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English as an Additional Language: Science Language Literacy Pilot Project

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Summary

The English as an Additional Language (EAL): Science Language Literacy Pilot Project (SLLP) was designed to help support secondary science teachers of EAL students, and to improve students' ability to learn in a mainstream science classroom while still in the process of learning English. Many of these students also had learning difficulties related to disrupted school backgrounds, which highlighted the need to identify and target their specific needs socially, emotionally and in terms of their literacy. Several additional factors prompted this initiative – apart from the clear need to support EAL students' transition into the mainstream – because although they are provided with targeted EAL support, they are often overwhelmed and prone to dropping out of school altogether. The local assessment results of students' performances indicated that it was critical to include additional methods of addressing EAL students' needs. Assessments included monitoring students' progress against the English as a Second Language (ESL) Companion to the Victorian Essential Learning Standards (VELS) and the science Essential Learning Standards (ELS).

Additionally, the introduction of various new ideas, supported by research, was being offered to support teachers' learning experiences. It was apparent that, in order to raise expectations of students' performance by developing more strategies to meet their needs, it was essential to trial some of the new approaches and integrate them with current best practice. The project was developed on the premise that, as a result of the government recognising these issues, a program or course offered to science teachers about how they might develop students' outcomes through developing their abilities in explicit teaching of science literacy would engage students to a greater extent in science, and also develop their English literacy, with the result that they would continue in school and progress to complete year 12 and potentially higher education.

Target student group

Although the target group of the pilot was teachers, it was the students who were identified as in need, and who required specialist teaching. Therefore, teachers selected for the pilot were those teaching years 7–11 in Victorian metropolitan public schools with large EAL populations. The EAL students were mainly refugees who had disrupted school histories. In order to develop these students' English literacy – and science literacy in particular – it was identified as essential that their teachers were given the opportunity to develop their professional capacities to identify needs, and design explicit teaching practices to ensure that students' needs were met. The long-term aim was to develop whole-school initiatives that would benefit all students in these schools.

The target groups of teachers selected for the training consisted of four teachers from three targeted secondary schools: three science teachers of years 7–11, and one EAL teacher.



Later, additional teachers joined the project to be engaged in ongoing and future planning and training for the coming year.

The main aims of the course were to explain to teachers how the English language makes meaning in science, and the need to make explicit the implicit knowledge of how English works to suit the purpose. The course informed teachers about how students' English language skills can be moved from concrete and personal contexts to abstract and impersonal contexts, and it provided guidance in planning learning activities that would scaffold students so they could eventually write their own texts.

The students' capabilities the project was trying to improve were the ability to learn in a mainstream science classroom – while still in the process of learning English – by explicitly learning how scientific genres are structured at the grammatical and whole-text level, and by being scaffolded through classroom activities to access texts and produce texts of their own.

Method

The pilot study took place in schools with large EAL populations, with the intention of modelling best-practice literacy improvement. In order to select schools for the project, expressions of interest were called for from schools with significant numbers of EAL students, particularly those schools that had flagged science as a school priority. Two of the three schools selected had a high number of refugee students enrolled in their mainstream for less than three years, most of whom had participated in intensive English language programs in specialist centres over a 12-month period prior to enrolment.

The approach used in the pilot was deliberately functional and systemic, so the focus included promoting whole-school approaches to explicit literacy teaching through a commitment to whole-school curriculum planning. This planning resulted in the development of a 'mode continuum' using the Genre Teaching and Learning Cycle [model](#).

As a result, the model can be adapted to other contexts, not only those described in our pilot group, because explicit literacy teaching practices are modelled. Explicit teaching and learning pedagogy is examined on the [MyRead](#) [website](#).

Funding for the pilot through the Smarter Schools National Partnerships program, which amounted to \$37,000, ensured that personnel, venue and catering costs were covered, and schools were not disadvantaged by being engaged in the pilot.



Victorian government schools selected in the study individually supported the pilot by providing resources and the opportunity for teachers involved to have additional time to plan and reflect on their learning and how it would work in their classrooms. The course ran over five days: two of these were planning and reflection days; the other three were training days.

The course undertaken by teachers focused on how English language makes meaning in science, and how making explicit the implicit knowledge about how English language works in science would have a flow-on effect and assist in making meaning for students across the board. The methods teachers were taught to use in the course were designed to help students learn how scientific genres are structured at grammatical and whole-text levels, through scaffolded activities that will assist them to access and produce their own texts.

Participating teachers had the opportunity to do the following:

- Develop an understanding of learning theories that are underpinned by the role of language in learning, ie learning and the role of the teacher in scaffolding students.
- Develop a pedagogy of explicitness where high challenge works hand in hand with high support, so that students are scaffolded into successful and sustained learning.
- Learn how to make explicit the implicit, so that students are scaffolded in their learning
- Consider the different genres that constitute their subject and their inherent patterns of language.
- Understand how technicality and abstraction are constructed, what needs to be learned by students, and explore how teachers can support students to read and produce increasingly abstract and technical science texts.
- Develop an understanding of the English language resources that are needed to read and write texts that are longer and more complex, organised so that they are cohesive and coherent, and are expressed in ways that account for uncertainties of ideas and evidence in science.
- Implement this new knowledge of a more explicit pedagogy in the classroom.

Data collection for the pilot was based on existing school practice: learning walks, classroom observation, reflection and mentoring were the norm, as was in-school evaluation. Student cohorts were monitored, including non-EAL/refugee students, to assess impact and engagement with the project. Students were also asked what advice they would have given their teachers that would improve student learning, if they had the opportunity to do so.



Results

Improvements in student performance were monitored by teachers as the Genre Learning and Teaching Cycle progressed. Teacher judgements of student achievement were monitored (as they had been initially) against the ESL Companion to VELS (put out by the Victorian Curriculum and Assessment Authority). Students learning in science was also re-assessed against the Learning Standards of the science domain of VELS. Students' success was measured through more active engagement with the subject area, their satisfaction with their involvement in bridging programs, and their participation in the classroom. Teachers monitored and assessed students' participation and performance through video analysis and through before-and-after student attitude reflections. As part of teacher judgments on student growth and associated class assessments, teachers participating in the project identified that there had been growth in student understanding of science. As no standardised assessments were used to identify student improvement in literacy, this has only been identified to a minor extent.

However, the outcome of the pilot indicates that more students have chosen to continue doing science in years 10–12 in 2013. This increase in science enrolments suggests students' improved confidence; many EAL and refugee students in the program have opted to continue at school into years 11 and 12, and are also intending to study science. We conclude that this outcome is significant, given the disrupted nature of their prior education and because they are still in the process of learning English.

The main factors contributing to the success of the project were that, for schools, it was a program offered at the right time; for teachers, it was being able to benefit from a new approach; for students, it was being in schools that wanted to identify more effective approaches to students who were vulnerable to not succeeding in the mainstream because of their backgrounds and stage of English-language learning.

Other factors and conditions for success were also in place in the schools. Where the following preconditions for success are in place, a program like this is more likely to be successful:

- Positive perceptions of students' potential to learn; an acceptance that teachers are both responsible for the learning in their classrooms and capable of delivering it, at point of need.
- School leadership needs to have acknowledged the need for improvement in literacy and numeracy, but also needs to locate the responsibility for that improvement in all of the subjects taught at the school.
- Leadership needs to have established – or have the desire to establish – a culture of professional conversation and collaborative planning by providing structures and expectations that support it.



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A project like the EAL science project will succeed best in schools in which teachers routinely visit other classrooms in an effort to understand and develop best practice; in which effective student management is judged in terms of improved learning outcomes; and in which improved learning outcomes are assessed on the basis of detailed and varied feedback from students.

A school also needs to understand the importance of teachers as learners, engaged in a process that requires planning, implementation and reflection. The school culture needs to respect teachers' capacity to apprentice students into the culture and knowledge of their discipline. These preconditions existed to a large degree in the schools that took part in this pilot program.

However, the main unanticipated outcome was the readiness of teachers to see the value of the approach and the implications for other learning areas. Teachers also demonstrated how this could be done, how the strategies could be implemented in subject areas such as mathematics, and realised the value of the approach to students other than the target group.

Lessons learned

Following are the lessons that have been learned in the development and implementation of this initiative.

1. Responsibility for the implementation and effectiveness of this initiative clearly rested with – and will rest with – leadership and the ability to involve teachers in the process. Ownership of the program needs to be shared by the practitioners who implement it, because they are the only ones who will have the knowledge and experience to drive its evolution and development throughout a school. A forum to articulate the value of this initiative must also be given high status, providing teachers with a place where they can share work samples, discuss areas of potentially negative influences and similar issues, and where they can be accountable for what they are doing. Importantly, it is a forum where they can also receive recognition and encouragement for their work. Such a process handled well, provides a research and evidence base that supports sustainable and evolving change through supportive networks and knowledge sharing.
2. So far in this pilot project, the need for evidence of sustainability is evidence of change and continued development in teacher practice in the schools involved in the pilot. Teachers are able to articulate the changes in their practice, the change in student understanding of – and interaction with – the knowledge and the reasons why this is happening. They now have a conceptual framework that equips them to locate difficulties students may encounter, without apportioning blame because students can't read or don't know enough English language to function well in the mainstream classroom.



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3. Teachers in these schools are able now to critique traditional resources such as textbooks, deciding whether students need to be provided with scaffolds to manage the text, or whether the text is deficient. Because the teachers understand how meaning is made in their subject area, they are better able to analyse the demands the subject makes of their students. Teachers report that they have realised that their knowledge as scientists is as important as their teaching knowledge.
4. To this mix is added new knowledge about how meaning is made, and it was noticed that these teachers seemed to find it impossible to teach in the 'old' way. They commented that they '... think differently about what they do, all the time'. Further evidence that the project is sustainable came from teacher evaluations. Teachers involved commented that even though the focus was on EAL students and science, they felt that strategies used were relevant for all their students and other subject areas.
5. For the ongoing success of this initiative, schools need to be able and willing to source and pay for appropriate training, delivered locally, and to provide ongoing support to allow teachers to practise, improve and share their understanding and skills. Schools also need to find ways to deliver the training to staff within their subject domains, drawing heavily on their expert disciplinary skills, as well as working in a cross-disciplinary setting.
6. The main challenges – beyond the need for an approach that commits to embedding the program in the long term, and which is adequately resourced – could well be around the challenges it gives to embedded practice: teachers need to be open-minded about adding to their teaching repertoires, without feeling that their previous practices are being challenged. The fact that this pilot started with a new cohort of students who had particular English language and literacy learning needs – and clearly needed a new approach if they were to be successful at learning in science classrooms – meant that teachers were open to change. Teachers were then able to see that these approaches had a wider application both for other students and in other learning areas.



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Drawing from the lessons learned as a result of this project, to be most effective the SLLP should be implemented as a whole-school approach, as outlined in Table 1.

Table 1: Requirements for successful implementation of SLLP

Participants	Actions and attitudes of participants
Leadership that:	<p>acknowledges the need for improvement in literacy and numeracy, but also locate the responsibility for that improvement in whole-school curriculum planning that focuses on explicitly teaching the literacy of subjects taught at the school</p> <p>establishes a culture of professional practice and collaborative planning by providing structures and resources that support this, such as peer observation and feedback</p> <p>understands the importance of teachers as learners, engaged in a process that requires planning, implementation and reflection</p> <p>nurtures a school culture that has respect for the teachers' capacity to apprentice students into the culture and knowledge of their discipline.</p>
Teachers who:	<p>hold positive perceptions of student potential to learn, and an acceptance that teachers are both responsible for the learning in their classrooms and capable of delivering it, at point of need</p> <p>routinely visit other classrooms in an effort to understand and develop best practice, in which effective student management is judged in terms of improved learning outcomes.</p>
Schools that:	<p>provide ongoing support for professional learning in disciplinary professional learning teams</p> <p>link teachers' work with school initiatives in the school's strategic plan</p> <p>invest resources into the program and look to models of implementation identified in the case studies</p> <p>are clear about how the program will enhance teaching in the school and improve student learning, engagement and participation.</p>



Next steps

One principal's testimonial provides evidence of how the pilot provided opportunities to embrace the pedagogies and strategies learned, and develop them into directions for the future:

I believe that our involvement in the EAL Science Language Literacy Project in the last 11 months, which allowed access to language literacy experts, has focused attention on how to best improve engagement and participation of not only EAL and refugee students, but all students.

This project, in the science learning area, has seen greater effort made in making the technical language much more explicit [and] has given us the opportunity to develop a teaching and learning continuum in science, with provision to accurately scaffold language demands in a real, genre-based context, maximising a student's retention of knowledge irrespective of its abstractness.

The professional dialogue that has occurred through our direct involvement in the project has resulted in significant change in our science teaching. More students have selected to continue doing science in years 10, 11 and 12 in 2013. This increase in science enrolments flags students' improved confidence in embracing complex genres. It is particularly encouraging to see that many of our EAL and refugee students are selecting to go on to year 11 and 12 and do science, including many students who have had interrupted schooling.

The plan now is to adopt the approach in other subjects, including mathematics, the arts, humanities and technology. The increased number of new arrivals has also focused our attention on the EAL and language literacy needs of these students. This program came at an opportune time to influence changes at the school in the transition process, welfare, course counselling and course structures in place for these students. There is an absolute need to continue this work and see that the project learning is fully implemented across all learning areas and re-evaluated. The pilot group has developed great resources, including videorecordings, which we will be able to use in training other staff. We have made a commitment to the project and we will maintain attention to it through ensuring staff who have been trained can help train other staff, as well as seeing if we can maintain contact with key experts to deliver the key learnings.



Research base

The three key ideas that guided this project are outlined below:

- Explicitly teaching the language demands of a subject area assists students to learn and to produce texts.
- Using the Genre Teaching and Learning Cycle helps teachers plan activities that provide scaffolds for learners.
- Teachers can mentor other teachers, and take what they learn into other areas of their teaching practice, increasing sustainability.

In addition, language theory – based on the systemic functional linguistics approach to language articulated by Halliday & Hasan (1976) – was acknowledged, supporting the view that schools are proponents of a specific culture and that within this broad education culture, the disciplines represent a further set of particular cultures – or communities of people – engaged in the same specific field of inquiry.

Halliday & Hasan (1976) identified how cultures are expressed, defined and transmitted through language and through meaning-making systems, including language and visual and symbolic representations. They argue that acquiring understanding involves the mastery of the codes and conventions that characterise the field of knowledge and the kind of task that a student is involved in. The different codes, conventions, texts and ways of thinking are the genres of the various cultures, and meaning-making systems operate along a register continuum from the personal, concrete and specific to the impersonal, abstract and general. Movement within that continuum requires a change in grammar, vocabulary and the way we organise texts.

Students in schools need to acquire, quite literally, the language of a range of such cultures. The further the student's home language is distanced from the languages of school – because of class, ethnicity, gender or any other reason – the more pressing it is that teachers teach the genres of school systematically and explicitly. In doing so, they will of course be teaching the knowledge explicitly and thoroughly.

The next question is one of pedagogy, which is about how teachers teach knowledge in a way that enables students to articulate and transfer their understanding to contexts outside the lesson in which they learned it. The project uses a Genre Teaching and Learning Cycle model to drive the application of the language theory. The teaching and learning cycle establishes a basic pattern in which the knowledge is demonstrated and ideas discovered and explored in the first context-setting phase.



The target text – whether linguistic, visual or symbolic – is then modelled and deconstructed. This is followed by a period of co-construction, with gradual release of teacher responsibility, until students are ready to produce and transfer independently by constructing their own texts or by reading authentic texts. An extremely important feature of the co-construction phase is the development of writing-like speech to support writing and reading.

The Genre Teaching and Learning Cycle is a methodology that has been used extensively in many contexts, including in Victoria, in intensive on-arrival EAL settings. It works to frame teaching and learning across a sequence of lessons, within a single lesson and within fragments of lessons. As well as shaping the form of a lesson, it describes a habit of mind, or a reflex behaviour, in a teacher who has internalised the approach.

Further reading and links

Department for Education and Childhood Development, South Australia, *Unlocking the World*, www.unlockingtheworld.com

Department for Education and Childhood Development, South Australia, *Teaching ESL students in Mainstream Classrooms*, www.unlockingtheworld.com/programs/teaching-esl-students-in-mainstream-classrooms

Department of Education and Early Childhood Development, Victoria, *Genre Teaching and Learning Cycle*, www.education.vic.gov.au/school/teachers/teachingresources/discipline/english/proflearn/pages/velswrite4.aspx#4

Department of Education and Early Learning, Victoria, *English as an Additional Language (EAL) Science Language Literacy Pilot Project*, www.education.vic.gov.au/school/principals/management/Pages/ealscience.aspx

Department of Education, Science and Training, Victoria, *MyRead: Strategies for teaching reading in the middle years*, www.myread.org/index.htm

Department of Education, Science and Training, Victoria, *MyRead: Cooperative reading as simple as ABC*, www.myread.org/guide_cooperative.htm

Gibbons, Pauline 2009, *English Learners: Academic Literacy and Thinking*, www.collaborativelearning.org/academiclitchap1.pdf

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Halliday, MAK & Martin, JR 1993, *Writing Science: Literacy and Discursive Power*, University of Pittsburgh Press, Pittsburgh.

Hoey, Michael 1991, *Patterns of Lexis in Text*, OUP, Oxford.

Kunz, K & Steiner, E 2013, 'Towards a Comparison of Cohesion in English and German: Concepts, Systemic Contrasts and a Corpus Architecture for Investigating Contrasts and Contact', in M Taboada, S Doval-Suárez & M González Álvarez (forthcoming), *Contrastive Discourse Analysis: Functional and Corpus Perspectives*, Equinox, London.

Martin, JR & Rose, D 2007, *Working with Discourse: Meaning beyond the clause*, Bloomsbury Academic/Continuum Press, UK.

O'Halloran, Kay 2005, *Mathematical Discourse: Language, Symbolism and Visual Images*, Trowbridge Press, Wiltshire.

Polias, John 2004, *Language and Learning in the KLA's and the Implications for Curriculum Writers*, Lexis Education, <http://education.qld.gov.au/literacy/docs/language-learning.pdf> .

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