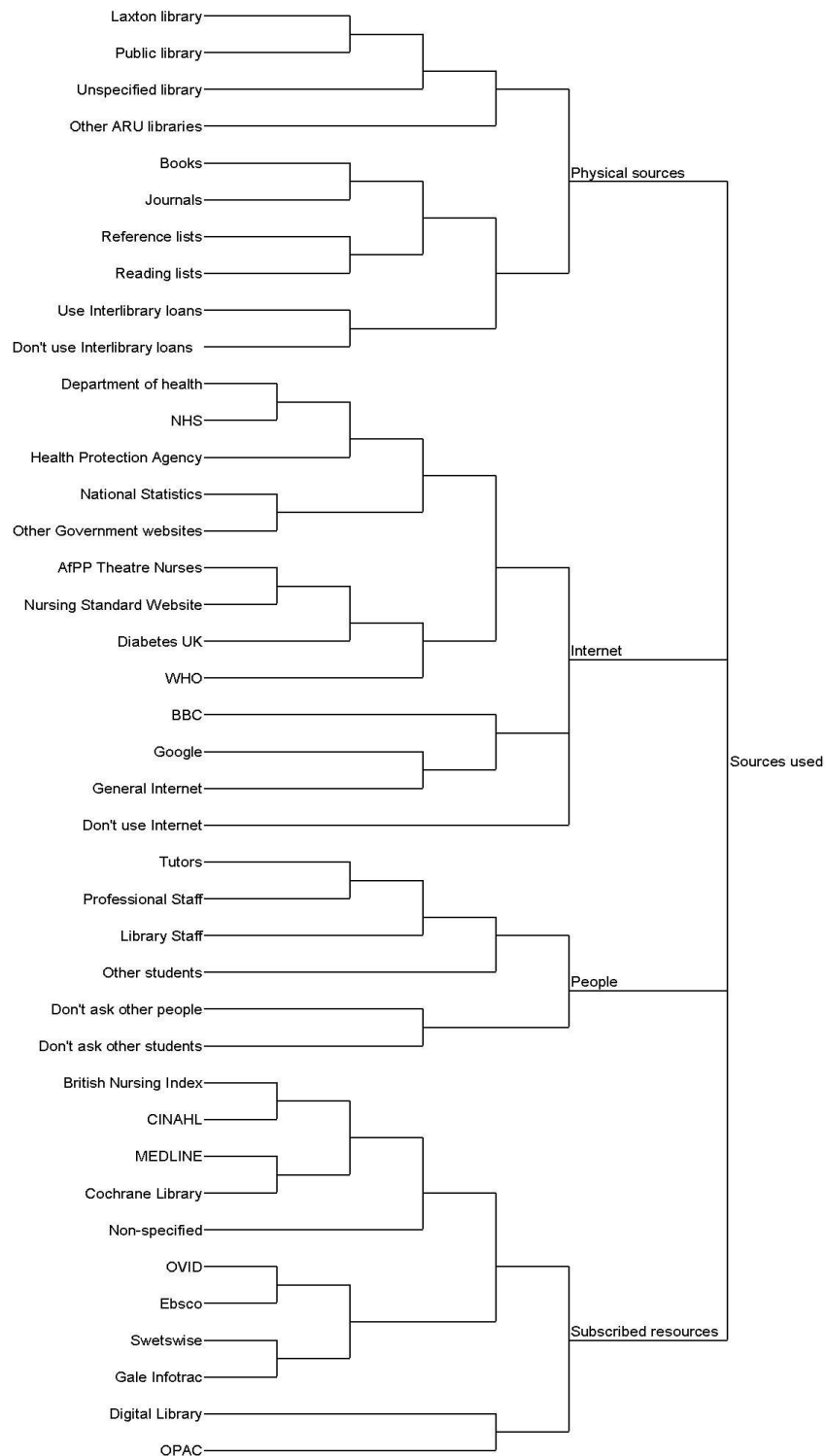


Figure 11-7: tree hierarchy of the nodal structure within the category for 'Sources used'

What is clear from this category is that there are many different sources that students use to find information. All eleven students used some physical sources and subscribed resources; whilst all bar student M-2 stated they used the Internet, and only students L-3 and L-1 did not use other people as sources. Indeed student L-1 specifically stated she did not use fellow students in case they stole her ideas.

For Physical sources the use of reference lists of journal articles was often cited as a way to find additional information:

“When I have an article I might look at the reference list and quite often I might have a couple of those already. So that backs up that you feel you have looked in the right areas. And sometimes if I haven’t got one that I think is relevant I’ll try and find it. I’ll look specifically for the journal.”

Student E-3

“Yeah I do use them actually. I will go and search for them yeah I do tend to use them because then it starts getting my mind thinking about other things that might be in there and I have found some of them to be really useful.”

Student M-2

Otherwise students confirm use of books and journals as their primary targets for information.

In terms of Internet use, students tended to emphasise the need to find reliable sites to obtain information or to find something specific.

“...NHS website, Department of Health, basically there are websites that are ‘dotgov’ that are reliable.”

Student I-1

“I tend to go to ones that are quite specific. For instance Diabetes UK and try and keep them reliable. The ones where you know the source is OK to use.

Student V-2

"I used the Internet to research the disease involved which was D George syndrome. I used BBC health website and I used the journal searches to find out about that disease and I handed it in and got a good mark.

...

"National Office of Statistics as well to get some more statistics for learning disabilities, the prevalence and incidence."

Student L-1

Students appeared keen to not remark that they did a general Internet search without some consideration of the consequences of their actions.

The use of the Internet led into discussion of the use of databases, indexes, and journal packages that were purchased by the library or were linked to within the library website. Some students were eager to highlight which specific databases they used although in some cases they were unsure as to the exact name of these specific resources.

"The areas that I looked at were ones that were most familiar to me which was CINAHL, OVID, and I found that I had a vast amount of literature from those two"

Student G-MSc

"I used Swetswise, and is it Gale Infotrac? There are some for different modules aren't there?"

Student L-3

"I know there is CINAHL and MEDLINE but I'd need someone to tell me if I'm going for fulltext which ones I can get off the computer and which ones I couldn't"

Student S-CPD

Other students confirmed they used the cross searching facility within the Digital Library webpages which uses similar databases and journal packages, but

doesn't necessitate any need for the student remembering the names of each one.

"I tend to use the big ones and then if I've got a specific topic I'm searching for I go back...obviously if people have recommended databases that they have found a lot of information from I'll try them. Obviously like if they've got mental health ones and psychology I'll go to them. I wouldn't have done that initially."

Student K-1

"I use several at a time, because it depends on what you want. You look down at the drop down list and some are listed in general nursing and I pick two or three databases out of that. Or I might change it if I wanted say critical care nursing or something like that from the list or if you want diabetes because if you change then the database list changes as well."

Student E-3

"Interviewer: Do you look at any specific databases?"

L-1: No I just tick them all.

Interviewer: So you just use the functionality of the digital library itself?

L-1: That's right."

Student L-1

The general indication from the students here is to show some knowledge of a thought process involved in their database searching rather than a 'gung-ho' or 'quick and dirty' approach.

The final category in this section is the use of other people as a source but for differing reasons. Student D-2 wanted confirmation from a specialist in the field that what she was doing was correct:

"I went and spoke to the nurse, the specialist nurse over at the hospital. I wrote an email to her and got an appointment then spent some time with her talking about the illness and patients and some research that had been done by other

nurses on a similar project. I just got some feedback that way and sort of linked that all in to what I was doing.”

Student D-2

Others used fellow students as sources in a collaborative approach to information gathering:

“Sometimes I consult with the other students like I find out about the possibility of signing myself up to the Postgraduate library from one of the students and we sometimes consult yes, and I think for future assignments it would be nice to sit down together and talk about ideas and prepare things in one go brainstorm into the discussion.”

Student I-1

“I’ve also asked other students who have done the assignment before where they got there literature from, the recommended journals. Usually they can either give me a hard copy or recommend an online one.”

Student K-1

What is clear from this category is that other people are part of a diverse range of sources that students use for information seeking. Students did not confine themselves to one method or strand of information seeking, rather they utilised a selection of differing sources in the hope of obtaining the right information for their particular task.

Chapter 12 DISCUSSION

The following discussion is arranged in two main sections. The first section discusses the results of the quantitative analysis and includes the development of ISkB profiles. It begins by discussing the separate elements of self-efficacy and learning styles, and then looks at how these two elements interact.

Personality is then discussed as a separate element and then in combination with both self-efficacy and learning styles. Finally, the results concerning the ISkB micro-processes are initially discussed in terms of any interactions with self-efficacy and learning styles, and then by linking in personality traits. The second section discusses the qualitative results with the seven categories that were identified during the data collection phase discussed in turn before being summarised holistically.

12.1 Quantitative element

Developing the questionnaire was a key aspect to this research. By using validated scales for personality, learning styles and self-efficacy, the validity and reliability of the overall questionnaire was not compromised. Cronbach's alpha analysis showed good reliability for the ILSE scale and adequate reliability for the ASSIST and Mini-Markers (section 11.1.1).

The formulation of single juxtaposed statements for the information seeking element of the questionnaire encapsulating the essence of the micro-processes in Foster's model could be contentious, but it did provide the opportunity for quantitative analysis. Indeed even if the statements were considered to differ from the micro-processes in some way they nevertheless allowed the statements themselves to be analysed. This part of the questionnaire did not lend itself to a reliability check as the questions were not measuring the same thing – it was not attempting to yield an overall result.

12.1.1 Self-efficacy

Most students considered themselves to be able to successfully perform information literacy tasks (tables 11-3, 11-4, and 11-5). This could possibly be due to students overestimating their proficiency – a phenomenon found elsewhere in information literacy self-reporting (Detlor et al., 2011, Gross and Latham, 2007, Franks and McAlonan, 2007, Ivanitskaya et al., 2006, Gross and Latham, 2009, Gross and Latham, 2012); or the scale itself may need adjusting to take this into account. Being a fairly new scale however means it has yet to be used extensively in research. Alternatively, nursing students may as a group be highly self-efficacious. The ILSE scale aims to measure self-efficacy, but as acknowledged by Kurbanoglu strong self-efficacy beliefs resemble confidence in terms of perceived ability to succeed (Kurbanoglu, 2009).

The general consensus from research is that as students' progress through a course they would improve their information literacy skills and become more efficacious (SCONUL, 1999). The results here do not bear testimony to this notion as students in their 2nd year had the most Advanced students. Here students gained confidence from year 1 to year 2 then lost confidence in year 3. This increase in confidence from year 1 to year 2 would be expected, but why did they lose confidence in year 3? Could it be that students were doing 'quick and dirty' searches and 'getting away with it' in years 1 and 2, but then coming unstuck in year 3 when they had to do more in-depth or systematic searching for their dissertation? The impact of negative experiences has been found to greatly impact on self-efficacy (Chiou and Wan, 2007). Age does not appear to be a major factor although younger students tend to rate themselves higher. Previous research (Onwuegbuzie and Jiao, 2004) also suggested that older students were more 'anxious' in terms of library use – potentially resulting in a lower level of confidence. According to Kurbanoglu (2009) stress and anxiety influence self-efficacy and efforts to reduce anxiety and increase learners' confidence in information literacy ought to be an important goal of information literacy instruction. The range of scales in use to measure information literacy and searching skill levels (e.g. Oakleaf (2009a), Ivanitskaya et al (2004)) bears testament to the attempts to get to grips with both finding out what students can do, and the way they do it.

12.1.2 Learning styles

A range of learning styles was apparent from the research with Strategic learners most numerous across the spectrum of students (tables 11-6, 11-7, and 11-8). Other research that utilised the short version of the ASSIST (Heinstrom, 2006a) has shown a more even spread of the three styles across participants, although a study using the RASI found fewer Surface learners (Sadler Smith, 1996). There were no statistically significant differences between courses or stage of course (as found elsewhere (Entwistle et al., 2000)) – but 1st year students had the highest percentage of Strategic learners and 3rd years the highest percentage of Deep learners. Those without a specific learning style gradually declined across the years possibly indicating that students take time to find their own style (although this may just reflect this particular sample). In terms of age groups; Deep learners become more numerous as students get older whilst at the same time Strategic learners decline. More mature students being inclined to follow a Deep approach has been found elsewhere (Sadler Smith, 1996). This suggests that older students are prepared to spend more time doing in-depth searching rather than planning a strategy and may link with critical thinking which has been found to develop over time (Staib, 2003).

12.1.3 Self-efficacy and learning style

Chi-square analysis showed a significant relationship between a Deep learning style with Advanced ILSE; and a Surface style with Intermediate ILSE (section 11.1.5). This is in accordance with previous research (Diseth, 2011). In addition Diseth and Martinsen (2003) found a clear link between the Deep approach to learning with motivation to succeed which suggests ability to put effort in and having confidence in one's own ability are linked. As Kurbanoglu et al (2006 p731) states "individuals with a high self-efficacy perception expect to succeed and will persevere in an activity until it is completed". Surface learners have lower self-efficacy than other learner types suggesting a link between low confidence and the way students learn. Kurbanoglu's (2003 p639) assertion that "individuals with low perception of self-efficacy anticipate failure and are less likely to attempt or persist in challenging activities" clearly links with the Surface

learner type. A Strategic learning style is also linked to Advanced self-efficacy, but has a much higher proportion of Intermediate students. Entwistle and Peterson (2004) contend that Deep learners strive for a thorough understanding much more than Strategic and Surface learners, and this suggests that a lower confidence level may be linked to level of understanding. Entwistle and Peterson maintain a “level of understanding continuum” exists with Surface learners at the low end moving through Strategic learners occupying the middle ground and Deep learners found at the end corresponding to a high level of understanding. This mirrors the confidence with information literacy results which showed Deep learners at the Advanced end of the scale, Surface learners at the Intermediate end, and Strategic learners again occupying the middle ground. This is shown in figure 12-1.

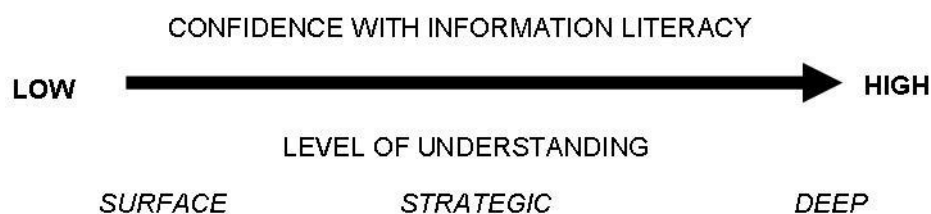


Figure 12-1: the relationship between learning styles (Surface, Strategic, and Deep), confidence with information literacy, and “level of understanding”

12.1.4 Personality

Average scores for the five personality traits across years and age groups show only slight differences (tables 11-9 and 11-10). Personality factors are usually considered to be relatively stable over time (Saucier and Goldberg, 2003, Funder, 2007, Pervin and Cervone, 2010) particularly for the short duration of a course (up to three years), so it may be that certain intrinsic traits may result in higher levels of ILSE.

12.1.5 Personality with self-efficacy and learning style

The Advanced ILSE group have higher levels of all 5 traits, but this does become more meaningful when Learning style is taken into account. Openness is linked not only to the Advanced ILSE group (in line with previous research (Caprara et al., 2011)), but also Deep learners, which were already significantly

linked (section 11.1.6). The link between Advanced self-efficacy, a Deep learning style and the Openness personality trait suggests these characteristics may be related to intelligence and perseverance. Being prepared to put effort into the learning process, being prepared to explore and having confidence in your IL skill level does imply a higher degree of these traits. The correlation between Deep learners and Openness has been found elsewhere (Diseth, 2003, Duff et al., 2004, Komarraju et al., 2011, Zhang, 2003, Swanberg and Martinsen, 2010). Strategic learners who are also positively linked to Advanced ILSE manifest the highest levels of Conscientiousness and Emotional Stability (section 11.1.7) supporting on the one hand the notion of students wanting to be well organised to facilitate learning (conscientious) – in line with Heinström (2003) Duff et al (2004), Diseth (2003), and Swanberg and Martinsen (2010); and not abandoning searches that fail (emotionally stable) (Heinström, 2003). Although no clear links between the lower ILSE level and Surface learners is apparent, the low scores for Conscientiousness, Agreeableness and Openness for this type of student do suggest less inclination to work diligently as they may lack the required traits and cognitive skills. They may also be reluctant or not see the need to work in particular ways. Surface learners link with Extraversion (found as an indirect consequence by Swanberg and Martinsen (2010)) is counter to Heinström (2003), Duff et al (2004), Zhang (2003) and Diseth (2003) who all found a positive link to Neuroticism (negative link with Emotional Stability). Whilst this result does appear anomalous, McLaughlin et al (2007) study of the academic achievement of nursing students linked Extraversion to lower marks suggesting these students can be easily distracted. Further Kwon and Song (2011) in their study of 185 students state that “an extroverted personality...does not necessarily entail a systematic, methodological approach which is an important element of competent information strategy” (Kwon and Song, 2011 p100), more akin of the Surface approach.

These links between learning style, ILSE, and personality allow the first initial profiles to be constructed.

DE1 = Deep learner, Advanced ILSE, and Openness

ST1 = Strategic learner, Advanced ILSE, and Conscientiousness

ST2 = Strategic learner, Advanced ILSE, and Emotional Stability

SU1 = Surface learner, Intermediate ILSE, and Extraversion

These profiles are shown schematically in figure 12-2.

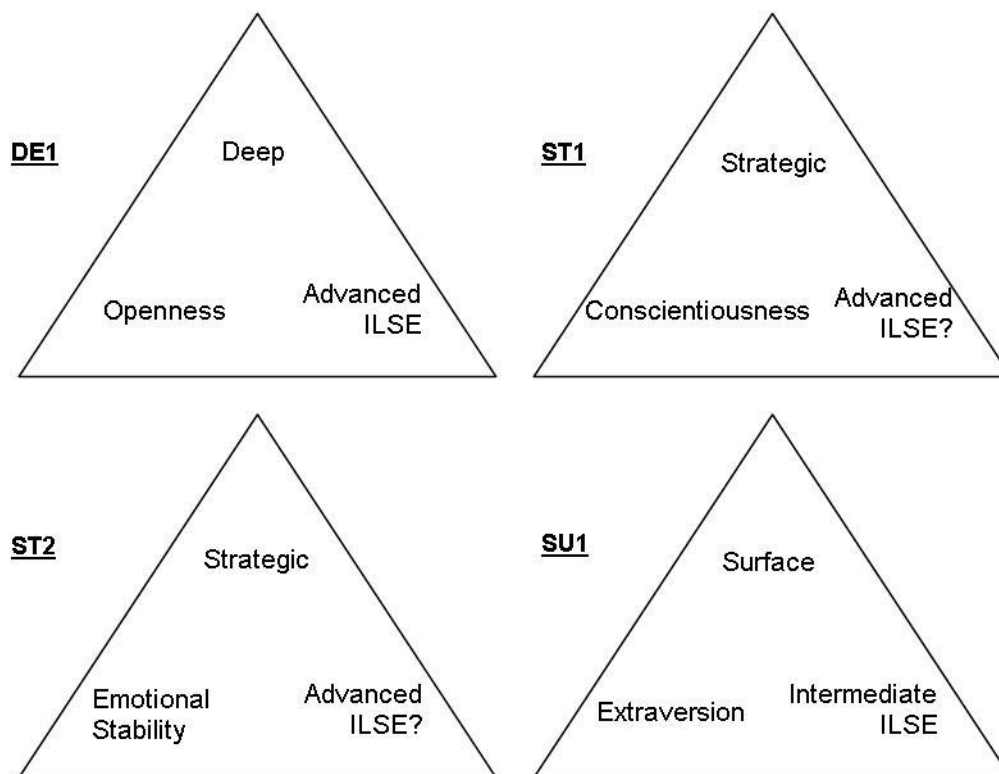


Figure 12-2: four potential profiles. Profiles ST1 and ST2 contain Advanced ILSE, but this was not a strong link with the Strategic learners hence the uncertainty

12.1.6 ISkB with self-efficacy and learning style

It is clear that students use a range of techniques and strategies in their ISkB and some of these appear overall to be more important than others (section 11.1.8).

The odds ratio analysis indicated clear links between particular micro-processes with ILSE levels and different learning styles (sections 11.1.9 and 11.1.10). The links between the Intermediate ILSE students with Monitoring suggests they

would prefer to stick with what they already know rather than look for additional information due to their lack of confidence; and Identifying the Shape of Existing Research suggests a need to confirm that what they have got is worthwhile (table 11-18). More confident students (Advanced ILSE) are more likely to work out what they need to find (Problem Definition) then to work out search strategies by identifying keywords and using these keywords in their search. Being prepared to build and adapt the search as it progresses (Chaining) also suggests higher confidence, as does an ability to define boundaries during the search process (Refining). In addition undertaking Sifting suggests a preparedness to determine relevancy as the search progresses; and high odds for Knowing Enough indicates these students are better able to decide when to stop searching.

The higher odds for Deep learners of Breadth Exploration, Browsing, and Sifting (table 11-19) supports the notion of students being willing to explore, cruise around where the search takes them, whilst ensuring they don't meander too far from their initial goal and is in line with Heinstrom's (2003) study. Networking fits neatly into this notion of finding out as much as possible from different sources. Identifying Keywords is less obvious as it would be expected that Strategic learners would be most likely wanting to find suitable search terms for their search. One possible reason could be that Deep learners need some element of structure to 'kick start' their search before they dig and delve around. In addition it is unclear how keywords were initially identified whether by looking around as in Browsing; or specifically singling them out from course related materials before searching.

The higher odds for Problem Definition and Refining for Strategic learners (table 11-19) are to be expected as this shows a need for a more structured approach to the ISkB process both at the beginning and during the search process. Using the right sources (Keyword Searching), judging the relevance of materials during the search (Sifting), and the relationship of this information with other sources (Identifying the Shape of Existing Research), and being clear of an end point of the search (Knowing Enough) are clearly appropriate processes that would be undertaken by Strategic learners. Serendipity and Eclecticism,

however, do not appear to fit quite so well with this group. It would not be expected that a Strategic learner would want to collect materials for later use unless they felt that this would assist with future searches (although 'later use' was not defined in the questionnaire), nor that they would expect relevant information to be chanced upon by scrolling through results. Serendipity and eclecticism could be seen as linked in terms of wanting to collect materials by looking around hoping to find as much as possible. Again, if Strategic learners are thought of in terms of wanting to achieve higher grades, then it does make more sense. These two micro-processes, however, may be considered to be on the 'periphery' of what Strategic learners do. Verifying is also linked to Strategic learners and fits if viewed in terms of confirming that accurate information is located – in essence 'verifying' the way the search is being conducted. Verifying could also be linked with Eclecticism in terms of wanting to collect and keep items in order to check their accuracy (verify) at a later date.

The positive link to Networking and Reviewing (table 11-19) may indicate that Surface learners prefer to ask others and to stick with what they have found before rather than search either for themselves or afresh; which does relate to the Intermediate ILSE's groups links to Monitoring and Identifying the Shape of Existing Research. By placing these particular micro-processes into figure 12-3, it becomes clear that they also 'fit' along different points of the continuum. Some micro-processes (for example Serendipity) cross different learning styles which in turn have 'blurred' edges.



Figure 12-3: those information seeking micro-processes with strong links to learning styles and information literacy self-efficacy

Only a single micro-process (Networking) has strong links with both Surface learners and Deep learners and thus appears twice in the figure at the two poles.

12.1.7 Linking in personality traits

All types of data analysis (ranks, anomalies, and regression) showed a strong link between Browsing and Openness, and in most cases with a Deep learning style (section 11.1.12). This would be expected as it ties a willingness to explore with an openness to experience and is in line with previous research (Heinstrom, 2003, Halder et al., 2010, Vermetten et al., 2001, Zhang, 2003). In addition the ranking of students disagreeing with micro-processes and the anomaly analysis suggests that students with higher Openness scores do not define their focus (Problem Definition) (table 11-21) rather they 'see where the search takes them' which ties in neatly with students who do prefer to browse, again in line with previous research (Heinstrom, 2003, Halder et al., 2010). It also ties in with the notion that Deep learners are able to self-regulate (Vermetten et al., 2001). Ranking also hinted at a link between Openness and Picture Building, mainly due to the fact that it was ranked much lower for the other traits. This link however was not borne out with the additional analysis suggesting the link may be tenuous.

Reviewing was both top ranked for Agreeableness and was significantly linked to this trait following the regression analysis. This micro-process was also top ranked for Intermediate ILSE and had high odds of being performed by Surface learners. However although some association between Reviewing and Surface learners could be muted here (as Surface learners tend to have lower ILSE levels), Surface learners had low scores for Agreeableness thus partially contradicting the association. Viewing Reviewing as a spectrum where different students consider the micro-process in different terms may help to explain this association as Surface learners would tend to have less to review so may believe they do more of it. Willingness to collect (Eclecticism) – which manifested from the anomaly data analysis and the students disagreeing with

the micro-process - fits with the ability to exhibit a patient approach (table 11-22). This is the sort of aspect found in more Agreeable individuals who exhibit diverse searching patterns (found in other personality research (Halder et al., 2010)). The ranking of 'students disagreeing with the micro-process' and the regression analysis also identified a negative association between Agreeableness with both Picture Building and Identifying the Shape of Existing Research (table 11-22). This suggests that this type of student may be more relaxed in their approach to both identifying search concepts to begin a search and with going into too much detail determining relevancy. A patient, calm approach to information seeking is indicative of Agreeable individuals (Heinstrom, 2003). The anomaly analysis also indicated a negative link between Incorporation and Chaining with higher levels of Agreeableness suggesting this type of student prefers to complete a search before checking what they have and they tend not to use reference lists from retrieved sources as information sources in their own right. This last point does seem to indicate a lower level of ILSE and would be more akin of Surface learners.

Both ranking and regression analysis showed positive links between Conscientiousness with Sifting and Verifying (tables 11-22 and 11-23). These links are to be expected as students with high levels of this trait would be projected to want to ensure that they are progressing well during their search and that the information they have found is accurate - aspects found elsewhere (Heinstrom, 2003). Both of these micro-processes were strongly linked with Strategic learners suggesting that conscientious students search strategically. The anomaly analysis however indicated a negative association between Conscientiousness and Serendipity (table 11-23). If students viewed Serendipity as going off on a tangent, then conscientious students who prefer to structure a search might avoid doing this; backing up conclusions elsewhere which found a link between Conscientious students and an ability to determine boundaries (Kwon and Song, 2011). A conscientious approach has also been linked to a desire to achieve (Zhang, 2003), which if Serendipity was felt to be wasting time would not be performed by students high on this trait. The links here are not however clear cut as Strategic learners have higher odds of performing Serendipity (table 11-19), but they also have the highest mean score for

Conscientiousness (table 11-13). This is hard to interpret, but again may indicate a 'blurring' of the boundary between different personality traits and learning styles, or indicates a manifestation of the evolving search process, or in fact may be that there are two types of Strategic learner.

The link between Extraversion and Breadth Exploration found from the anomaly analysis (table 11-22) may be due in part to students with higher levels of this trait being less able to choose the best terms to start a search and just do a broad search to begin with. This analysis fits with the Deep learner profile of preferring to browse around and this inability to use a systematic method of studying by Extravert students has been found elsewhere (Kwon and Song, 2011). Thus Deep learners who are Extravert are likely to perform both Breadth Exploration and Networking. However, the notion of consulting human sources for information has been linked to Extraversion (Kwon and Song, 2011, Heinström, 2003) which in this study is also linked to the Surface learner type (table 11-13). Networking which is also linked here with the Surface learner type fits neatly with Monitoring – consulting documents that are easy (perceptually) to access (in line with Heinström (2006a)). Thus Surface learners who are Extravert do both Networking and Monitoring. Incorporation which was ranked highly for more Extravert students agreeing with the micro-process also fits in terms of students wanting to stop and check what they have regularly rather than do a 'complete' search.

Emotional Stability has no clear links to any particular micro-process from the anomaly analysis or regression analysis (tables 11-22 and 11-23), but Identifying the Shape of Existing Research is ranked much higher for this trait than any other trait. This micro-process concerns judging relevance of information in relationship to other sources, a lack of this skill has been found in individuals with lower Emotional Stability (greater Neuroticism) (Heinström, 2003). This micro-process is also linked with Strategic learners and the Intermediate ILSE group suggesting some link between personality, learning style and ILSE. In addition the highest mean personality score for Emotional Stability was for Strategic learners (table 11-13); further enhancing this relationship between the micro-process, personality trait and learning style.

Previous research has found that highly neurotic individuals are 'poorer' information seekers in general as they perceive more obstacles in the search process, tend to abandon searches early, and have negative, anxious feelings towards information searching (Heinstrom, 2003, Halder et al., 2010).

The individual profiles formulated by adding in the micro-processes are given below, and shown schematically in figure 12-4:

DE1 = Deep learner, Advanced ILSE, Openness, Browsing, Serendipity, Identify Keywords

DE2 = Deep learner, Advanced ILSE, Conscientiousness, Sifting, Problem Definition

DE3 = Deep learner, Advanced ILSE, Extraversion, Networking, Breadth Exploration

ST1 = Strategic learner, Advanced ILSE, Conscientiousness, Sifting, Verifying, Chaining, Keyword Searching, Serendipity, Refining, Problem Definition, Knowing Enough

ST2 = Strategic learner, Intermediate ILSE, Emotional Stability, Eclecticism, Identify Shape of Existing Research

SU1 = Surface learner, Intermediate ILSE, Extraversion, Networking, Monitoring, Incorporation

SU2 = Surface learner, Intermediate ILSE, Agreeableness, Eclecticism, Reviewing

KEY: RED = Learning style BLUE = Self-efficacy PURPLE = Personality GREEN = ISkB micro-processes

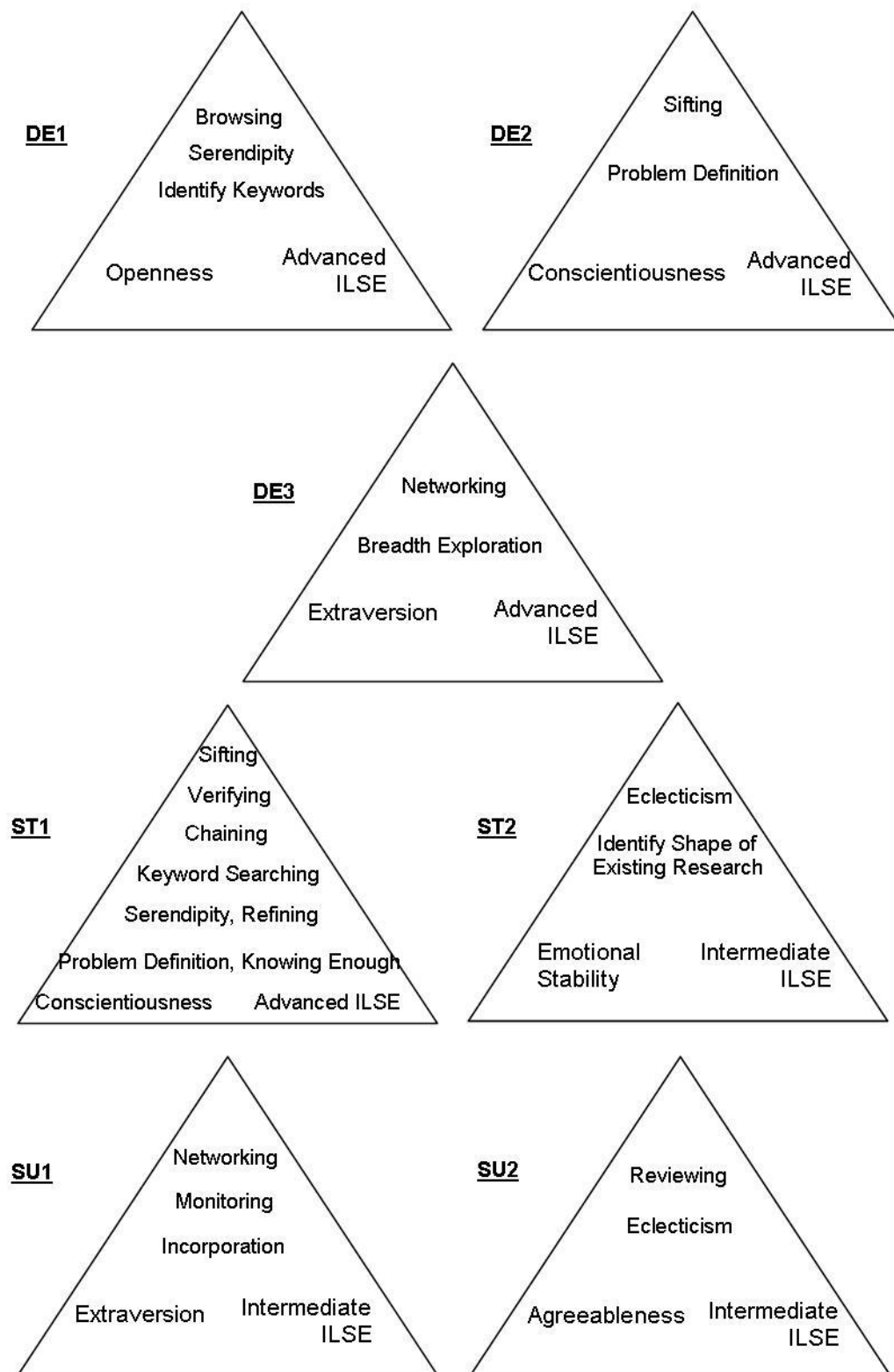


Figure 12-4: the seven ISkB profiles. Profiles DE1, DE2 and DE3 are for the Deep learners; ST1 and ST2 are for the Strategic learners; and SU1 and SU2 are for the Surface learners

All three profiles for Deep learners contain Advanced ILSE, but have different personality traits and ISkB micro-processes. Strategic learners are split in terms of ILSE with one profile for Advanced ILSE students and one profile for Intermediate ILSE students, both of which have different personality traits and ISkB micro-processes. Surface learners have two profiles, both containing Intermediate ILSE, but both with different personality traits and different ISkB micro-processes. Picture Building is the only micro-process with no clear links and has been omitted from the figure.

Adding in the personality traits to figure 12-5 shows the relationship between the traits, learning styles, information literacy self-efficacy, and micro-processes.

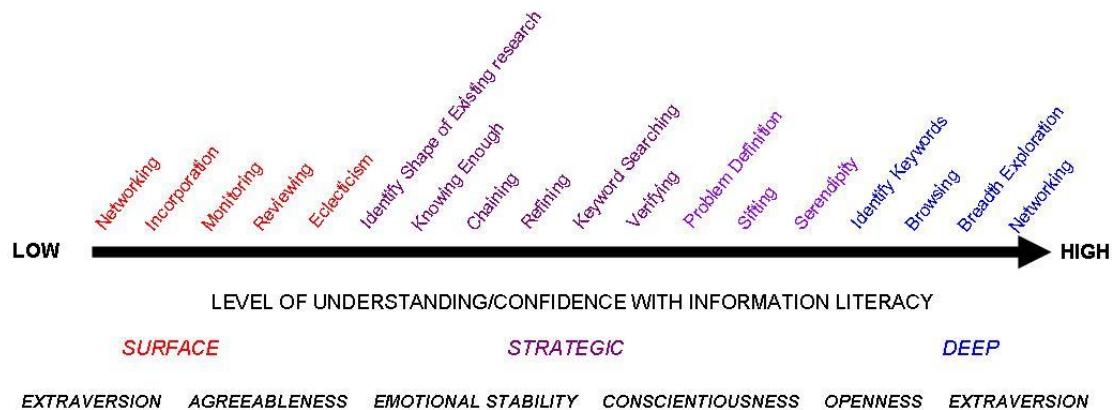


Figure 12-5: the five personality traits and their links with the information seeking micro-processes, learning styles and information literacy self-efficacy

The personality traits in figure 12-5 appear only once except for Extraversion which has links to both Deep learners and Surface learners; in addition to the Networking micro-process and thus is placed at the poles.

12.2 Qualitative element

12.2.1 Use of the Qualitative Interpretive Categorisation (QIC) technique

Whilst the development of a blended method of qualitative analysis (QIC) using *a priori* categories is open to question, it has been advocated as a legitimate approach to data analysis (Constas, 1992, Creswell, 2009, Miles and Huberman, 1994). It can be applied in specific situations where the researcher is constrained (ethics, time pressures), and where specific research questions are to be addressed. QIC blends from a pragmatic methodological perspective existing data collection and analysis techniques using *a priori* categories in the form of a start list which focuses the researcher to 'look out' for particular statements in the data and allows clustering to manifest early in the analysis. The initial start list (table 10-4) in this research was modified to the extent of excluding one category, the creation of another, and the renaming of two categories to better illustrate the results. In addition four categories remained from the initial list creating a final set of categories (table 11-25).

12.2.2 Amount of information

There was a clear difference in students' views about how much information was required at the start of an assignment and how much at the end. It was clear that students just wanted to find something that would help get them started. After determining the information need they attained their 'comfort level' (Zach, 2005) by locating a few key quality references that gave sufficient information to start whilst nearer the end of the assignment the emphasis switched to quantity, in line with MacDonald et al (2011), Prabha et al (2007) and Zach (2005). This notion of 'just enough' to start followed by 'plenty to finish' approximates to Simon's (1956) satisficing/optimizing theory. In essence students' 'satisfice' at the start of the assignment then switch to 'optimizing' at the end, in part due to a perception of needing a ratio of 1 reference per 100 words. The notion of dynamism throughout the search process has been found in relevance judgments, but in those cases users become more discerning, not

less so (Taylor, 2012). Trying to find a mixture of sources or just getting more information also fits with a need to optimise.

KEY POINT: students satisfice first, then try to optimise later

12.2.3 Confidence

Students' confidence levels using the library resources did not appear to be universally progressive through the course which is counter to the general perception (SCONUL, 1999). Whilst students are not necessarily more confident as they progress, they do attain confidence when they are familiar with searching resources. In terms of those on long courses, it appears that between year 1 and year 2 they become more confident; and between year 2 and year 3 less confident. In addition those who hadn't searched for a while then came back into it struggled due to unfamiliarity. This notion of on-going learning support to help students develop their skills over the duration of the course has been concluded elsewhere (Cole and Kelsey, 2004); along with a recognition that confidence is situation specific (Elmborg, 2006, Cool, 2001). Thus a straightforward upward curve of information literacy development over time may be better thought of as containing peaks and troughs dependent on the situation. This notion of 'tailoring' information literacy instruction across the course or in line with the situation gains credence from these results and is therefore of import (Detlor et al., 2011, Dunaway and Orblych, 2011).

KEY POINT: students' information literacy development over time is non-linear

12.2.4 Pertinence

Research into the concept of relevance has found it to be a multi-dimensional phenomenon which evolves along with the user's understanding of the topic being researched (Dirndorfer-Anderson, 2005). In addition users judge more information as 'partially relevant' during the process of new information generation (Spink et al., 1998). Here relevance was incorporated into a concept of pertinence relating to that which has relevance to the matter at that moment

in time (more akin to Schamber et al (1990) view). Although many elements of journal articles were identified by the students as pertaining to pertinence (date, title, relevance bar), it was the availability of the full text that was clearly the most important. Previous research has shown that the availability of the full text document has a bearing in terms of judging relevancy, but not impacting as a factor in its own right (Vakkari and Hakala, 2000). The idea that pertinence is linked to convenience and that items become more pertinent the more convenient they are has however been found elsewhere (Connaway et al., 2011, Urquhart et al., 2003b). This has clear implications for student learning. If students are ignoring articles that they believe are not available in their full format, then journals that are not accessible via the institution or are not freely available will be utilised less. Additionally, if students do not search via the institution they will only access 'free to all' journals. Thus Steinerova's (2008) conclusion that relevance is linked to 'value', 'utility', and 'importance' is diluted by the convenience of availability when it is viewed in terms of pertinence.

KEY POINT: the more accessible the information is, the more pertinent it becomes.

12.2.5 Revision of searching

Students do several searches in the course of their information seeking to find the 'right' information for their assignment. Whether it is changing the focus from book to journals (or vice-versa) or a change of keywords the revision is done in an attempt to improve the search. Previous research suggests that amongst HCPs electronic searching skills are poor (Koivunen et al., 2010, Morris-Docker et al., 2004) with information overload a problem (Bond, 2009). In addition nurses have been found to adopt a disordered approach to searching (Roberts, 2004). All these factors (poor searching skills, perception of too much information, non-systematic searches) will impact on the search results and lead to revision of searches. No clear elements of bouncing (Nicholas et al., 2004, Nicholas et al., 2007a) were identified from the results here, but might

have become apparent if more details of the searching technique itself were established.

KEY POINT: students revise searches to find the 'right' information.

12.2.6 Satisfaction

The point at which the search was considered a success was when 'satisfaction' was attained, but students found the concept hard to quantify. They only knew they were satisfied at the moment the decision was reached. It is inherently linked to other aspects of information seeking (particularly revising a search, pertinence and amount of information) and dependent on the specific needs of the student at that moment in time. Thus the amount of information that creates a 'satisfaction' level (satisfices) is situation specific (Simon, 1956). Dissatisfaction is multi-faceted with 'inconvenience', 'not enough information', and 'search is too difficult' all manifesting in the results. All these aspects have been found elsewhere (Prabha et al., 2007), but lack of time was not established as a factor here. Satisfaction then is a dynamic, situation-specific component that determines the stopping point of the search process.

KEY POINT: satisfaction/dissatisfaction is the end of the each search process.

12.2.7 Search strategy

There was no consistent approach in students' search strategy. They all felt that computer searching was required, but not necessarily the first thing that was done. Elements of needing to orient themselves (reading around, familiarising) before commencing more detailed searching (elsewhere termed 'discovering vocabulary' (Duncan and Holtslander, 2012)) manifested in the results, but not universally so. The idea that students utilise a 'shotgun' approach to searching (Roberts, 2004) and that the search is often lacking in detail and non-linear (Haines et al., 2010, Koivunen et al., 2010, Verhoeven et al., 2009) has already been discussed and may be due to differing levels of confidence or the choice of sources. Alternatively, as the students were describing different critical

incidents the nature of the particular assignment may impact on the type of search strategy employed. This lack of a clear method on how to start or follow up a search has implications for information skills training which need to be flexible and targeted to specific needs and situations.

KEY POINT: there is no standard approach to the search strategy which is contingent on the situation.

12.2.8 Sources used

There was a huge and diverse range of information sources used by the students, but in general they utilised a considered approach to searching – they were not ‘gung ho’. This range of sources was used to try and obtain the right information for a particular task as found elsewhere (Urquhart et al., 2004, Urquhart et al., 2003b). All students in this research used physical sources (reference/reading lists, books, journals) and subscribed resources (databases), with books and journals the primary targets. Other people were also heavily consulted in line with previous research on nurses and nursing students (Dee and Stanley, 2005, Spenceley et al., 2008, O’Leary and Mhaolrunaigh, 2012). This strong reliance on informal sources appears at first glance to be counter to the notion of evidence based practice, but it depends on what information is being sought and how it is used. Getting help orientating oneself to the task at hand before starting a search or obtaining confirmation that what has been found is ‘good’ do not in themselves impede evidence based practice per se if it is the research evidence that is used. Students’ poor knowledge of the names of bibliographic databases may be in part due to the use of the Digital Library which encourages cross searching of multiple databases as well as the use of ‘simple’ search techniques. This inability to remember the names of specific bibliographic databases is a phenomenon also found in the JUSTEIS project (Spink et al., 2003 p119). This ‘encouragement’ may appeal to student nurses who often lack proficiency in searching (Koivunen et al., 2010).

KEY POINT: a diverse range of information sources are used to find the right information for a particular aspect of the search.

12.2.9 Summary

The qualitative results concentrated on determining the 'mechanics' of the search process itself and yielded a range of aspects that influence various stages of this process.

Key points:

1. Students satisfice first, then try to optimise later
2. Students' information literacy development over time is non-linear
3. The more accessible the information is, the more pertinent it becomes.
4. Students revise searches to find the 'right' information.
5. Satisfaction/dissatisfaction is at the end of each search process.
6. There is no standard approach to the search strategy which is contingent on the situation.
7. A diverse range of information sources are used to find the right information for a particular aspect of the search.

Itemizing these stages into a flow-chart (loosely based on Bystrom and Jarvelin (1995)) shows how these key points influence certain stages of the process (figure 12-6). The initial task and search strategy employed is dependent on the situation the student finds themselves in (what stage of the course are they at?, what type of assignment is it?, how much do they already know?). The sources chosen for the search mould the search strategy. Situation also affects the results and the satisfaction with these results. The results themselves are influenced by the accessibility of the information which is contained within the criteria for pertinence. Revising the search emanates from dissatisfaction with the results and may impact on the sources used in the new search strategy.

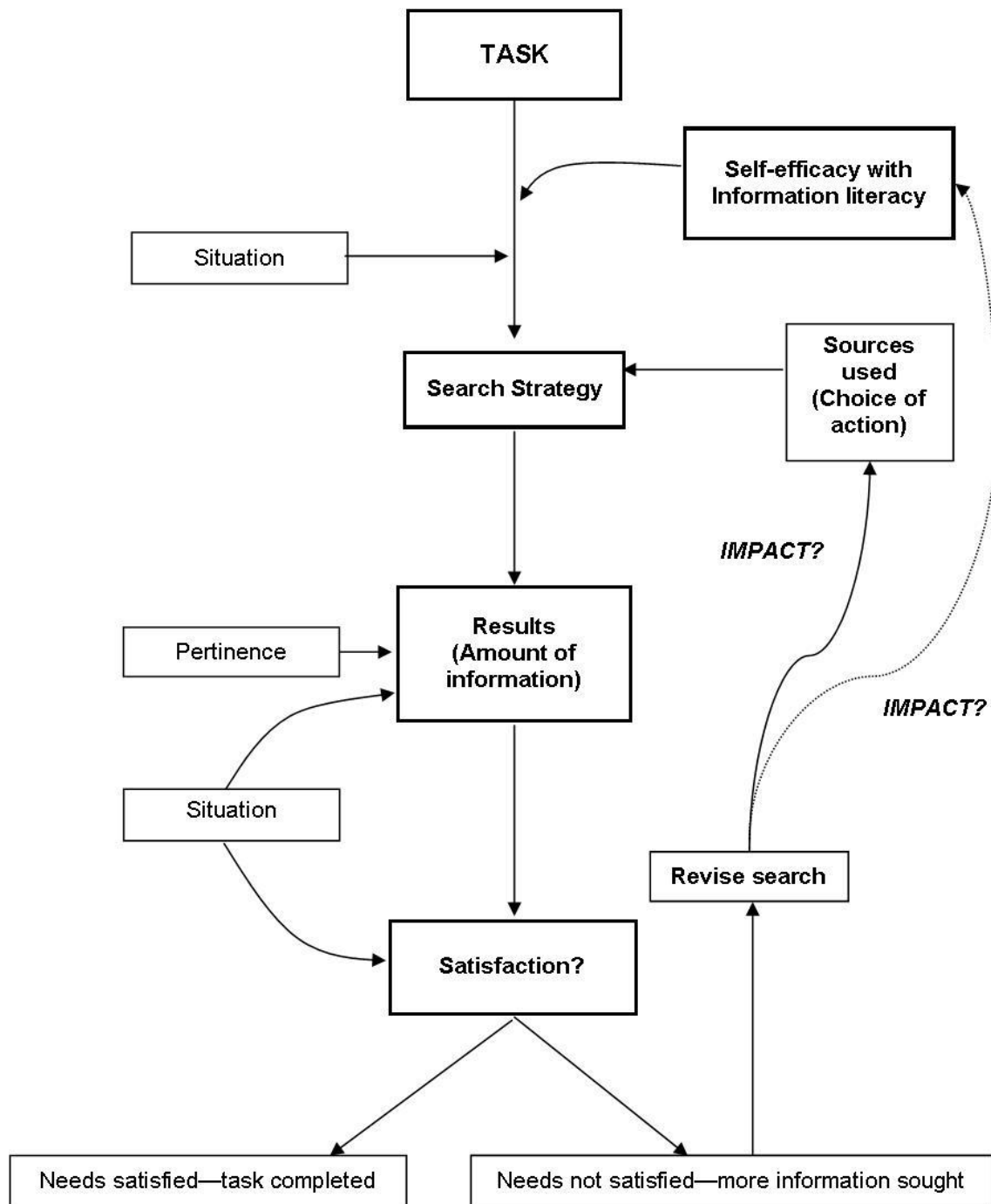


Figure 12-6: the information search process

12.3 Mixed element

How do the qualitative findings enhance the understanding of the quantitative results?

Although the two research strategies focussed on different research questions, the two are necessarily linked within the overall information seeking process. The qualitative results substantiated the findings from the quantitative results that self-efficacy with information literacy does not necessarily increase as students' progress through a course, but it is a key factor in determining how the search progresses. However, this element formed part of the information seeking profiles that were discussed in the quantitative part of the study which also incorporated personality, learning style, and elements of information seeking preferences. As such it is the complete ISkB profile that feeds into the qualitative model at the point before the student undertakes the search and has a direct bearing on the search strategy. The profile also has a bearing on other aspects of the search process such as the amount of information found and satisfaction with the process. Therefore the search process model can be amended to include both the ISkB profile model and the information search process model (figure 12-7). This complete model would necessarily have a bearing on how students orient themselves to undertake the search for information, what they would do as the search develops, and how well they would 'feel' the search has gone. In addition when the search is revised this may have an impact on the ISkB profile of the student in terms of self-efficacy, and/or the micro-processes employed in the search itself.

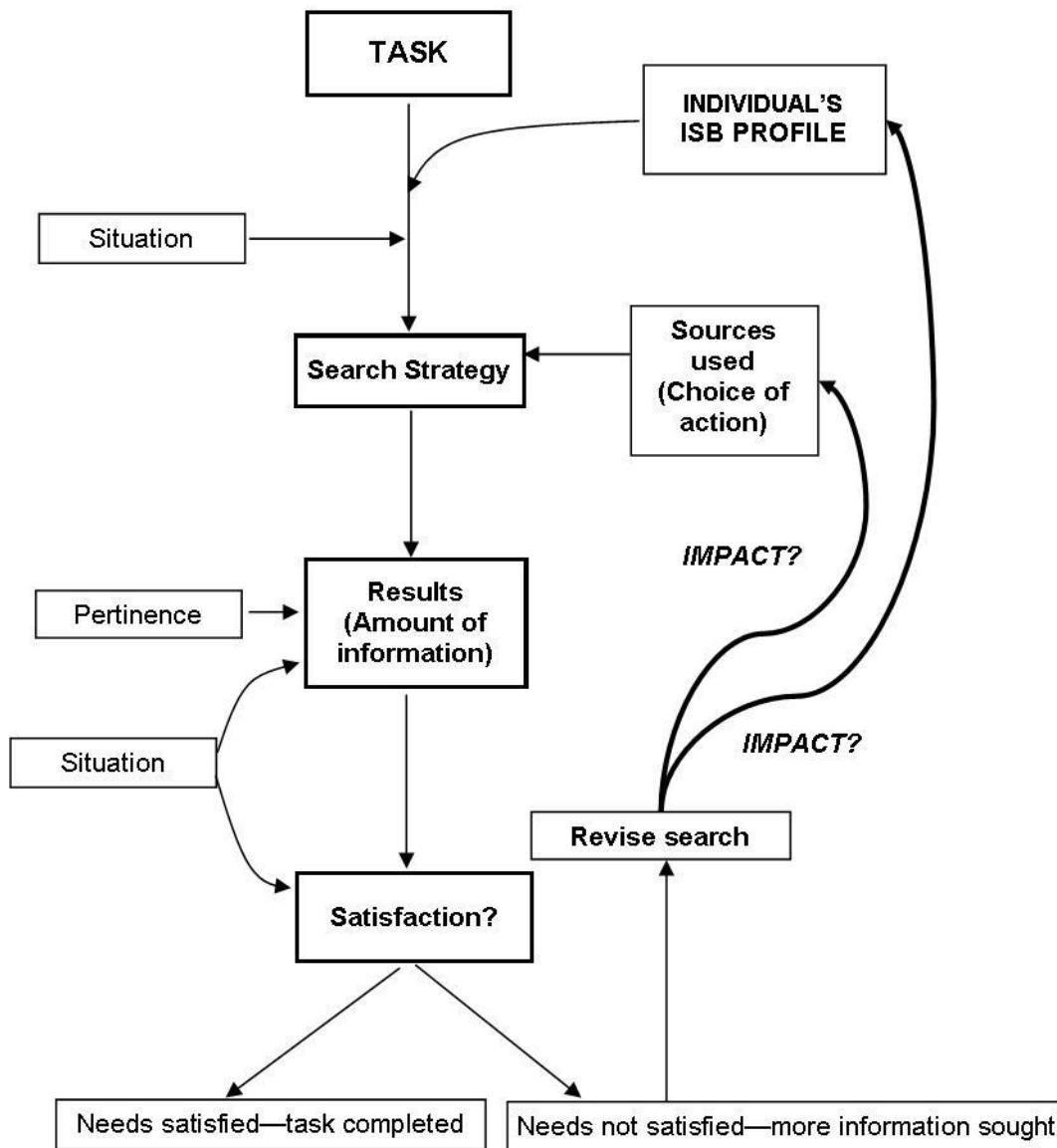


Figure 12-7: the information search process including the ISKB profile

From a practical point of view – how can this model assist with information skills training programmes? What has been shown here is that ‘situation’ is a key element in the information seeking process. Not only does the stage of the course the student is at or the course type that they are undertaking have a bearing, but also the stage they are at in the information gathering process itself. Students need to be clear (and teachers need to be aware) that they are likely to search in a different manner depending on whether they are in the early stages of a three year degree, doing a major project, or returning to study for a short course. In addition within these groups there are likely to be students that

possess different information seeking profiles. If facilitators could determine the profile of students by assessing their personality type, ILSE level, and learning style preference it would be possible to tailor information skills sessions (or hand-out materials, online help etc.) accordingly. In terms of Spink and Heinstrom's (2011) IB model this indicates a tightening (perhaps linking?) of elements within the levels in the model – in particular the sub-process level (information seeking and searching etc) and several elements of the cognitive, affective and social behaviour level (information style, metacognition, information processing etc).

For groups, typically first year students and CPD short course students have lower ILSE levels so teaching would need to focus on performing the search itself in order to provide satisfactory results. Improving information literacy skills would also be beneficial at this stage. Second year students appeared more confident in their information literacy skills so teaching could focus more on developing search strategies that would be appropriate for particular requirements. In addition it would be useful at this stage to encourage more in depth and targeted searching in an effort to retain this confidence before year three. Third year students and the Masters level students, who have had experience of searching and would be expected by this stage to have a grasp of information seeking, will be undertaking more substantial projects and need to know how to deal with what they find. Maintaining ILSE confidence levels throughout the duration of the course would be a valuable outcome to strive for.

Chapter 13 CONCLUSIONS AND RECOMMENDATIONS

13.1 Introduction

This research aimed to produce an information seeking behaviour profile for nursing students which could be used to inform the design of information literacy programmes (including the tailoring of information skills training sessions) for nursing students in the UK.

The following five research questions were addressed:

Quantitative

- What is the relationship between personality, self-efficacy, learning styles, and information seeking behaviour?
- What is the impact of differing personalities, self-efficacy levels, and/or learning styles on information seeking behaviour?

Qualitative

- Why do users search the way they do?
- What are the preferred methods of information seeking?

Mixed-method

- How do the qualitative findings enhance the understanding of the quantitative results?

In order to investigate these research questions the following objectives were identified:

Quantitative

- Determine whether 'different' students (type of course; stage of course) search differently.
- Identify (by literature review) how personality, learning styles, and self-efficacy are defined and applied to ISkB.
- Determine the role of personality, self-efficacy and learning style in the context of ISkB and how these act and interact on ISkB.

Qualitative

- Examine how nursing students perceive their ISkB and needs.
- Investigate the processes and methods nursing students utilise to find information.

Mixed-method

- Investigate how the qualitative data can be linked back to the quantitative data to better inform the production of an information seeking behaviour profile.

In terms of the quantitative research questions it is clear that there are relationships between different personalities, learning styles and levels of ILSE, and these in turn do impact on the way students prefer to search for information. Students on different courses or at different stages of a long course expressed different preferred learning styles and levels of ILSE and by examining the preferred information seeking processes individual profiles could be established. Qualitative data reveal the importance of situation in the information search process, and by determining how ISkB needs were perceived by students, allowed the development of an information search process model. Linking the information seeking profile into the search process model allowed a complete picture to be developed.

13.2 Literature review

The three aspects of personality, self-efficacy, and learning style which were reviewed and defined as separate entities did in fact have qualities that were linked. Assessing the research in depth enabled a rounded view of the three aspects to be established which in turn could be applied to IB research. Information seeking behaviour is a vast field of research with many different aspects and factors investigated. The evolution of IB models from early factor relationship and search process models, through task-based and non-linear models finally to integrated general models is an attempt to create an overall model that encompasses all aspects of the elements involved. Some of these

elements in turn have been extensively researched due to their perceived importance in the overall process (tasks, situation, serendipity, relevance). But the study of these individual elements in isolation, or studying ISkB as a 'general' process that can be modelled as performed by a particular population, neglects the impact of the individual doing the searching. Personality, learning style, and self-efficacy with information literacy all have a bearing on how the search process is conducted as found by individual studies (Palmer, 1991b, Palmer, 1991a, Heinstrom, 2002, Heinstrom, 2003, Heinstrom, 2006a, Hertzum and Pejtersen, 2000, Franks and McAlonan, 2007, Halder et al., 2010, Kwon and Song, 2011, Malliari et al., 2011) and Bawden and Robinson's (2011) review. Not taking into account these individual characteristics necessarily limits the robustness of any general model. Of the general models discussed in the literature review (section 4.3) Niedzwiedzka (2003), Godbold (2006), Spink and Cole (2006a), due to their very general nature contain no reference to personality, learning styles, or self-efficacy with information literacy; and whist Sonnenwald and Iivonen (1999) do include aspects of 'the person doing the search', any interactions are vague. Urquhart and Rowley's (2007) model which focuses on student information seeking does include an element of information literacy, but no focus on student characteristics; leaving Wilson and Walsh's (1996) early model as the only general model reviewed incorporating context and self-efficacy. A model of 'everything' may well be too much to ask – it would be too complicated to be of any use, but an acknowledgement that a 'one size fits all' model for all information seeking situations is too simplistic would be a straightforward addendum to any general model. By the same token, models that do focus on a specific group or population should acknowledge that the group in question may well have different requirements to other groups and as such the model is not 'general'.

13.3 Methodological approach

The overall methodological approach followed a concurrent embedded quantitative dominant mixed methods design with an overarching pragmatic

approach. This approach was clearly justified in Chapter 3 as it allowed the research to be flexible, adaptable, and have the focus of the overall goal of producing information seeking profiles for nursing students to inform the design of information literacy programmes for nursing students in the UK.

The questionnaire used for the quantitative data collection used three scales (Mini-Markers, ASSIST, ILSES) that were not only brief, but had been found to be valid and reliable in other research settings. The information seeking data was collected using Foster's non-linear model as it lent itself to the formulation of sets of juxtaposed statements as each micro-process is considered as a standalone factor rather than part of a chain or structured behaviour (section 10.2).

The questionnaire was quite long as it uses the three scales, the section on information seeking, and a short demographic section. This was not seen as too onerous in the pilot study, but did appear to be a slight issue in the main study with some students taking quite a long time to fill in all the responses. By investigating all three aspects (personality, learning style, and ILSE) it was inevitable that the questionnaire would be lengthy despite using the shortest versions of the scales. In addition Foster's model identified 17 processes involved in information seeking and to investigate those processes fully, they all needed to be included in the questionnaire. If the results found in this study are replicated in other studies it would then be possible to remove the information seeking aspect of the questionnaire as the 'known profiles' would reveal which processes students with particular personalities, learning styles, and ILSE levels would undertake. Initially, however, the complete questionnaire would have to be used. In addition the ILSE scale produced many more Advanced level students than Intermediate or Beginners. Being a new scale this may need to be adapted to better discriminate between the complete range of students. Further research using this scale may show different results, so caution should be shown at this stage. Knowledge of the student profile should enable targeted instruction to better inform students on information seeking skills and strategies. Students would then likely become more competent information seekers hopefully producing better work and have other associated benefits (less stress, spend less time frustrated with failed searches); indirectly benefiting academics.

Qualitative data collection used semi-structured interviews revolving around a Critical Incident. This was done to enable the participant to focus on a 'real' situation. Data from the interviews were analysed using QIC (Qualitative Interpretative Categorisation), a composite technique developed for this research pragmatically synthesising well known approaches into a blended framework. Using QIC (and *a-priori* categories) allowed particular aspects of interest developed from research questions to be identified and categorised (section 10.2).

Developing the blended data analysis framework (part out of necessity for the Ethical approval and part pragmatically to focus on elements of interest) allowed a non-expert researcher to 'pin-down' key aspects from the interviews at an early stage in the analysis. The QIC method is considered a viable way to analyse interview data when the need for interview guides to be formulated early and time pressures are factors. The use of tree hierarchies allowed the display of concepts from specific to general showing proximal relationships as well as groupings.

13.3 Main findings

13.3.1 Quantitative

The quantitative part of the research showed clear relationships between students with differing attributes and aspects of Foster's ISB model enabling the construction of seven distinct profiles. Knowledge of which attributes students have, would enable the tailoring of information skills training programmes to different students' strengths. In addition the programme itself would necessarily need to include modes of delivery that particular students would prefer depending on their learning style and overall profile.

As already identified, reflection is a major component of student nurse learning. At the institution where this research took place reflection is an important component of the three year degree programme. The current curriculum which was modelled on reflective practice includes summative reflective essays as well as formative tutorials and groupwork focussed on reflecting from practice. In addition reflection forms part of their theory and practice based portfolios (Waller, 2012).

Self-efficacy

The participants in this study appeared (in the main) to be confident in their information literacy skills, but this was not uniformly progressive between years 1 and 3 of the undergraduate programme. It is possible that students over-estimated their proficiency as they didn't know what they didn't know. This apparent over confidence is important in that students may not seek help to improve their skills, or see the benefit of any additional information skills training. Nevertheless, encouraging students to find out their level of ILSE could be advantageous if it is 'measured' before and after training sessions or as they progress through their course. The peak in confidence in year 2 followed by a dip in year 3 may be due to this realisation that their skills are not sufficient for the type of assignments they need to complete. To counter this sudden shock to the system a steady programme of skills sessions (long and thin delivery), with step-wise additional levels of difficulty being introduced throughout the duration of the course may be beneficial. In this light skill progression may be smoother. This type of skills programme requires academic staff to be not only aware of the benefits, but also mindful of the reasons behind such a programme. Getting academic staff 'on board' would require librarians to interact and network with tutors to try and get such a programme embedded into the curriculum.

Learning styles

Having a notion as to the way students prefer to learn is useful in terms of tailoring teaching sessions. This group of nursing students had a range of styles with strategic learners the highest fraction overall. Mixed styles declined across the years suggesting that students may 'acquire' a style as they progress through a course. In addition older students had more deep learners suggesting

mature students spend more time searching in depth than structuring their search. Approaching studying in either a deep, strategic, or surface manner has been found to be linked to academic achievement and therefore encouraging deeper approaches would be of benefit to students. Being aware of this would likely encourage students to ascertain their own learning style (possibly voluntarily) and as such they should be given the opportunity to do so.

Self-efficacy and learning styles

A key statistically significant relationship was found between ILSE and learning style: deep with advanced; surface with intermediate. This relationship when viewed in tandem with Entwistle and Peterson's (2004) level of understanding continuum indicates that deep learners have (or wish to acquire) a high level of understanding and are also the most confident ILSE; more so than strategic learners with surface learners having the lowest confidence and level of understanding. As it has been hinted that learning styles may develop over the duration of the course it would be in the interests of trainers to improve the confidence levels of students in terms of information literacy which would in turn encourage a deeper approach to studying and thus a higher level of understanding.

Personality with self-efficacy and learning styles

There was found to be very little difference overall between the five personality traits, but certain traits were related to different learning styles and ILSE levels allowing tentative profiles to be formulated. These relationships were in some cases direct, others were by association. The Openness trait had direct relationships to both a Deep learning style and Advanced ILSE strengthening the overall association. Conscientiousness and Emotional Stability were directly linked to the Strategic learning style and thus by association potentially with Advanced ILSE. Extraversion was found to be linked to a Surface learning style which by association linked to the Intermediate level ILSE group. At this stage there was no obvious link between either learning styles or ILSE with the Agreeableness trait. These initial profiles provided a useful starting point in the development of the final ISB profiles.

ISB with self-efficacy and learning styles

Some micro-processes appeared to be more important overall than others: Serendipity Reviewing, Identify Keywords, and Problem Definition all scored more than 80% positive; whereas Identify Shape of Existing Research, Breadth Exploration, Picture Building and Monitoring were the only micro-processes that scored less than 50% positive.

Statistical analysis showed links between some micro-processes and the two different levels of ILSE.

- Monitoring and Identify the Shape of Existing Research were both positively linked with lower levels of ILSE
- Problem Definition, Chaining, Sifting, and Refining were linked with higher levels of ILSE
- Deep learners appeared to prefer Breadth Exploration, Browsing, Sifting, Networking, and Identifying Keywords
- Strategic learners were linked with Problem definition, Refining, Keyword Searching, Sifting, Identify Shape of Existing Research, Knowing Enough, Serendipity, Eclecticism, and Verifying
- Surface learners were linked with Networking, Reviewing, Monitoring, and Identify Shape of Existing Research.

Making sense of this apparently confusing set of results was done by placing these ISB micro-processes into the 'level of understanding continuum' relating them to the appropriate learning style and ILSE level. The result showed that where two different learning styles were linked to the same micro-process (such as Problem Definition which is linked to both Strategic and Deep learners), if these were placed at the 'join' along the continuum that all the micro-processes could be placed a single time except for Networking which was the only micro-process preferred by both Deep and Surface learners. The final step was to see if personality traits would fit into the model.

Linking in personality traits

Positive links were found between Openness and Browsing; Agreeableness with Reviewing; Conscientiousness with Sifting and Verifying; Emotional Stability with Identify Shape of Existing Research; and Extraversion with Breadth Exploration and Incorporation. By 'adding in' the personality traits keeping in mind the relationships with the micro-processes and the earlier identified relationships with learning styles and ILSE, a complete model is formed with only Extraversion appearing twice all other traits can be placed in the appropriate area a single time (figure 12-5 in section 12.1.7)

It was possible to place Conscientiousness at the join between Strategic learners and Deep learners as the two micro-processes that were duplicated in these two styles could also be placed in that area. The link between Extraversion and Networking, and both with Surface and Deep learning styles is the only relationship that does not fit the 'single slot' model. Picture Building is the only micro-process with no clear links to a learning style, ILSE level or a personality trait.

Creation of final profiles

From this model seven distinct ISB profiles were formed. These may be useful in that if the learning style and personality of the individual student is known, then it can be surmised how they are likely to prefer to search for information; or at least which aspects of information searching they are likely to prefer to do (figure 12-4 in section 12.1.7)

In essence the two research questions are addressed in tandem by the profiles and the 'level of understanding' continuum. There are relationships between personality, self-efficacy, and learning styles (in some cases significant relationships), and these in turn are related to different aspects of ISB. The impact of these relationships is that certain individuals are likely to search in a different way to others and thus expecting all students to follow a uniform pattern of ISB would be erroneous. It may be necessary to include individual or smaller group sessions in any information literacy skills programme to cater for those students who are not in the majority.

13.3.2 Qualitative

Seven categories were identified and each yielded a specific key point

Amount of information

What students wanted at the start of their search was clearly different to what they expected to have obtained by the end. Students appeared to satisfy first (just getting something to enable them to start their assignment), then try to optimise later on to ensure they had enough breadth and depth of information and sources. This was a not altogether surprising finding and mirrored other research (MacDonald et al., 2011, Prabha et al., 2007). Instructing students on how best to 'get the ball rolling' in addition to instruction on how to search in a systematic manner may improve search results and satisfaction levels.

Confidence

A rather more surprising finding was the discovery that students' information literacy development over time is non-linear. The idea that students 'lose' confidence between years 2 and 3 of the full time undergraduate course suggests on-going learning support and situation specific information literacy instruction may be beneficial.

Pertinence

The more accessible or convenient the information is, the more pertinent it becomes. Quite simply; students want full text articles, but poor information literacy skills (such as not using the correct authenticated methods) may be limiting the amount of full text articles that are available. In terms of information literacy skills teaching, reinforcing the correct methods to locate full text articles will be of benefit.

Revision of searching

Reinforcement of searching techniques would also assist students who tend to revise searches (sometimes several times) to find the 'right' information. In addition providing instruction on 'best practice' searching would in all probability reduce the amount of 'quick and dirty' or plain erroneous searches. Students do try to 'improve' their search, but seem to lack the necessary skill set to accomplish it.

Satisfaction

Poor searching skills are also linked to whether students are satisfied or dissatisfied with their search results. Satisfaction manifests at the end of each search activity within the overall information seeking process and as such is situation specific. It is also dynamic, but determines the stopping point of the search. Information literacy instruction to improve searching skills would likely improve the level of satisfaction and also reduce time spent on the search.

Search strategy

Students had no standard approach to the search strategy meaning that information literacy training needs to be flexible and targeted to specific situations. Even if information skills training concentrates on a single search approach, it must be acknowledged that some students may prefer to search in a different manner and provision for this must be allowed.

Sources used

Students look almost everywhere to find the right information for a particular aspect of the search. Using non-formal sources (such as other people) should not be regarded as 'wrong', but it is difficult to see how this type of information seeking could be taught. In essence it is probable that orientating students to sources that they may otherwise have neglected or been unfamiliar with would broaden their source-base and likely improve their overall information seeking satisfaction.

ISB model

The impact of these key points on the search process was shown using Bystrom and Jarvelin's (1995) search process model and highlighted the importance of situation in information seeking of students. Being aware of the needs of the student is an important facet of the type and level of information literacy instruction given.

13.3.3 Mixed

Although the production of an ISkB model was not the original motivation for the study, one evolved. This derived from the blending of the two separate stages of the research, enabled by the pragmatic approach taken throughout the study,

and revealed the importance of situation; both what stage of the course students are at and also the stage of the information seeking process. The additional factor of the profile of the student influences the methods and strategies students are likely to employ (or would prefer to employ) in their search. To use the model in a practical manner in order to develop information literacy training programmes, the identification of the student profile is key. Establishing very early how students prefer to search and tailoring skills sessions to account for this would likely improve satisfaction levels. In general terms for whole group instructing where individual profiles are not known, this study has revealed that certain groups of students have different levels of ILSE overall, so focussing on the majority may be necessary. First year and short course students just want some satisfactory results; second years need more in depth searching instruction to prepare for year three; and third year and Masters level students need to deal with what they have found. Structuring a 'long and thin' modular instruction programme that helps students to maintain ILSE confidence levels, with remedial or individual instruction as an additional option, would be a valuable method to increase satisfaction levels in students' information seeking. Short course students would not be able to embark on a long and thin instruction programme, but as the current groups of three year undergraduates qualify they will in turn become those students on the short courses in the future. As such over time they themselves will have already benefited from such a programme. The research conducted here provides important information to feed into any such programme.

13.4 Recommendations

The focus of the research here was to determine profiles for nursing students – how and why they searched in different ways – rather than information literacy per se. As some relationships were found between different personalities, learning styles, and ILSE with information seeking preferences, profiles were determined. As such having knowledge of a student's profile would allow any training to be moulded to their preference. These following general recommendations have been established:

- Information skills training programmes need to be tailored to the students attending.
- When feasible determine the personality, learning style, and ILSE level of individual students to identify their information seeking profile enabling them to concentrate on their strengths and preferences when searching for information
- If it is not possible to determine individual information seeking profiles, then group profiles can be deployed to cater for the majority. Once known the skills programme can be developed in accordance with the profiles and include a range of learning modes (face to face instruction, hands-on work, online modules)
- Remedial sessions for individuals or smaller groups should be in place to cater for those students not in the majority.
- A 'long and thin' structured information skills training programme would benefit students on three year courses and help maintain confidence levels.
- This training programme must take account of the situation the students are in as well as their ISB profile.

It is recommended at this educational establishment that a 'long and thin' information skills training programme be embedded into the curriculum for students doing long courses. This programme should include large group sessions, small group sessions and individual sessions (including voluntary remedial sessions). Before embarking on these programmes the personality, learning style, and ILSE of the students should be investigated to determine the majority profiles of the students in the groups. The training programme should be moulded to the situation the students are in (stage of course). Students on shorter courses should also where possible have their personality, learning style, and ILSE determined in order that any group skills session be adapted to the majority profiles.

13.5 Contributions of this study

- Whilst research has been done investigating relationships and influence of personality, self-efficacy with information literacy and learning style in association with ISB; this study is the first to investigate all these aspects.
- It is the first study to use Foster's non-linear ISB model for the development of a questionnaire which lent itself neatly to the investigation of whether students undertook particular processes in their information seeking.
- It has developed a blended framework for qualitative analysis – QIC (Qualitative Interpretative Categorisation) which is a useful method to employ when time is an issue and/or when ethics dictates a need for a 'startlist' of categories.
- It has produced a set of information seeking profiles that can be used to tailor information skills programmes to an individual or a groups strengths and a related 'level of understanding' continuum
- It has produced an information searching model which shows how the student's profile fits into the process and the importance of situation in ISkB.

13.6 Limitations and further research

Based on the findings of this study, further research is required in order to explore related areas.

The study was limited to a sample of nursing students at one institution which limits the generalisability of the quantitative results. It would be interesting to investigate whether other types of students or other nursing students at other institutions yielded different results. Furthermore, a larger sample (in excess of three hundred participants) would enhance any such findings.

In addition this research was a snapshot of cross-sectional views at one moment in time, so there is a need for longitudinal analysis to identify any trends or differences between groups. This type of analysis however would be demanding due to the amount of time involved and attrition of students would also be a factor.

Finally, the ILSES needs to be further tested to ascertain whether it needs to discriminate better between the three different levels.

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Chapter 15 APPENDICES

Appendix A: Mind Map for literature search



Appendix B: Selection of learning styles reviews

Study	Instruments reviewed	Conclusions
De Bello (1990)	<ul style="list-style-type: none"> • Dunn and Dunn's Learning Style Inventory • National Association of Secondary School Principals Learning Style model • Hill's Cognitive Styles Profile • Letteri's Cognitive Style Delineators • Ramirez's Child Rating Form • Reinert's Edmonds Learning Style Identification Exercise • Schmeck's Inventory of Learning Processes • Hunt's Paragraph Completion Method • Kolb's Learning Style Inventory • Gregorc's Style Delineator • McCarthy's 4 Mat System 	This review reports others research into reliability and validity of these instruments, but does not critically evaluate the research. No firm conclusions are reached regarding the instruments, and De Bello recommends that the reader look elsewhere for conclusions.
Swanson (1995)	<ul style="list-style-type: none"> • Dunn and Dunn's Learning Style Inventory • Kolb's Learning Style Inventory • Gregorc's Style Delineator • The Myers-Briggs Type Indicator • Cranfield's Learning Style Inventory • The Grashna-Reichmann Student Learning Style Scale 	No effort is made in this review to critically analyse the instruments reviewed, and as such no conclusions are made as to their merits.
Wilson (1998)	<ul style="list-style-type: none"> • Dunn and Dunn's Learning Style Inventory • Kolb's Learning Style Inventory • Gregorc's Style Delineator • The Myers-Briggs Type Indicator 	These four instruments are discussed in this review, but no conclusions are made regarding validity and reliability.
Coffield et al (2004a, b)	<ul style="list-style-type: none"> • Dunn and Dunn's Learning Style Inventory • Kolb's Learning Style Inventory • Gregorc's Style Delineator • The Myers-Briggs Type Indicator • Allinson and Hayes' Cognitive Styles Index 	The thirteen instruments listed here are analysed in depth for validity and reliability in this review. All the instruments are assessed for their application in the field with firm conclusions made as to which are appropriate for use. The review is also highly

	<ul style="list-style-type: none"> • Apter's Motivational Style Profile • Entwistle's Approaches and Study Skills Inventory for Students • Hermann's Brain Dominance Instrument • Honey and Mumford's Learning Styles Questionnaire • Jackson's Learning Styles Profiler • Riding's Cognitive Styles Analysis • Sternberg's Thinking Styles Inventory • Vermunt's Inventory of Learning Styles 	critical of some of the instruments, but bases this on sound reasoning and evaluation.
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Appendix C: Letter of invitation

Executive Dean
Professor David Humber



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Information Seeking Behaviour
Version 2

23 September 2008

Dear Student

I am currently studying for a PhD in Information Science. For my thesis I have chosen to analyse whether personality, self-efficacy, or learning styles affects the information seeking behaviour of students of nursing and midwifery.

To obtain the necessary data, I shall be asking students enrolled on nursing and midwifery courses at Anglia Ruskin University to complete a questionnaire. In addition a random selection of the respondents will also be chosen for supplementary interviews. Courses will include: the Registered Nurse and Registered Midwife programme, Continuing Professional Development and the Masters programme.

Therefore I am writing to invite you to contribute to my study.

Confidentiality will be maintained throughout the duration of the study and only those who agree to be interviewed will be identified by the researcher. Results of interviews will not be traceable to the participant. The results of the study will be freely available.

Approval has been sought and granted for this study from the Dean of the Faculty of Health and Social Care at Anglia Ruskin University and by Cambridgeshire 3 Research Ethics Committee.

Thank you for your co-operation,

Yours faithfully

Peter Stokes
Assistant Librarian, Peterborough



Appendix D: Participant information sheet

Executive Dean
Professor David Humber



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DATE

Version 1

PARTICIPANT INFORMATION SHEET

Study Title

Information seeking behaviour of nursing and midwifery students.

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

What is the purpose of the study?

Most models of Information Seeking Behaviour (ISB) (Wilson 1999, Ellis 1989, Ingwersen 1996) concentrate on the linear staged seeking process; with less emphasis on the individual differences of the searcher (Wilson includes some psychological and mass communication theories). More recent models (Foster 2005) do incorporate elements of 'looping' and 'feedback', and categorise information seeking processes but require further validation to assess transferability. A recent study by Heinström (2004, 2005) investigated the ISB of postgraduate students in terms of their personality and seeking styles, grouping students into three categories of seeking 'types', and it would be useful to extend this to undergraduates. The proposed research will analyse the information searching and seeking behaviour of undergraduate nursing students including personality traits, self-efficacy and learning styles; and use the results to extend Foster's nonlinear model – a middle range theory development (Case 2006). This study will be completed by 2009 and aims to ascertain whether personality, self-efficacy, or learning styles affects the way students search for information. It is a doctoral research study.



INVESTOR IN PEOPLE



Why have I been chosen?

Participants for this study must be enrolled on a course at Anglia Ruskin University.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.

What will happen to me if I take part?

If you choose to take part, you will be asked to fill in a short questionnaire on information seeking along with personality, self-efficacy or learning styles pre-validated research tools. You may also be asked to take part in semi-structured interviews at a later stage of the research.

What are the benefits of taking part?

By taking part in this study you will be helping the University to find out how information skills training is best delivered to have the most potential benefit to nursing students. This may benefit those in the early stages of their studies and also those who go on to undertake further modules or educational programmes at Anglia Ruskin University or elsewhere.

What if something goes wrong?

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have grounds for a legal action but you may have to pay for it. Regardless of this, if you wish to complain, the normal National Health Service or Anglia Ruskin University complaints mechanisms should be available to you.

Confidentiality and anonymity

All information which is collected about you during the course of the research will be kept strictly confidential. Any information about you which leaves the Anglia Ruskin University site will have your name and address removed so that you cannot be recognised from it.

You are not expected to pass any personal information to me and no student will be tracked through the research. If the data is subsequently published no personal information will be used. This information is not relevant to any analysis of the data.

What will happen to the results of the research study?

The results of the study will form the thesis for a PhD. A copy of this document will be housed at the Peterborough site library of Anglia Ruskin University and at Aberystwyth University. This will be freely available to be viewed. It is likely that it will also be published in a condensed form before the end of 2011 in an academic journal.

Who has reviewed the study?

Peterborough and Fenland Local Research Ethics Committee, and representatives at the Department of Information Studies at the University of Wales, Aberystwyth have reviewed the proposal. The Dean of the Faculty of Health and Social Care at Anglia Ruskin University has given approval for the research.

Please keep copies of this participant information sheet and a consent form

Thank you for taking the time to read this information sheet. I hope it provides a clear outline of the study, which will help you decide whether to take part.

If you have any further questions or queries, please contact me at stokes@hshs.ac.uk or 01223 885976.

Appendix E: Consent forms

Executive Dean
Professor David Humber



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Centre Number : 1
Study Number: 1
Participant Identification Number for this trial: None
Version: 1

DATE

CONSENT FORM

For Phase 1: questionnaire

Title of Project:

Information seeking behaviour of nursing and midwifery students

Name of Researcher: Peter Stokes, Assistant Librarian

Please initial box

1. I confirm that I have read and understand the information sheet dated23 Sept 2008.....
(version .2) for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time,
without giving any reason, without my legal rights being affected. ☐
3. I agree to take part in the questionnaire phase of the above study. ☐

Name of Participant

Date

Signature

Researcher

Date

Signature

1 for participant; 1 for researcher;



Executive Dean
Professor David Humber



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Centre Number : 1
Study Number: 1
Participant Identification Number for this trial: None
Version: 1

DATE

CONSENT FORM

For Phase 2: supplementary interviews

Title of Project:

Information seeking behaviour of nursing and midwifery students

Name of Researcher: Peter Stokes, Assistant Librarian

Please initial box

1. I confirm that I have read and understand the information sheet dated23 Sept 2008.....
(version .2) for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time,
without giving any reason, without my legal rights being affected. ☐
3. I agree to take part (if selected) in the interviewing phase of the above study. ☐

Name of Participant

Date

Signature

Researcher

Date

Signature

1 for participant; 1 for researcher;



Appendix F: Interview schedule

Interview Guide

In the interview, I am trying to get a proper understanding of how you might go about researching for information on an assignment. Of course this may depend on the situation you are in at the time – other assignments, other constraints at home or elsewhere, whether you have good access to computers or the library when you need it, whether the information you find fits together neatly for the assignment or not. The interview should – I hope – help you to reflect on the approach you take to literature searching, and what you do to find information that helps you in completing the assignment – and also in completing your course.

I'll be trying to work through the stages and processes involved, how you felt about the in-between stages between reading the assignment instructions and handing in the final version of the assignment.

(1) CRITICAL INCIDENT TECHNIQUE

Please tell me about one entire project from a title or area through to completion: Please tell me about the activities and places that you look as you progress through a literature search. By all means take a moment to think back to where you were and who you consulted about this.

(Possible probes: a. At the beginning – what did you think about the title, where did you start, who did you ask?

b. Once you are a little further what did you do?

c. A little later in your research perhaps when you had done some searching or worked for a while on the topic. Were there any problems that you encountered?

d. As your work progresses and towards completion of your research? How did you cope with any difficulties – or how do you know you'd done as much as you could?)

(2) Do you feel that you changed the way you search from the beginning of your search and as you move through? How did your priorities change?

(Supplementary: if in 2nd or 3rd year or has studied before – Has your level of confidence to do a search changed over time? If it has gone up/down, why do you think that is?)

(3) How does this search compare with other searches you have done before or after this time? If you searched differently in the past, why do you think you changed? If you now search differently – why have you subsequently changed?

(If you use the same strategies and activities, can you describe them for me? If you use different strategies and activities, can you describe them for me? How do the activities you describe fit in with your overall strategy of information-seeking?)

- (4) Where would you look for information? And who would you ask – and why?
(Information sources/types e.g., Databases (which ones?), OPAC, Library Shelves, Web, fellow students) Do you tend to have a set of resources that you usually try first – or does this depend on what you need to do?
- (5) How do you identify new or useful information sources?
(When looking at a range of sources, how do you decide which ones will be useful? How do you decide which results are relevant?) Can you remember any Eureka moment when you found something that was really useful at that point?
- (6) When are you satisfied that you have enough information and can therefore move on to a new question, activity or different way of searching? How do you judge when enough is enough?
- (Probe: quantity, match with perceived needs for assignment (expectations of number of references, type of references, try to tease out how any interpolation is done, any critique of the information in the items retrieved, putting it all together.)*

Appendix G: Questionnaire

SECTION 1: INFORMATION SEEKING

For each of the questions in Parts 1-3; circle either "a" or "b" to indicate your answer. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies most.

Part 1

- 1.1 a I tend to start my search broad and then narrow down later
 b I prefer to try and find exactly what I want straight away, then broaden my search out if necessary
- 1.2 a If I come across information that looks interesting, but isn't immediately useful – I store it for later use
 b I ignore information that isn't readily needed
- 1.3 a I use my social network (friends, colleagues) to obtain information
 b I tend to search for information on my own and don't consult with friends and colleagues
- 1.4 a I think searching specific databases is important
 b I think the information will turn up somehow regardless of how much time I spend locating the right source
- 1.5 a I often keep scrolling through most of my search results long after selecting some pertinent articles.
 b I don't bother scrolling through my results after selecting some pertinent articles.
- 1.6 a I regularly keep track of key journals and authors by accessing new issues and editions
 b I always perform a search to find new information
- 1.7 a I often check the reference list of key articles for additional sources
 b I don't tend to use other article's reference lists as information sources
- 1.8 a I feel that I can often find useful information whilst looking for something else.
 b I do not feel that I can often find useful information whilst looking for something else.

Part 2

- 2.1
 - a I think defining my focus and boundaries are important
 - b I don't consider defining a focus as being a major consideration in information searching
- 2.2
 - a I often use mind mapping to build a picture of my search concepts
 - b I tend to start searching with keywords rather than building a picture of a search strategy
- 2.3
 - a I tend to use my existing knowledge and sources to determine the current situation in my topic area
 - b I don't consult previously obtained information to determine the current state of existing knowledge
- 2.4
 - a I think finding suitable terms is important in a search
 - b I think I can get the information I need without worrying too much about keyword selection
- 2.5
 - a I judge the relevance of information by its relationship with key articles, authors and latest opinion
 - b I determine whether information is relevant by looking at the title or abstract

Part 3

- 3.1
 - a I am usually able to decide when I have enough information for an assignment.
 - b I usually find it difficult to assess when I have enough information for an assignment.
- 3.2
 - a I can easily define boundaries for a database search.
 - b I find it difficult to define boundaries for a database search.
- 3.3
 - a I check articles for relevancy regularly during a search.
 - b I tend to get lots of articles before checking them for relevancy.
- 3.4
 - a I tend to do my research in stages in order to collate my retrieved material.
 - b I tend to collate my retrieved material when I have completed searching.
- 3.5
 - a I like to check the accuracy of key articles by searching for original sourced references
 - b I tend to take the information presented in an article at face value

SECTION 2: SELF-RATING OF YOUR COMPETENCE

This scale has been prepared to rate your competence on some information skills.

Here the notations shall be referred to as: **7** almost always true, **6** usually true, **5** often true, **4** occasionally true, **3** sometimes but infrequently true, **2** usually not true, **1** almost never true.

Please mark the most suitable choice for you.

C1	I can use different kinds of print sources (i.e. books, periodicals, encyclopaedias, chronologies, etc.)	1	2	3	4	5	6	7
C2	I can use electronic information sources	1	2	3	4	5	6	7
C3	I can locate information sources in the library	1	2	3	4	5	6	7
C4	I can use the library catalogue	1	2	3	4	5	6	7
C5	I can locate resources in the library using the library catalogue	1	2	3	4	5	6	7
A6	I can define the information I need	1	2	3	4	5	6	7
D7	I can select information most appropriate to the information need	1	2	3	4	5	6	7
E8	I can interpret the visual information (i.e. graphs, tables, diagrams)	1	2	3	4	5	6	7
F9	I can write a research paper	1	2	3	4	5	6	7
F10	I can prepare a bibliography	1	2	3	4	5	6	7
F11	I can create bibliographic records for different kinds of materials (i.e. Books, articles, web pages)	1	2	3	4	5	6	7
F12	I can make citations and use quotations within the text	1	2	3	4	5	6	7
G13	I can learn from my information problem solving experience and improve my information literacy skill	1	2	3	4	5	6	7
E14	I can synthesize newly gathered information with previous information	1	2	3	4	5	6	7
F15	I can determine the content and form the parts (introduction, conclusion) of a presentation (written, oral)	1	2	3	4	5	6	7
F16	I can create bibliographic records and organize the bibliography	1	2	3	4	5	6	7
G17	I can criticize the quality of my information seeking process and its products	1	2	3	4	5	6	7

SECTION 3: LEARNING STYLE

Please work through the following comments, giving your **immediate** response. In deciding your answers, think in terms of **your current research project**. It is also very important that you answer **all** the questions: check you have.

1 = strongly disagree 2 = disagree 3 = agree 4 = strongly agree

1	Often I find myself wondering whether the work I am doing here is really worthwhile.	1	2	3	4
2	When I'm reading an article or book, I try to find out for myself exactly what the author means.	1	2	3	4
3	I organize the time I work on my project carefully to make the best use of it.	1	2	3	4
4	I concentrate on learning just those bits of information I have to know to pass.	1	2	3	4
5	I look carefully at tutors' comments on course work to see how to get higher marks next time.	1	2	3	4
6	Regularly I find myself thinking about ideas regarding my project when I'm doing other things.	1	2	3	4
7	I'm pretty good at getting down to work whenever I need to.	1	2	3	4
8	Much of what I'm reading related to my project makes little sense: it's like unrelated bits and pieces.	1	2	3	4
9	I put a lot of effort into my project work because I'm determined to do well.	1	2	3	4
10	When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.	1	2	3	4
11	I don't find it at all difficult to motivate myself.	1	2	3	4
12	Often I find myself questioning things I hear in lectures or read in books.	1	2	3	4
13	I manage to find conditions for studying which allow me to get on with my work easily.	1	2	3	4
14	Often I feel I'm drowning in the sheer amount of material we're having to cope with.	1	2	3	4
15	Ideas in course books or articles often set me off on long chains of thought of my own.	1	2	3	4
16	I often worry about whether I'll ever be able to cope with the work properly.	1	2	3	4
17	When I read, I examine the details carefully to see how they fit in with what's being said.	1	2	3	4
18	I often have trouble in making sense of the things I have to remember.	1	2	3	4

SECTION 4: PERSONALITY

Please use this list of common human traits to describe yourself as accurately as possible. Describe yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically, as compared with other persons you know of the same sex and of roughly your same age. Before each trait, please write a number indicating how accurately that trait describes you, using the following rating scale:

1 Extremely Inaccurate	2 Very Inaccurate	3 Moderately Inaccurate	4 Slightly Inaccurate	5 Neither Inaccurate nor Accurate	6 Slightly Accurate	7 Moderately Accurate	8 Very Accurate	9 Extremely Accurate
------------------------------	-------------------------	-------------------------------	-----------------------------	--	---------------------------	-----------------------------	-----------------------	----------------------------

_____ Bashful	_____ Energetic	_____ Moody	_____ Systematic
_____ Bold	_____ Envious	_____ Organized	_____ Talkative
_____ Careless	_____ Extraverted	_____ Philosophical	_____ Temperamental
_____ Cold	_____ Fretful	_____ Practical	_____ Touchy
_____ Complex	_____ Harsh	_____ Quiet	_____ Uncreative
_____ Cooperative	_____ Imaginative	_____ Relaxed	_____ Unenvious
_____ Creative	_____ Inefficient	_____ Rude	_____ Unintellectual
_____ Deep	_____ Intellectual	_____ Shy	_____ Unsympathetic
_____ Disorganized	_____ Jealous	_____ Sloppy	_____ Warm
_____ Efficient	_____ Kind	_____ Sympathetic	_____ Withdrawn

SECTION 5: ABOUT YOU

4.1 Please select your course from the following:

a. RN Diploma/Degree	<input type="checkbox"/>	a1 Adult a2 Child a3 Mental Health a4 Learning Disabilities	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	a5 Current year of course	<input type="checkbox"/>
b. RM Diploma/Degree	<input type="checkbox"/>	b1 Current year of course	<input type="checkbox"/>		
c. Postgraduate (Masters)	<input type="checkbox"/>	c1 Length of course (yrs)	<input type="checkbox"/>	c2 Current year of course	<input type="checkbox"/>
d. CPD module	<input type="checkbox"/>				
e. ODP	<input type="checkbox"/>	e1 Current year of course	<input type="checkbox"/>		

4.2 Please select your gender

Male	<input type="checkbox"/>
Female	<input type="checkbox"/>

4.3 Please select your relevant age group

Under 20 years old	<input type="checkbox"/>
21 - 30	<input type="checkbox"/>
31 – 40	<input type="checkbox"/>
41 – 50	<input type="checkbox"/>
51 – 60	<input type="checkbox"/>
Over 60 years old	<input type="checkbox"/>

Thank you for taking the time to complete this questionnaire