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Professional Standards for Australian School Science Laboratory Technicians

Acknowledgements

The original Working Party was formed at the National Forum on the Role and Support Structures for School Laboratory Technicians in Australian Secondary Schools held at the Mercure Hotel, Sydney Thursday 8 July 2010. A workshop for this Working Party was held at the Australian Science Teachers Associations (ASTA) Office in Canberra Saturday-Sunday 27/28 November 2010.

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The Working Party

Original Working Party 2010

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Working Party for the Revised Standards 2017-2018

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SETA representatives formed a Working Party for review during 2017-2018. Additional feedback was kindly provided for this draft to produce the 2019 Standards by Lisa Chandler (WA); Emma Framont (WA); Geoff Gleadall (Vic); Jane Griffith (WA); Andrew Hull (Tas); Karen McCoy (Vic); Mandy Timmers (Qld); Laurence Wooding (NSW); Rianne Wright (SA) and collated by Teresa Gigengack (WA).

It is intended that these standards will operate as a living document which will be improved upon in response to changes in policy or to issues as they arise. The text in this document was last updated in 2019.

Contents

INTRODUCTION

It is important for students to have hands-on activities to support inquiry-based learning in science. They are stated as part of the guiding principles to underpin STEM education in schools.[1] Skilled technical support has been identified as part of the essential infrastructure required for science teachers to deliver effective practical science.[2,3,4]

In schools, the technical support for science is provided by school science laboratory technicians (hereon referred to as 'science technicians'). Science technicians provide the knowledge, skill and support necessary for practical science activities to be undertaken in schools. They provide expert advice and guidance to ensure the effective management of equipment and material preparation, maintenance, health and safety requirements and school procedural and legislative compliance elements necessary for the safe operation of school laboratories and practical science activities.

Just like professional teaching standards, these standards for science technicians are intended to help develop the knowledge, skills, and attitudes needed to increase capacity and improve curriculum service effectiveness, as well as to define a career pathway for science technicians. They also serve to contribute positively to the education sector's understanding of the importance of the technical profession.

The key elements of quality technician service provision are described in these standards. Establishing and defining professional standards to describe the specialised knowledge and skills required to work in the science area of a school is essential to guide and promote the delivery of proficient and safe science curriculum support. Professional standards also provide a framework for developing skills and knowledge and help the employer to ensure staff have appropriate career pathways and receive appropriate training to safely support school science.

It is recommended that all education institutions adopt these professional standards for science technicians to ensure an engaging and inquiry-oriented curriculum can be maintained and supported in the future.

BACKGROUND

The Australian Science Teachers Association (ASTA) and Science Education Technicians Australia (SETA) expressed concerns about the status of technical support for science teaching programs in Australian schools. This led to the Australian Government through its Department of Education, Employment and Workplace Relations (DEEWR) to fund a national survey to investigate the training and support for technicians, their roles and the level of servicing provided by technicians for the teaching and learning of secondary science.

The ensuing report identified many issues in Australia's educational system and led to the conclusion that existing systems are generally not well equipped to meet the challenges of implementing the Australian Curriculum: Science.[4]

The report made eight recommendations to redress these issues by aligning training programs for science technicians with the needs of the educational sector, setting minimum standards for training and induction into the role, defining nationally consistent job specifications, support for ongoing training, establishing minimum standards for staffing levels (defined by a technicians' service factor) and creating an online advisory service.[4]

A Working Party was formed and sought to set out a national template for professional standards for technicians that will support quality teaching of science in schools.[5] The draft standards were developed after reviewing existing structures in jurisdictions and sectors from across the country. The Working Party noted significant variation between employers and attempted to identify a structure that would suitably reflect the professional role of technicians and at the same time be easy to adopt by employers in all states and territories. During 2017 - 2019 these standards were significantly reviewed in response to feedback from the wider technician community. It is expected that future reviews will be conducted periodically.

The development of these standards has included a synthesis of the descriptions of science technicians' knowledge, practice and professional engagement across Australian education jurisdictions. The standards have been informed by science technicians' understanding of what is required at different classification levels, with extensive consultation to validate each descriptor.

PURPOSE

It is intended that these standards be adopted and implemented by all employers of science technicians in schools.

The articulation and adoption of these standards will:

1. **Provide a national approach to support the Australian Curriculum: Science.**

   A national approach will promote consistency of high-level technical support for teachers so that engaging, safe and practical learning experiences are achieved in schools throughout metropolitan, regional, rural and remote locations in Australia.

2. **Provide a common language for professional dialogue between science technicians, science educators, professional associations and employers.**

   They will make explicit the immense diversity of the knowledge, skills, and practice of science technicians, which is required to effectively support the delivery of practical science and reflect the current and growing expertise, career aspirations and achievements of all science technicians.

3. **Promote the value of ongoing professional development of science technicians to employers.**

   Continual professional development enables science technicians to adapt and change in response to new curricula and integrating emerging technologies and remain current with education department/school employer policy, procedural and legislative requirements.

4. **Encourage all science technicians to engage in professional development and provide an appropriate structure for accreditation and promotion of training opportunities for technicians.**

   Defined levels of demonstrable knowledge and expertise will inspire science technicians to engage in professional development programmes and identify particular stages in a career path.

5. **Recognise and improve the professional capacity and status of technicians within the broader education community.**

   This will lead to a higher level of job satisfaction.

To support the effective adoption of the *Professional Standards for Australian School Science Laboratory Technicians*, this document describes:

a) Standards for staffing levels as defined by the technicians' service factor
b) Standards required for employment of technicians in science in schools
c) A career structure that recognises the development of skills and experience.

GRANDFATHER CLAUSE

The Working Party recognises that there are existing highly competent technicians without post-secondary science related qualifications who have developed their knowledge and skills through “on the job training” and professional development programs.

It is not the intent of this paper to suggest that these technicians need to undertake retraining to continue working in their existing positions. It is expected that a recognition of current competencies would ensure that currently employed technicians with considerable knowledge and experience can be assessed as having already attained the specified standards and be classified at that particular level.

It is the intent of this document to ensure that technicians entering the profession in the future will have relevant qualifications before entering the workplace. They may then progress through this career pathway.

RURAL AND REMOTE SCHOOLS

In developing these professional standards, the Working Party was intently aware of the particular challenges faced by a large number of rural and remote schools that exist in many parts of Australia. These schools experience significant problems in trying to deliver quality science programs due to their size, geographical isolation, failure to attract qualified staff, and lack of access to ongoing professional development.

**Please Note:* These standards describe best practice and it is acknowledged that rural and remote schools face challenges in attracting trained technicians. Although not a desirable situation, if schools in these circumstances propose to employ untrained staff, it is essential that they receive training by a qualified trainer in the safe handling of chemicals and other hazardous materials before they commence working in a school laboratory, are provided with appropriate training when starting their position at the educational institution and are closely supervised by competent and trained staff.

They should also be provided with opportunities by their employer to access:

1. relevant training in order to
   a. maintain their personal safety and the safety of others
   b. develop skills necessary to support the teaching of science
2. authoritative source(s) of advice on procedural issues
3. school science technician networks and mentoring opportunities
4. internet resources such as Science ASSIST (https://assist.asta.edu.au/).

**Please note:* It is beyond the scope of this document to describe mechanisms for the sourcing of funding and delivery of training relevant to the educational setting including training packages and accreditation for recognition of skills and prior learning.

RECOMMENDED TECHNICIAN STAFFING LEVELS

The allocation of technician staffing time has a direct impact on the services that can be provided to safely and effectively support practical science in schools. Inquiry based science education requires technical support provided by skilled technicians at a satisfactory service level. '*Science departments should have enough technical or technician support to enable teachers to carry out frequent and effective practical science*'.[2]

In order for teachers to access suitable levels of support for the science curriculum and for schools to meet the legislative requirements for the management of hazardous chemicals, it is essential that schools allocate sufficient time for technicians to effectively and safely perform all the required tasks.

The Royal Society and the Association for Science Education (2001) developed a service factor and described the standard of service that would be provided for different levels of the service factor. The service factor is calculated as follows:

$$\text{Service Factor} = \frac{\text{Technician hours per week}}{\text{Hours of science teaching per week}}$$

Technician hours per week are the sum of hours of employment in one week of all technicians working at that school during term time. This is not based upon the number of students at the school.

The hours of science teaching per week is the sum of hours of science teaching per week for all classes at that school.

LEVELS OF SERVICE

Association of Science Education service standards (Royal Society & ASE, 2001)

Service factor	Description of service standard
0.85	This is the recommended allocation of technician support to science teaching for a compact suite of laboratories with adjoining preparation and storage space. All functions are feasible including the accessing of training and developing opportunities to meet the schools changing needs.
0.70	At this level of allocation provision of the full range of functions will depend upon recruiting well-qualified and experienced technicians. Where the full range is possible there will be a need to prioritise functions and decide on the emphasis of support required. It may still be possible to achieve a balance between resource related design and development and direct support activities.
0.60	It will not be possible to deliver all functions adequately and a restricted range of priorities will need to be identified. Efficient management of resources and administration are likely to be affected and activities related to design and development of practical programmes and direct support will be in jeopardy. Functions possible may well depend on the skills and experience available and a policy for training will be essential to maintain the service.
0.45	Functions will be markedly reduced and in most cases no more than simple, immediate maintenance and control will be possible. In the long-term efficiency in these will be impaired. The availability and range of resources will become restricted and the development of effective practical programmes may be impaired. A supervisory structure for the less experienced may have to be provided from elsewhere. Regular training will be essential but difficult to accommodate.

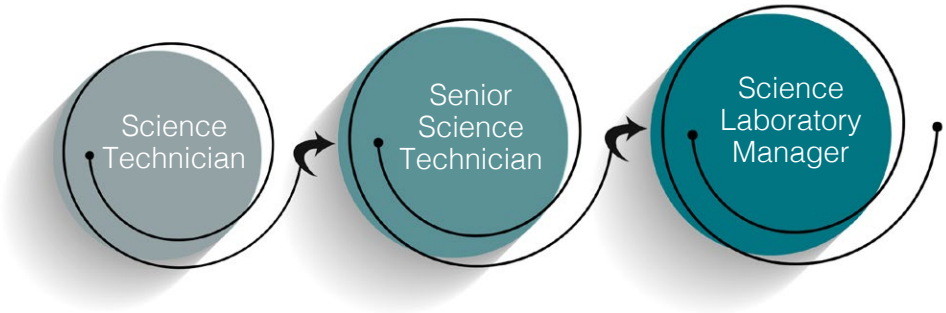
The report by Hackling (2009) recommended that the *minimum* service factor in Australian schools be set at 0.6.

A higher service factor of 0.85 is recommended for senior secondary schools plus additional hours for schools with extra curriculum demands such as individual research projects or International Baccalaureate® (IB) programs or circumstances that reduce efficiency such as diverse locations of laboratories, preparation areas and storerooms, absence of a lift where there are multiple levels, buildings undergoing construction and other disruptions to the work areas.

In addition to term time allocation of technician hours, consideration for employment during school holidays enables tasks such as stocktaking, organisation, maintenance and repairs to be undertaken.

LEVELS OF CLASSIFICATION AND QUALIFICATIONS

This document is intended to support a career pathway for science technicians across Australia. The standards describe the role of technicians in the education sector and what is required of technicians at three levels of classification:



	Science Technician (ST)	**Senior Science Technician (SST)**	**Science Laboratory Manager (SLM)**
Level of autonomy	Works under general supervision	Works autonomously under limited direction	Works with a high degree of autonomy
Provision of services	Provides standard services within a defined service delivery framework.	Delivers a range of services in complex situations.	Determines operational service delivery plans based on accepted standards.
Minimum qualifications	Certificate IV in Laboratory Techniques*	Diploma of Laboratory Technology* and relevant laboratory experience or transferrable industry skills or a relevant science degree.	Diploma of Laboratory Technology* and extensive relevant laboratory experience or transferrable industry skills or a relevant science degree.

**Or equivalent qualification. It is noted that a Certificate IV in Laboratory Techniques, provides basic laboratory safety and techniques. This is a good foundation but does not meet all the knowledge and skills required for the educational setting.*

Science technicians fulfil a unique role in the teaching of science. The position requires specialised training to provide the support required for good practical science. Generalist staff in other areas in the school should not be asked to work in science without additional training. The skill set required is extremely broad and is also more diverse than in industry or tertiary laboratories.

All science technicians must be inducted by a qualified trainer in the safe handling of chemicals and other hazardous materials before they commence working in a school laboratory. This is particularly relevant in small and remote schools where the person may be working in isolation.

It is acknowledged that some schools employ subject specialist technicians for specific science disciplines (E.g. biology, chemistry, physics). It would not be expected that all technicians have an in-depth knowledge of all science disciplines but are given the opportunity to professionally develop all areas.

All science technicians should be encouraged and financially supported to undertake regular professional development programs.

Science Technician (ST)

This is the entry level for technicians in schools. This position requires general supervision by a senior science technician, science laboratory manager or head of the science department. This should not be the position of a sole technician in a school as some of the duties and responsibilities for a sole technician would be beyond reasonable expectations for this level.

Senior Science Technician (SST)

This is the minimum employment level for a sole technician in any school as this position requires a high level of expertise, experience and qualifications. The SST is expected to work autonomously under limited direction and instruction, delivering a range of services in complex situations. Although not a requirement of this level, they may be responsible for the supervision of STs, when they are employed.

Science Laboratory Manager

This position in a school requires extensive experience, expertise, qualifications and managerial skills in systems, resources and personnel. The science laboratory manager exercises a high degree of autonomy, receiving minimal direction and instructions. Although not a requirement of this level, they may have responsibility for supervising, training and directing the work of other technicians when they are employed.

ORGANISATION OF STANDARDS

As science technicians use their knowledge of science concepts, technical expertise and work collaboratively with the science teachers, together they create a synergy to enable hands-on and inquiry-based learning opportunities to encourage the engagement of students in the science curriculum. The standards have been aligned with the Professional Standards for Teachers published by the Australian Institute of Teaching and School Leadership.[6]

The standards are organised into three domains: professional knowledge, professional practice and professional attributes. Within the domains, standards identify the main components of what technicians require in knowledge and expertise. Descriptors provide an indication of how the standards will apply at each level of capability.

This document sets out a three tier classification structure, to establish a career structure for technicians and a workable model that can accommodate the range of schools, from small remote schools to large urban schools. They also provide a continuum of professional expertise throughout the technician's career.

DOMAINS OF LABORATORY PRACTICE

Technicians contribute directly and indirectly to safely and effectively support practical science in schools.

A technician's work is defined by all three domains, which are interconnected and overlapping.

Domain 1: Professional Knowledge

Technicians possess a sound understanding of school curriculum scientific concepts and knowledge of the school science program. They have a well-developed knowledge of the techniques and processes needed to operate within a laboratory setting. Technicians are knowledgeable about departmental/school procedures and the legislative requirements by which activities in schools are bound and the administrative systems necessary for managing the faculty's resources.

Domain 2: Professional Practice

Technicians apply their knowledge and skills in a practical way to a wide range of situations that arise within the science faculty. They practice effective and appropriate laboratory techniques and provide guidance on safe work practices, procedural and legislative requirements. They ensure that all equipment and resources provided to teachers are well maintained and are appropriate to the learning outcome.

Domain 3: Professional Attributes

Technicians are effective communicators who continuously reflect on, evaluate, improve and share their professional knowledge and practice with other technicians, teachers and students both at a school level and in the wider community. They engage in professional learning both individually and collaboratively to enhance their knowledge and practice.

STANDARDS AND DESCRIPTORS

The standards identify the knowledge and capabilities of technicians. Technicians should use the standards as a guide for their professional development as they progress through their career.
Descriptors are a statement of the identified components of each standard relevant to each level. They outline the professional actions technicians engage in as they apply their professional knowledge, skills and attributes to the school context.

SUMMARY OF STANDARDS

DOMAIN	STANDARD
Professional Knowledge	1. Know scientific concepts and laboratory techniques 2. Know procedural and administrative requirements
Professional Practice	3. Organise practical requirements of the science curriculum 4. Practice sound laboratory techniques 5. Manage resources, procedural and administrative tasks
Professional Attributes	6. Engage in professional development 7. Work collaboratively within the school community and wider professional communities

DOMAIN 1: PROFESSIONAL KNOWLEDGE

Standard 1. Know scientific concepts and laboratory techniques

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
1.1 Scientific Concepts	Develop a fundamental understanding of the school science curriculum/program	Possess a broad understanding of the school science curriculum/program and the science concepts taught	Possess comprehensive scientific knowledge about the science concepts being taught in the school science curriculum/program
1.2 Technical knowledge of equipment and technology used in science	Develop the fundamental technical knowledge to identify and safely operate science equipment	Possess broad technical knowledge to identify and safely operate science equipment	Possess comprehensive technical knowledge to identify and safely operate science equipment Learn new techniques and masters operating new equipment Remain conversant with current scientific trends

Standard 2. Know procedural and administrative requirements

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
2.1 Procedural, legislative and licence requirements	Develop an awareness of school policies, procedures, relevant legislation and licence requirements	Possess a working knowledge of school policies, procedures, relevant legislation and licence requirements	Possess comprehensive knowledge of school policies, procedures, relevant legislation and licence requirements
2.2 Stock Management systems	Learn basic stock control and basic chemical management systems	Possess a working knowledge of stock control and chemical management systems	Possess comprehensive knowledge of stock control chemical management systems
2.3 Financial management	Learn basic purchasing procedures	Possess a working knowledge of purchasing procedures and awareness of the budget	Possess comprehensive knowledge of purchasing procedures and assist with budgeting
2.4 Scheduling (Time and space management)	Learn science booking systems and how to access science timetables	Possess a working knowledge of science booking systems and timetabling	Possess comprehensive knowledge of science booking systems and timetabling

DOMAIN 2: PROFESSIONAL PRACTICE

Standard 3. Organise practical requirements of the science curriculum

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
3.1 Preparation of materials and equipment for practical activities	Be able to identify science equipment and material Prepare, collate and purchase materials and equipment as directed	Prepare, collate and purchase materials and equipment Trial or test activities and/or equipment as necessary	Prepare, collate and purchase materials and equipment Research, give guidance and may suggest alternatives regarding the suitability of materials and equipment
3.2 Procurement and maintenance of equipment	Locate basic science equipment Identify equipment requiring repair and maintenance	Source or construct science equipment Perform basic repairs and maintenance of equipment	Research and source specialised science equipment Undertake more complex repairs and maintenance or source appropriate repairers
3.3 Demonstration of practical activities and skills	Develop proficiency in the demonstration of practical activities and skills	Demonstrate practical activities and skills	Demonstrate and suggest alternative practical activities and skills

Standard 4. Practice sound laboratory techniques

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
4.1 Safe work practices	Follow safe work practices: Maintain a safe working environment Follow standard operating procedures (SOPs) Read safety data sheets (SDSs) Complete risk assessments relevant to the technician role Assist with safety audits	Develop and implement safe work practices: Assist in development, maintenance, and review of safe work practices Develop, maintain and review SOPs Complete and assist in reviewing risk assessments Complete safety audits when required	Ensure appropriate safe work practices are being followed Develop, maintain and review safe work practices Develop, maintain and review SOPs Complete and review risk assessments Complete safety audits and document recommendations
4.2 Provide appropriate guidance and recommendations on safety issues	Convey instructions on science safety matters to co-workers, teachers and students	Provide information and instructions on science safety matters to co-workers, teachers and students	Provide guidance and train others on science safety matters to co-workers, teachers and students
4.3 Practical skills in the use of equipment and technology used in science	Develop proficiency in using and operating science equipment and technology	Demonstrate skills in using and operating general and some specialist science equipment and technology	Demonstrate skills and provide advice or train others in using and operating general and specialist science equipment and technology

Standard 5. Manage resources, procedural and administrative tasks

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
5.1 Procedural, legislative and licensing compliance	Comply with local policies for legislative and licensing requirements Comply with local systems for chemical management	Maintain local policies for legislation and licensing requirements Maintain and assist with developing local systems to maintain chemical management requirements	Ensure that local policies and procedures are followed regarding legislative and licensing requirements Ensure chemical management is compliant with school procedures, legislative and licensing requirements Identify and implement changes when required
5.2 Management of resources (Stock control and chemical management)	Maintain existing stock control databases	Maintain and assist with managing stock control databases Follow management practices for handling hazardous substances	Ensure stock control databases are relevant and current Risk assessment of purchases Management of hazardous substances and waste
5.3 Management of finances	Follow basic purchasing procedures	Make purchases and assist with budgeting	Oversee purchasing and manage a science budget

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
5.4 Scheduling (time and space management)	Use science booking systems and accesses science timetables	Use science booking systems, accesses science timetables and may recommend changes to facilitate sharing of resources	Use science booking systems, access science timetables and may recommend changes to facilitate sharing of resources and best use of facilities Contribute to planning of science timetables and facilities

DOMAIN 3: PROFESSIONAL ATTRIBUTES

Standard 6. Engage in professional development

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
6.1 Participate in relevant professional learning	Participate in professional learning	Participate in professional learning Undertake relevant professional research	Participate in professional learning Undertake relevant professional research Suggest suitable professional development opportunities
6.2 Plan and deliver professional learning for others	Not Applicable	May plan and deliver professional learning for laboratory personnel	Plan and deliver professional learning for laboratory personnel and teaching staff

Standard 7. Work collaboratively within the school community and wider professional communities

Descriptor	Science Technician	Senior Science Technician	Science Laboratory Manager
7.1 Professional relationships within the science faculty, working with science students* and the school community *This may include assisting with field trips, advice and support for experimental design	Actively contribute to science faculty discussions Assist with student work, where appropriate Develop professional working relationships with other school personnel	Actively contribute to science faculty meetings Assist with student work, where appropriate Maintain professional working relationships with other school personnel Participate in the development of science facilities	Attend science faculty meetings and ensures that laboratory issues are raised and discussed Assist with student work, where appropriate Liaise effectively with school personnel and may assist in the selection process for new staff Develop plans, in conjunction with other senior staff members, for the development of science facilities
7.2 Engage with professional networks and broader communities	Participate in school science technician networks Join relevant professional association(s)	Participate in school science technician networks Join relevant professional associations(s)	Participate in and network with scientific professionals within the educational environment and the wider community Join and promote relevant professional association(s)

GLOSSARY

AITSL	Australian Institute of Teaching and School Leadership
ACARA	Australian Curriculum, Assessment and Reporting Authority
ASE	Association for Science Education
ASTA	Australian Science Teachers Association
DECS	Department of Education and Children's Services
DEECD	Department of Education and Early Childhood Development
DEEWR	Department of Education and Workplace Relations
HoD	Head of Department
Science ASSIST	Australian School Science Information Support for Teachers and Technicians
SETA	Science Education Technicians Australia
SLM	Science Laboratory Manager
SOP	Standard Operating Procedure
SST	Senior Science Technician
ST	Science Technician
WHS	Workplace Health and Safety

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SCIENCE EDUCATION TECHNICIANS AUSTRALIA