



# STEM SKILLS IN THE WORKFORCE: WHAT DO EMPLOYERS WANT?

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Science, technology, engineering and mathematics (STEM) underpin Australia's potential to innovate and compete on the global stage - so are we ready to build the future we want?

## KEY FINDINGS

Business and industry representatives have reported a shortage of STEM graduates. The Office of the Chief Scientist commissioned Deloitte Access Economics to survey employer attitudes to STEM skills and STEM skilled employees. Not all employers responded to every question.

- ▶ Of the 466 employers who responded to the question, 384 agreed that people with STEM qualifications are valuable to the workplace, even when their major field of study is not a prerequisite for their role.
- ▶ STEM employees were nominated as being among the most innovative by 345 of 486 employers.
- ▶ Of 451 employers, 241 expected their needs for STEM professionals to increase over the next five to ten years. 169 of 342 expect an increase in their needs for STEM-qualified technicians and trades people.
- ▶ Some employers experienced difficulty in hiring. Of 356 employers, 144 reported difficulty filling technician and trades worker roles, and 135 of 429 had difficulty recruiting STEM graduates. Around one in five reported a shortage of graduates. Around one in three reported a mismatch between the skills required and those of applicants.
- ▶ Employers valued work placements for preparing students to work. Only 140 of 502 employers currently offered structured placements.
- ▶ Many employers are not satisfied with their engagement with post-secondary education institutions.

## BACKGROUND

This paper reports on the employer perceptions of STEM qualified people including the skills and attributes that they bring to the workplace, the value that employers place on STEM graduates, and expectations of future demand.

In Australia, 15 per cent of the working age population have a STEM qualification (Certificate III or above) and those numbers are rising. Between 2006 and 2011, the number of people in positions requiring STEM qualifications grew 1.5 times faster than all other occupation groups.<sup>i</sup>

The trend is not unique to Australia. Most modern economies in the world are working to harness the technological and innovation advantages that a STEM education can bring.<sup>ii</sup>

Is Australia developing a skilled and active STEM workforce ready to meet the challenges of growing a different economy?

## AIM

The project aimed to understand:

- ▶ The skills and attributes that employers need from STEM graduates today and into the future.
- ▶ Whether employers are able to recruit workers with the STEM skills they require and if not why not.
- ▶ The extent to which employers are engaged and satisfied with education providers to train work-ready STEM students to meet their requirements.

## METHOD

In 2013, Deloitte Access Economics carried out an online survey of employers. In total, 1,065 employers responded, representing 450,000 employees, across a range of industry sectors. Not all respondents answered all the questions in the survey and over half of employers did not specify the industry sector for their organisation. The response rate therefore varied between the survey questions. Response numbers are reported for each question.

A broad spectrum of industries and businesses was targeted. These either currently employed, or are looking to employ, staff with a STEM qualification, a sampling approach that may introduce a selection bias towards STEM-intensive firms.

## RESULTS

### Employer perceptions

Employer perceptions of their STEM qualified people were positive overall.

Employers (384 of 466) agreed that people with STEM qualifications are valuable to their business, even in positions where the employee's qualification (major field of study) is not a prerequisite for that role. This was particularly true of the mining industry where 84 per cent of respondents from that sector agreed with this statement, as did 88 per cent of the Professional, Scientific and Technical Services sector.

Also, 345 of 486 employers nominated their STEM-qualified staff as among their most innovative.

Flexibility to modify work practices to accommodate innovation is also crucial for business success; 342 of 483 of employers agree that their STEM-trained staff are able to adapt to changes in the business.

### Capabilities that employers value

To explore perceptions further, employers were asked to indicate the importance they place on a range of employee skills and attributes (Figure 1).

The importance placed on the skills and attributes varied by industry sector (Figure 2). For example, 86 per cent of employers in the Information, Media and Telecommunications sector rated programming important or very important – much higher than other sectors. This sector also rated design thinking as a high priority.

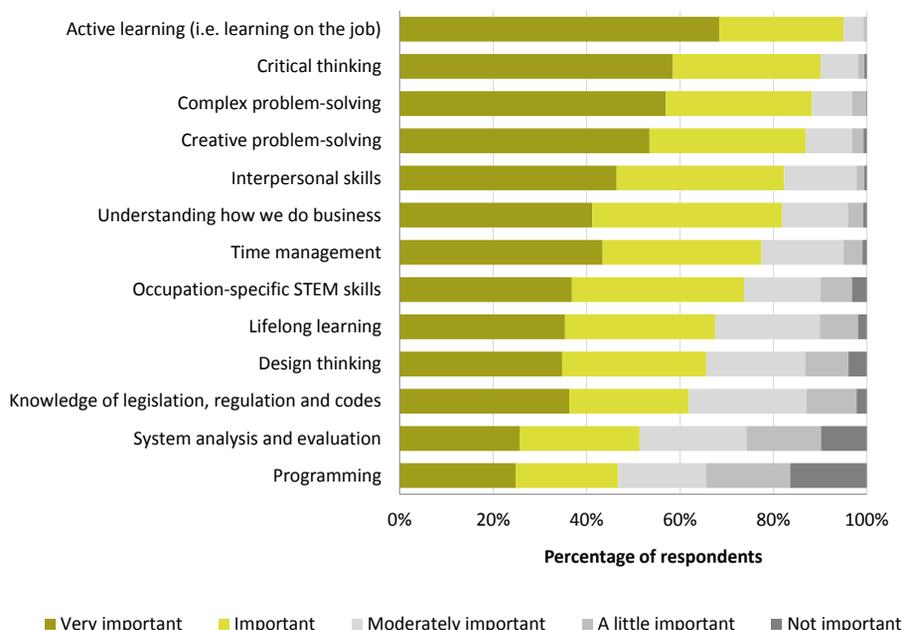
Respondents were asked to list any additional skills which they considered important to their workplace. Overwhelmingly, “communication” was identified as important.

### Comparing STEM and non-STEM qualified employees

Employers compared their experience with STEM and non-STEM qualified employees against the desirable attributes listed (Figure 3). Those who employ both STEM and non-STEM qualified employees (410 employers) rated STEM-qualified employees higher, on average, across the majority of attributes, including the four most highly ranked. STEM qualified employees were particularly highly rated relative to non-STEM in the Financial and Insurance Services, Construction and Health Care and Social Assistance industry sectors.

Figure 1: Importance of skills and attributes in the workplace

Respondents' rating of each of 13 different skills and attributes. Employers were asked to rate each skill's importance on the following Likert scale: Not important; A little important; Moderately important; Important; or Very important. The coloured bars represent the distribution of respondents between the response categories.



**Figure 2: To what extent are the following skills and attributes important to your workplace?**

Percentage of employers in each industry sector by skill level that answered 'important' or 'very important'. Cells below the 50th percentile of values in the table are coloured red and those above blue.

	Agriculture, Forestry & Fishing	Construction	Education & Training	Electricity, Gas, Water & Waste Services	Financial & Insurance Services	Health Care & Social Assistance	Information Media & Telecomms.	Manufacturing	Mining	Professional, Scientific & Technical Services	Public Admin. & Safety
Active learning (i.e. learning on the job)	96	100	83	100	98	82	96	93	94	97	94
Complex problem-solving	75	67	78	86	95	82	91	85	97	97	88
Creative problem-solving	88	89	89	100	83	64	91	87	88	97	76
Critical thinking	75	56	94	100	95	91	91	86	97	92	94
Design thinking	42	75	78	57	47	40	100	83	78	73	47
Interpersonal skills	79	78	94	86	75	91	91	75	71	87	88
Knowledge of legislation, regulation and codes	67	44	61	43	80	82	50	58	59	67	65
Lifelong learning	78	33	94	71	70	64	70	57	70	76	59
Occupation-specific STEM skills	77	56	59	100	78	45	78	71	71	79	76
Programming	14	25	44	57	48	30	86	44	44	41	25
System analysis and evaluation	32	29	56	71	44	60	83	55	47	52	44
Time management	75	78	76	71	70	55	87	78	67	86	71
Understanding how we do business	88	89	94	86	75	100	74	84	85	84	82

### Expected demand

Employers considered their anticipated requirements for STEM-qualified people over the next five to ten years. Of 451 respondents, 241 expected an increase in demand for STEM qualified professionals, while 34 expected a decrease. Almost 40 per cent of those expecting an increase in demand were from the Manufacturing and Professional, Scientific and Technical Services industry sectors.

The same question was asked of employers regarding their expected demand for STEM qualified technicians and trades people. Of the 342 respondents, 169 expected an increase in demand, while 33 expected a decrease.

Expectations differed across industry sectors. For instance, 79 per cent of the Information Media and Telecommunications sector expected an increase in demand for professionals whilst 24 per cent of the mining industry expected a decrease.

### Recruitment

The survey gathered information regarding attitudes towards PhD graduates (233 employers completed questions regarding the role of PhD graduates). The three main roles of PhD graduates were: provision of professional services (119 of 188), research and development (119 of 188) and leadership/management (113 of 118).

Where respondents did not employ PhDs, it was because the qualification was not a requirement for the role (31 of 46), they lacked practical experience (23 of 46) or they lacked required business knowledge (22 of 46).

Of the 429 employers who responded to a question regarding recruitment of early career STEM qualified people, 135 reported difficulties in recruiting STEM graduates with less than 5 years' experience.

And 144 of 356 employers found it difficult to recruit STEM-skilled technicians and trade workers.

Despite receiving applications for advertised positions, difficulty was reported in hiring, indicating a mismatch between the skills required and those possessed by the applicants. The industry sectors with the highest percentage of professional positions unfilled were Public Administration and Safety sector (24 per cent, 7 applications per position); Financial and Insurance Services (21 per cent, 13 applications per position); and Agriculture, Forestry and Fishing (16 per cent, 13 applications per position).

Employers reported on the issues they had encountered in the recruitment of these staff. Of the 280 employers that responded, 214 had encountered problems. Two issues were reported—supply and quality.

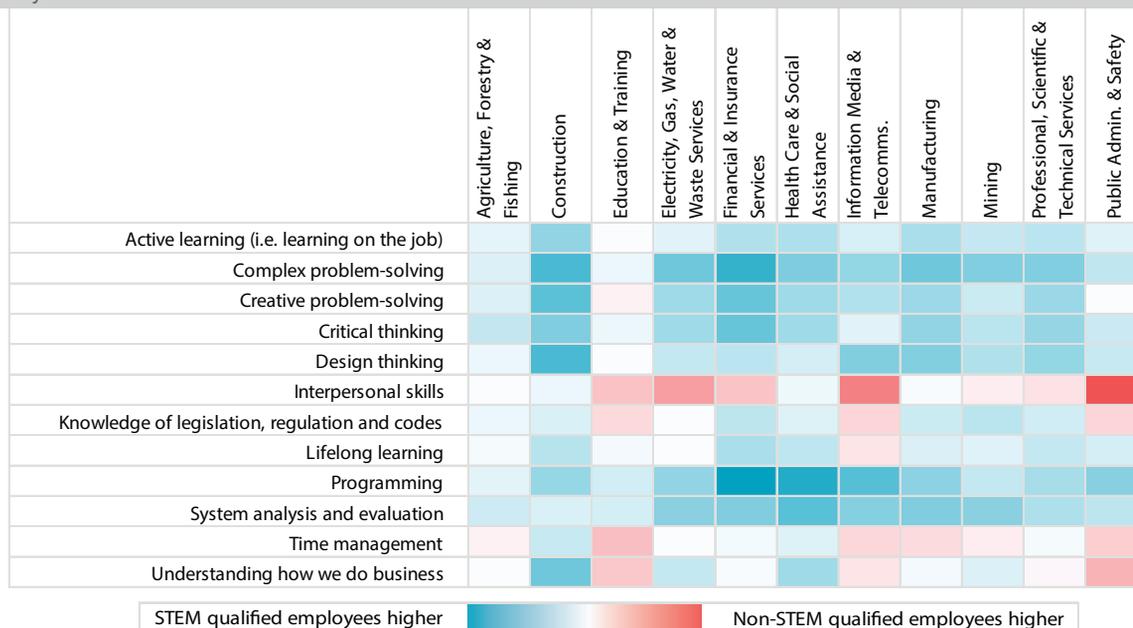
Regarding supply, a lack of applications for STEM positions had been encountered by 45 of 280 employers, and a shortage of STEM-qualified graduates was reported by 59 of 280 employers.

Regarding quality, employers reported receiving applications from candidates with unsatisfactory skills such as a lack of business understanding (101 of 280); a lack of practical experience and lab skills (92 of 280); a lack of general workplace experience (98 of 280); or from people with qualifications inappropriate for their business needs (72 of 280).

These workplace issues were of particular concern to the Professional and Scientific Services; Manufacturing; Information Media and Telecommunications; and Agriculture, Forestry and Fishing sectors.

**Figure 3: Comparison of employer perceptions of the skill levels of STEM and non-STEM employees**

Employers were asked to rate the skill level of STEM and non-STEM employees. The chart below compares employers' perceptions of the skill levels of STEM and non-STEM qualified employees - displaying the difference between the average score for each skill across industry sectors.



### Work experience

Employers indicated the importance of a range of candidate attributes when assessing the suitability of STEM qualified applicants for their workplace. Over two thirds (224 of 323) responded that work experience in a relevant industry was important or very important. Over half (162 of 320) indicated that work experience of greater than 12 weeks was important or very important. However, in response to a specific question, only 140 of 502 employers offer structured work placements to students.

### Collaboration between educational institutions and Australian workplaces

In total, 314 of 507 respondents reported some level of engagement with a post-secondary institution. Large businesses were more likely to be engaged than small and medium enterprises (SMEs).

Employers were asked to indicate their level of satisfaction with this engagement across a range of engagement types. On average, just over 50 per cent of employers were satisfied. Employers were least satisfied with engagement to develop business relevant STEM courses (64 of 153) and encouragement of employees to teach at educational institutions. However, where these were available, 92 of 143 employers were satisfied with work placements for academic credit.

Of those workplaces which did not have links with post-secondary educational institutions, 55 of 167 said that they hadn't been approached, while 46 of 167 said that they had never considered approaching post-secondary educational institutions.

## CONCLUSION

This report highlights a mismatch between the skills required by employers and those of job applicants. Clearly, an effort has to be made to minimise this discrepancy. The information presented here should help to identify what needs to be done.

### Further Information

The full Deloitte Access Economics report, Australia's STEM workforce: a survey of employers, is available at [www.chiefscientist.gov.au](http://www.chiefscientist.gov.au)

### References

- i) ABS (2014), Perspectives on Education and Training: Australians with qualifications in science, technology, engineering and mathematics (STEM), 2010–11, Cat. no. 4250.0.55.005. Australian Bureau of Statistics, Canberra.
- ii) Office of the Chief Scientist (2014), Science, Technology, Engineering and Mathematics: Australia's Future. Australian Government, Canberra.

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