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Examining the consequences of Year 12 course choices

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ACER

Australian Council *for* Educational Research

Learning difficulties

Professor Geoff Masters
Chief Executive Officer

In this issue of Research Developments, *Dr Louise Ellis reviews research on teaching methods that are effective for a wide range of students in mainstream classrooms, but are especially powerful for students with learning difficulties. The Australian Government's National Literacy and Numeracy Plan highlights the need for the early identification of students with learning difficulties and for intervention strategies that are effective in improving their literacy and numeracy outcomes.*

On a related topic, this edition includes an article by Dr Lawrence Ingvarson on effective teacher training—an area receiving considerable research attention and the subject of a national inquiry into the ways in which teacher training courses are preparing future Australian teachers.

Dr John Ainley observes that although Information and Communication Technology (ICT) has been embraced with enthusiasm by Australian schools there is relatively little experience in measuring the development of students' ICT literacy skills. ACER has been commissioned to conduct a national survey of these skills. The survey will provide educators and policy makers with a comprehensive picture of the current state of ICT literacy in Australian schools.

In her article, Dr Sue Thomson concludes that inappropriate course selection in Year 12 can make it difficult for students to gain admission to higher education as well as reducing their job opportunities. A recent report from the Longitudinal Surveys of Australian Youth found that, although most Year 12 students make a successful transition to tertiary study or work, some parts of the Year 12 curriculum act as better pathways to post secondary education and training than others, reinforcing the importance of quality career guidance in schools.

We hope you enjoy this edition of *Research Developments*.

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the consequences 12 course choices

By Dr Sue Thomson

Sue is a Principal Research Fellow at ACER

At the end of secondary school, most students complete a Year 12 certificate. The subjects that students choose to study for this certificate can have a major influence on the educational and career options open to them after finishing school. **Dr Sue Thomson** *explains how particular subjects or subject combinations are more likely to act as gateways to higher education or to vocational education and training, while other combinations are more likely to lead to the workforce.*

The important role of subject selection in creating post-school study and employment options was the subject of a recent research study by ACER that investigated the patterns of course choice in Year 12 and the consequences of these choices. The study addressed a range of questions including: What are the typical 'clusters' of subjects or course types studied by Year 12 students and have they changed over the last few years? Are there particular courses that are more likely to be studied by males or females, or those from different social backgrounds? Into which field of study or work do students from particular course types tend to move and do some courses lead to better outcomes than others?

To find answers to these and other questions ACER conducted a study of two cohorts of students who were in Year 9 in 1995 (Y95) and 1998 (Y98). They were in Year 12 in 1998 and 2001 respectively. The students were first surveyed in Year 9 and then tracked annually to gather data on their Year 12 subject choices and their pathways from school to further study, training or the labour force.

The report revealed that not all Year 12 courses are equal in terms of the options they create for students. In fact, inappropriate course selection in Year 12 can place serious limitations on students' study and employment options.

Course selection

At Year 12, some students chose a course of subjects that were related to each other in some way while others opted for subjects that were unrelated, according to their preferences or what was available in the school. Analysis of the subject selections made by participants in the study found seven identifiable 'clusters' of subjects: advanced mathematics-physical sciences, business studies, humanities and social sciences, arts, technical vocational studies, service-clerical vocational studies and other sciences. As well, three mixed groups were defined: one which had two major foci, including subjects from the mathematics-physical sciences group, one which had two major foci but none from the mathematics-physical sciences group, and a mixed eclectic group for which no major focus was identifiable.

In the three year period between the two cohorts completing Year 12, there were substantial changes in patterns of course selection. Of the seven defined clusters in each analysis, two remained the same between cohorts: the physical sciences and the visual and performing arts clusters. The areas that appeared to change the most were the areas of business, other sciences and, to a lesser extent, humanities and languages. The changes in the way that subjects cluster together reflects different choices made by students as to their course of study, and it appears that far fewer students are choosing the more defined courses of study.

For both cohorts, male students were more likely than female students to participate in the advanced mathematics-physical sciences and the technical vocational courses. Females on the other hand were more likely to be enrolled in social sciences and humanities, arts, the mixed-eclectic courses and the service-clerical vocational subjects.

Level of achievement was one of the primary defining characteristics in determining course participation. Students from high achievement levels dominated the areas of advanced mathematics-physical sciences, in the mixed area that included mathematics-physical sciences, and in the social sciences and humanities. Students from lower achievement levels were more likely to take any of the vocational courses.

Pathways to further study or employment

Although most Year 12 students made a successful transition to tertiary study or work, some parts of the Year 12 curriculum acted as better pathways to post secondary education and training than others. Further study and employment outcomes were clearly best for those students who had included some advanced mathematics and physical sciences subjects in their Year 12 studies and worst for those undertaking clerical and services vocational subjects.

The courses that provided the best pathways to higher education, with more than half of their participants entering university, were advanced mathematics-physical sciences, the mixed group of subjects including advanced mathematics-physical sciences, as well as social sciences and humanities courses. In contrast, the courses that provided the poorest pathway to further education and training of any type were service-clerical vocational, mixed eclectic and visual and performing arts courses.

Around 80 per cent of students in the advanced mathematics-physical science group went on to higher education. No other grouping of subjects acted as a gateway to higher education to the same extent. For both cohorts of students (Y95 and Y98), the humanities and social sciences courses also provided quite strong pathways to higher education. Around 60 per cent of the students enrolled in this course entered higher education in the year after completing Year 12.

Other courses were less successful as conduits to higher education. Fewer than half of the students studying courses such as business studies and other sciences or the mixed general course (with no advanced mathematics or physical sciences) gained entry to higher education in the year after they completed Year 12. For both cohorts, around one-third of students from the visual and performing arts and mixed-eclectic course groupings did not continue on with any further study. This is of some concern particularly for the younger cohort as the mixed-eclectic grouping is the second largest in terms of numbers of participating students.

Outcomes for those students who did not enter further education and training after completing Year 12 were not as positive as for those who did. Around half were in full-time employment, mostly working in low-level positions primarily in the areas of retail, accommodation, cafes and restaurants and manufacturing. Typically they worked as clerks, data entry operators, cashiers, kitchen hands, waiters and bar attendants. The other half were engaged in 'marginal' activities: employed part-time, unemployed or not in the labour force.

Subject choice in Year 12 appeared to influence whether a student went on to full-time employment or marginal activities. Again, outcomes were the best for those students who had included some advanced mathematics-physical sciences in their Year

12 course. For these students, only six in one hundred of the original group of students was in the marginal activities category, a very strong outcome. Other good outcomes were found for students of humanities and languages, business, other sciences, and mixed-general courses, with around 10 per cent of students in each of these groups having marginalised transitions to the workforce.

For the Y95 cohort, full-time employment rates were highest for those who had been in business studies and other sciences, lowest for visual and performing arts. For the Y98 cohort, highest full-time employment rates were achieved by those in the other sciences and visual and performing arts, and lowest rates for those in social sciences and humanities. Full-time employment rates had declined for almost all of the Year 12 course of study areas.

Conclusions

Over recent years the range of Year 12 options available to students has broadened significantly as schools have introduced courses to cater for those who aim for vocational education and training: whether TAFE studies, an apprenticeship or traineeship, or for those who simply want a general education before leaving school and entering the workforce. This research raises the question as to whether some of the courses of study are meeting the needs of all students who take them. While it is encouraging that so many of our students do go on to further studies or to work, it is of concern that some courses provided limited options for many of those who chose them.

The results of this study suggest strongly that the decisions students make about the courses they take in their senior years of

school do make a difference to their chances of successfully entering further study or employment. Clearly, some parts of the Year 12 curriculum act as better pathways to different aspects of post secondary education, training and employment than others.

It is very important that students consider the potential implications of the decisions they make when choosing a Year 12 course. Schools have a responsibility to ensure that students are aware of the potential ramifications of their choices. Careers advice and guidance is vital, particularly for those students who do not have appropriate role models outside of school to provide this. Some students, as a result of their subject selection, may find themselves unable to participate in further education and in a very vulnerable position in the labour force. ■

Further information

The full report, *Pathways from school to further education or work: Examining the consequences of Year 12 course choices,* by Sue Thomson is Research Report 42 in the Longitudinal Surveys of Australian Youth (LSAY), a program conducted jointly by ACER and the Australian Government Department of Education Science and Training (DEST). This report and previous LSAY reports are available for download from the ACER website at *www.acer.edu.au*

great teachers

By Dr Lawrence Ingvarson

Lawrence is the Research Director of ACER's Teaching and Learning research program.

Teacher education is high on the political agenda in Australia, with several government inquiries on the topic currently underway. These inquiries reflect, in part, dissatisfaction among many school principals with the preparedness of graduates.
Dr Lawrence Ingvarson *asks how well new teachers feel they have been prepared for their vital role.*

A recent survey asked teachers about how well their teacher education had prepared them for the demands of teaching. ACER surveyed the teachers at the start of their second year of teaching for the Victorian Institute of Teaching in 2004. Teachers who completed a four-year undergraduate course generally reported more favourably on their course than teachers who completed a post-graduate degree. On a four point scale, teachers generally rated their courses slightly below a three, except in the area of working with and reporting to parents, which scored near a two on average.

School experience was rated higher than other elements of teacher education programs, but teachers from most courses made frequent mention of unsatisfactory arrangements, including the selection and preparation of teachers supervising the practicum experience in schools.

Most universities are having difficulty in finding schools and teachers who are able and willing to provide quality practicum experiences for their students, and in ensuring that those experiences link productively with the theoretical components of their courses.

Differences in practicum arrangements were not related to the reported effectiveness of teacher education programs. This is not to say that the practicum is unimportant—rather it appears that links are generally poor between the practicum and what students are learning in the university

component of the course. It is hard for universities to find supervising teachers with the training to be an effective student-teacher supervisor in a school.

There were three main features of teacher education programs that were associated with the preparedness of teachers:

A strong focus on the 'content to be taught'

Courses with a strong content focus enabled future teachers to:

• gain a deep understanding of the content knowledge they were expected to teach;

• make clear links between content or subject matter units and units about how to teach the content;

• make clear links between theoretical and practical aspects of teaching;

• develop a sound understanding of how students learn the specific content that they were expected to teach;

• learn how to probe students' prior understandings of content they were about to teach;

• learn how to present content in ways that built on students' existing understanding; and

• learn methods of teaching specific to the content they were expected to teach.

Assessment and curriculum planning

Opportunity to learn *'how to assess student learning and plan curriculum units'* was also strongly associated with preparedness in the areas of professional knowledge and knowledge of students in the first year of teaching. However, less than 20 per cent of teachers said their courses had prepared them, to a major extent, in this area.

Feedback

Opportunity to *receive feedback* was also significantly related to the reported effectiveness of courses. Students in the most highly rated courses were much more likely to mention the opportunities they had had for gaining timely and useful feedback from lecturers and practicing teachers as helpful features. Feedback on practice has long been recognised as a vital requirement for professional learning but teachers reported receiving little feedback from university staff as they were learning to teach. One of the key elements in linking theory to practice is feedback.

Current levels of funding for teacher education do not make it easy for university staff to provide feedback to students about their developing practice. However, the low level of feedback about practice may point to a significant weakness in current approaches to teacher education.

Teachers who reported that they felt well prepared had completed courses that gave them deep knowledge of what they were expected to help students learn, and how students learned it, as well as skill in diagnosing students' existing levels of understanding of the content to be taught, planning activities that would promote further development and assessing the extent to which development had taken place.

These professional capabilities appear to remain the necessary, though not sufficient, foundations in preparing teachers to meet the wider demands of the job, from establishing a productive learning environment to working effectively with parents.

The findings of this study do not provide support for those who think that making teacher education "practical" and "school-based" is the answer. Teacher education programs that might be highly "practical", in the sense of giving heavy emphasis to skills in classroom management for example, will not make up for a deficiency in the aspects of content knowledge identified in this study.

A national approach

Unlike other professions, teacher education has relatively weak forms of external assessment and accreditation by professional bodies at the state level. There is no equivalent of the Australian Medical Council, a national body that assesses and accredits initial medical training courses using visitation panels made up of experts in medical education and medical practice and ensures cross-fertilisation of ideas across states. Nor is there any equivalent to the Teacher Training Agency in England with its capacity to adjust funding to providers on the basis of their capacity to prepare teachers well.

However, now that each state has a statutory authority responsible for teacher registration we are much closer to the situation that applied in medicine in 1985 where the state governments and medical boards agreed to establish the Australian Medical Council. The newly established National Institute for Quality Teaching and School Leadership would appear to be a suitable body to take up a parallel role in the field of education.

Teacher education research and evaluation

ACER is currently involved in other projects focused on teacher education. ACER conducted an evaluation of the Bachelor of Learning Management at Central Queensland University (CQU) in 2005. The Bachelor of Learning Management is a four year initial teaching degree which aims to prepare "workplace ready" and "futures-oriented" graduates who have a strong sense of social and educational vision, responsibility and change. The course aims to better prepare teachers for the needs of contemporary schools and to address the challenges of learning in a knowledge-based economy at a time of rapid and substantial social change.

The results of this evaluation also emphasised the importance of a strong focus on content and content-specific pedagogy. It was noted that the Bachelor of Learning Management is one of the few courses that has a unit of study titled "Teaching Reading".

The evaluation found that teacher education courses need to make explicit the fundamental principles of sound pedagogy and the methods they will use to ensure future teachers will learn to implement them.

In addition, the preparation of teachers should be genuinely based on a partnership between the profession, employers and the universities, one that is reflected both in decision making and allocation of funding for teacher education.

ACER is also advising the National Institute for Quality Teaching and School Leadership on the development of a national system for the accreditation of pre-service teacher education programs. The project will be completed in December 2005.

The International Association for the Evaluation of Educational Achievement Teacher Education Study (TEDS) study began in September 2005 and will compare policy, practices and outcomes of programs for preparing teachers of mathematics in up to 30 countries. The study, which may continue for up to three years, will be jointly managed by ACER and Michigan State University (MSU), in collaboration with Data Processing Centre, Hamburg. It is hoped that Australia will participate.

The current parliamentary Inquiry into Teacher Education covers the scope, suitability, organisation, resourcing and delivery of teacher training courses in Australia's public and private universities. The inquiry is also to examine the preparedness of graduates to meet the current and future demands of teaching in Australia's schools. The issue of teacher education is clearly one of great importance, and is currently receiving a lot of attention in various research and evaluation studies. There will undoubtedly be further discussion when the Inquiry into Teacher Education concludes. ■

Further information

http://www.acer.edu.au/research/
Click on Teaching and Learning in the Research Programs section.

http://www.aph.gov.au/house/committee/evt/teachereduc/

Balanced

approach needed for students with learning difficulties

Louise A. Ellis

Louise was a Research Fellow with ACER from June 2004 to August 2005.

The latest Australian Education Review, 'Balancing approaches: Revisiting the educational psychology research on teaching students with learning difficulties' *was released in October. The review's author,* **Louise Ellis***, explains what contemporary research says about the often controversial subject of how best to teach basic skills to students with learning difficulties.*

As Professor Peter Freebody says in the foreword to the review, the issue of how we should teach entry-level literacy and numeracy is perhaps one of the most divisive topics in education. There are similar heated debates about the education of students with learning disabilities or difficulties. This review deals with both issues.

Concerns regarding the most appropriate methods to address the educational needs of students with learning difficulties are widespread among teachers. The Commonwealth government has a major policy objective to improve the literacy and numeracy skills of *all* Australian children. Its *National Literacy and Numeracy Plan* espouses the need for early identification of, and adoption of intervention strategies for, students with learning difficulties in order to improve their literacy and numeracy outcomes.

This review examines research, drawn largely from the field of educational psychology, in an attempt to identify methods that are effective for a wide range of students in mainstream classrooms, but are especially powerful for students with learning difficulties. The review provides detailed information on a range of teaching methods that have been used extensively and have been judged to be effective by research.

Instructional methods have generated much interest and heated controversy for several decades, particularly in the area of literacy. There has been much debate among professionals regarding the most effective instruction techniques for both mainstream students and for those with learning difficulties. Two prominent psychological theories, the behavioural and cognitive perspectives, have heavily influenced much classroom teaching practice. During the 1970s and throughout the early 1980s, behavioural approaches provided a structure and an optimism that were of immense influence on teachers. Two popular methods derived from this perspective include *direct instruction* and *precision teaching*. However, an increasing number of people began to criticise, either directly or by implication, the exclusive use of behavioural methods. As such, cognitive approaches have gained widespread use over the past 20 years; particularly by way of *constructivism*.

This review focuses largely on *meta-analyses*, many of which were undertaken in the United States of America. The intent was to identify the relative effectiveness of various teaching approaches. Meta-analysis is a research procedure used to aggregate findings across many studies. Unlike traditional reviews, meta-analyses can synthesise larger quantities of research

findings and quantify the outcomes of, and make judgements about, the effectiveness of the strategy being researched. Meta-analyses are seen as providing a more objective, quantifiable summary of the evidence than individual research studies are able to provide. The number of meta-analyses published in education research has increased markedly over the past ten years.

Direct Instruction and Strategy Instruction

Direct instruction (sometimes referred to as *explicit instruction*) is a teacher-centred approach. Key features of direct instruction programs include: scripted presentation, teaching the essentials, small group teaching, rapid pacing and practice and drill.

An example of a direct instruction program designed for Australian schools is Elementary Math Mastery (EMM). EMM is a powerful diagnostic tool which clearly maps student progress, and can be used with both mainstream students and those with learning difficulties. EMM enables teachers to identify exactly where and when students experience difficulty in their learning. The daily incremental portions learned are small, and because they are reinforced and built upon in subsequent lessons they are more easily retained. The teacher models each scripted lesson in the prescribed format with whiteboard presentations being an integral component. Everything taught is revisited, developed further, and gradually integrated into the whole mathematical scheme.

Strategy instruction has usually been associated with constructivist models. However, proponents of strategy instruction do not assume that students with learning difficulties will independently *discover*

effective learning strategies, nor do they believe that direct teaching is required. Learning strategies are tactics used by students to enhance their performance on a given task or tasks. Strategies are broadly classified as cognitive, metacognitive or self-regulatory. Cognitive strategies focus on developing or enhancing particular task-related skills such as underlining, note-taking, rehearsing and summarising. Meta-cognitive strategies are those that focus on the self-management of learning—planning, implementing, and monitoring one's own efforts, and on the conditional knowledge of when, where, why and how to use particular strategies. Self-regulation strategies have been defined in terms of self-generated thoughts, feelings and actions, which are systematically oriented toward the attainment of students' own goals.

The balanced approach can generally be described as a combination or alternation of various aspects of the curriculum and/or instruction. Balanced approaches can be applied to both *what* is taught (the curriculum) and *how* it is taught (the method of instruction). 'Best practice' is now generally recognised by classroom practitioners as the combination of instructional approaches which best fits the students being taught.

Moreover, advocates of balanced programs do not endorse a *laissez faire* combination of approaches, but rather a thoughtful, carefully integrated selection of validated instructional components. Many researchers believe that effective balance is achieved through the selection of methods of instruction that best suit the types of learning involved in a lesson, and that in deciding such matters the age, ability, and aptitude of the individual students should have been taken into account.

What is best practice for students with learning difficulties?

Essentially the research reviewed in this publication suggests that firstly, teaching approaches based on models of direct instruction and strategy instruction produce higher positive effects for students with learning difficulties than other approaches. Secondly, when a balanced approach is adopted, the outcomes for students are most positive. Thirdly, teachers need to have the necessary theoretical and pedagogical knowledge and skills to combine essential elements of both approaches. Fourthly, teachers need to have the attitude that *all* students can learn, even those who experience difficulties in learning.

The review emphasises that there is no one single instructional method that deserves sole claim to being 'best practice'. Of course this will come as no surprise to teaching practitioners operating in the real worlds of their classrooms. Rather than single strategy solutions, the common wisdom of research in the field currently points to the need for *balanced* approaches, also known as 'eclectic' and 'combined' approaches, to accommodate the diverse needs of students.

The meta-analytic research reviewed in this publication, derived largely from the field of educational psychology, is described and analysed in considerable detail in the review. The findings are strongly supportive of the view that a combination of *direct instruction* and *strategy instruction* has a greater and more long-lasting impact in dealing with the academic problems of those with learning difficulties than any single-focused approach.

The review calls for an end to the continuing contest between the instructivist and constructivist teaching

'camps'. The best research avoids the adoption of either/or positions. Such a contest limits the professional consideration by practitioners of the possibility of balancing instruction and it blinds educators to the value of different perspectives.

What are the implications for teacher training?

Most Australian university departments currently base their teacher education programs on constructivist views of learning and do not expose their students to a wide range of methods, including teacher-directed instruction. In view of the findings presented in this review, it is worrying that significant numbers of teachers in Australia are not being exposed to training and research that emphasises the importance of direct instruction.

In order to move closer towards the adoption of the 'best practice' for students with learning difficulties, it is critical that teachers be trained in the use of practices that have been shown to be effective. Thus, tertiary teacher-training courses and inservice professional development programs must incorporate training in the use of direct instruction and strategy instruction, as well as the training in constructivist methods currently provided. This will provide teachers with the skills/competencies in the paedagogic/ teaching practices most necessary for those with learning difficulties. Only then will they be provided with a conceptual understanding, attitude and level of competence that will enable them to freely exercise the choices associated with best practice.

Future research

The review urges an end to the either/or debate regarding teaching methodology. In Australia, direct instruction is the under-researched and under-resourced half of the balanced approaches equation. Since this review has established its important role in effective teaching for students with learning difficulties, more research into its effectiveness should be undertaken. Currently there have been few Australian studies specifically designed to compare the effectiveness of direct instruction with constructivist instruction. In order to move forward, further research comparing the effectiveness of the different methods of instruction in Australian classrooms is necessary.

The evidence presented in the review also casts light on the relative neglect of numeracy research in comparison with literacy research in Australia and other Western countries. Further research into the numeracy field is required to obtain a clearer picture of 'best practice' for teaching literacy and numeracy. If such work were undertaken, it may be found that much of the research findings in literacy are replicated, but there may also be unique characteristics to numeracy learning.

Research that would enable the research community to determine the extent to which Australian teachers implement integrated approaches when teaching students with learning difficulties should also be conducted. Findings from such research would enable teachers of students with learning difficulties to be more confident about what constitutes 'best practice' with these students.

An evaluation of what is currently taught in teacher-training courses is vital. It is critical that teachers be trained in the use of all teaching practices that have been shown to be effective, so they will be able to exercise the choices associated with best practice. ■

Further information

Balancing approaches: Revisiting the educational psychology research on teaching students with learning difficulties, by Louise Ellis was published by ACER in October 2005 as Australian Education Review Number 48. The review can be purchased from ACER Press or downloaded from the ACER web site at *www.acer.edu.au*

Measuring Australian

students' ICT literacy

By Dr John Ainley

John is Deputy CEO (Research) and Research Director of the National and International Surveys research program.

Proficiency with Information and Communication Technology (ICT) is becoming increasingly important for participation in work and society, but how ICT literate are Australia's students?

Dr John Ainley *describes a major project that will provide some answers to this question.*

The importance of ICT literacy is recognised in Australia's National Goals for Schooling in the Twenty-First Century: when students leave school they should be "confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society."

Although ICT has been embraced with enthusiasm by Australian schools there is relatively little experience in measuring the development of ICT literacy by students. While recent national assessments in science and civics and citizenship have added to the picture of student achievement developed through state-based literacy and numeracy assessments, to date there has been no national assessment program to determine how well Australia is progressing towards meeting this important goal.

The Ministerial Council for Education, Employment, Training and Youth Affairs (MCEETYA) through its Performance Measurement and Reporting Taskforce (PMRT) commissioned ACER to conduct the National Sample Assessment of information and communication technology literacy. For the purpose of these assessments the PMRT adopted a definition of ICT literacy as "the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society".

So how ICT literate are Australia's students? This question will soon be answered after thousands of students in Year 6 and Year 10 from across Australia undertook the country's first major national survey of ICT literacy from September to November 2005. In what is believed to be the first assessment of its kind, all of the testing and marking took place in a totally computer-based environment with no pen and paper components.

The assessment instrument developed by ACER consisted of seven assessment modules and a student background questionnaire. Each student completed three assessment modules and the questionnaire. A successful trial of the assessments was undertaken by ACER in April 2005 involving 620 Year 6 and Year 10 students from around 31 high schools and 35 primary schools. The main sample assessment in term 4 of 2005 involved approximately 260 schools and around 4000 students at both Year 6 and Year 10.

The National Sample Assessment of ICT literacy is a major undertaking for ACER. A team of staff across the organisation including administration staff, test developers, IT specialists and external providers have worked together to develop the assessment and the infrastructure behind it, facing some major challenges along the way.

A team of ACER test developers had the task of coming up with assessment items that were meaningful to the students and

allowed them to demonstrate both a productive and creative use of ICT, while, at the same time, evaluating students' analytical skills in creating and dealing with information. This required a new approach to ICT assessments, which to date have typically focused on students' use of particular software packages. Previous assessments have tested skills such as applying formatting to text in a word processing document or using a spreadsheet. A major goal of the National Sample Assessment was to move beyond these skills-based tests and incorporate something more challenging and original.

Test developers wanted to introduce tasks that required students to create meaningful products using a range of real software in a live environment. This posed a number of difficulties: no existing product could be used to test a students' ability to create a product using software and also assess their basic skills in using common software applications. A new infrastructure had to be developed.

Software developers at ACER worked with companies in the US, the Netherlands and Melbourne to create a software infrastructure specially designed for the assessment. Existing software that emulates the entire Microsoft Office suite of products in an environment in which students' use of the products can be automatically captured and scored was sourced through the US company SkillCheck. For example if a skills test requires a student to select and format a piece of text within a Word document, the software is able to recognise how the student completed the task and score the response automatically.

While this existing product was sufficient for the skills component of the national assessment, it did not have the capacity

to test students' ability to create the new products that test developers hoped to include in the assessment. Extra components of the software were developed to integrate with the package. It was then possible to develop a test platform to allow students to complete the skills test component of the assessment and the creative components while moving between the two platforms.

Seven separate modules were developed for use in the assessments. One module was a test of general skills to determine whether a student possessed basic skills in using the ICT products. In this skills-based module, students responded to multiple-choice questions and completed basic file management and generic software skills tasks. Students needed to successfully complete this first skills test to proceed to the rest of the assessment. In light of the trial data it was expected that more than 90 per cent of students undertaking the assessment would be able to complete the tasks and proceed to the rest of the assessment.

Having successfully negotiated this first component students were then asked to complete two of the remaining six modules that were selected at random. Each module was linked by a common context or theme. In each module students negotiated a series of lead up tasks using research skills to look at a range of information and decide what information to use in creating a product. For example, in one module students were required to conduct some research by navigating a small, controlled web environment and then create a report incorporating information collected from that website. The final products created by the students were captured by the software as electronic

images and transmitted to markers who assessed them electronically as an interactive piece of documentation. Students achieving less than the predetermined cut-score on the general skills module were automatically allocated the two easiest assessment modules.

At each participating school, 15 students were selected randomly to take part in the study. Specially configured notebook computers with local network connections were used to complete the assessment. Each session included five students and a supervisor. The assessment took about 100 minutes for each student to complete.

Test administrators indicate that the assessment has been very well received by students with high levels of engagement and very positive feedback regarding the electronic environment and the interactivity of the tool. The only negative feedback has been a backhanded compliment with students indicating that they would have liked more time to interact with the free response product oriented modules. The more able students wanted to demonstrate their skill in manipulating new applications.

The national assessment of ICT literacy will provide Australia's educators and policy makers with a comprehensive picture of the level of ICT literacy of Australian students. Feedback on the assessments will be provided to participating schools in December this year. A detailed report, based on the results of the National Sample Assessment, on the ICT literacy of Australia's students is due to be published in mid 2006. ■

State-of-the-art

ACER's Sydney office is building its capacity in test administration services by acting as a major marking centre. The System and School Testing research program has been awarded several contracts with state governments for the marking of system-wide cohort tests.

test marking facility established

The development of a computerised test marking facility has been a major undertaking for staff in the Sydney office during 2005, with ACER coordinating the establishment of the 180-terminal marking facility, employing and training markers and team leaders, as well as general project management.

In 2005 ACER coordinated the marking of some 460 000 test papers involving assessment programs in New South Wales, Queensland and South Australia. This involved the recruitment and training of almost 800 markers across the testing centres in the ACER Sydney office and at sites in South Australia and Queensland.

"ACER is an acknowledged leader in developing and implementing system wide testing programs," says Research Director, System and School Testing and General Manager of the Sydney office, Professor Jim Tognolini.

"ACER has strengths in developing quality testing instruments and constructing tests to help education systems gather data on where students are in their learning and monitor the growth of students. The expansion of our services into marking tests allows us to contribute further to the gathering of important data and reporting to parents."

In the first of the marking projects, ACER coordinated the assessment of 125 000 test papers completed by students in Years 7 and 8 across New South Wales undertaking the Secondary Numeracy Assessment Program (SNAP). ACER managed a receiving and recording facility, recruited and trained approximately 260 casual markers and equated tests against a previous SNAP paper.

The New South Wales Department of Education and Training contracted ACER to conduct the marking of writing tasks in the state's Basic Skills Tests. All NSW Year 3 and 5 students took part in the tests. Approximately 150 000 Basic Skills Test

papers were marked in the Sydney office over a two and a half week period in August and September. Around 260 markers were employed and worked in day and evening shifts to complete the task. This year the writing papers were marked in an exclusively online environment. ACER is working with Security Mail, a scanning contractor and online application supplier, and the NSW Department of Education and Training to provide the physical infrastructure for the project.

Marking projects in South Australia and Queensland were undertaken in August and September. ACER has been appointed to manage the marking of the writing component of the Queensland Years 3, 5 and 7 Tests in Aspects of Literacy and Numeracy for 2005. Training and marking for this project took place in August and September at a facility in Queensland. In South Australia, ACER established a marking centre from which it coordinated the marking of South Australia's Years 3, 5 and 7 tests in literacy and numeracy. ■

ACER update

Research Conference 2005

Dr Lorna Earl, Associate Professor and co-director of the Ontario Institute for Studies in Education delivers her keynote address at Research Conference 2005.

Around 750 researchers, policy makers and teachers from around Australia and overseas met in Melbourne on 8 and 9 August at ACER's 10th annual Research Conference. The theme of this year's conference was 'Using Data to Support Learning'. This was the largest Research Conference undertaken by ACER to date both in terms of the number of delegates and the number of sessions offered. Three keynote sessions and 16 concurrent sessions were provided over the two days of the program. The keynote speakers were Gage Kingsbury from the United States, Lorna Earl from Canada and John Hattie from New Zealand. Conference papers are available on the ACER website at *www.acer.edu.au/workshops*

Aptitude Test for International Secondary Students

ACER has developed the Aptitude Test for International Secondary Students (ATISS) to assist schools in the selection of Chinese students to study in Australian secondary schools. The Australian Government Department of Education, Science and Training commissioned the development of ATISS in response to concerns regarding the language test visa requirement introduced for some groups of international secondary students in 2003.

When Chinese students apply to an Australian secondary school, the school may direct them to sit ATISS. The test, which is entirely computer-based, will be conducted at testing centres across China by Thomson Prometric. The candidate fee is paid by the student. Schools will receive information about students' reasoning skills unhampered by their English language skills. They will also receive valuable information about students' English language skills through the reading comprehension and writing components of the test.

The test will be piloted across China in February and March 2006. Schools interested in participating in the pilot should contact Susan Nankervis, ATISS Project Director, 03 9277 5566, *nankervis@acer.edu.au*

CEET conference

The Annual Conference of the Monash University-ACER Centre for the Economics of Education and Training (CEET) was held in Melbourne on 28 October. The conference theme was 'Australian education and training: responding to economic trends and social needs'. The conference examined questions including: Are high skill jobs moving off-shore? How do we measure skills shortages? Where are the good job prospects? What is happening to migration, and to participation in education and work? Is disadvantage being reduced? What are the responses in education and training? Further details on the conference are available from the CEET website at *www.education.monash.edu.au/centres/ceet/*

Professor Gabrielle Matters joins ACER

ACER is pleased to announce the appointment of Professor Gabrielle Matters to the position of Principal Research Fellow based in Brisbane. Prior to joining ACER in October Gabrielle Matters held several senior roles in Queensland, including a number of years as Deputy Director (Testing and Publishing) at the Board of Senior Secondary School Studies and, most recently, as Director, Assessment & New Basics Branch with the Queensland Department of Education and the Arts. Prior to entering educational administration, Professor Matters taught chemistry and physics for 20 years in independent, state and Catholic schools, including five years as a deputy principal. She is the author of journal articles, books and conference papers on a wide range of topics including test design and marking, test-taking behaviour, assessment/testing formats, the underachievement of boys, relationships between pedagogy and assessment, school reform and standard based assessment. Professor Matters will work to establish a greater presence for ACER in Queensland and will also work on projects within ACER's Assessment and Reporting research program.

LSAY briefing papers released

Two new briefing papers have been released by ACER that summarise findings from the Longitudinal Surveys of Australian Youth (LSAY). In *Education and labour market outcomes for Indigenous young people* (August 2005) findings on the different educational and employment outcomes achieved by Indigenous Australians compared to their non-Indigenous counterparts are summarised. In *Year 12 subjects and further study* (September 2005) previously published research into the patterns of Year 12 subject choice and the implications for further study and employment options of these choices are summarised.

Both papers are available for download from the ACER website at *www.acer.edu.au* Click on 'Quick links to major projects' from the ACER homepage and follow the link to LSAY.

Supporting young gifted children in vulnerable communities

The ACER Young Gifted Learners project aims to support early childhood educators to design rich, targeted and personalised learning programs for young children who grasp ideas and concepts quickly. The project has financial support from the Telstra Foundation.

The project will help early childhood educators in economically disadvantaged communities to develop strategies for early identification of giftedness, create enriching programs for young gifted learners that are highly personalised, and build partnerships with families to support a gifted child's learning and to develop the confidence to negotiate appropriate educational pathways for their children. A CD will be developed for early childhood educators and parents, to provide advice on supporting young gifted learners.

For further information contact Dr Alison Elliott on 02 8338 6800, or *elliott@acer.edu.au*

Understanding the needs of trainee teachers

ACER has responded to identified needs within the university sector, particularly Faculties of Education, with the production of two new tests.

The first, the Tertiary Education Mathematics Test (TEMT) was developed in association with the Department of Science and Mathematics at the University of Melbourne, to assess students' knowledge of: number, measurement, shape and data, algebra, and reasoning and proof.

The second test, the Tertiary Writing Assessment (TWA) assesses the written skills of university students at the commencement of their tertiary studies. In addition to assessing the basic skills of entrants to university courses, both tests can act as a diagnostic tool to guide the teaching program for Education students.

Further information about both tests can be found at *www.acer.edu.au/temt* and *www.acer.edu.au/twa*

Masters appointed to National UNESCO Commission

Chief executive of ACER, Professor Geoff Masters, has been appointed as an Honorary Member of the Australian National Commission for the UN Educational, Scientific and Cultural Organisation (UNESCO). The National Commission advises the Australian Government on all matters relating to UNESCO and supports programs which contribute to achieving UNESCO objectives and ideals. Professor Masters was appointed until the end of December 2007. He is also a member and co-chair of the UNESCO National Education Network.

What do students know about work?

A recent study conducted by ACER for The Smith Family with funding from the AMP foundation into the perceptions of work held by senior secondary school students uncovered a significant 'mismatch' between student career aspirations and the reality of the labour market. The survey of 3018 Year 10, 11 and 12 students from financially disadvantaged backgrounds found that a

majority of students are identifying preferred career paths based on their skills and personal interests with little to no understanding of the availability of these jobs in the current labour market.

The report, *What do students know about work? Senior secondary school students' perceptions of the world of work,* is available from The Smith Family website at *www.smithfamily.com.au*

Professional development for science teachers in the Middle East

Helen Lye, a Research Fellow at ACER has recently completed a series of very successful science workshops in India and countries in the Middle East. The one-day workshops were designed to give classroom teachers guidance in how they could integrate assessments into their classroom activities, experiments and investigations.

The workshops were very popular with 70-100 participants attending each of the scheduled workshops that were run in Oman, Qatar, Bahrain, UAE and India.

Annual Leadership Conference

In late August the Australian Principals Centre conducted the Annual Leadership Conference for the Victorian Association of State School Principals which was held over three days at Geelong Football Club. The conference theme was 'The New Shape of Schools' and included speakers drawn from Australia and overseas. Around 235 people attended the conference and associated trade exhibition.

Literature review on accreditation of teacher education

ACER's Teaching and Learning research program has been awarded a contract with the National Institute for Quality Teaching and School Leadership (NIQTSL) to prepare a literature review and issues paper on the development of a national system for the accreditation of teacher education. It is the third project to be undertaken by ACER for NIQTSL. The project is to be completed by December 2005.

Global Achieve tests in India and the Gulf States

ACER will conduct the *Global Achieve* tests of English, mathematics and science in India and a number of countries in the Middle East including UAE, Oman, Bahrain and Qatar in November this year. *Global Achieve* is a pencil and paper test for students in Years 3 to 10. It was first administered in English and mathematics in 2004 in schools in Dubai and India. Science will be tested for the first time in 2005 in Years 6, 7 and 8.

AIM Testing

ACER was recently awarded a contract with the Victorian Curriculum and Assessment Authority (VCAA) to develop and trial test items for the Achievement Improvement Monitor (AIM) testing to take place at Year 9 in 2006. This will be the first time AIM testing has taken place at Year 9 level. ACER will develop a test item bank for mathematics and English (including reading, writing and spelling). Test items for Year 9 were trialled in New South Wales schools in October. ACER also trialled items for the AIM tests at Years 3, 5 and 7.

Award winning conference presentation

ACER Research Fellow Dr Njora Hungi was awarded a Gold Medal for one of two presentations he delivered to the IIEP-UNESCO International Invitational Educational Policy Research Conference in Paris in late September. Only 25 of 58 papers that were submitted for consideration were eventually selected to be delivered at the conference. Dr Njora Hungi's paper entitled *Explaining differences in mathematics and reading achievement among primary school pupils* was awarded a gold international research medal by a panel of experts on the basis of the paper's academic merit, potential for educational policy impact and quality of presentation.

ACER India liaison office

ACER has received approval for the Indian liaison office from the Reserve Bank of India. The office is co-located with ACER's service partner Planet EDU in Gurgaon, Haryana near New Delhi. Ms Ratna Dhamija has been appointed as Manager, India Operations and commenced with the office in September. A broad range of ACER assessment services are being provided for schools out of the India liaison office. A seminar on science assessment was recently conducted in New Delhi, Hydrabad and Pune and was well attended by participating schools.

PISA and TIMSS in Australia in 2006

Australia will again participate in both the OECD's Programme for International Student Assessment (PISA) and the IEA's Trends in International Mathematics and Science Study (TIMSS). The next round of testing will take place in 2006. In July and August 2006 a sample of 15 year-old students will be assessed in scientific, reading and mathematical literacy as part of the PISA project. In October and November 2006 a sample of students in Years 4 and 8 will participate in the TIMSS assessment of science and mathematics. There will also be a small field trial during March/April 2006 which will involve some students from Years 5 and 9. Students in every state and territory will participate in each of these assessments.

Pakistan delegation visits ACER

ACER hosted a delegation from the Ministry of Education, Pakistan in Melbourne from 29 September to 4 October. The team of four was led by Mrs Sharma Khalid Akbar, Joint Education Advisor, Ministry of Education and included: Mr Muhammad Tariq Ayub, Secretary, Department of Education, Balochistan; Mr Sardar Naeem Ahmed Shiraz, Secretary Department of Education, AJK and Professor Dr Munawar Sultana Mirza, Director, Institute of Education, University of Punjab. The visit was funded by the World Bank National Education Assessment System project which is setting up sample testing at Years 4 and 8. Meetings were held with ACER staff and staff of the Victorian Curriculum and Assessment Authority (VCAA) involved in similar work.

PISA National Managers meet in Mildura

National Project Managers from 57 countries participating in the OECD's Programme for International Student Assessment (PISA) joined ACER staff for a week long meeting in Mildura at the end of October.

An international team led by ACER staff conducted briefings and training activities. The purpose of the week's activities was to prepare the key staff from participating countries for the next round of PISA testing, which will take place during 2006. Topics covered included a review of the results of the recently completed field trial, sampling of the schools and students to be tested in each country next year, review of the test items to be used, procedures for translation of items into the various national languages involved, test administration procedures, data capture procedures and data processing, and general project administration.

Science Education Assessment Resource (SEAR)

The Science Education Assessment Resource (SEAR) is now available to teachers free of charge via the Curriculum Corporation website at *www.curriculum.edu.au/sear*

SEAR provides a wide range of assessment materials suitable for use across the compulsory years of schooling. It includes more than 1400 items in over 350 tasks. There are items for diagnostic, formative and summative purposes.

The materials were produced by ACER staff in conjunction with Curriculum Corporation, Edith Cowan University, the Australian Science Teachers Association and the Australian Academy of Science with funding from the Australian Government.

National PISA and TIMSS websites

New look PISA 2006 and TIMSS 2006/07 websites have been launched. In addition to general access to more information, sample items, reports and key findings, participating teachers and schools can login to these websites to access specific information and resources.

Visit the websites at
TIMSS: *www.timss.acer.edu.au*
PISA: *www.ozpisa.acer.edu.au*
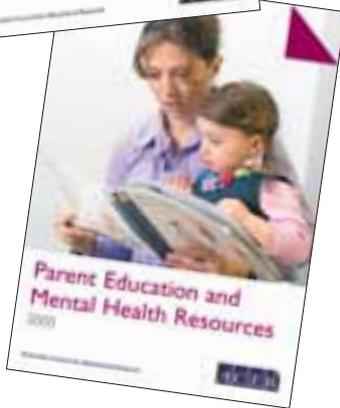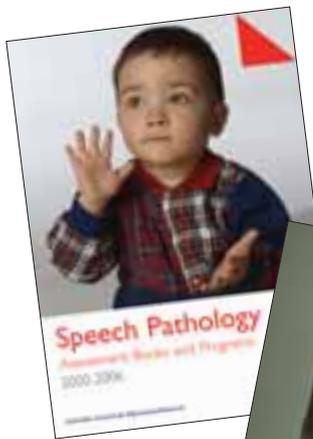
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