<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Papua New Guinea country report.</th>
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</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Jackson, Russell.</td>
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<tr>
<td><strong>Date</strong></td>
<td>1997</td>
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<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10220/2700">http://hdl.handle.net/10220/2700</a></td>
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Papua New Guinea country report for the group meeting on scientific and technological culture

Venue - Singapore, 28-31 May
Russell Jackson, Senior Curriculum Officer - Science
Department of Education, PO Box 446 Waigani, Papua New Guinea

1 Introduction

The education system is in a process of reform that involves structural change, new teaching practices, curriculum review and different administrative practices. As a result, changes are taking place in science and technology education at all levels.

2 The education system

2.1 A changing structure

In the last decade, the philosophy of education has shifted away from manpower production to the development of a more adaptable person who is more 'holistically' educated and who fits into and supports the local and national community. The government also wishes to provide basic education for all citizens. The new structure for education, approved in 1995, allows an increase in the places available at all levels for a minimal increase in cost. Since one system cannot simply be dropped overnight, to be replaced by the new one, a period of 'transition' between the two is occurring where two educational structures are operating side by side. The previous 6-4-2 structure is changing to a 3-6-2-2 structure as shown below.

The current structure

<table>
<thead>
<tr>
<th>Non-formal Pre-School</th>
<th>Community School</th>
<th>High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Preschool</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Elementary School</td>
<td>2</td>
<td>College of Distance</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Education (CODE)</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Vocational School</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>National High School or Technical College</td>
</tr>
</tbody>
</table>

The reformed structure

<table>
<thead>
<tr>
<th>Prep</th>
<th>Elementary school</th>
<th>Primary School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower Secondary School 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CODE or Vocational School 10</td>
</tr>
<tr>
<td></td>
<td>Upper Secondary School 11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or Technical College 12</td>
<td></td>
</tr>
</tbody>
</table>

The restructure will result in elementary schools from pre-school to grade 2 (age range 6-8), primary schools from grades 3 to 8 (age range 9-14) and secondary schools mainly from grades 9 to 10 (age range 15-16) but with some continuing up to grade twelve (finishing age 18). The teachers in community/primary schools are being freed to upgrade to a higher position because of the local selection of elementary teachers. The same principle applies in high schools which drop the teaching of grades 7 and 8, freeing up teachers to allow the school to either double up with more grade 9 and 10s or to include grade 11 and 12 students.

A college of distance education runs courses for students who wish to take or re-take grade 9 or 10 courses. Technical colleges run courses for trades such as electricians, builders, plumbers and laboratory technicians and vocational schools cater for the less academic with courses such as carpentry, home-economics, construction and mechanics.

Previously, all levels used English as the medium of instruction. Elementary education; however, is to be taught in the students' own language. This will be a challenge for all involved at this level as there are over 800 language groups.
Due to some administrative reshuffling, the number of universities within PNG has risen from 2 to 6 in the last few years, but with a minimal increase in student numbers. The main bulk of science graduates come from the University of PNG and the University of Technology. There are eight teacher's colleges preparing primary school teachers and a university of education for secondary school teachers.

### 2.2 Age cohorts
Student attrition has been a problem. In 1994, there were 115,000 students in grade 1 and 57,000 in grade 6. About 70% of the 7-year-old cohort were in school and the percentage dropped rapidly with each level increase. At the end of grade 6, 19,000 were selected to go on to grade 7 and 11,000 finally sat the grade 10 examination. Around 1200 entered grade 11. The two universities had a total annual intake of around 700 students, about 200 of which were science related. At most levels the boy/girl ratio was around 3:2 increasing to 2:1 by grade 11.

The reform process intends to drastically increase places available and already the numbers entering grade 7 and 11 have doubled with many more beginning school now than in 1994 (see Appendix 2).

### 2.3 Assessment periods
In the current system, students are assessed at the end of grades 6, 10 and 12. In the reformed system, students are being assessed at the end of grades 8, 10 and 12. Assessment reform will be a key issue. A practical examination was recently introduced at grade 10 to test basic science skills.

### 3 Science and technology education
The table below indicates how science appears in the curriculum.

Note: **bold** entries are still under discussion, the remaining reform entries are on trial

<table>
<thead>
<tr>
<th>Grade</th>
<th>Age</th>
<th>Science in the current system</th>
<th>Time/week</th>
<th>Science in the reformed system</th>
<th>Time/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep</td>
<td>6</td>
<td>• informal</td>
<td></td>
<td>• exploring the environment</td>
<td>30 mins</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>• general science</td>
<td>30 mins</td>
<td>• exploring the environment</td>
<td>30 mins</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>• general science</td>
<td>30 mins</td>
<td>• exploring the environment</td>
<td>30 mins</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>• general science</td>
<td>30 mins</td>
<td>• environmental studies</td>
<td>150 mins</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>• general science</td>
<td>60 mins</td>
<td>• environmental studies</td>
<td>150 mins</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>• general science</td>
<td>60 mins</td>
<td>• environmental studies</td>
<td>150 mins</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>• general science</td>
<td>60 mins</td>
<td>• general science</td>
<td>200 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• technology</td>
<td>160 mins</td>
</tr>
<tr>
<td>7</td>
<td>13</td>
<td>• general science</td>
<td>200 mins</td>
<td>• general science</td>
<td>200 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• basic technology</td>
<td>160 mins</td>
</tr>
<tr>
<td>8</td>
<td>14</td>
<td>• general science</td>
<td>200 mins</td>
<td>• general science</td>
<td>200 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• basic technology</td>
<td>160 mins</td>
</tr>
<tr>
<td>9</td>
<td>15</td>
<td>• general science</td>
<td>200 mins</td>
<td>• general science or specialisation</td>
<td>200 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• technology</td>
<td>160 mins</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
<td>• general science</td>
<td>200 mins</td>
<td>• general science or specialisation</td>
<td>200 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• technology</td>
<td>160 mins</td>
</tr>
<tr>
<td>11</td>
<td>17</td>
<td>• compulsory biology, physics and chemistry</td>
<td>300 mins</td>
<td>• compulsory biology, physics, chemistry</td>
<td>300 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• rural and urban technology</td>
<td>200 mins</td>
</tr>
<tr>
<td>12</td>
<td>18</td>
<td>• optional biology, physics, chemistry, science and society</td>
<td>max. of 3 x 150 min</td>
<td>• optional biology, physics, chemistry, applied science</td>
<td>max. of 2 x 200 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• rural and urban technology</td>
<td>200 mins</td>
</tr>
</tbody>
</table>

Technology appears as a new subject in grades 7 and 8 and again at grades 11 and 12. It may become a core 6-12 subject in future.
3.2 Current curriculum

The current community school course was intended to be an active-discovery approach. Unfortunately, these aims are not being reflected in practice due to a number of reasons familiar to most science educators such as: shortage of preparation time, lack of teacher confidence, low status of the subject, limited facilities, inadequate teacher training, shortage of reference materials, social and financial problems, poor materials distribution, large class size, rigid timetables and the use of formal teaching methods.

The topics over the six years are: air, earth, water, measurement, force, heat, light, sound, electricity and magnetism, living things, growth and reproduction and ecology. There is no integrating theme and activities within the headings above are all self-contained. There are 193 listed activities which take around a lesson each resulting in a packed syllabus. Interactive radio science broadcasts are available from grades 4 to 6. A syllabus and teachers' guides containing detailed objectives (generally in the form of behavioural objectives) and lesson plans are used to present each topic. There is no student text at this level.

In high school there is an emphasis on a more laboratory-based science by means of a 21 unit modular course based on science concepts such as: heat, chemistry and microbiology. The course lacks an integrating theme and has very little quantitative material. Course content has become more relevant over the years with the addition of local examples. A syllabus and teachers' guides containing detailed objectives (generally in the form of behavioural objectives) and lesson plans are used to present each topic. The course is supported by a student text for each year.

At grade 11, separate strands of Biology, Chemistry and Physics are taught. These three courses consist of the standard academic fare found in most courses internationally at this level. The actual cognitive level is similar to students in the UK after 11 years of schooling.

3.3 The reformed system

In grades prep to 2, most aspects of science will now appear in the new strand titled Exploring the Environment. It is hoped the teachers will relate better to science in this context than the previous community school course. The main components of this course are science concepts and processes but use will be made of an agricultural/environmental context. Some aspects of science at this level will also appear in the Health strand. Due to the unique language situation, it will be very difficult to produce all materials centrally for the elementary system. Guidelines will assist teachers in their planning but most curriculum work will need to be done in local groups. This will encourage better use of the local environment rather than forcing teachers to overuse outside contexts.

In lower primary, science will be part of a subject titled Environmental Studies which occupies 150 minutes per week. Some aspects of science will also be taught in Health at this level.

Upper primary and lower secondary science are still under discussion but both will encourage more skills development and activity than previously. A Science Overview document has been prepared which will be the basis for curriculum development in terms of progression, depth and breadth. It will play an important role in monitoring that science skills and concepts are still being taught in the absence of a separate science subject at the lower levels. The document covers science from prep to grade 12. It does not detail the contexts or activities for learning.

In grade 11, students will be able to take biology, physics and chemistry and in grade 12 they can choose up to any two of these. An additional science course Applied Science has been approved for development which will become another option. The course will be aimed at students who do not necessarily wish to study science at a higher level. It would be useful for potential teachers, lawyers, technicians or just as an interesting course for those who like science. The course focuses on topics relevant to PNG e.g. forestry, water, energy, nutrition, population, wetlands, ecotourism, geology and tackles issues that could be potentially disastrous for PNG in years to come. Urban and rural technology is available as an option in some schools. Most science students at this level also take major mathematics.

3.4 Materials

The science section of CDD develops and supplies a whole variety of in-house publications, as well as the provision of some imported books for teachers reference. Written publications are in the form of textbooks, student resource books, teacher resource books, student readers, teachers' guides, interactive radio broadcast books, picture books, slide set notes, newsletters and reference texts. Science kits are provided for new schools at each level. Radio science and secondary school TV broadcasts are on air. Slide sets and posters are also given out at times.
4 School and community

4.1 Parents
Around 80% of students come from a rural/subsistence background. In general, parents do not have a particular preference for science apart from the fact that good science grades are the best passport to university. Since most science taught in schools has been of a Western variety, many parents are unable to contribute. As parental levels of education improves, the problem should decrease.

4.2 Local community
Schools in the previous structure were aptly named community schools as they were intended to become part of the local community and be involved in local decision-making. This only happened in a small number of the schools. It is hoped the elementary schools, which are built by the community, will have much more involvement. Some schools organise community work and visits, and some invite local 'experts' in various fields.

4.3 Cultural relevance
Relevance is a key component of the reform. Cultural background and learning are intertwined. Courses will come from the culture where possible, using examples from elsewhere when necessary. The situation at elementary is particularly interesting as the language will force the development of science material based on the locality and people. A central curriculum unit will be unable to produce standard materials in over 800 languages. The richness and importance of scientific practices and applications carried out in PNG justifies their basis as major component of science education.

Local forms of classification, counting, weighing, measuring, conceptualising, time and space, colour, properties of matter, epistemology and ontology will be pursued and recorded. In addition to these there are all the technological aspects such as: traditional medicine development; construction; gardening; food preservation; hunting techniques etc.

Science still favours boys during assessment but the gap is closing. All new materials represent girls far more equally than they have in the past.

4.4 Political anxieties
There is a great desire for change. PNG wishes to produce its own system and it is important for the nation to devise its own courses that it can run without the need for external support.

Unfortunately, from a science point of view, political will is not strong. Scientific and technological capacity building would be assisted with national guidelines. A science and technology council act was passed by parliament in 1992 though the council is yet to be formed. A ministry for higher education, research and science was established in 1994 but was devolved soon after. Recently, a ministry for energy and science was formed. Science and technology awaits a stable political 'home' and although grassroots initiatives do happen, political awareness and support would help immensely.

4.5 Popularisation of science
The formal education system does not set out to popularise science to the masses although schools television and radio science programmes are broadcast weekly and accessible to anyone who wishes to tune in. An internet node has just been established this month and will have some effect on education.

The Papua New Guinea Association for Science and Science Education (PASSE) promotes science generally by organising competitions for students and teachers, giving prizes for high achieving students, running inservices and sending students on science trips overseas. They also put articles in the national newspapers. This new association now has over 270 members out of a 700 strong workforce. PASSE is also preparing a directory of all scientific institutions and manpower in the country. There are other associations such as the institute of chemists and the biological society both of which publish papers. The PNG science journal and the PNG journal of education also publish science or science education articles.

International projects such as the international year of the coral reef have an effect. A committee is running competitions, news articles and sending out materials. A number of schools are involved in projects such as Science Across Asia Pacific, the Australian Science Competition and the South Pacific Rainfall and Climate Experiment.

Various bodies put out newsletters, some governmental and some NGOs. The main bulk of information tends to be warnings for environmental damage and health rather than stimulus material.

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Final comments

Brave steps are being taken to reform the education system. During this period, the debate is open and ongoing so contributions are coming in from all sides. The changes to the science curriculum are not finalised but they do have direction. Continuing input from educators and others at this stage will help improve science education.

The main hope for improved science education overall is through the inservicing and upgrading of teachers throughout the system. From a curriculum development point of view, it will be important to make the changes and the reasons for changes more public and more open to debate from all sides. All changes must allow for and promote an aspect of improved professionalism in the teaching force.

Political support for science and science education will help as will increased funding. Scientific capacity building should be a major role of science education both in terms of mass scientific literacy and through the development of local scientists. There is a definite need for a cadre of indigenous scientists sympathetic to and in tune with the country's national goals, in particular, those 'routine scientists' who do not necessarily have to ponder on the meaning of life, but get down to some solid data gathering and analysing. Conservation is now a major issue so such people will be vital to PNG's sustainable resource development.

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Appendix 1  Papua New Guinea

Papua New Guinea

Appendix 2 Student numbers

Student numbers, 1994

projected student numbers, 2000