

Numeracy programs in schools

The Department's Knowledge Bank presents case studies and accounts from teachers and schools trialling innovative 'next' practices. Items related to numeracy can be accessed in the Knowledge Bank at:

<http://www.education.vic.gov.au/knowledgebank/case.asp>

Details of four case studies are listed below.

Balwyn Primary School: Investigating best practice in numeracy

As part of a Teacher Professional Leave project, teachers at Balwyn Primary School set out to investigate best practice in numeracy, to enable them to drive change within the numeracy program. The focus was on gaining strategies to develop the skills and knowledge of staff and on educating the parent community, with the ultimate outcome of promoting student confidence and improving overall outcomes in mathematics.

Background

The school has a multi-age class structure, based on the belief that learning is developmental and that this structure provides greater opportunities for individual growth and achievement.

Results of staff and student surveys in 2004 highlighted the need to change the attitude of staff towards teaching

mathematics by improving their confidence in teaching approaches and developing their skills to cater for different needs in their classrooms.

There was an increasing awareness amongst staff and leadership that Balwyn needed to develop a whole-school approach to numeracy and planning, including consistent planning formats and consistent vocabulary when discussing numeracy with students and the community.

Objectives

- To increase individual student outcomes in numeracy.
- To negotiate and introduce consistent planning formats.
- To develop staff and student vocabulary when discussing numeracy and to ensure consistency.
- To build up the numeracy resources.
- To develop staff and parent understandings of how resources are used to increase numeracy understandings.
- To increase parent participation during numeracy blocks.

Approach

The teachers set out to:

- work with staff and the community to increase numeracy understandings

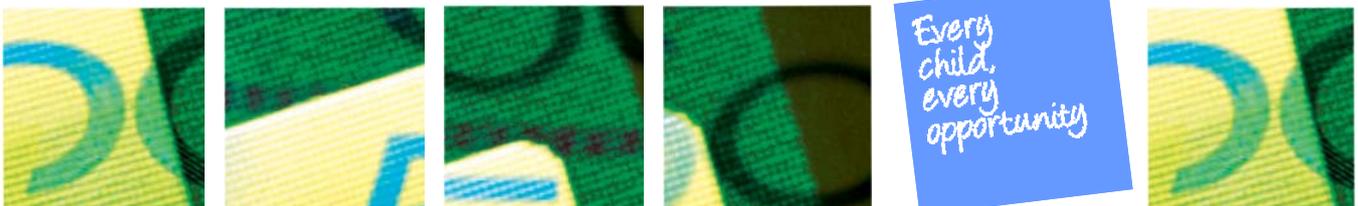
- work to increase resources, knowledge of resources and visibility of numeracy
- work with staff to improve teaching, including planning, teaching approaches, assessment and evaluation
- work with students and staff to improve attitudes and confidence in numeracy.

Investigation of best practice

The teachers visited best-practice schools to observe teaching and learning practices; attended exemplary staff professional development; collected and discussed readings; and explored via experimentation in their own classrooms. They presented internal professional development sessions to create passion and enthusiasm in students and staff to drive change. As a result, staff showed improved understandings of best teaching practices in mathematics, and improved attitudes towards their own teaching and learning about maths. Students became more positive and focused, and are enjoying their daily maths sessions.

Resources

All maths resources in the school were audited and catalogued. Maths kits have been set up for teachers to use which focus on a specific dimension of teaching within



the maths curriculum. Each classroom also has their own Numeracy Kit, which has been set up for teachers to store and use readily within their classrooms. Each kit contains resources that are used daily during the numeracy block, such as calculators, counters, maths dictionaries, assorted dice and playing cards.

Maths Talk Boards

All teachers have implemented a Maths Talk Board within their classrooms. These display the common mathematical vocabulary connected to the current maths learning focus. By having the same words used and displayed across classes, students feel the familiarity of consistent teaching and learning, and are able to associate more strongly with their past experiences.

Family Numeracy Bags

Family Numeracy Bags were introduced to enable families to play a maths game while thinking, socialising and having fun. They incorporate the mathematics of problem solving, making choices and reflecting on chance, strategising and other mathematical concepts that are used in everyday life.

Family Numeracy Nights

Whole families attend these evenings, which feature a range of hands-on activities, e.g. problem-solving activities, games (whole group and small group), group tasks and competitions. Through these sessions, members of the community experience numeracy learning in the same way their children do during the day. This, combined with modern understandings of mathematical terms, enables parents to communicate confidently with their children about numeracy, supporting a positive home/school partnership.

Mathematical enrichment

Opportunities to provide enrichment for gifted mathematical students are provided across the school. Students are given opportunities to share ideas with 'like minded' students, challenge themselves and extend their thinking. On Fun Maths Fridays, students across the whole school are placed in cluster groups of like abilities to develop maths skills, solve problems and play maths games. Talented mathematicians are encouraged to participate in programs such as the Enrichment and Challenge stages of the Mathematics Challenge for Young Australians; Tournament of Minds; and the Australian Primary Schools Mathematical Olympiads. These enrichment opportunities are designed to encourage a greater interest in and awareness of the power of mathematics and promote each student's ability to solve stimulating mathematics problems, with students coming together to discuss mathematics ideas and strategies and solve problems over an extended time.

Conclusion

The whole school now approaches mathematics teaching and learning with greater confidence and enthusiasm. There have been significant improvements made in teachers' approaches to delivering mathematics learning tasks, focusing on hands-on and real-life activities and using open-ended tasks, and the increasingly positive approach by students to viewing themselves as mathematicians.

The full version of this Teacher Professional Leave report can be found on Knowledge Bank at: <http://www.education.vic.gov.au/>.

And now.....

'Driving numeracy change' has had a significant impact on increasing the profile of the mathematics curriculum at Balwyn Primary School.

The teachers have an increased confidence in their ability to successfully teach mathematics due to an increase in teacher professional development and resources. In turn, the students' positive attitudes towards mathematics have increased, as they now are more confident in taking risks and challenging their thinking.

In 2008, this enabled the Numeracy Coordinator to have a strong curriculum focus on consistency with whole-school planning and a strong emphasis on incorporating the use of ICT into mathematics teaching and learning, in line with the School Strategic Plan.

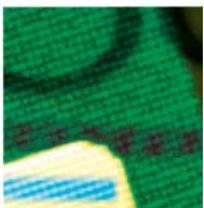
Kings Park Primary School: Numeracy Program

Full Report

The Kings Park Primary School numeracy program involves a minimum of five hours per week. Students solve problems in diverse areas and relate the knowledge and skills gained into every day life, confidently and competently. Components of the program include:

Numeracy Committee Team

Drawn from all teaching teams, the team is lead by a numeracy coordinator. This helps to guard against reliance on one or two people to sustain the numeracy program. The committee provides teachers with the opportunity to important decision making process. The numeracy coordinator also meets with the principal and leadership team to discuss the progress of the school's annual numeracy goals.



Teacher resources and materials

All teams have access to numeracy stations where the teachers can use any equipment needed for numeracy development. Teachers use a range of resources, concrete aids, open-ended tasks and a hands-on approach to teaching and learning.

The numeracy committee monitors the use of the equipment.

The Numeracy Folder

The numeracy coordinator manages a numeracy folder on the school server where resources, team planners, work programs and assessment templates are shared.

Wikispaces

Each teaching team has produced a year-level wikispace for students to access interactive numeracy websites. Teachers with interactive whiteboards use the websites for session starters.

Professional development

Teachers complete an Individual Learning Plan at the beginning of the year outlining their strengths and areas for improvement. The coordinator is responsible for ensuring that each teacher has access to internal and external professional learning to support their plan.

Staff training is undertaken before any new initiative is implemented. New teachers are supported through an induction program that includes observing more experienced staff in action. Year-level teachers ensure that at least 20 per cent of total teaching time is spent on the mathematics program (at least an hour daily block or five hours per week in total).

The **School Numeracy Booklet** guides the planning

and teaching of numeracy. It comprises a range of support materials including the developmental continuum, samples of term planners and work programs, teaching prompts, assessment ideas and ways in use numeracy in inquiry sessions.

Consistent Assessment Practices

An assessment schedule is given to each staff member at the beginning of the year in the school numeracy booklet. Once testing is complete teachers in teaching teams analyse their data and look for trends and identify students at risk within each team. These students are closely monitored and have Learning Improvement Plans.

The **National Assessment Plan** is undertaken by students in Years 3 and 5.

Selected students from Years 3–6 are involved in the **International Competitions and Assessments for Schools Mathematics Competition** yearly. Students who excel in numeracy are given the opportunity to enter the competition.

Promotion of Numeracy

The school participates in various activities throughout the year including 'Maths Month'. Parents are invited to come and participate in these events.

The **Classroom Helpers Program** is conducted by the numeracy coordinator at the beginning of the year. The program values and recognises the importance of parent participation.

Leongatha Primary School: Mathematics Strategic Plan Full report

Leongatha Primary School's Strategic Plan focuses on Mathematics as a priority area. To this end Mathematics has been given priority within the

timetable and in staff professional development sessions.

The Professional Learning Team focus has been to look at the characteristics of effective mathematics teachers. All staff were surveyed at the end of 2007 to see how they rated their own performance in teaching against the characteristics, using a five point scale. This survey showed consolidation of rankings, which tended to centre around the four mark.

Teaching and Learning teams have shared ideas on what the characteristics look like in their classrooms, and also spend time sharing activities that work well for them.

A focus on classroom visits is underway with the purpose of teachers focusing on a characteristic they would like to improve on, then seeing how it is put into practice in another classroom. A planning sheet has been devised so that both teachers know how the lesson will run and their expected roles within the lesson (team teacher; adult helper; passive observers are not encouraged!). There is also time for reflection so that the teachers can discuss how the visiting teacher can further implement the practice within their own room. The assistant principal will cover classes while these visits occur.

Curriculum change is also underway in the Prep department. Developmental/inquiry learning has been incorporated into curriculum plans and has created an integrated, cross curricula approach. Initially introduced as a way of improving oral language, this approach has been extended to develop broader skills development. Pattern work, counting by 2s, measuring, and many other concepts are practised and refined each day



as children make and create things which capture their interest.

Examples of how this integrated approach is demonstrating 'real maths in action' as been noted by the teaching staff. For example, following a lesson on counting by 2s, the children in one grade lined up all the seats for their puppet show in 2s. A class discussion on bees and honey led to the child creating patterns with hexagons, creating and ordering towers according to height. Children are also 'buying and selling' using play money from their shop.

Mordialloc College: Numeracy across the curriculum

Full report

In Years 7 and 8, numeracy is taught in flexible integrated learning environments. Students are not placed in timetable classes for any core subject areas so there are no 'traditional' math classes. Textbooks are only used as home-study support resources.

When students need particular skills to move forward, they book themselves into directed workshops which teach numeracy skills and knowledge. These workshops may span the whole year level when a consistent message is required; operate on a formal basis in groups of 15–25 students; or operate informally with small groups or one-on-one with one of any of the teaching teams in learning time.

In both learning centres, students have a 'Learning Guide', their significant teacher who is responsible for monitoring and assessing the student across many learning domains including numeracy. The guide has in-depth knowledge of the student's

numeracy ability and will extend, or further support, the child's learning to cater for individual needs.

In Years 7 and 8 students also participate in weekly numeracy rotations based on engaging students in applying mathematical concepts in new and interesting ways.

Students are encouraged to demonstrate evidence of their learning by applying their new knowledge to varied tasks that they have accessed through resources provided by teaching staff, or as part of a student designed enquiry project.

In Year 9 numeracy and science learning areas are taught under the subject heading, 'Discovery.' Students work through the mathematics text in the traditional classroom with opportunities to apply their knowledge through project work and problem-solving activities.

In Years 7, 8 and 9, students are taught that real learning is not just the work task and the product. In contrast they are taught how to organise their learning, build good learning habits, make choices and become learner directed and to focus on the process of their learning for improvement – this applies directly to their numeracy learning as it does to all other learning areas.

Years 10, 11 and 12 follow traditional, more teacher-directed, textbook-based methods.

Numeracy and the Principles of Learning and Teaching?

The school succeeds in applying the PoLT principles in Years 7, 8 and 9 because the structure of the programs provides opportunities for teams and students to learn, reflect and improve together.

In Years 7, 8 and 9 numeracy is integrated across the learning program. Students work closely

with their significant teachers. These teachers have strong relationships with their group of students and consistent, frequent assessment is provided through; benchmark testing, continual learning conversations, student learning portfolios, and student-led conferences.

The students are more productive because the individualised, team-based nature of the program provides improved support. Students can choose when they want to work on numeracy tasks and how and when they will apply this learning and demonstrate it. The learning environment promotes independence, interdependence and self-motivation.

Student use 'capacity matrices' to guide their student learning. The matrices list skill and knowledge elements broken down from dimensions across all learning areas including numeracy. Students can attempt these elements at their own pace and link them to other areas of their learning. They may work with whomever they choose in the learning centres and they all know that it is their responsibility to have managed and pre-planned their time and that they must track their learning and stay on task. Students are motivated to stay on task because they have a voice in how the programs develop and run and they can always work at their own pace.

Students' needs are ascertained at the beginning of the program by pre-testing and one-on-one conversations about their ability. Student choice is a priority and factored in to the design of the programs based on the developmental stages of learning and guided by the learning foci and the Victorian Essential Learning Standards (the Standards). How a student may wish to demonstrate their numeracy



learning is only limited by their imagination. Students may attend a particular workshop as many times as they feel necessary.

Students use quality processes and thinking tools to plan, integrate and complete their numeracy studies and to link their achievements to future learning. In Years 7 and 8, each numeracy learning element can be learnt from resource sheets, from a text, or with other students. However, it is only when the student can provide evidence on how they have applied these skills to a new or different situation that the student and their guide record that they have mastered the particular skills. This requires the students to develop their higher-order thinking skills and challenges them to apply their numeracy learning to real life situations.

Assessment practices in Years 7, 8 and 9 have become far more rigorous and consistent since the integrated learning program was introduced in 2006. Because the teaching and learning has a strong team-based approach and students spend far more of their learning time with this known and trusted team, there are more opportunities for formative assessment practices to inform knowledge of an individual student's learning outcomes. The student is always involved in their assessment and the opportunity to involve the students in peer and self-assessment has improved greatly.

ICT support for numeracy

Within all programs students have broad access to ICT with multiple laptop trolleys in all learning centres, desktop-pods at senior levels, multimedia, smart boards, Click-view and varied new software. Students at senior levels use graphics calculators. Junior students in

Years 7 and 8 develop their digital portfolios throughout the year to demonstrate learning improvement that includes integration of numeracy skills and knowledge.

School leadership and numeracy

The team nature of our learning programs, introduction of the Standards from 2006 and horizontal organisation of resourcing has led to a systematic reorganisation of school leadership, particularly in curriculum areas.

In Years 7, 8, 9 and 10, Standards mentors lead curriculum support, information and resourcing for numeracy along with all other domains. Senior school VCE mentors have been established and the VCE Math/Science mentor provides a further layer of expertise and leadership to the Standards mentors. This has enabled the school leadership to develop knowledge bases that communicate both vertically (year level to year level) and horizontally (across the year level.)

Staff workshops are based on teams learning together and learning area meetings enable sharing of new approaches to teaching numeracy.

In Years 11 and 12 all math subjects are offered and run regardless of numbers and numeracy electives offered in the middle years reflect the broad needs and interests of student learning at this level in preparation for senior studies. In addition, the college offers an accelerated program in Mathematics in conjunction with the Select Entry Accelerated learning (SEAL) program.

