Dyslexia in Higher Education:

An exploratory study of learning support, screening and diagnostic assessment.

Dorota Zdzienski, November 1998

Abstract

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There has been a notable lack of research, reported teaching experience and standardisation of assessment procedures for dyslexic learners in Higher Education. This is endorsed by the findings of a National Survey on Dyslexia In Higher Education (Singleton, in press). This study investigates the nature of learning support, screening and diagnostic assessment procedures for dyslexic students at Higher Education level.

This study necessitated the review of successive definitions of dyslexia, together with dispelling some of the myths that surround it and documenting the moves to make provision for special educational support at government level. A literature review of major publications in the field from 1895 to 1998, predominantly from the UK investigates information on the causes and features of dyslexia.

A series of six individual case studies were drawn upon to examine students' learning experiences and explore the effectiveness of a variety of study support methods, some of which have been developed by the researcher.

In total, the research studies and experimental work on design and trialling of screening and diagnostic tests involved 2000 students across many subject disciplines, from the Universities of Kingston and Surrey, of whom 200 were dyslexic.

Data was collected on student performance in cognitive and attainment tasks and analysed quantitatively to establish mean performance levels. Qualitative analysis was also employed to identify study skills difficulties and areas where dyslexic students showed differences in their responses to tasks compared to those of their non-dyslexic peers. The resultant wider approach to diagnosis is based on profiling areas of relative strength and weakness in study skills, and includes reporting on learning style preferences, in addition to the identification of dyslexia.

The final stage of the research was the development and production of a computerised screener, 'QuickScan', which draws on the various and diverse aspects of student needs with the aim of establishing a screening procedure which would answer as many of these needs as could be feasible.

5.2　The development of a screening procedure - 'QuickScan': a study styles, study skills and dyslexia questionnaire

'In a recent National Conference on Dyslexia in adults, the principal concern was not whether dyslexia existed but rather 'how' dyslexia is to be reliably identified amongst the Higher Education population'. (Beaton, McDougal & Singleton 1997).

A recent HEFCE report on pre-assessment screening (Singleton, Trotter and Smart 1998) presents the results of a survey of screening methods. 49% of institutions apply a qualitative assessment of reading and writing skills, and the main issue that this raises is how the experience and knowledge of the assessor relates to the reliability of the assessment method. It may therefore be appropriate to question the use of qualitative tests as screening instruments.

From the same survey it was found that 72% of institutions use a dyslexia checklist as their main screening method. (For full details of the survey see Dyslexia in Higher Education, Zdzienski 1998, section 5.3.10).

As SpLD can co-exist with English as a second or other language difficulties or general study skills needs, it would be helpful to have a single screening procedure for identifying all of these aspects of need for learning support.

Currently the staff/student ratio in the support services often makes it very difficult to cater for all students, and the service is frequently based on a self-referral system which not all students make use of. It would be potentially cost-effective and possibly appealing to a wider range of students, if an individualised computer based screening procedure could be put in place for students to use independently, and, should they wish, follow up with requests for staff advice and support for learning.

The design of such a screening procedure was one of the aims of the main study and is reported in this section. The resulting questionnaire entitled QuickScan (ISL 1997) was compiled and developed by the researcher and programmed for computer by ISL working in close association with the researcher.

5.2.1. <u>Research Background</u>

In practice there are economic implications which inhibit planning for large scale screening one of the greatest obstacles being the impact on staff time of marking all the scripts.

There are several dyslexia checklists and lists of symptoms available with reference to SpLD/Dyslexia (Dyslexia in Higher Education, Zdzienski 1998, section 3). Some of these could be deemed too general to be systematically implemented at this level. However, in this study, the widely known BDA (British Dyslexia Association) Adult Checklist, which is recommended by the ADO (Adult Dyslexia Organisation) and has been employed in a range of studies (Turner 1997), was selected for use in an adapted form suitable for issue to large numbers of students. For its target audience the adaptation was intended to give it a more appropriate and accessible format, namely that of a questionnaire about individual learning styles and study skills.

Vinegrad's (1994) research supports the reliability of the Adult Checklist as a means of identifying dyslexia among adults. This is further supported by personal observation of over 60 students who had had independent dyslexia assessments within a university population, and with whom there was rarely any significant mis-match between the results of the Adult Checklist and the consequent confirmation of dyslexia by the Educational Psychologist (Zdzienski, HEFCE Project - Kingston University 1993 - 1995). In some cases students selected perhaps fewer of the checklists positive indicators, but still enough to alert the tutor's attention to the self reported existence of memory, sequencing and directional difficulties.

In Vinegrad's research, an additional finding was the 'extreme hesitation' of dyslexic individuals in responding to the Adult Checklist compared to others who tended to tick the relevant boxes in a 'rapid fashion'. The difficulties that these particular individuals experienced in having to make quick decisions was regarded in itself as being a 'powerful indicator of dyslexia'.

It was decided that the components of the screening procedure would not only include those areas of difficulty frequently cited in the literature as having been expressed by dyslexic learners (See 4, 5, and 6. below), but also attempt to explore learning style preferences (in terms of 1, 2 and 3 below).

1. Kinaesthetic: Learning by direct physical involvement with the material to be learnt.

2. Auditory: Learning using the aural modality, verbalising the material to be learnt.

3. Visual: Learning through seeing and visualising the material to be learnt.
4. Subject's self image as a learner.
5. Sequencing problems.
6. Memory related difficulties.
7. Adult Dyslexia Checklist (BDA)
8. QuickScan Dyslexia Checklist (A checklist of generally acknowledged potential indicators of dyslexia.)

5.2.2 <u>Proposed components of an exploratory screening procedure:</u>

In addition to individual screening, an important aim of the programme was to take maximum advantage of computerisation to collect and store data on a much wider range of potential influences on learning than those specifically included to produce results for feedback to the student.

One such example is the possible connection between crossed laterality or ambivalence of lateral functions, left/right confusion and learning difficulties. By collecting appropriate data further light might also be shed on family incidence, creativity, bilingualism, and the Irlen Syndrome. (Scotopic sensitivity).

5.2.3 Exploring and assessing learning styles

'Students with dyslexia need to recognise, value and develop their particular learning style in order fully to utilise their strengths and circumvent their weaknesses'. (Singleton, in press).

At the Fourth International Conference of the Society for Effective Affective Learning (SEAL), held in 1991, Michael Lawlor and June McOstrich carried out a workshop which explored learning styles. *'One of the errors of the past has been the assumption that we all learn in the same way and can be taught in the same way.'* (Lawlor, 1991). They created opportunities for audience participation, and helped the participants to find out what were their learning style preferences.

Some people learn best by seeing, others by hearing, and some in a kinaesthetic sense (through physical involvement).

Currently there is a particular interest in Further Education (as a result of a number of funded projects) in the concept of individual learning styles, and helping students to become more self-aware so that they can apply this self-knowledge to enhance their studies. It is probably for this reason that the QuickScan has been seen by several Further Education Colleges as potentially an appropriate resource for further research and development.

The Barsch Learning Style Preference Form , which has been developed at Ventura College, California, would be of interest for future comparative studies with the learning styles section of the QuickScan, as it also categorises its participants into visual, auditory and tactile (kinaesthetic) learners.

The screening device developed and described in this study (precursor of QuickScan) is intended to indicate not only weaknesses, but also areas of strength and personal learning style preference as well as study and language skills efficiency. As this screener is based on responses to a self reporting questionnaire it must be made clear that the results produced should not be seen as an attempt to formally assess sensory modality preferences. However, in indicating the choices students have made in a variety of situations presented to them, it reflects the modalities for which they have shown a preference and offers suggestions for working most efficiently with them.

There is currently considerable interest among dyslexia specialists in how learning disabled students best receive information. (Brant. 1998). Bringing this to the student's awareness is just the first step towards their gaining metacognitive control of their own learning strategies. Within the field of NLP (Neuro Linguistic Programming) much interesting work has already been undertaken in the area of identifying preferred learning modalities and experimenting with switching from one modality to another to explore personal potential. (Bandler and Mac Donald 1988). The issue here is not one of assessing modalities which are mutually exclusive, fixed entities, but rather one of encouraging awareness and exploration of each individual's most effective learning style or styles.

5.2.4 An Exploratory Investigation

After extensive exploratory work investigating the screening procedures for identifying dyslexia in adults, a set of 112 questions was compiled for use in a self-report style questionnaire covering the range of areas noted in the preceding section on components. The prototype for QuickScan was designed and trialled with a sample of thirty students from five institutions drawing from a range of colleges in London and Winchester with populations likely to be considered representative of sixth-forms and H.E. institutions in general.   (For the complete set of questions see appendix 5G). The variables from the resulting data were split into two types: continuous variables (scores), and categorical variables (i.e. yes/no, left/right).

The research design involved the pre-selection of three groups of ten students (dyslexics by self referral and by referral from their institutions, ESL (English as a second language students) and non-dyslexics both the latter groups being referred by colleges.

The contributing groups of students were from a Sixth Form College (St. Charles Catholic Sixth Form College in London) and in Higher Education (South Bank University in London and King Alfred's College of Higher Education in Winchester) and several adults were referred through the ADO (Adult Dyslexia Organisation) and the HDC (Hornsby Dyslexia Centre).

5.2.5 The results of the Investigation

The QuickScan Dyslexia Checklist total score was compared with that of the well established Adult Dyslexia Checklist which had been administered in identical circumstances.

The main findings were that on comparison of the means of the three groups (dyslexic, ESL and non-dyslexic, there was no significant difference in sensory modality preference (see Table 5.i)

Table 5.i: A summary of statistics for the variables for 30 subjects (part one).

Kinaesthetic		Dyslexic	Non-dyslexic	ESL
1.	Mean	7.7	6.5	7.7
	Median	7.5	7.0	7.0
	Standard Deviation	1.7	2.5	1.4
	Range	5 - 11	2 - 10	6 - 10

Auditory		Dyslexic	Non-dyslexic	ESL
2.	Mean	6.7	7.7	7.3
	Median	6.5	8.0	7.0
	Standard Deviation	1.7	2.3	2.4
	Range	4 - 11	4 - 11	5 - 12

Visual		Dyslexic	Non-dyslexic	ESL
3.	Mean	7.6	7.1	8.7
	Median	8.0	7.5	9.0
	Standard Deviation	2.1	2.0	1.9
	Range	3 - 10	5 - 10	6 - 12

Variables 4 to 8, however, all indicate significant evidence of differences between the mean scores for the three groups (see table 5.ii).

Table 5.ii: A summary of statistics for the variables for 30 subjects (part two)

Self Image as a learner		Dyslexic	Non-dyslexic	ESL
4.	Mean	5.7	3.3	4.3
	Median	6.0	3.0	4.5
	Standard Deviation	1.3	1.6	1.2
	Range	4 - 7	1 - 6	2 - 6

Sequencing problems		Dyslexic	Non-dyslexic	ESL
5.	Mean	8.2	1.2	2.5
	Median	8.0	1.0	3.0
	Standard Deviation	0.9	0.9	1.1
	Range	7 - 10	0 - 3	0 - 4

Memory related difficulties		Dyslexic	Non-dyslexic	ESL
6.	Mean	12.8	1.9	3.8
	Median	13.5	2.0	4.0
	Standard Deviation	2.8	1.0	1.3
	Range	9 - 16	0 - 4	2 - 6

Adult Dyslexia Checklist		Dyslexic	Non-dyslexic	ESL
7.	Mean	11.2	1.3	2.8
	Median	11.0	0	2.5
	Standard Deviation	0.8	2.1	1.3
	Range	10 -12	0 - 6	1 - 5

QuickScan Dyslexia Checklist		Dyslexic	Non-dyslexic	ESL
8.	Mean	23.7	3.9	7.2
	Median	24.0	3.0	7.5
	Standard Deviation	1.4	2.8	2.4
	Range	21 - 15	0 - 8	4 - 10

<u>Analysis of Variance</u>

Analysis of Variance (ANOVA) was carried out on all of the three groups for each given variance. Since there was sufficient statistical evidence to suggest that the mean scores were different on all of the categories listed above, Pairwise Comparisons were also carried out for each pair of the variables and p-values obtained.

In order to see if there was any relationship between the variables in the dataset, correlation coefficients (r) were obtained. These are presented below (see Table 5.iii). Where any significant association between two variables exist (a correlation coefficient of greater than 0.7), these are briefly discussed.

Table 5.iii: Correlation coefficients for the three sets of variables

CORRELATION COEFFICIENTS FOR THE VARIABLES FOR DYSLEXIC SUBJECTS								
	1.KIN	2.AUD	3.VIS	4.S.I	5.SEQ	6.MEM	7.ADUL	8.QUIC
1. KIN	1							
2. AUD	-0.2260	1						
3.VIS	0.78336	0.05685	1					
4.S.I.	0.44392	-0.0926	0.59522	1				
5.SEQ	0.32661	-0.5254	0.33951	0.23504	1			
6.MEM	0.68979	-0.6006	0.35204	0.60941	0.27827	1		
7.ADUL	0.62863	-0.4466	0.19094	0.37913	0.39854	0.78004	1	
8.QUIC	0.64872	-0.2254	0.67517	0.88455	0.22168	0.74380	0.45690	1

CORRELATION COEFFICIENTS FOR THE VARIABLES FOR NON-DYSLEXIC SUBJECTS								
	1.KIN	2.AUD	3.VIS	4.S.I	5.SEQ	6.MEM	7.ADUL	8.QUIC
1.KIN	1							
2.AUD	0.41400	1						
3.VIS	0.71927	0.45623	1					
4.S.I.	0.46607	0.41701	0.74823	1				
5.SEQ	0.61653	0.40602	0.41753	0.54678	1			
6.MEM	0.46016	0.52824	0.57307	0.77156	0.51067	1		
7.ADUL	0.46455	0.62564	0.66025	0.51789	0.48117	0.70401	1	
8.QUIC	0.71205	0.66757	0.69587	0.57974	0.73073	0.66348	0.87483	1

	1.KIN	2.AUD	3.VIS	4.S.I.	5.SEQ	6.MEM	7.ADUL	8.QUIC
CORRELATION COEFFICIENTS								
FOR THE VARIABLES FOR ESL SUBJECTS								
1.KIN	1							
2.AUD	-0.0033	1						
3.VIS	0.48704	0.3121	1					
4.S.I.	-0.0067	-11778	-0.3987	1				
5.SEQ	-0.3264	0.0218	-0.3963	0.04435	1			
6.MEM	-0.5713	0.34339	0.10405	0.18924	0.07813	1		
7.ADUL	-0.2737	0.70109	0.14741	0.26202	1	0.48717	1	
8.QUIC	0.28702	0.36911	0.37932	0.09796	0.08763	-0.0934	0.51767	1

In the cases of Self Image as a learner, the Adult Checklist and the QuickScan Checklist, there is a significant difference between Dyslexic and Non-Dyslexic students, and Dyslexic and ESL students. However, the mean scores between the Non-Dyslexic and ESL student groups are similar. The relevant confidence intervals for these five sub-categories are presented below in Table 5.iv.

Table 5.iv: Confidence Intervals

	Parameter	From	To	Mean Difference	95 % Confidence Interval
1.	Self-image as a learner (total / 10)	Dyslexic	Non Dys	= 2.4	-1.5, 6.3
		Dyslexic	ESL	= 1.4	-2.3, 3.2
2.	Sequencing problems (total / 10)	Dyslexic	Non Dys	= 6.0	5.5, 8.5
		Non Dys	ESL	= -1.3	-3.1, 0.5
		Dyslexic	ESL	= 5.7	3.9, 7.5
3.	Memory related difficulties (total / 17)	Dyslexic	Non Dys	=10.9	3.3, 18.5
		Non Dys	ESL	= -1.9	-4.3, 0.5
		Dyslexic	ESL	= 9.0	0.7, 17.3
4.	Adult Dyslexia Checklist (total / 14)	Dyslexic	Non Dys	= 9.9	5.5, 14.4
		Dyslexic	ESL	= 8.4	6.3, 10.5
5.	QuickScan Dyslexia Checklist (total / 30)	Dyslexic	Non Dys	=19.8	10.9, 28.7
		Dyslexic	ESL	=16.5	9.9, 23.1

In the case of Sequencing problems and Memory related difficulties a significant difference is found between all three student groups, indicating that in these two important areas related to learning, dyslexic students can be identified as a clearly separate and distinct group.

Amongst the findings of this pilot study which suggest that further investigation may be merited, are the discoveries of very close correlation between, for example in the dyslexic students' group between:

1.   Self image as a learner and the QuickScan Dyslexia Checklist (R=0.88500)
2.   Memory and the Adult Dyslexia Checklist (R=0.7800)
3.   Memory and the QuickScan Dyslexia Checklist (R=0.7440)

Furthermore close correlations were found within the non-dyslexic group between:

1.   The Adult Dyslexia Checklist and the QuickScan Dyslexia Checklist (P=0.8748)
2.   Self Image as a learner and memory (R=0.7700)

5.2.6 A Larger Scale Study

In the light of the pilot study, the refined questionnaire, 'QuickScan', (ISL 1997) was completed. It placed dyslexia within the context of a wider 'learning continuum'.   It included questions relating to many of the commonly accepted and researched positive indicators of dyslexia interspersed with the range of other questions which related to students' self perception of their strengths and weaknesses in relation to study. It is hoped that the refined QuickScan, now presented in a computer administered format will provide all students with a tool for examining themselves as learners, getting some practical and immediate feed-back, and more importantly, receiving some indication as to whether they may be dyslexic. In such cases they would be recommended to make an appointment with the Study Support Tutor.

A larger scale study with sixty students in higher education is nearing completion at the time of writing this chapter. The sample, drawn from two universities, Leicester and Ulster include thirty dyslexic students. The administration of QuickScan by computer has been found to be reliable (R=0.9). The comparison of the means of the dyslexic and non-dyslexic group confirm that the analysis of the questionnaire data is capable of discriminating between dyslexics and non-dyslexics.

Whilst QuickScan contains over 100 questions, compared to 20 in the Adult Dyslexia Checklist, it takes non-dyslexic students between 8 and 15 minutes to complete. Depending on individual reading and decision-making speeds, it is likely to take dyslexic students longer.

On the basis of experimental results during development it has been interesting to note that for dyslexics the length of time taken to complete QuickScan does not increase in linear proportion to the greater number of questions. Although there are five times more questions than on the Adult Checklist, it does not take dyslexics five times as long to complete. So far as has been observed dyslexics complete QuickScan in about twenty minutes.

As QuickScan is now available on computer it will be possible to check the total length of time students take to respond to all the questions as well as the number of times they amend their answers. This will yield some further data regarding one of the important issues in both the diagnosis and support of dyslexic students, namely their speed and efficiency of processing written information compared to that of non-dyslexic students.

In addition, the advantages of the QuickScan include the fact that it is self-administered, automatically analysed, and can provide immediate feedback to each student in the form of a printed report.

5.2.7 Information about QuickScan

QuickScan is Part One of a two part computer-based assessment programme, named 'The StudyScan Suite' (ISL, 1997) which can be purchased by institutions of Higher and Further Education.

QuickScan, the 15 minute questionnaire is devised for use on a computer network. It is for adults who want to explore the way they learn in terms of their individual learning preferences and study habits. The results of the completed questionnaire are computer analysed to produce useful personalised study guidelines on screen or in printed form.

The resulting profiles indicate whether students need study skills support and/or whether a full dyslexia assessment is appropriate.

The computer programme includes the facility to outline the services and contacts available in the institution where the student is registered.

QuickScan is not a test as such but a self-reporting questionnaire. It has been constructed in the format of a 'yes-no item' model with over a hundred items. The only departure from a yes-no response is the inclusion of 8 'left or right' responses where students are asked to indicate their preferred hand or eye for a given function (e.g. *Do you write with your left or right hand?*).

Clearly the main disadvantage with this model is the necessity to simplify both questions responses. However, it is emphasised that for questions where respondents might validly chose either answer, they should opt for the one which is generally the truer response. The questions have been worded carefully, for example they are expressed in the following terms:- *'Do you tend to...'* or *'Do you generally find that...'*

The on-screen computer instructions ask students to respond with the first answer that comes to mind and to work their way quickly through the programme as questions are presented. The formulation of questions has been refined after a first pilot and ambiguities minimised.

There are 110 questions in total, which are presented in a randomised sequence in any sitting. This has been done to minimise the possibility of students remembering previous sittings of the programme and thus ensure the most spontaneous possible response.

A bar graph indicates the percentage of the items that has been completed. Students can select from three options, the font size (10, 12 or 14) and background colour (white, yellow or blue), and can change them if desired during the questionnaire.

5.2.8 A sample of ten questions selected from QuickScan

This random selection of 10 questions illustrates responses given by students (See Table 5.v). Responses coded 'D' are the answers given by one of the dyslexic students, and those marked 'X' are from a non-dyslexic student

Table 5.v: Selected Questions from QuickScan

Code D = Dyslexic X= Non-Dyslexic		

Answer Code

Question		
'Do you consider that for general purposes your reading is fast enough?	yes	X
	no	**D**
Do you tend to hum, or to talk to yourself?	yes	**X**
	no	**D**
Is English your first language?	yes	**X**
	no	**D**
Can reading actually cause you to get headaches?	yes	**D**
	no	**X**
When you can't remember a particular spelling do you try to picture the word in your mind's eye?	yes	**D**
	no	**X**

Question		
Do you tend to mix up numbers, e.g. 281 for 218?	yes	**D**
	no	**X**
Have you on occasions been described by others as a talented person?	yes	**D**
	no	**X**
When you look back over your hand written notes	yes	**D**

Question		
Do you write with your left or right hand? do you tend to find them difficult to read?	left	
	right	**X D**

The information gathered from the student responses is categorised and cross-referenced as they complete the questionnaire. The programme produces the results based on the proportion of positive indicators including difficulty with, for example, memory, sequencing, laterality, self-image as a learner, reading, study, etc. The emerging profile shows the students' preferred sensory channel for learning, namely, predominantly visual, auditory or kinaesthetic, or any combination of these.

A consistency scale (Cline, P., 1993) is being refined which will show the extent to which the student has responded in the same way to a question when it has appeared a second time using different wording, for example:

'Do you consider that for general purposes your reading is fast enough?' and 'Would you describe yourself as a fluent reader?'

Consistency of response is a particularly relevant factor in establishing the individual's preferred learning style. Practical suggestions for study are based on the emerging patterns of results from the questionnaire.

5.2.9 Learning Styles

Of the total of 110 questions in QuickScan nearly 30% relate to investigating the student's preferred learning style. Questions are based on the observable behavioural characteristics which have been researched as indicators of students' dominant sensory systems (Zaner-Bloser,1979). These are categorised into the three modality strengths of Visual, Auditory and Kinaesthetic. In the process of practical group experimentation it was found that many students have a mixed learning preference rather than a single one. Thus the QuickScan output has been refined to accommodate single double or even triple modality. This facet of modality was examined in the Hornsby NLP (Neuro-Linguistic Programming) Course (1992).

It is quite surprising to find that students are frequently unaware of their stronger sensory channel(s) for learning and they sometimes follow less personally appropriate ways of learning. It appears to be a liberating and positively helpful experience for them to discover the best way of approaching learning from the perspective of their 'strengths'.

The above finding is borne out by independent experience of supporting dyslexic students in Higher Education, where it was frequently found that some students would be unaware of their strengths. For example, one student, not realising that he was a particularly good visual learner had been continuously underachieving because he kept trying to use verbal methods for learning and was getting frustrated at the difficulties he was experiencing. Once he discovered that visual learning in fact involved a different approach, he was able to carry out tasks with greater ease and confidence, and to apply the concept of 'visualisation' and 'imagery' to a range of study situations.

Examples taken from case studies prior to the development of QuickScan of teaching to modality strengths and developing memory strategies appear in 'The Interaction between SpLD and NLP Techniques' (Zdzienski 1994)

5.2.10 <u>An example of the QuickScan response to a dyslexic student `D'</u>

An example is provided below to illustrate the QuickScan approach. The dyslexic student to whom we can refer as 'Student D', completed QuickScan (see table 5.vi below) and was found to be a predominantly Visual learner. The following study suggestions were provided for him by the computer programme printout:-

Table 5.vi Study suggestions for a predominantly visual learner.

'VISUAL KEY WORDS:

See, watch, imagine, picture, visualise, draw, look, display, clear sight

A visual learning preference means you learn best by seeing for yourself, and watching others demonstrating a particular skill. You need to look at materials which you are studying and be able to see the connections between different aspects of the subject.

Planning, colour-coding and categorising information in a visual way is very effective. Highlighting important areas of text, creating flow-charts, diagrams and in particular mind-maps would be a good way of storing materials, planning essays and revising for tests.

People who are very visual learners can often study for long periods with a high level of concentration and intensity.

Reading can be very enjoyable experience and can be interspersed by moments of vivid imagination on behalf of the reader.

Learning, therefore can be very effective when set within the context of a particular scene, and visual reminders can act as a good memory trigger.

Awkward spellings are most accessible by sight, and difficult words, specific terms and definitions, or various formulae can be remembered by visualising them.

Revision of such information is most memorable when produced on small cards which can be looked at frequently and regularly throughout the days before an examination.

If you are very visual then you can, and might at times, prefer to think in pictures and images rather than words.

Problem-solving, memorising and coping with stressful situations can sometimes be more easily achieved using mental imagery.

Thorough planning, and a meticulous and professional (neat) level of presentation are strengths.

Concentrated study is best carried out where there is a minimum of distracting movements and disorder.'

Additionally, student D's responses gave a clear indication of Specific Learning Difficulties, and therefore the following information (see Table 5.vii) was also provided for him:-

Table 5.vii: Recommendations made to student D

RECOMMENDATIONS	NO	YES
1. To have a consultation with the Learning Support Tutor		X
2. To make an appointment and do a full assessment		X
3. To enrol on a study skills Course		X

1. For a consultation please contact
......location ....
tel.no. etc. ....

2. For a full assessment please contact
..

Additional Information: e.g. English
Language Centre is at ....

3. For study skills support please contact ....

The bottom section of this form is automatically completed by the institution's programme from data entered during the installation process.

5.2.11 <u>An Educational Psychologist's assessment of student `D'</u>

This candidate did, in fact, make an appointment for a full assessment with an educational psychologist, and was found to be dyslexic, with above average ability (Wechsler Adult Intelligence Scale), but with particular weaknesses in auditory working memory and coding processes. Additionally the full assessment process revealed that his reading comprehension skills (Scholastic Abilities Test for Adults) were above average when tested under Untimed conditions, but when Timed, his results fell into the below average category. Spelling was low average, and handwriting was described as 'slow and inefficient' with a 6% spelling error rate in written composition.

Speed of processing was generally below average:-

Reading at 95wpm (words per minute) compared to an adult average of 250 wpm
Writing at 19 wpm, compared to an adult average of 20 - 30 wpm.
Laterality functions were as follows:-
Handedness: Right
Eyedness: Right
showing a right sided lateral organisation for eye and hand function/co-ordination.
Left/Right awareness was rather confused.

Two recommendations were made by the psychologist with regard to written examinations. The first for additional time to complete each paper (at the rate of an additional 15 minutes per hour), and the second for allowances to be made for weaknesses in spelling and handwriting presentation.

A summary of this student's responses to QuickScan are presented (see Table 5.viii). These show a reasonable match with the findings of the independent assessment report.

Table 5.viii: Summary of student D's responses to QuickScan

Learning Profile Scale - indicating increasing difficulties from mild to severe
mild - positive - severe

Positive indicators of general learning difficulties	▓▓▓▓▓▓▓▓
positive indicators of SpLD (dyslexia)	▓▓▓▓▓▓▓▓▓
Memory - related difficulties	▓▓▓▓▓▓▓▓▓▓
Sequencing problems	▓▓▓▓▓▓▓▓▓
Visual problems which affect reading	▓▓▓▓▓▓
general reading difficulties	▓▓▓▓▓▓▓▓▓▓
problems with writing	▓▓▓▓▓▓▓▓▓▓▓▓
Further indicators:	NO YES
problems with spelling	▓▓▓▓
mixed laterality functions	▓▓▓▓▓
left/right confusion	▓▓▓▓
difficulties with maths	▓▓▓
CREATIVITY	▓▓▓

5.2.12 Results

The first results which were collated from the larger study group (Leicester and Ulster University student group) were analysed to determine the reliability of the Quickscan to identify students with dyslexia, and to see whether or not it could discriminate sufficiently between dyslexic and non-dyslexic students. The results are presented below:-

Discrimination of a 50 item questionnaire

between dyslexic and non-dyslexic students

1. Descriptive Statistics for the two groups

Students coded '0' are non-dyslexic, and those coded '1' are dyslexic. Table 1
provides descriptive statistics for the two groups on the 50 item questionnaire. This
is followed by histograms of the spread of scores for each of the two groups in
figures 1 and 2.

Table 1. Descriptive statistics

Descriptives

			N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
							Lower Bound	Upper Bound		
SCORE	DYSLEXIC	.00	31	95.9677	6.2848	1.1288	93.6625	98.2730	86.00	112.00
		1.00	30	115.2667	8.3291	1.5207	112.1565	118.3768	94.00	132.00
		Total	61	105.4590	12.1622	1.5572	102.3441	108.5739	86.00	132.00

Figure 1. Histogram of results for non-dyslexic students

Histogram

For DYSLEXIC= .00

Std. Dev = 6.28
Mean = 96.0
N = 31.00

SCORE
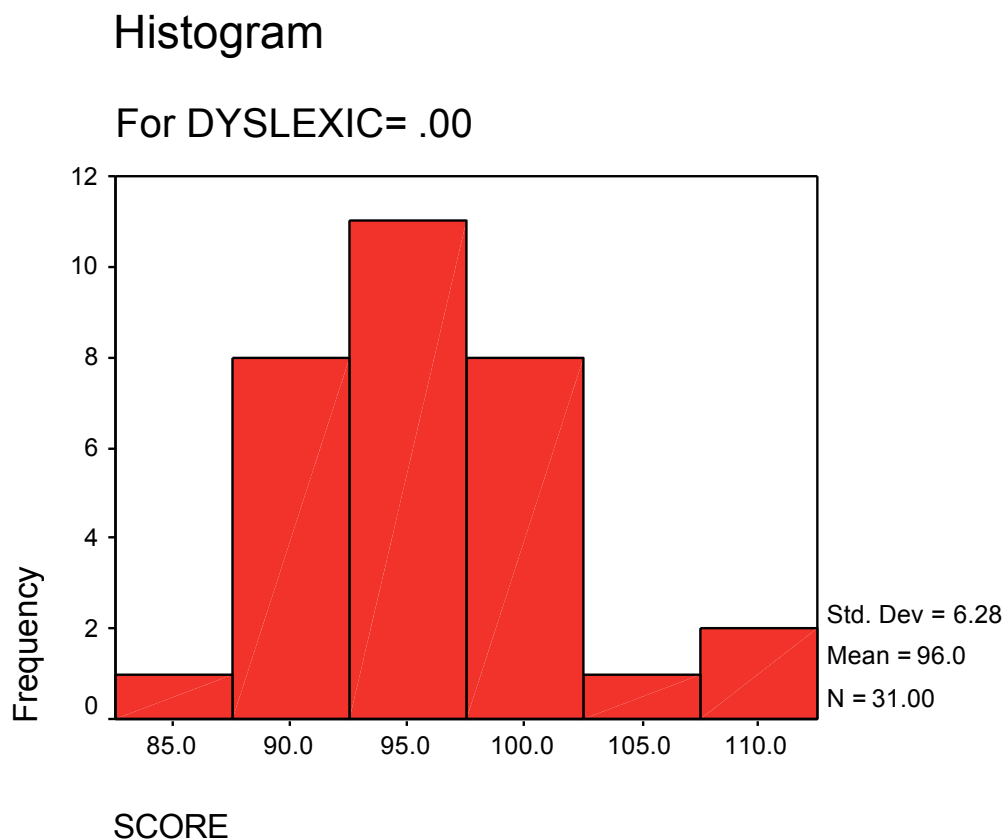
Figure 2. Histogram of results for dyslexic students.

Histogram

For DYSLEXIC= 1.00

Std. Dev = 8.33
Mean = 115.3
N = 30.00
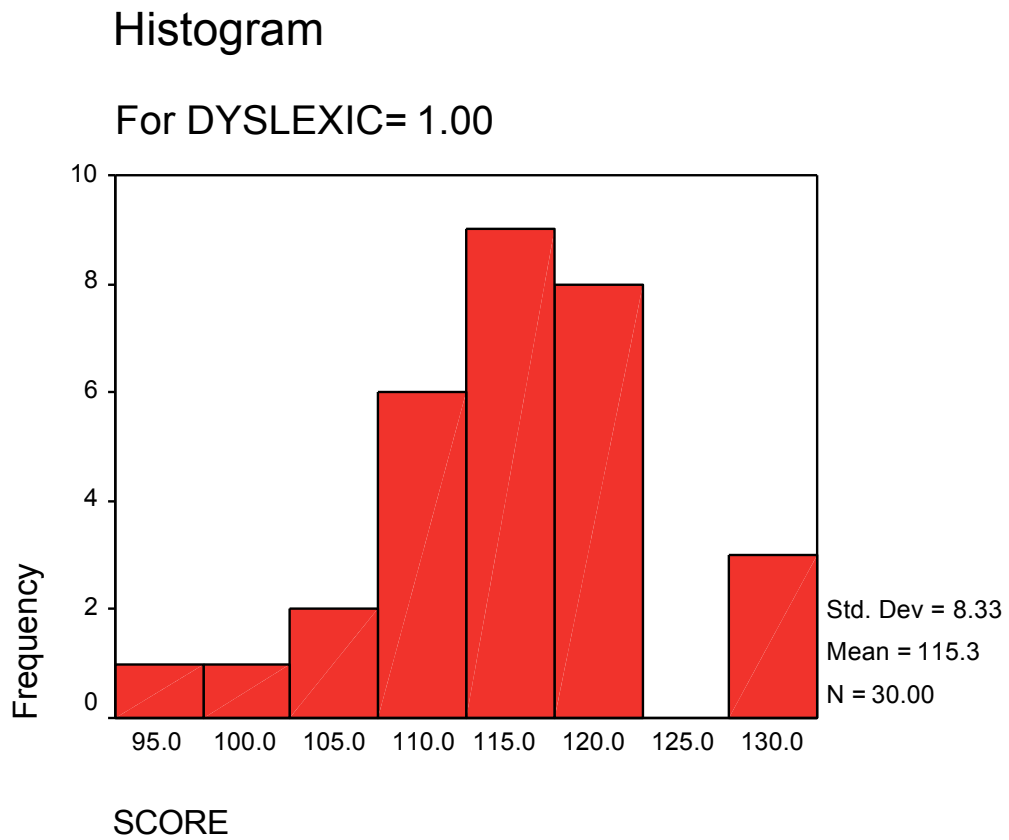
SCORE

2. Comparison of means

The means of the two groups were compared using a one way analysis of variance (ANOVA). Figure 3 is a boxplot of the results, and table 2 the results of the ANOVA. This clearly shows that the scaled scores from the questionnaire data is capable of discriminating between the dyslexic and non-dyslexic group.

Figure 3. Boxplot of results for the two groups
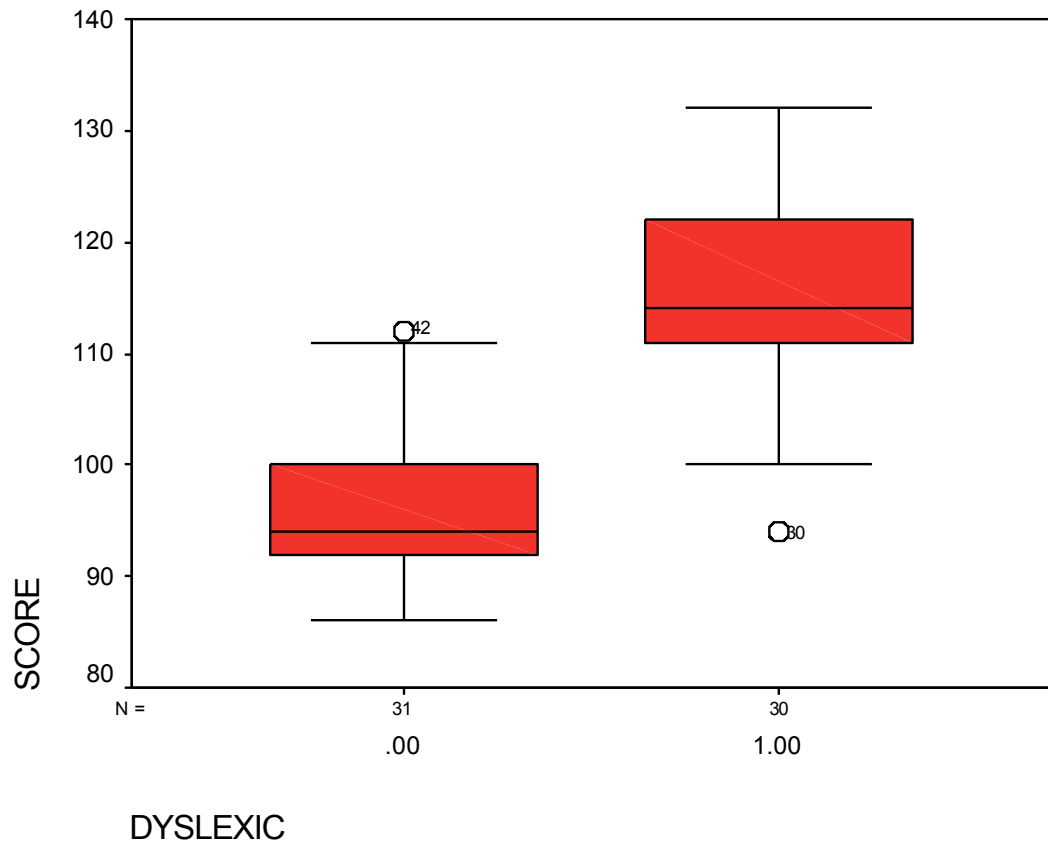
Table 2. ANOVA results

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
SCORE	Between Groups	5678.313	1	5678.313	104.798	.000
	Within Groups	3196.834	59	54.184		
	Total	8875.148	60			

3. Conclusion

A cut score of 105 on the scaled score would probably give maximum discrimination between dyslexic and non-dyslexic students, given that there is a three point error in either direction on this score.

5.2.13 <u>Discussion of results</u>

The results reported above are produced from both the initial pilot study and the further group of 60 students currently in Higher Education, of whom 30 are dyslexic. This work is being carried out with the co-operation of the Psychology Department of Ulster University and the School of Education and Student Support Services of Leicester University. The estimated reliability of QuickScan in its first administration via the computer screen has been measured to be 0.9. The comparison of means of the two groups (30 dyslexic and 30 non-dyslexic students) using a one way analysis of variance (ANOVA) clearly confirms that the questionnaire data is capable of discriminating between the dyslexic and non-dyslexic group (Zdzienski in press).

<u>Laterality</u>

Difference between mixed laterality, right or left sidedness and left/right confusion for the three student groups has been noted but not yet statistically tested. It was considered advisable to include a larger group for the study of these variables. However, from the Leicester University study group (table 5.ix) comprising 19 dyslexic students and 16 non-dyslexic students the following figures emerge:

Table 5.ix Laterality

	right side	left side dominant	ambiv/mixe	left/right confusion
dyslexic students	26%	16%	58%	37%
non-dyslexic	57%	18%	25%	18%

Further analysis will need to be carried out on larger groups in order to confirm or amend these findings. Many tutors and other professionals working with dyslexic students for a number of years would confirm it to be their experience that more dyslexic students appear to have an ambivalence of laterality functions compared to their non-dyslexic peers.

Currently, because of a lack of research evidence to say otherwise, many Educational Psychologists no longer consider it relevant to even report on the students' laterality in their dyslexia assessment reports. In fact, this topic features under the sub-heading 'What are *not* signs of dyslexia?' (Turner 1997) and the

McCarthy Scales (1972) are referred to at which time it was found that 40% of the general population was 'cross-lateral', thereby seemingly negating its relevance, as either a predictor or a significant symptom of dyslexia. The issue of laterality is thus dismissed by Turner as a feature 'likely to proceed from a different origin from dyslexia'.

In the light of the early findings of this study, it may in due course be considered difficult to dismiss the possible relevance of laterality to dyslexia. It will be possible (through this computer programme) to gather more data on this 'controversy-riven' topic, before reaching any conclusions.

Familial Factors

QuickScan asks the student to indicate whether there is any incidence of dyslexia in the family, and this is taken as a strong indicator of dyslexia for a student who is experiencing difficulties.

It is generally accepted that a positive family incidence is the first major risk factor, as 80% of cases can be identified in this way (Vogler, Defries and Decker 1985). It is interesting to note, therefore, that in the results of the study (including Leicester and Ulster students) 80% of the dyslexic students answered positively, compared to only 5% of the non-dyslexic students. From the non-dyslexic group a few students emerged who participated in the tests because they had difficulties but had not been assessed before, and they indeed may be dyslexic students who have compensated to a greater or lesser extent. The figure therefore could be closer to 1%.

Spelling Difficulties

One of the most persistent difficulties dyslexic people encounter is in spelling (McLoughlin, Fitzgibbon and Young 1994). It is interesting to note that 95% of the dyslexic study group reported continuing problems in this area compared to 20% in the non-dyslexic study group.

Learning Styles

Interestingly, there appears to be no difference between the three groups in the mean assessments for Kinaesthetic, Auditory or Visual sensory channels. Although the more recent results from the Leicester student group shows 10% greater preference for a kinaesthetic mode of learning among the dyslexic students. However, there is clearly a benefit in raising students' awareness of their preferred sensory channel in learning, for the purposes of more effective study and improved scholastic performance.

Sequencing and Memory

In this study, significant differences between the groups' means are noted in the Sequencing, Memory, and Dyslexia categories. The most relevant distinction between dyslexic students and their non-dyslexic peers in Higher and Further Education may well be in those areas that are most affected by any deficiency in sequencing and memory skills.

5.2.14 Conclusions

There is already evidence to suggest cautiously that QuickScan may be able to play a useful part in helping students to maximise their study performance and be guided where appropriate towards dyslexia assessment and specialist tuition.

The main implications for teaching, would be for training in sequencing and memory skills to play a key role in study skills support for dyslexic students.

There is case study evidence from the results of the HEFCE project (Dyslexia in Higher Education, Zdzienski 1998, section 2) to support the value of training and development programmes in sequencing and memory skills for dyslexic students at 16+.

QuickScan addresses a wider range of students than those with SpLD, providing feedback and study skills advice which students find helpful. It supplies additional information to support the individual tutor interview yet can be sought and received in confidence via computer administration. This I.T. procedure appears to be welcomed by students who can then proceed if they wish to apply for further advice from the learning support specialist.

5.2.15. <u>Future Implications</u>

In summary, current evidence supports the view that the administration of QuickScan as a first filter for large numbers of students can lead to appropriate further action as determined by the students in consultation with their Study Support Tutors and that the StudyScan Suite may prove to be an effective and accessible resource.
The implications can, for the dyslexic group can already be anticipated as including training in sequencing and memory skills.

Whilst there is no suggestion that it replaces the full assessment by an Educational Psychologist, early indications are that QuickScan is a valid and reliable indicator, which provides constructive, individualised study guidelines, and perhaps more interestingly at this point, increasing knowledge about the characteristics of the dyslexic group, for example with reference to their continuing difficulties with spelling, sequencing and memory skills and to the incidence of family traits. The trend suggests that the dyslexic group shows positive family incidence and increased information may illuminate the question of learning styles and modality preferences. It would be especially interesting to analyse the data for signs of *'dyslexic thinking styles and difficulties within a higher education context'*. (Singleton, 1999).

Current evidence from several users supports the view that the administration of QuickScan as a first filter for students can lead to appropriate further action as determined by the students in consultation with their Study Support Tutors. Comments include: *QuickScan is definitely n excellent teaching tool for work with dyslexics'* (Croydon College)

From September 1998, QuickScan will be on the network in several colleges. Currently the programme is being evaluated by the Open University, West Kent and Croydon Colleges, and it is being treated as a shared development, in which the relevant staff have had meetings and conveyed their comments, positive reactions, concerns and suggestions for amendments.

QuickScan is also being evaluated as part of an HEFCE initiative entitled 'Pre-Assessment Screening for Dyslexia in Higher Education' (Singleton, Trotter & Smart, 1998) at Hull University. A range of screening procedures is being investigated (checklist, interview, questionnaire, informal testing, computer screening) and the only other computer based programme on offer for this age/ability level is the Dyslexia Test (McLean, 1997) which is being developed at the Helen Arkell Centre. An evaluation form was sent out to colleges and universities and the interim report on responses presents an unsurprising survey result showing that 94% of institutions are currently using a personal interview as their primary form of screening, compared to 6% that are using computer based screening.

Table 5x.   Percentage of HEIs using each method in pre-assessment dyslexia screening.
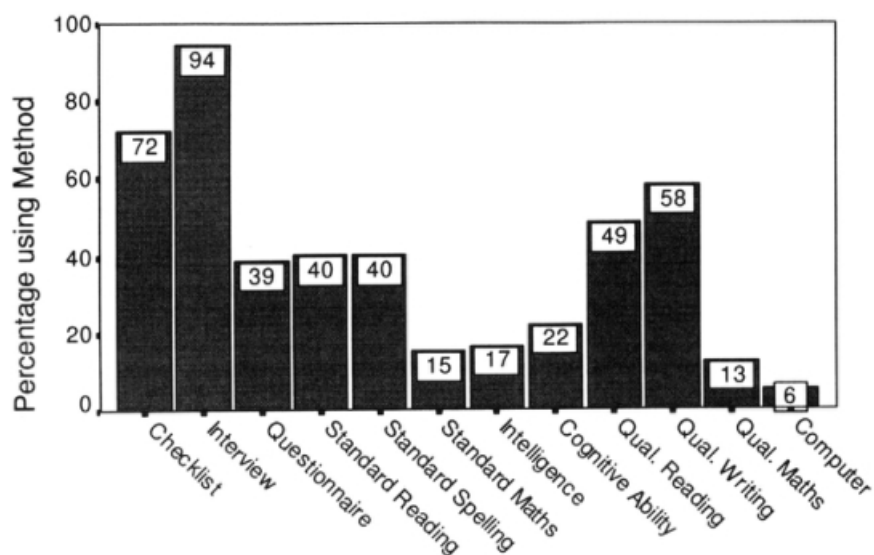
(Singleton, Trotter and Smart 1998)

The only problem is that personal interviews cannot easily cater for large numbers of students and are normally based on tutor or self referral, a computer screening programme can be accessible to all students and staff, and could result in early identification and support.

Screening: QuickScan

The experimental QuickScan has been delivered on the institutional networks of some twenty Further and Higher Education Institutions and is already being used as a first filter for the identification of students who may be dyslexic. It will also be of use to non-dyslexic students, as it will present them with a summary of their learning style preferences together with some relevant tips on study and revision.

QuickScan was found to be reliable (R=0.9)(see section 5.2.12) and analysis confirmed that the questionnaire data is capable of discriminating between dyslexic and non-dyslexic students (Zdzienski, in press). Quickscan is currently proving to have a comparability with Educational Psychologists' conclusions of between 90-95%, allowing for a small number of apparent false positives (not as yet confirmed since the students concerned had not been previously assessed), and some false negatives, mainly in cases of students with a history of dyslexia but who no longer appeared to be experiencing too many practical difficulties (i.e. they were 'well compensated') Beyond the original aims of the study it has further been found that QuickScan can also be used with equal success rates in a small number of secondary schools for the15+ age group.

The QuickScan programme is capable of differentiating between students who show positive indicators of dyslexia and those who simply have study skills difficulties but are not dyslexic. It also includes indicators which identify students for whom English is not their most fluent language. With further development the programme could have a wider application than was originally envisaged. It appears to be able to differentiate between dyslexic students and those students with basic English language difficulties.

Tutors have found the learning styles profiles useful as discussion documents in subsequent individual and group tutorial sessions with their students. Some have commented that QuickScan fulfils some of the recommendations of the Tomlinson Report (1996 Report of the Further Education Funding Council Learning Difficulties and/or Disabilities Committee) by encouraging 'inclusive learning'. There is currently a new project in progress (at West Kent College) aimed at examining students' preferred learning styles and which employs QuickScan as the primary vehicle for the collection of data.

Since the experimental version of QuickScan was developed, other computer based screening programmes have been produced (e.g. The Dyslexia Test, McLean 1997 - under development).

The National Working Party Report lists QuickScan and StudyScan under the title "New Approaches to Screening" stating that the advantages of computer-based assessment of dyslexia can be considerable - *'not only are there savings in cost and time, but also in the case of adults, assessments can be self-administered and therefore confidential'*.

Whilst it may be too early to draw conclusions regarding the efficiency, and more fundamentally, the actual desirability of a)computer-based screening and b) computer-based assessment, the implications are many and diverse, and there is much further research to be done in this area.

The long term implications of this study are that eventually it may be possible for the computerised generation of study support programmes and even materials at the appropriate level to enhance existing provision in Higher Education.

'Computer based assessment can provide the opportunity for the integration of learning and assessment and making probable immediate and effective feedback to students. Computer based assessment has greater potential than paper based systems for access and flexibility for both students and tutors and for the effective management, collation and transfer of assessment information.' (Bull 1996).

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