

Country Reports

Switzerland

1.1 Relevant Policy

Education in Switzerland is divided into preschool (up to seven years of age); nine years of compulsory education comprising primary and first level secondary; post-secondary education; and tertiary education. There are different approaches to the organisation of education in the German-speaking, French-Speaking and Italian-speaking areas of Switzerland. All areas, however, follow the traditional dual education system, with vocational and academic routes. More recently, a third route has developed for those entering middle-ranking professions.¹ There has traditionally been a strong partnership between state, trade associations and employers, in which all three partners contribute funding and resources to varying extents.²

At compulsory education level, there is provision for students with learning difficulties to be taught in smaller classes for a range of subjects, including maths.³ There is also a government target to reduce the number of learners without an upper secondary qualification to 5% by 2015. This has resulted in the introduction of an individual support case management system, including additional maths support to help learners obtain the relevant upper secondary qualification.⁴

Measures to ensure that occupational competences are not entirely dictated by large corporations include ensuring that trade associations representing SMEs, as well as large companies, are involved in deciding relevant competences; and by national level establishment of assessments for the Federal VET Diploma (by professional organisations), and national level training of examiners (by the national agency SFIVET).⁵ It is worth noting, however, that all of this is in an applied context, meaning that mathematics and numeracy provision within VET programmes is relatively tightly focused.⁶

There is a recognised need for maths teaching to continue beyond compulsory education, especially for students that may have struggled with maths at school and need ongoing support.⁷ Further maths training is also necessary for students pursuing specific vocational courses, including engineering, IT, business and finance, science-related and other technical fields. In addition, ongoing globalisation and rapid technological change mean that further learning and updating is required.⁸

1.2 Institutions and Courses

GENERAL SYSTEM

There are three principal routes followed at post-secondary level: general (academic) education (up to 20% of learners), vocational (70%) and a recently implemented full-time vocational training programme (11%). Within these routes, small numbers take a teacher training route or a technical diploma route.⁹

Tertiary level institutions include universities, teacher training schools for secondary level teaching, higher vocational schools, specialised professional institutes and apprenticeship programmes.¹⁰

VOCATIONAL COURSES

Most young people choose a vocational path between the ages of 12 and 15.¹¹ The main upper secondary vocational route is through the vocational track, as outlined above. Post-secondary vocational education provides apprenticeships for 16-19, comprising two days a week at a vocational school and three days a week professional training. Approximately 90% of students achieve a certificate of proficiency at the end of the course. Recently instituted full-

¹ <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

² Musset, P., et. al. (2013), *A Skills beyond School Review of Austria*, OECD Reviews of Vocational Education and Training, OECD Publishing.

³ <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

⁴ www.sbf.admin.ch/themen/01369/01723/01725/index.html

⁵ www.sbf.admin.ch/themen/01369/01723/01725/index.html

⁶ <http://www.oecd.org/austria/ASkillsbeyondSchoolReviewofAustria.pdf>

⁷ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

⁸ <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

⁹ <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

¹⁰ <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

¹¹ Bierhoff, H., and S. J. Prais (1997), *From School to Productive Work: Britain and Switzerland Compared*, National Institute of Economic and Social Research, Cambridge: Cambridge University Press.

time vocational training programmes prepare students for specific careers, for example, in social work, teaching and some middle-ranking business or technical careers. The programme leads to an intermediate diploma.¹²

Approaches to the provision of off-the-job training varies across different of the VET/Professional Education and Training (PET) routes. There are also a number of different providers including non-government schools run by trade associations;¹³ government-run schools; and in state-funded professional colleges.¹⁴

1.3 Practice and Pedagogy

Vocational trainees study maths in applied contexts and consolidate that learning through direct application in the workplace.¹⁵ Vocational maths education typically does not return in detail to the basics of maths for those who have not acquired them sufficiently at school.¹⁶ Maths curriculum content is largely driven by labour market organisations; there are currently no national standards for VET maths.¹⁷ National standards in maths must be achieved for learners following the general education route. Learners on apprenticeship routes may follow a one-year programme to achieve the elementary vocational training qualification.¹⁸

A study of different teaching approaches used in maths lessons found that there was no appreciable difference in learner achievement between three different styles adopted: lecturing; problem-based development; and problem-based discovery. The discovery approach, however, had a negative emotional impact on the quality of learning.¹⁹

While the academic route is well-served in terms of assessed maths provision, the vocational route has taken a highly contextualised approach that does not directly address the lack of basic numeracy and maths skills amongst some students nor guarantee a consistent minimum standard.²⁰ Limited direct tuition in numeracy (and literacy) is hampering the ability of VET/PET students to adapt to the demands of rapid globalisation and technological change.²¹

UZWIL – FLAWIL VOCATIONAL TRAINING CENTRE – PROGRESSING FROM APPRENTICESHIP TO UNIVERSITY²²

Target Group:

Recently completed apprenticeship students studying for vocational matriculation in order to qualify for entrance to the University for Applied Sciences.

Context:

This initiative is in a state-run school. It is a programme for those who have successfully completed an apprenticeship and who wish to progress to university rather than moving straight into the labour market.

Nature of Intervention:

This is a state-funded initiative in which apprentices are encouraged to progress to higher levels of study. The programme includes a mathematics component which is highly specialised and which is taught by a teacher who is qualified as both a mechanical engineer and a maths teacher.

Results/Impact:

The programme is addressing a perceived imbalance that there are 'not enough university graduates and too many in the trades'.

Lessons Learned:

This initiative:

- Recognises that the popularity and status of the vocational route can lead to a high proportion of young people exiting study and/or training programmes without progressing to higher education.
- Reinforces the value of teaching mathematics in context.
- Draws attention to the dual qualification of the teacher in engineering and maths; teacher training is an additional third element. The subject expertise in engineering and maths is likely to raise the credibility of the teacher and ease communication with the students.

¹² <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

¹³ https://www.det.nsw.edu.au/media/downloads/what-we-offer/awards-scholarships-and-grants/scholarships/premier-s-teacher-scholarships/volume9/tafe_ziems.doc

¹⁴ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

¹⁵ https://www.det.nsw.edu.au/media/downloads/what-we-offer/awards-scholarships-and-grants/scholarships/premier-s-teacher-scholarships/volume9/tafe_ziems.doc

¹⁶ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

¹⁷ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

¹⁸ <http://education.stateuniversity.com/pages/1472/Switzerland-EDUCATIONAL-SYSTEM-OVERVIEW.html>

¹⁹ Hugener, I., et. al. (2009), 'Teaching patterns and learning quality in Swiss and German mathematics lessons', *Learning and Instruction* 19:1, pp. 66-78.

²⁰ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

²¹ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

²² www.sbf.admin.ch/themen/01369/01723/01725/index.html

BUHLER AG²³

Target Group:

Apprentices at an international milling company.

Context:

There are typically 300 apprenticeships in the company at any one time. It is an example of a situation in which apprentices need different levels of maths.

Nature of Intervention:

The maths is taught via off the job training in a government run school. There is no internal company maths training programme, but there is a requirement for apprentices to *'master maths according to the job profile'*. There are some informal maths studies in the workplace but they are not linked to any accredited qualifications, or recognised in any formal way. The company also has informal working relationships with universities to address work challenges that require complex calculations. More advanced maths skills as part of the workforce capacity are achieved in two main ways: the company recruits employees with a university degree and existing employees are given the option to *'further educate themselves'* by studying for a degree.

Results/Impact:

Maths learning covers the basics in an off-the-job context. Further learning is pursued on a *'need to know and apply'* basis for most posts.

Lessons Learned:

There is a general education approach to maths in the state-run off-the-job training with a common curriculum across a number of trade areas. Beyond this programme, individual employees are expected to learn the mathematics needed for particular job roles in order to be successful in the apprenticeship programme and beyond it.

TECHNICAL VOCATIONAL SCHOOL (TVS)²⁴

Target Group:

Young apprentices at a Technical Vocational School.

Context:

This example focuses on the school component of an apprenticeship programme.

Nature of Intervention:

Maths training takes place off the job. A number of different, flexible pathways are offered, all of which are face-to-face rather than distance learning. Some of the lessons are taught in English for ease of communication with English speaking countries.

Results/Impact:

The flexible pathways allow easy interaction between practical and academic routes for vocational progression. Learners are able to move from a more academic to a more practical career pathway and vice versa. The flexibility and strong emphasis on trade make it a popular route for young people.

Lessons Learned:

This example illustrates how the maths teacher at the TVS recognises the importance of the trade context. The identification of ready transfer between academic and vocational routes, however, may not be the experience in all apprenticeship programmes.²⁵

PROFESSIONAL COLLEGE EXAMPLE²⁶

Target Group:

Individuals with particular weaknesses in numeracy who are otherwise suitable for a PPET programme.

Context:

In addition to the dual routes of academic and VET programmes, professional education and training programmes have become important for those wishing to enter, for example, the fields of business, arts, technical and construction. The evidence indicates that business and arts students possess stronger literacy and numeracy skills in comparison to technical and construction students.²⁷

Nature of Intervention:

²³ https://www.det.nsw.edu.au/media/downloads/what-we-offer/awards-scholarships-and-grants/scholarships/premier-s-teacher-scholarships/volume9/tafe_ziems.doc

²⁴ https://www.det.nsw.edu.au/media/downloads/what-we-offer/awards-scholarships-and-grants/scholarships/premier-s-teacher-scholarships/volume9/tafe_ziems.doc

²⁵ www.sbf.admin.ch/themen/01369/01723/01725/index.html

²⁶ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

²⁷ <http://www.oecd.org/switzerland/Skills%20beyond%20School%20Review%20of%20Switzerland.pdf>

The professional college tests the numeracy and literacy levels of applicants entering programmes of study. It provides additional preparatory courses in the first semester for learners requiring additional support.

Results/Impact:

The intervention demonstrates the role of professional colleges in addressing gaps in basic academic skills which are not always picked up in vocational programmes.

Lessons Learned:

This intervention has been identified as a possible model of best practice which could be disseminated to other professional colleges. The Government is in a good position to do this, as it provides state funding towards professional college provision. This would overcome the different priorities that currently exists across cantons and between different industry sectors.

SWITZERLAND – SOUTH AFRICA COLLABORATIVE PROJECT²⁸

Target Group:

Students struggling with maths.

Context:

This research and development project was instituted as a collaboration between two teacher education institutions - one each in Switzerland and South Africa - to develop, trial and evaluate the use of video clips in teaching maths.

Nature of Intervention:

The intervention comprised the development of short (one to three minutes) video clips to unpack mathematical concepts. The video clips used natural materials to animate and develop mathematical processes. The video clips were accessed via YouTube.

Results/Impact:

The programmes demonstrate a shift in emphasis from approaches with a high dependence on instruction and complex intellectual challenges to a more playful approach which encourages trial and error and a willingness to experiment and generalise. The video clips are described as *'delightful and self-explanatory'*.

Lessons Learned:

This intervention provides an increased potential for using material which motivates and engages learners at a number of levels and in a range of school and vocational contexts.

1.4 Key Points of Learning

Vocational trainees study maths in applied contexts and consolidate that learning through direct application in the workplace. Vocational maths education typically does not return in detail to the basics of maths for those who have not acquired them sufficiently at school. Maths curriculum content is largely driven by labour market organisations; there are currently no national standards for VET maths. National standards in maths must be achieved for learners following the general education route.

While the academic route is well-served in terms of assessed maths provision, the vocational route has taken a highly contextualised approach that does not directly address the lack of basic numeracy and maths skills amongst some students nor guarantee a consistent minimum standard. Limited direct tuition in numeracy (and literacy) is hampering the ability of vocational learners to adapt to the demands of rapid globalisation and technological change.

²⁸ Linneweber-Lammerskitten, H., and M. Schafer (2010), 'Motivating Mathematical exploration through the use of video clips: a collaborative research and development project between South Africa and Switzerland', Proceedings of the Eighteenth Annual Meeting of the Southern African Association for Research in Mathematics, Science and Technology Education. Accessed via: <http://www.sdu.uct.ac.za>