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A comparison of ScOT and SCISSH as subject retrieval aids in school library catalogues

Philip Hider and Ashley Freeman

Abstract

This article reports on a research project that investigated whether a recent version of the Schools Online Thesaurus (ScOT) provides an improvement on SCIS Subject Headings (SCISSH), or the contrary, for catalogue users searching by subject or topic. An experimental design was employed to evaluate the effectiveness of these two controlled vocabularies in quantitative terms. Test databases, hosted by the Schools Catalogue Information Service (SCIS) on their Voyager system, were used to represent different potential versions of a school library catalogue. A group of teacher librarians and students searched on these databases, their search results were rated for relevance and the performance of the databases was compared statistically.

Introduction

In 2006 the Schools Catalogue Information Service (SCIS), a national cataloguing service for Australian, New Zealand and international schools, began adding subject descriptors from the Schools Online Thesaurus (ScOT), a controlled vocabulary of terms used in Australian and New Zealand schools, to some SCIS bibliographic records in addition to SCIS Subject Headings (SCISSH), the established and more traditional controlled language approach used by Australian and New Zealand school libraries. Most of the records added to the SCIS database since July 2007 have both sets of headings as SCIS cataloguing agencies now add ScOT descriptors to the bibliographic records they create. Consequently descriptors from both controlled vocabularies are now present on over ninety thousand bibliographic records that can viewed, with both sets of headings, on SCIS OPAC. The ScOT descriptors are distinguished in bibliographic records on SCIS OPAC by the addition of 'scot' after the relevant terms in the 'Subject headings' field while SCISSH terms are followed by 'scisshl' as shown in the following example.

Figure 1. SCIS record with ScOT and SCISSH

SCIS No: 1386751

ISBN: 9780753415375

Title: 10 explorers that changed the world / written by Clive Gifford ; illustrated by David Cousens.

Other Titles: Ten explorers that changed the world

Publisher: London : Kingfisher, 2006.

Description: 64 p. : col. ill., maps.

Main Author: Gifford, Clive.

Contributors: Cousens, David.

Subject Headings: Explorers - Biography. scisshl

SCIS offers its customers a choice of downloading records with either or both controlled vocabularies. Almost universally schools only receive SCIS subject headings on the bibliographic records they download from SCIS Web which is the option currently recommended by SCIS. Schools are not encouraged by SCIS to use both ScOT descriptors and SCIS subject headings in their online public access catalogues (OPACs) unless they fully understand the ramifications of such a decision and have an integrated library management system that can accommodate and distinguish between both vocabularies. Nor are they encouraged to use ScOT alone unless they fully understand the implications of that decision (Curriculum Corporation 2007). At the present time SCIS's main reason for adding ScOT terms to SCIS bibliographic records is to create an available store of bibliographic records with ScOT descriptors if a decision is ever made to replace SCISSH with ScOT as the, or the predominant, vocabulary on SCIS bibliographic records. Currently, the principle use being made of ScOT is as one of the controlled vocabularies used to index online resources provided by Education Network Australia (EdNA) and The Le@rning Federation (TLF).

Discussion about the merits of replacing or not replacing SCIS subject headings with ScOT descriptors has, to date, largely taken place within SCIS. Advocates for ScOT claim that the thesaurus provides a more user-friendly vocabulary for both searcher and indexer, with a clearer and more conceptually accurate hierarchical structure, which is more likely to support retrieval beyond the conventional library catalogue. Others question whether ScOT is sufficiently developed and broad enough in scope to satisfactorily replace SCISSH which has been regularly reviewed and extended since its development in the 1980s. Concerns about the practicalities and implications of such a major change have also been voiced.

A key question for Australian and New Zealand teacher librarians is whether ScOT could provide subject access to resources in the OPAC which is *at least* as effective as that provided by SCISSH. If so, then ScOT's additional, and growing, coverage of resources beyond the OPAC may well make it the vocabulary of choice, since it would potentially facilitate more consistent results from federated searches. The proposition does have a proviso, namely, that the cost of using ScOT is no greater than that of indexing using SCISSH.

This paper reports on a research project that investigated whether a recent version of ScOT provides an improvement on SCISSH, or the contrary, for catalogue users.

Schools Online Thesaurus (ScOT)

Perceived weaknesses of traditional lists of subject headings such as SCISSH and Library of Congress Subject Headings (LCSH), on which SCISSH is partly based, have led to initiatives in various disciplines and subject areas to construct specialist vocabularies based on a more systematic and faceted approach, and on a richer and more current terminology. A typical example might be the development of the *Music Thesaurus* reported by Cronquist (2004). Other initiatives have aimed at developing more general vocabularies, sometimes for specific audiences, and ScOT is an example of this, as is FAST (Faceted Application of Subject Terminology), which is essentially an attempt to restructure LCSH (Jin 2008).

Similarly, ScOT is an alternative to SCISSH, in providing access to resources used within Australian and New Zealand schools. It largely replaces pre-coordinated strings of terms with separate descriptors suitable for post-coordinated searching. For example, an encyclopaedia of animals which would be given the SCIS subject heading 'Animals – Encyclopaedias' would instead have two ScOT descriptors, 'Animals' and 'Encyclopaedias'. In this way, it is claimed to more readily accommodate the 'keyword' searching that has become the pervasive form of searching on today's OPACs. First, it updates some of the terminology, making it both more current and more 'user-friendly' (Haby 2002). Second, it is developed on the basis not only of literary warrant, but also 'user warrant', though this refers more to curriculum terminology (as found in Australian documentation) than to, say, school children's query terms (Haby 2003).

ScOT has been developed firstly as a discovery tool for online resources, then subsequently to provide access to the range of resources that are represented in the school library catalogue. One of its drivers has been the Schools Online Curriculum Content Initiative, now known as the Le@rning Federation, which aims to provide Australian schools with a wealth of online learning resources. Another driver is the Education Network Australia, which shares this aim, as represented by its EdNA Online project. The value of a controlled vocabulary, based on a well-constructed thesaurus, as a retrieval aid is recognised by developers of many high-end information services, and well-established databases such as ERIC, and subject gateways such as SOSIG, have successfully integrated thesauri into their interfaces (Shiri & Revie 2000).

Given the broad aims and scope of ScOT – it attempts to cover the entire Australian school curriculum, from preschool to year 12 (Haby 2002) – it is not surprising that its development has been incremental, and not without setbacks. The modular nature of ScOT's early construction led to various inconsistencies and gaps identified by Quinn (2005). The extent to which these deficiencies have been addressed is a moot point.

Controlled subject vocabularies and the OPAC

The effectiveness of controlled subject vocabularies has been of interest to librarians since the days of the card catalogue. With the advent of computers, this topic has involved not only comparisons between different controlled vocabularies, and discussion about how particular vocabularies could be improved, but also assessments as to whether alternative retrieval methods, such as full-text searching, are superior or similarly effective. The answers to these questions depend, of course, on the search

context, which involves particular types of user and particular information resources and their metadata.

Although school library catalogues currently represent resources which for the most part cannot be indexed as full text, there are many choices that may be made regarding retrieval method, or methods. For subject access, using bibliographic data alone – titles, subtitles, content notes, etc. – is generally considered significantly less effective than using it in combination with subject indexing, and preferably controlled subject indexing. Voorbij (1998) reports on how catalogue records for materials in the humanities and social sciences were considerably enhanced by subject descriptors in many cases, facilitating a much higher level of recall. Similarly, Gross and Taylor (2005) have shown that about a third of results would not be retrieved were it not for controlled subject vocabulary.

However, whether the difference in effectiveness is worth the cost of the subject indexing is another matter, particularly given the greater amount of content-related bibliographic data now included in many records, which is likely to have significantly reduced the difference. Again, the answer to this question depends on context – how much it costs to add subject terms, or to procure catalogue records that already include subject terms, and how effectively the school library OPAC utilises these terms, for example, by incorporating a subject authority file. The literature is replete with recommendations to share catalogue records wherever possible and to ensure that the reference structures developed in vocabularies such as SCISSH are utilised by one's library management system; the value of these structures is explained by Dowling (2001), amongst many others.

If it is assumed that controlled subject indexing is worthwhile, then the next question is which controlled vocabulary, or vocabularies. The pervasiveness of alternative retrieval systems, particularly Web search engines such as Google, has no doubt had an effect on how children (and adults) interact with library OPACs, and this has not been lost on OPAC developers, who are beginning to offer straightforward Google-like interfaces with basic keyword searching, automatic spelling correction, ranked output, and the like. Although they may not accommodate total search success, they appear capable of providing favourable returns (Hirsch 1997), which in turn has led to further interest in the development of faceted vocabularies, such as ScOT, as it is claimed that such vocabularies work better than traditional subject headings in such environments.

Some comparisons between vocabularies have focused on the extent to which their terms match; more evaluative studies have examined the extent to which a controlled vocabulary matches the terms entered by users (Eerola & Vakkari 2008). An example of the latter is an analysis carried out by Abbas (2005), which showed that middle school children in the United States often use search terms at odds with the established subject vocabularies, leading to the recommendation that new, more appropriate vocabularies are deployed in digital libraries built for children. Other analyses have examined the congruence between a controlled vocabulary and the terminology used by specialists through reference to their documentation. Thus Plummer (2006) describes how LCSH deviate from the terms used by teachers and curriculum developers in the case of mathematics.

However, the effectiveness of a controlled vocabulary is not simply a matter of its approximation to users' vocabulary, which may itself vary according to search context, or any other vocabulary. Controlled vocabularies may also be more or less effective according to their consistency, their reference structure, including its coverage of non-preferred terms, their subject coverage, and their adaptability. Such characteristics may be examined qualitatively, in the abstract, but this does not provide evidence of a vocabulary's overall effectiveness in real-life information seeking.

Since observing effectiveness in a real-life setting presents major difficulties in eliciting from users information about the search goals and relevance of results, as well as being intrusive, most evaluations of subject indexing have been based on experiments that have attempted to simulate real-life search contexts through the use of test datasets containing records of actual documents that have been manually assessed for relevance – such experiments, in fact, date back to the origins of information retrieval as a field of research. An example of a more modern experiment is Srinivasan's study of MeSH and citation-based indexing (1996), in the context of the MEDLINE database. The advantage of using a closed, pre-assessed dataset is that both recall and precision measures can be calculated, providing a fuller picture of the potential of each vocabulary.

The information retrieval experiment has, however, been criticised for failing to simulate real-life information seeking closely enough. Experimental measures of relevance are usually dichotomous – a resource is assessed as either relevant or not relevant – and often based solely on topicality. We know that in real life, relevance is often much more complex. Experiments also tend to be based on custom-built systems instead of systems with more basic functionalities found in the commercial world. Most importantly, perhaps, experiments measure relevance rather than use or information acquisition – it does not necessarily follow that a greater recall or precision ratio will result in a greater use of resources, or, in the school library context, more learning.

These criticisms can probably be never fully addressed for as long as they remain controlled, but their design can be adjusted to make their results more relevant to real-life situations. The experiments described in this paper have been designed with the context of the school library OPAC firmly in mind.

Research design

An experimental design was employed to evaluate the effectiveness of the two controlled vocabularies in quantitative terms. Three experimental databases, hosted by SCIS on their Voyager system, were used to represent three potential versions of a school library catalogue. The databases contained the same approximately thirty thousand SCIS bibliographic records: one database contained the records stripped of their ScOT descriptors; another database contained the records stripped of their SCIS subject headings; and a third database contained the records stripped of both ScOT descriptors and SCISSH. The records did not include any other subject indexing, but did include titles, subtitles, contents and summary notes, etc., which often indicate subject coverage. The SCISSH-only and ScOT-only databases included the corresponding subject authority files. It should be noted that the ScOT descriptors

were taken from those versions of ScOT current at the time of indexing, in other words, versions operational in 2006 and 2007.

Sixty topics were compiled to represent typical subject search goals across a range of curriculum areas and subjects from the New South Wales Board of Studies syllabus for years 7 to 10 and the Higher School Certificate syllabus (years 11 and 12). The topics were provided by teacher librarians from several secondary schools (state and private) in the Riverina region of New South Wales as topics on which materials are typically searched for by students undertaking class assignments, and selected on the basis of their distinctiveness, distribution across the curriculum areas and across the NSW stages 4, 5 and 6 (which represent grades 7-8, 9-10 and 11-12 respectively). The topics were also considered appropriate by senior SCIS staff members who were consulted. The list of topics is provided in Appendix A.

Both students and teacher librarians were invited to search for the resources in the databases that might contain information relevant to the topics, but to search in two different ways: the students were asked to perform keyword searches, while the teacher librarians were asked to search through the controlled vocabularies, making full use of the vocabularies' reference structures. This did not directly cover the effect of the vocabularies on iterative searching, nor post-result browsing on a faceted navigation system, but it was considered to cover the major subject search behaviours at the OPAC.

Four teacher librarians familiar with ScOT and SCISSH thus performed 'expert' searches, utilising the reference structure of the vocabularies, each teacher librarian covering all sixty topics – two teacher librarians used the ScOT-only database for the first thirty topics and the SCISSH-only database for the last thirty topics; the other two teacher librarians used the SCISSH-only database for the first thirty topics and the ScOT-only database for the last thirty topics. The teacher librarians were asked to perform only subject searches (and browses), but as many searches as they wished, citing the three resources that they considered most relevant (or most likely to be most relevant), bearing in mind the topic's intended stage; they were asked to spend no more than five minutes on any topic.

Six secondary students from Mater Dai Catholic College in Wagga Wagga – two students from stages 4, 5 and 6 – performed 'keyword' searches for the topics on the database with neither ScOT descriptors nor SCISSH, each student covering the twenty topics corresponding to their stage. The students were asked to find and cite at least one resource that they deemed relevant, or potentially relevant. Again, they were allowed to perform as many searches as they wished, but only 'keyword' searches in this case (this could include the use of Boolean operators), spending no more than two minutes on any topic.

The topics were also reviewed by one of the authors who submitted them verbatim as queries, but modified so as to omit non-content words. Logs of the students' queries showed a large overlap with the author's verbatim queries, but there was enough variation to allow for at least one significantly different query for many of the topics. Each topic's most promising looking variant, in terms of delivering new relevant items, was chosen and submitted as a second list of queries; where there no variants, the modified verbatim query was re-submitted.

The two lists of queries – modified verbatim and student-search derived – were then entered as keyword searches on the three databases – ScOT-only, SCISSH-only and neither – by a research assistant and the top five relevance-ranked hits (as given by Voyager) recorded.

The expert and student search results produced by the three databases were then rated for topical relevance by an independent teacher librarian, using the following three-point scale, bearing in mind the topic's intended stage.

(1) not relevant -- the resource is not relevant to the topic stated and is likely to be of little use to the student

(2) somewhat relevant -- the resource is somewhat relevant to the topic stated and is likely to be of use to the student

(3) very relevant -- the resource is very relevant to the topic stated and is likely to be of much use to the student

The same teacher librarian rated the three resources per topic cited by each of the expert searchers, and the five resources cited in the first results list produced by each of the 'keyword' queries. As it was not practicable to perform the relevance rating by examining all the items in hand (most were physical resources), the teacher librarian was asked to base her judgment, in the case of physical items, on the information found in their records, such as summaries and lists of contents but excluding subject indexing, and on reviews of the items found in online sources. Only a very small number of search results -- less than 0.1% -- were unable to be ranked (due to insufficient information).

The keyword experiment provided the opportunity for comparison not only between the performance of the two controlled vocabularies, but also between the performance of the other content-related indexing (based on titles, subtitles, contents and summary notes, etc.) and the performance of this indexing supplemented by one or other of the controlled vocabularies. The two sets of results, from expert and keyword searches, also allowed for an assessment of the added value that expert searching brings to document retrieval via a school library OPAC.

Results

The relevance ratings for the expert search results produced by the ScOT-only and SCISSH-only databases are summarised in table 1. Very little difference between the ScOT and SCISSH results across the rating scale suggest that in the reality of a typical school library and its OPAC, the two vocabularies can be used for more sophisticated subject searching with similar amounts of effectiveness. The large number of irrelevant hits may well be related to the size of the database and the specificity of the queries; in most result sets, there were at least some relevant hits for students to follow up on. The four 'expert' teacher librarians produced reasonably consistent rankings, as indicated by table 2.

 Table 1. Expert search results by database

	Using ScOT	Using SCISSH
Very relevant	121	121
Somewhat relevant	72	78
Not relevant	162	160
Not determined	5	1
Total	360	360

Table 2. Expert search results by expert

	Expert 1	Expert 2	Expert 3	Expert 4
Very relevant	70	56	56	60
Somewhat relevant	42	45	33	30
Not relevant	68	76	89	89
Total	180	177	178	179

Tables 3 and 4 summarise the ratings given to the top hits from the keyword searching. The results indicate that the two controlled vocabularies support keyword type searching to similar degrees, with the subject headings producing the best results with the verbatim searches, but least well with the variants. More surprisingly, however, the results also indicated that in the context of the school library OPAC, keyword searching supported by no subject vocabulary, and just the other bibliographic data (title, contents, etc.), is not necessarily less effective. The extent to which this result might be dependent on a system's particular relevance ranking algorithm needs further investigation. It would appear, however, that while records with subject headings/descriptors are likely to include more relevant terms, they may also, in some cases, lead to an over-emphasis of these terms at the expense of others, which may be critical when only the first five or ten ranked results are viewed.

This problem of applying relevance ranking algorithms to subject headings and descriptors may be particularly acute when they form part of phrases or strings which do not represent the query. For example, in the case of the topic 'culture and customs of Indonesia', records with subject headings such as 'customs and excise' will not help. A more sophisticated ranking algorithm might give more weight to a fully matching heading or subdivision, but this only reduces, and by no means solves, the problem.

Table 3. Verbatim keyword search results by database

	ScOT	SCISSH	Neither
Very	64	70	61

relevant			
Somewhat relevant	48	52	47
Not relevant	187	178	190
No hit	1	0	2
Not determined	0	0	0
Total	300	300	300

Table 4. Variant student keyword search results by database

	ScOT	SCISSH	Neither
Very relevant	52	51	61
Somewhat relevant	52	44	47
Not relevant	191	200	187
No hit	5	5	5
Not determined	0	0	0
Total	300	300	300

It is perhaps unfair to compare the results of the expert searches with those of the keyword searches, as usually the former supplement the latter, and are generally not performed in isolation. However, it may be noted that while the experts scored about as well as the relevance-raking algorithm with only three citations per topic, as opposed to the five that the system was allowed, they would have expended considerably more time and effort in doing so. The 20 verbatim keyword searches on the database with neither ScOT nor SCISSH produced 61 'very relevant' hits, which is more than three of the four expert searchers managed using the subject indexes.

Conclusions and discussion

The results of this research project indicate that the two vocabularies, ScOT and SCISSH, support both expert and keyword searchers of school library OPACs to quite similar degrees. Although the vocabularies' performance might be less similar in larger databases (such as the SCIS database or that of a public library network), teacher librarians are likely to be primarily interested in how they affect retrieval of their own school's resources. It may well be that differences are blunted due to the difference between surrogate records and their document – what counts at the end of the day is whether or not the student finds the resource itself useful, and records are inevitably only an approximation of the actual item.

This conclusion does not mean that ScOT has no more potential than SCISSH as a subject access tool. There are three important ways in which it might. First, as more of a school library's resources are accessed online, including those that they might share with other schools or with Web users at large, so the value of ScOT is likely to surpass SCISSH. Although theoretically these online resources might be indexed using SCISSH, the reality is that outside of the SCIS cataloguing world, ScOT is

likely to present a more accessible indexing system—to teachers and teacher librarians, and to resource producers and contributors.

Second, more advanced retrieval systems (i.e. catalogues) are likely to enhance searching through the faceted ScOT vocabulary than the less systematic SCISSH. While the Voyager system used in these experiments might be regarded as moderately advanced by the standards of today's commercially available school library management systems, it is by no means as advanced as those which are possible using today's technology. For instance, the Voyager search interface does not facilitate faceted navigation in the way that some of the newer OPAC modules do, and it is likely that ScOT would be a more effective vocabulary in this regard. The relevance ranking algorithm used in Voyager system is also probably not optimal – one that utilises not only the subject vocabulary, but its cross references, for example, is likely to be more effective.

Third, ScOT continues to be developed. The latest update to ScOT is version 6.3 which was introduced in February 2009. Identified issues are being addressed by the SCIS cataloguing agencies that are employing ScOT, as they are accustomed to doing with SCISSH. This should result in ScOT becoming more honed and pertinent to the OPAC environment that it has latterly been applied to.

Some school libraries or education systems may take up the option to use both controlled vocabularies in their OPACs. However, the two vocabularies share many similarities which minimise gain; the results of the keyword searches on non-subject data also suggest that adding layers of subject terms has limited returns.

While both vocabularies continue to be maintained and applied to SCIS records we have the luxury of choice. The costs of maintaining and applying both vocabularies is likely to mean, however, that at some point in the future that SCIS will need to make a choice. If ScOT is to replace SCISSH, then the issue of legacy data becomes important – many tens and possibly hundreds of thousands of SCIS records with only SCISSH are still used in school library OPACs throughout Australia, New Zealand and beyond. Studies have indicated that automatic switching between subject vocabularies, particularly between a thesaurus and a list of subject headings, tends to be only partially successful (Chaplan 1995), while manual mapping of ScOT and SCISSH would be a very significant undertaking. The longer both vocabularies are maintained and applied the greater the number of current resources with SCIS bibliographic records containing ScOT descriptors to ease the transition.

In any case, no matter which vocabularies are used, and how they and the retrieval systems are improved, there remains the basic need for information literacy education. As Chen (1993) observes, 'No matter how advanced technology facilitates information seeking in the future, students will still need a familiar assortment of skills to perform successful searches: typing, spelling, usage, reading, interpreting, knowing key word concepts, and understanding the fundamentals of a school's classification system.'

Acknowledgement

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Appendix A. Search topics

Culture and customs of Indonesia?
Historical maps of Sydney
Information on Indonesian animals
Life in Shakespearian times
Biographies of Australian scientists
Australian Aboriginal dreamtime stories
The tribal system in traditional Australian Aboriginal society
Information on Ancient Egyptian gods
Threatened habitats of Australian birds
What are the seven sacraments of the Catholic Church?
World heritage sites in Australia
The number system of the Mayans
Ancient Egyptian mummies
Australian native trees
What types of animals live in rainforests?
Information about the planet Mercury
Find images to create a collage of buildings
Information on medieval castles
Information on Japanese food
How living things adapt in an ecosystem
The physical characteristics of Mt Kosciusko?
Information on Maori people
Physical characteristics of Uluru
Diaries of soldiers in World War 1
The life and contribution of Sir Donald Bradman
Examples of electro magnetic devices
Information on alcohol abuse

A cross section of the human eye
Australian Society in the 1950s
Alternative energy sources
Latin American dances
Stories about Superheros
Information on the World Health Organisation
What characterises Australia's democracy?
Types of poisonous substances
The impact of Climate Change on Australia
Immigration to Australia after World War Two
Current information on cardio-vascular diseases
Australia during the Great Depression
Information on eating disorders
Effects of lifestyle on health
The symptoms of Schizophrenia
Surveillance in the workplace
The use of mobile phones by children
Single parent families
Information on different types of metals
Critical analysis of Shakespeare's "Romeo and Juliet"
Information on sibling relationships
Examples of innovative camping equipment
Factors affecting sporting performance
Information on Doris Pilkington
Characteristic symptoms of Alcoholism
Body decoration in modern society
Social disadvantage in Australia
Personalities of the civil rights movement
The origins of the Vietnam War
The history of Rugby League in Australia
Management of an Australian farm animal
Diets for optimum nutrition
Modern day pirates in Asia