SCIENCE 3 SUBJECT TERMS PROJECT

Summary quality assurance report

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Table of Contents

1 Introduction

1.1 Purpose

This document is a summary report on the quality assurance process for subject terms developed for the ScOT Science 3 Subject Terms Project. Included in this report is a record of the quality assurance undertaken on all subject terms and general issues arising from the Project.

1.2 Audience

ScOT Management Group, ScOT Consultative Group, ACER.

1.3 Acknowledgements

Acknowledgements are made to Anna Gifford and the project team from Australian Council for Educational Research for undertaking this subject build of ScOT; Steve Sunter from TLF in providing ongoing feedback and advice on subject terms in particular those relating to anatomy; and Steve Winter the TLF Science 3 Project Manager for providing advice and access to documentation about the Science 3 Project.

1.4 Note for this report

During the life of the ScOT Science 3 Subject Terms Project the day to day management of ScOT was transferred from Curriculum Corporation to The Le@rning Federation effective from 1 July 2004. All references to "Curriculum Corporation" in this report have been changed to "The Le@rning Federation" or "TLF" for the sake of consistency.

2 Summary

ACER delivered to The Le@rning Federation (TLF) the first draft of subject terms for the ScOT Science 3 Subject Terms Project (the Project) on 9 June 2004. Overall 454 subject terms (371 preferred and 83 non preferred subject terms) were added to ScOT and 787 existing subject terms were modified.

Additional work was undertaken during the quality assurance process on reviewing anatomy and materials subject terms following advice received from the TLF Quality Assurance Team.

The subject terms developed for the Project constitutes Version 4.2 of ScOT. The following table outlines the breakdown of the type and quantity of subject terms.

	Version 4.1	Version 4.2	Comments
Total subject terms	8,336	8,880	544 additional subject terms
Preferred subject terms	6,719	7,096	377 additional subject terms
Non preferred	1,617	1,704	87 additional subject terms
Top terms	243	214	Top terms reduced by 12%
Orphans	7	0	Reduced to zero.

3 Subject build process

3.1 Consultation

At the commencement of the Project meetings were held between ACER and Steven Haby at TLF to confirm key dates for deliverables and the scope of the Project. A meeting was also held with Steve Winter, TLF Science 3 Project Manager to obtain additional information and documentation about the learning objects (LO) being developed for the Science 3 Project.

ACER assembled a Reference Group of subject and thesaurus experts to participate in the subject term development process. The Reference Group interacted through electronic communication with review files sent regularly and feedback returned by email. This was supplemented by a number of telephone and personal discussions.

ACER communicated throughout the life of the Project with Steven Haby at TLF by telephone, email and meetings. Promptness of response by both parties ensured that this line of communication remained open and effective through the life of the Project.

During the quality assurance advice was sought from Steve Sunter on a regular basis concerning specific concepts and subject terms. Steve provided useful feedback which was instrumental in the decision to review the anatomy subject terms.

3.2 Reference tools

LO briefs and specifications (known as Learning Object Design Specifications or LODS) provided by Steve Winter from TLF were used as core resources for the Project, supplemented by online and print curriculum resources, relevant thesauri and subject-specific resources such as textbooks and online teaching resources. A detailed list of resources is provided in Appendix 6.

3.3 Advice

Advice was sought from subject organisations and other experts in specific fields when required.

3.4 Subject term construction

The following methodology was used for the development of the subject terms:

1. Establishment by ACER of a Science Reference Group (SRG) and email protocol for ongoing discussion and feedback. Timeframes and methodologies were established and agreed upon.

2. Collection of the learning object design specifications from TLF

3. Confirmation of quality assurance processes proscribed by TLF and the *ScOT Quality Assurance Specifications.*

4. Audit of learning object design specifications for concepts.

5. Clustering of concepts and themes from the learning object design specifications (eg Physics – Energy; Environment; Chemistry etc). A DB TextWorks database was constructed to house these concepts and clusters for ease of recording and reporting.

6. A review of relevant curricula and resources was undertaken to ensure that all topics concepts were sufficiently covered.

7. The areas of Animals and Anatomy were, on the request of Curriculum Corporation, given close attention and restructured.

8. The reference structures of each subject term was finalised including assignation of broader, narrower and related terms and scope notes. Links with existing ScOT terms were also established. Modifications were made within MultiTes.

9. After a final review, the list of new subject terms, a list of modified existing subject terms and a brief report was sent to TLF on 9 June 2004.

10. TLF then commenced quality assurance on the list of subject terms focussing on the guidelines in the ScOT Quality Assurance Specifications (known as the Specifications).

11. A report on the thesaurus quality assurance was sent to ACER on 30 June 2004.

12. A meeting was held at ACER between TLF and ACER to review the quality assurance reports. Most issues in the report were resolved or agreement reached for further review by ACER. A number of issues arising from this meeting were identified for further review by TLF.

13. TLF made the agreed changes in ScOT

14. A second quality assurance report was sent to ACER on 15 July 2004.

15. A teleconference between ACER and TLF was held to work through issues raised from the second quality assurance report.

3.5 Quality assurance process

TLF undertook quality assurance of the subject terms according to the *ScOT Quality Assurance Specifications* V1.1. Subject terms were checked against guidelines on format, structure and relationships within the broader framework of ScOT for accuracy. Relevant thesauri (listed in Appendix 6.2) were consulted in cases where doubts existed about the reference structure.

The first quality assurance report was submitted to ACER on 30 June 2004 for comment and a meeting was held with ACER at TLF on 2 July 2004 to review the report. At this meeting it was agreed that the anatomy subject terms would need further review.

A second quality assurance report was submitted to ACER on 15 July 2004 which addressed issues arising from the meeting on 2 July 2004 and also included revised anatomy and materials subject terms. A teleconference was held on 16 July 2004 to finalise the subject terms.

4 Issues arising from the Project

4.1 Scope of project

The development of terms for this build was guided by the access ACER gained to LODS supplied by the TLF Science 3 Project Manager. These documents ranged from brief outlines of an intended learning outcome to expanded descriptions of ways in which the learning objects could teach these concepts. These documents were invaluable in guiding the scope and focus of the terms being developed. They allowed the build to develop in a controlled and meaningful way; this is in comparison to the SOSE Build ACER undertook for Curriculum Corporation, in which the lack of focus caused difficulties.

4.2 Overlap with previous Science builds

With two builds in Science having previously taken place, much of the content and concepts examined for the Science 3 build overlapped with terms already developed for ScOT. The first impact of this was a reduction in the number of terms. Time still needed to be spent reviewing these areas to ensure that the coverage of terms within these topics was adequately comprehensive. The second impact of this was the need to interweave new concepts into the existing terms. This was a fairly straightforward process, as Science is a structured discipline that lends itself well to hierarchies.

4.3 Overlap with other builds

There was some crossover between subject terms developed for this Project and previous ScOT development. This required an amount of structural reworking to accommodate the new terms in as effective a way as possible. An example of this is in the area of environmental studies, where there were several overlaps between SOSE and Science. The term 'Environmental impact' had been developed as part of an earlier build, but was a concept that was also present in Science curricula. Conversely, the concept 'Environmental influences' had not been previously included but was strongly articulated in this Project, so was added.

4.4 Restructure of anatomy and materials subject terms

4.4.1 Initial review of anatomy subject terms

ACER was initially asked to rework two areas within ScOT, namely Anatomy and Animals. This has been done with the caveat that the structure devised may not be the final solution but aims to improve the current organisation of terms in these areas. It should be noted that no appropriate model could be found in any of the resources consulted.

The existing structure for Anatomy within ScOT was confusing in that:

1. Animal and human anatomical parts were intermingled.

2. The boundary between anatomy and physiology was blurred.

By considering other resources such as Library of Congress and in aiming to maintain relevance with the terms that had been developed for ScOT, ACER decided to:

1. Clearly delineate the difference between Anatomy (structure) and Physiology (function) within ScOT. For example, where previously Heart was subordinate to Circulatory system, we relocated Heart to Body parts and related it to Circulatory system.

2. Create a hierarchy within Anatomy where Human anatomy and Animal anatomy were separated, and a descriptor 'Body parts' scoped to include all those parts common to both animals and humans (eg Head, Legs, Eyes) and to relocate all animal-specific body parts as subordinate to Animal anatomy.

3. On further discussions with Steven Haby, it was decided to create undertake a further review of anatomy subject terms such as Respiratory organs and Reproductive organs to group the relevant systems' organs.

4.4.2 Further review of anatomy subject terms

Following discussions with ACER based on advice received from TLF it was agreed that all subject terms within ScOT relating to Anatomy would need to be reviewed.

The main issues were:

- The level of detail in regards to parts of the body, systems and organs.

- How best to describe organs and systems for humans and animals without duplicity

- Organs and parts of the body specific to animals or types of animals but not humans, e.g. beaks, bills, antennae.

- Relationship to diseases and illnesses.

- Additional LO delivered to TLF relating to anatomy.

Various models were proposed and discussed based on the review of other controlled vocabularies such as MESH, LCSH, BIOSIS, NASA Thesaurus and USAID among others.

The original structure delivered as part of the Science 3 build had a separate reference structure for animal anatomy and human anatomy. A result of this secondary review and a subsequent expansion of the subject terms for anatomy, a simplified structure was developed summarised as follows.

- New subject term Anatomy incorporating human anatomy and animal anatomy.

- Subject terms for organs, systems, fluids, musculoskeletal system, regions and parts developed under Anatomy.

- Organs (Anatomy) listed all organs of the body arranged under broad functions, e.g. Digestive organs.

- Organs linked to various systems and/or regions of the body, e.g. Respiratory system and/or diseases.

4.4.3 Review of materials subject terms

Following discussions with ACER concerning subject terms associated with materials a decision was made to review the subject term Materials and narrower terms within its reference structure. The review indicated that there were:

- A number of errors within the reference structure, e.g. Watercolour paints is a NT under Paint and Materials. Paint also appears as a NT under Materials. Various characteristics of materials, e.g. Strength appeared as NT under Materials which was incorrect.

- Inconsistencies within reference structures, e.g. Marble appears as a NT under Materials but not under the appropriate Stones.

- Lack of linkages between related subject terms, e.g. Pencils not linked to Writing.

- NT, e.g. Cement having dual roles, i.e. as a building material and as artists' materials.

As a result of this review a number of changes were made to simplify the structure for Materials and to focus the scope on different types of materials rather than their characteristics.

4.5 Access to subject experts

For the Science 3 build ACER relied on a pool of thesaurus and subject experts within ACER, and sent out requests for participation to external subject experts including subject associations, professional groups and other related organisations. Relevant ACER research staffs were also asked to contact their own groups that they used in the course of their work. There was unfortunately a considerable lack of response from the external experts. ACER is confident that through consultation with the internal reference group and reference to external resources that the terms developed are relevant but greater consultation and participation by curriculum experts would have enhanced this build.

On a positive note the meeting and discussions with Steve Winter TLF Science 3 Project Manager were found to be extremely valuable and enabled ACER to develop subject terms more focused on the content of the LO under development. In addition liaison and advice from Steve Sunter was also found to be valuable during the quality assurance process.

5   Orphan subject terms

Orphan subject terms have no relationship (BT, RT or NT) with other subject terms in a thesaurus however they may have UF (non preferred subject terms) assigned. It is a fundamental principle of ScOT to have no orphans.

There were however 7 orphan subject terms in Version 4.1 and these were reviewed and revised as part of the quality assurance process with ACER in the initial review of the subject terms for the ScOT Science 3 Subject Terms Project.

These orphans were not addressed during earlier quality assurance reviews of ScOT during subject builds. Nearly all of these orphans should have been incorporated within their added reference structures shown in the table at the time of their construction.

The *ScOT Quality Assurance Specifications* (known as the *Specifications*) have also been updated to reflect the work associated with the orphan subject terms. Included at the introduction of the *Specifications* under a new section "Principles of ScOT" is the statement that::

> "It is a fundamental principle of ScOT that there will be no instances of orphan subject terms and a check will be made as part of the ongoing quality assurance and management to ensure no orphans are included."

The following table lists the orphan terms as shown in Version 4.1 and the changes made in Version 4.2. Italics indicate additions to the subject term and strikethrough indicate deletions.

No	Subject Term in Version 4.1	Subject Term in Version 4.2	Comment

1	Teaching
	  UF: Pedagogy
		Teaching
		  UF: Pedagogy
		  BT: Education
		  NT: Teaching methods
		  RT: Teachers
			Omission. This should have been incorporated within the reference structure of Education.
			
			Added orphan subject term Teaching methods.

2	Teaching methods
	  UF: Pedagogies
		Teaching methods
		  UF: Pedagogies
		  BT: Teaching	

3	Theatre in the round
	  UF: Arena staging
	  UF: Arena theatre
	  UF: Centre staging
	  UF: Circle staging
		Theatre in the round
		  UF: Arena staging
		  UF: Arena theatre
		  UF: Centre staging
		  UF: Circle staging
		  BT: Theatre (Performing arts)
			Omission. This should have been incorporated within the reference structure of Theatre (Performing arts).

4	Theatre of the absurd
	  UF: Absurdism
	  UF: Absurdist theatre
		Theatre of the absurd
		  UF: Absurdism
		  UF: Absurdist theatre
		  BT: Theatre (Performing arts)
			See comments above.

5	Trams
	  UF: Light rail vehicles
		Trams
		  UF: Light rail vehicles
		  BT: Road vehicles
		  RT: Rail transport
			Most trams travel on roads for all or some of their journey. The existing subject term Road vehicles is an appropriate BT.

			It was not considered worthwhile to enter into the debate between a light rail vehicle and a tram in light of the curricula needs and the existing UF/USE reference structure retained. RT to Rail transport established.

6	Visual arts portfolios
	  UF: Art portfolios
		Visual arts portfolios
		  UF: Art portfolios
		  BT: Assessment portfolios
		  RT: Visual arts
			Omission. This should have been incorporated as part of the reference structure of Assessment portfolios.
			
			RT to Visual arts established.

7	Water tables
	  UF: Groundwater level
	  UF: Groundwater surface
	  UF: Groundwater table
		~~Water table~~
		Water tables
		  UF: Groundwater level
		  UF: Groundwater surface
		  UF: Groundwater table
		  BT: Water supply
			Added to Water supply as NT and changed from plural to singular.

6 Appendix

6.1 List of thesauri consulted

6.1.1 Used by ACER for terminology development

- *Australian public affairs information service (APAIS) thesaurus. National Library of Australia* [website] http://www.nla.gov.au/apais/thesaurus/

- *Australian thesaurus of education descriptors* 3rd ed. Melbourne : ACER, 2003

- *CAB thesaurus - an online thesaurus of the applied life sciences* [website] http://194.203.77.66/Index.asp

- *Canadian thesaurus of construction science and technology* [website] http://irc.nrc-cnrc.gc.ca/thesaurus/ctcst-search-form.html

- *Family thesaurus online* [website] http://www.aifs.gov.au/institute/info/thesaurus.html

- *Health and ageing thesaurus [website]* http://www.health.gov.au/thesaurus.htm

- *Intellectual property subject thesaurus* 2nd ed. [website] http://www.ipaustralia.gov.au/pdfs/sniper/sniper-subjects.pdf

- *Library of Congress subject headings* 12th ed. Washington DC : Library of Congress, 1989

- Lowther, D and Whitehouse, I. *A draft environmental thesaurus for New Zealand.* [New Zealand] : Ministry for the Environment, 1999 http://www.mfe.govt.nz/publications/ser/tech-report-51-info-management-mar99.pdf

- *Macquarie dictionary* 3rd ed rev. North Ryde NSW : Macquarie Library, 2001

- *MeSH (Medical Subject Headings)* [website] http://www.nlm.nih.gov/mesh/MBrowser.html

- *NAL agricultural thesaurus* [website] http://agclass.nal.usda.gov/agt/agt.htm

- *NASA Thesaurus* http://www.sti.nasa.gov/98Thesaurus/vol1.pdf

- *SCIS subject headings* 5th ed. Carlton South Vic : Curriculum Corporation, 2002

- *Thesaurus for the Australian Transport Index* http://www.arrb.com.au/documents/libraryThesaurus.pdf

- *UK archival thesaurus* http://www.ukat.org.uk/thesaurus/

- *UNESCO thesaurus* [website] http://databases.unesco.org/thesaurus/

- *VOCED thesaurus* [website] http://www.voced.edu.au/thes.htm

- *Waterways object name thesaurus* [website] http://www.mda.org.uk/waterw/

6.1.2 Used by TLF

The following thesauri were referred to during the quality assurance and the review of anatomy and materials subject headings.

- *Australian thesaurus of education descriptors* 3rd ed. Melbourne : ACER, 2003

- *Canadian thesaurus of construction science and technology* [website] http://irc.nrc-cnrc.gc.ca/thesaurus/ctcst-search-form.html

- *Health and ageing thesaurus [website]* http://www.health.gov.au/thesaurus.htm

- LC Authorities online at http://lcauth.dra.com/lcauth/

- *Macquarie dictionary* 3rd ed rev. North Ryde NSW : Macquarie Library, 2001

- *MeSH (Medical Subject Headings)* [website] http://www.nlm.nih.gov/mesh/MBrowser.html

- *NASA Thesaurus* http://www.sti.nasa.gov/98Thesaurus/vol1.pdf

- *SCIS subject headings* 5th ed. Carlton South Vic : Curriculum Corporation, 2002

- *Getty Art and Architecture Thesaurus* at http://www.getty.edu/research/conducting_research/vocabularies/aat/

- *ERIC Thesaurus* online at http://www.ericfacility.net/

- *Thesaurus of Scientific, Technical and Engineering Terms.* Philadelphia PA : Science Information Resource Center, 1988

- *USAID Thesaurus*. US Agency for International Development, 1998

6.2 Curriculum resources

6.2.1 State and territory curriculum resources

- ACT – Curriculum profiles for Australian schools – Science at http://www.det.act.gov.au/publicat/pdf/pscience.pdf

- NSW Science 7-10 curriculum at http://www.boardofstudies.nsw.edu.au/syllabus_sc/pdf_doc/science_710_syl.pdf

- NSW Science and Technology – Stage 1 – Living Things – Minibeasts at http://www.curriculumsupport.nsw.edu.au/Science/files/Sci_S1_Mini-Beasts.doc?CFID=1041183&CFTOKEN=59959480

- Queensland Science years 1-10 syllabus – rationale at http://www.qsa.qld.edu.au/yrs1_10/kla/science/pdf/syllabus/rationale.pdf

- Queensland Science years 1-10 Forces in everyday life at http://www.qsa.qld.edu.au/yrs1_10/kla/science/pdf/modules/qsm041.pdf

- Queensland Science years 1-10 Interaction between living and nonliving things at http://www.qsa.qld.edu.au/yrs1_10/kla/science/pdf/modules/qsm028.pdf

- Queensland Science years 1-10 Needs of living things at http://www.qsa.qld.edu.au/yrs1_10/kla/science/pdf/modules/qsm013.pdf

- Queensland Science years 1-10 Science and society resource document at http://www.qsa.qld.edu.au/yrs1_10/oia/elab/science-e.doc

- Science in the New Zealand Curriculum at http://www.minedu.govt.nz/web/downloadable/dl3525_v1/sci-nzc.pdf

- South Australia - Draft R-10 science teaching resource at http://www.sacsa.sa.edu.au/ATT/%7B63C8B8C9-B8F1-49E6-B420-29BEEB48F65B%7D/Science.pdf

- South Australia – Outdoor education assessment exemplar at http://www.ssabsa.sa.edu.au/support/hpd/oued/oued-ae-1ecass.doc

- Tasmania Science website at http://www.discover.tased.edu.au/science/

- Victoria - Sample programs and units : Science : Level 4 : Physical and Chemical Sciences at http://csf.vcaa.vic.edu.au/smp/spsc0402.htm

- Western Australia – Science curriculum resources at
  http://www.eddept.wa.edu.au/cmis/eval/curriculum/learningareas/science/index.htm

6.2.2 Non government curriculum resources

- Food Chains – Gould League minibeast teaching activities at
  http://www.gould.edu.au/downloads/MinibeastActivitiesP3.pdf

- Marsden State High School – Environmental issues at
  http://www.marsdenshs.qld.edu.au/subjects/science/junior_science/biology/enviro.html

- Questacon level 3-4 teaching suggestions at
  http://www.questacon.edu.au/html/assets/pdf/Primary_3-4.pdf

- Sunsmart [website]at http://www.sunsmart.com.au/

- Teachers Online Primary Science at
  http://www.melroseps.vic.edu.au/Science%20OnLine/Phy/sub/friction/friction.htm