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Final report

project

Building research and project management skills in fisheries staff in Papua New Guinea

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1 Acknowledgments

It could be argued that this project represented a “departure from the norm” for ACIAR. So, it seems fitting to commence this final report and acknowledgements section by acknowledging ACIAR for its willingness to fund and support a “new” and disruptive approach to its projects. In particular it is important to acknowledge Dr. Chris Barlow and Associate Professor Jes Sammut who were willing to “take a punt” on this kind of project. And in that vein to acknowledge Jacob Wani whose insight as to what was needed for researchers and technicians in the National Fisheries Authority in PNG was the initial prompt for this project.

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Finally, the entire team wishes to acknowledge the participants who were a joy to work and engage with. We hope this has been an important moment in their life and professional development.

2 Executive summary

The project originated through discussions with executive managers within the PNG National Fisheries Authority (NFA), ACIAR Project Leaders and recommendations from the ACIAR Country Consultation process conducted in 2011. The consultations revealed (a) an ongoing lack of research capability within NFA and (b) an understanding that current modes of building research capacity within ACIAR projects was not achieving the desired outcomes. Specifically, these conversations identified a pressing need for research into the barriers that prevented the development of scientific practice in research staff and the lack of structured, formal, accessible and accredited education opportunities for staff, linked to projects, that could be used to overcome the research capacity deficit. There was a recognition that NFA was an organisation of scientists, and if NFA and ACIAR were to fulfil their stated missions the building of skills in scientific practice in staff had to be prioritised.

In response, the University of Tasmania's (UTAS) Institute for Regional Development (IRD), which has a track record of teaching and learning within an integrated capacity building framework, in partnership with NFA, was funded to develop and deliver a research program that addressed these needs. The research program developed an educational program and systematically evaluated the impact of training on the quality of scientific practice and knowledge transfer. An accredited University of Tasmania *Graduate Certificate in Research* comprising four (4) units focused on the practice of research was adapted as the core educational program for the project. In total 45 participants undertook the certificate; most were scientists within NFA, but others accepted in the program included staff from The College of Fisheries and PNG Departments of Agriculture (connected into ACIAR projects). Thirty-nine participants completed the course. Thirty- seven graduated with a University of Tasmania qualification and two achieved a formal Completion Certificate. Along with the delivery of the formal qualification and a high completion rate of the course, participants demonstrated a better understanding of the practice of science (beyond technical knowledge), a clearer identification of their own role within the processes of science, and the adoption of change in their day to day work as scientists.

Broadly the impacts generated by the project fall into three categories: personal, NFA workforce planning and challenges to capacity building approaches. The structure and focus of the course triggered a degree of personal impact stronger than expected. The overwhelming level of engagement in each unit of study and, the “light bulb” moments as participants connected their work roles and responsibilities to the broader body of scientific practice, resulted in a level of personal impact expressed as *“self as scientist”*. The learning sparked a desire for further study in many of the participants. Concomitantly, the level of engagement by the participants generated an awareness of the need for workforce planning within NFA and the inclusion of *learning pathways* as a means of strengthening the NFA staff profile and as a professional development strategy for staff in NFA.

This project challenged the often “add-on” and *ad* hoc capacity building in research projects by offering a tailored, systematic, adult learning focussed and formally accredited program (to the standards of the Australian Qualifications Framework); and the participants grasped the opportunity. The strategy also revealed other ways of documenting impact through *change pathways.* The project findings on embedded practice-based accredited training (and course design) will assist Indonesian scientists in the ACIAR funded South-South Project design the research skills placements of Cambodian fisheries scientist in Sulawesi and Bali.

3 Background

Aquaculture and fisheries are central to the food supply and livelihoods of coastal and inland communities in PNG. The FAO data (http://www.fao.org/fishery/countrysector/FI- CP_PG/3/en, accessed 29/4/13) suggests that wild capture production in PNG rose from approximately 40,000t in 1995 to a peak of about 254,000t in 2005, and has since declined to about 185,000t in 2011. Aquaculture production, while still low, has risen sharply from about 23t in 1995 to 1,621t in 2011, with a 2011 farm gate value of about USD$7.9million. These figures suggest that the PNG fisheries and aquaculture communities have the potential to boost economic return to local farmers, fishers, and the local community, as well as benefits to PNG more broadly. However, to maximize environmentally and socially sustainable production from PNG's aquaculture and fisheries industries, there exists a real need for skilled project management, as well as research development and extension professionals within the NFA. Further, this approach was adopted because it aligned closely with the ACIAR research priority of enhancing livelihoods within PNG's smallholder fisheries and aquaculture and the principle of engagement with the private sector, industry bodies and non-government organisations (NGOs) in partnership with government in both undertaking research and implementing research results.

The ACIAR Country Consultation process in 2011 revealed projects are constrained by limited capacity in science. Insufficient understanding and rigour, with respect to experimental design and analysis, scientific writing, project management and basic scoping skills, continue to limit project effectiveness – skills intrinsic to the practice of good science. Similarly, a training needs analysis report commissioned by the NFA (Kinch & Carnie 2011) highlighted the need to develop and embed skills in organisations and projects. Discussions with executive managers within the PNG NFA and ACIAR Project Leaders supported these conclusions.

Scientific staff in the NFA generally commence their employment in aquaculture and fisheries with limited research qualifications, experience and skills. These staff are supported by NFA to become technically proficient and experts in their fields; our analysis shows that professional development is overwhelmingly linked to the technical needs of specific projects (Appendix 1: Who did we teach? An analysis of EOI and enrolment information). This same analysis showed limited uptake of program-based training by NFA staff, which likely reflects few opportunities for NFA staff to undertake professional development as scientists. The follow on from this analysis is that the long-term institutional benefits that arise from well-articulated career development are never realised.

In response to the reviews and discussions, the NFA specifically identified:

(i) a need to conduct research on the barriers to staff gaining sound science capabilities;

(ii) an assessment of the impact of NFA's formal research training and qualifications being linked to projects on scientific capabilities; and

(iii) a systematic evaluation of imparted training to improve the quality of science and knowledge transfer within the NFA.

This research was proposed to identify and implement specific remedial actions through developing and testing a capacity building program for up to 45-50 fisheries researchers (drawn from multiple levels of the organisation). The project was designed to build capacity in NFA staff and offer staff an opportunity to obtain formal academic qualifications (testamur and graduation celebration). The project aimed to extend the capacity (define here what you mean by capacity in terms of this project context) and capabilities (similarly, define here what you mean) of NFA researchers *and* to consider how skills and 'know-how' could be embedded into institutional research processes in the longer term, leading to a strengthening of research and project capabilities across the NFA. The research focus of the project was to evaluate if the methodology employed delivered direct benefits to participants *and* spill-overs to the broader fisheries stakeholder community.

A Graduate Certificate in Research was chosen to deliver training in research skills to participants. A Graduate Certificate is a formal and structured qualification of four units, delivered to the Australian Qualification Level 8 standard. It was felt that this approach of a formal course focused on building both capacity and capability was a good starting point for capacity building within NFA. The proposal was to adapt the existing UTAS Graduate Certificate in Research, an approved and existing course of study within UTAS suited to post graduate researcher development and focused on scientific skill development.

The University of Tasmania's Institute for Regional Development (IRD) had developed a high level of expertise in building "real world" capacity of adults with varying exposure to tertiary education systems. Specifically, the

IRD demonstrated experience in training that acknowledges participants' prior work experience as a starting point and core building block for adult learning. Building on this experience, the Graduate Certificate in Research developed for PNG commenced with the *Learning through Practice* unit. This unit has been designed (and now offered in several different cultural settings) as an entry point for students who may have low levels of higher education and qualifications, affording a relevant and systematic approach to sustained skills building. It is an entry point well- suited to mature-age students and cohorts with heterogenous educational journeys, like those undertaken by NFA staff.

The project was developed using culturally appropriate adult learning principles, so that participant ownership of the learning process and outcomes could be nurtured and encouraged.

The project's evaluation strategy (based on a cyclical *Plan-Implement-Reflect* model) was designed to provide data and analysis of the project effectiveness and impact at the level of:

- the individual and the acquisition and embedding of scientific capability,
- a body of knowledge aligned to building workforce capability for institutional strengthening in NFA, and
- networks and pathways (i.e. in what way does this capacity building stimulate awareness and fostering of contacts and connections given that participants are drawn from a range of ACIAR projects with a diversity of partners as is illustrated in the table below).

Related projects in PNG

Project title/research area	**Institute/organisation** (Commissioned Collaborating)
Project - FIS/2008/023 Increasing production from inland aquaculture in Papua New Guinea for food and income security	University of New South Wales and NFA, et al.
Project - FIS/2010/054 Mariculture development in New Ireland, Papua New Guinea	James Cook University, NFA, UNRE and SPC et al.
Project - FIS/2011/049 Evaluation of the potential for commercial aquaculture of the freshwater prawn *Macrobrachium rosenbergii* in Papua New Guinea	SPC and NFA
Project - FIS/2012/102) Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery (*currently in pipeline)*	CSIRO and NFA

Approaches to promoting adoption of project outputs incorporated the following:

1. Where appropriate, collaboration with NFA staff in the design and delivery aspects of this project (e.g. PNG Workplace Health & Safety) will ensure project outputs meet the learning needs…….
2. The course content and project evaluation strategies included a requirement for participants to commit to documenting practice change in their day-to-day project activities. This will promote adoption by……
3. Entry and Exit interviews with participants and interviews with their supervisors and managers on completion of the course will identify areas of improvement and insights about the learning/ training experience. This will ensure outputs are refined based on the reflective.

Along with these strategies for evaluation and feedback the methodology included evaluation of the program and the capacity building course by an external, independent consultant familiar with the context and aims of the project but at arm's length in terms of the teaching and assessment.

Finally, central to the ACIAR Fisheries Program's initiatives in PNG has been the interaction with the NFA. The project has been developed in close collaboration with the NFA, seeking to support its responsibility for the management and development of the PNG fisheries sector. With successful completion of the course, project participants were afforded the opportunity to attain a UTAS Graduate Certificate in Research for which UTAS waived the student fees. For three years and 45 students, the value of the waiver was in the order of AUD$400,000.

4 Objectives

Previous work and our own analysis suggested the need for a dedicated process to up- skill researchers involved in fisheries projects within the NFA, which is the key agency for fisheries research and development within PNG. Specifically, this work highlighted the underdeveloped state of research and management skills among NFA staff and the difficulty of developing these skills within project work.

In response to these needs, this project delivered an integrated capacity building program (ICBP) focused on capacity building and the development of research design capability, and project development, implementation and management skills for scientists.

The overall research aims of this project were to understand the mechanisms, processes and functionality of an ICBP designed to increase research and project management skills underpinning aquaculture and fisheries research projects in PNG; and to embed these skills within the NFA.

The specific objectives were:

Objective 1: To determine research training and project management needs for scientists and technicians;

Objective 2: To design, deliver and validate a formally accredited training program integrating participatory approaches with research skills;

Objective 3: To develop self-awareness among participants as scientists and as part of the wider global community of scientists;[1]

Objective 4: To evaluate the benefits of integrated capacity building to stakeholders of the research process; and

Objective 5: To identify better management strategies for embedding integrated capacity building in development of the local scientific workforce in fisheries in PNG.

The project examined ways to build research and project management capacity in Port Moresby and regional areas by engaging NFA staff involved in ACIAR and other projects, including those in Head Office, as project participants.

The following research questions were addressed:

1. How can effective research and project management training be delivered to local scientists and technicians?
2. What are the benefits of integrating research training with workplace practices (i.e. in current projects) and participatory approaches? and
3. Does working towards a formal qualification facilitate the capacity building process?

The identified outputs, outcomes and impacts included:

- An accredited capacity building program for PNG fisheries scientists and technicians;
- A body of knowledge to inform policy on professional development and capacity building for science research and research capability and practice change in developing countries;
- Increased awareness of the need for staff profiling and workforce planning within NFA.
- Three cohorts of NFA (and related) staff formally trained in research methods and project management skills with self-awareness and willingness to explore other professional developmentpathways;
- A graduation ceremony celebrating NFA staff achievements with senior UTAS academics and ACIAR staff present.

[1]

[1] *1 It should be noted that Objective 3 emerged as a new Objective as the project was implemented and participants engaged with the course materials and units, reflecting the value of the Plan-Implement-Reflect model of evaluation.*

5 Methodology

The project involved the development and delivery of three iterations of a 4-unit Graduate Certificate in Research (1 iteration / year for 3 years), with the ongoing evaluation program extending into a fourth year. Each iteration was delivered to a cohort of 15-18 participants, and units were supported by ongoing mentoring and tutoring as required. Each participant was interviewed on entry and upon completion. While participants were recruited primarily from the NFA (60%), as awareness of the project grew, leaders of other ACIAR projects asked if one or two of their staff might join. ACIAR agreed to this request recognising the networking and other flow-on benefits that arise from cross institutional training.

The course offered in this project was informed by the University of Tasmania's Graduate Certificate in Research. The project team selected a combination of units from the UTAS Graduate Certificate in Research that would, in their opinion, satisfy the professional development needs of NFA staff. The course comprised two compulsory units, *Introduction to Higher Degrees by Research* and *Communicating Research*, which were coupled with *Learning through Practice* and *Research Methods*. The order of delivery was changed to reflect the capacity of the participants; Learning through Practice (unit 1) was the first unit delivered, followed by *Introduction to Higher Degrees by Research* (unit 2), *Communicating Research* (unit 3) and *Research Methods* (Unit 4). The course content and approach were developed with input from NFA and project leaders in ACIAR Fisheries projects in PNG.

The research questions were addressed through a research design framed around an action learning cycle comprising three complementary approaches:

1. Context Analysis of research capabilities within NFA and NFA-ACIAR projects. This approach afforded an opportunity to gain input and reflection from ACIAR project leaders, NFA staff and staff involved with related ACIAR projects. The reflections related to the specific training needs of NFA and how a project such as this one assists with delivery of these training needs.

2. Observations in classroom (by participants and trainers)
   On-site and in-classroom observations which give insights on the influences and challenges of environment, resourcing, levels of engagement, problem solving processes and initiative. These insights informed and shaped course teaching and assessment processes.

3. Reflections during and at the completion of the course
   Reflections were sought from participants, project trainers and NFA staff who supported the project. The reflections related to the effectiveness of the training directly and, importantly, also to the impact of the training on the way people now undertake project management and research. The impacts focused at the individual, organisation and community level. All participants were interviewed at the completion of the training and, for cohort 1, again a year later. These reflections were captured in a combination of methods including surveys, group and one-on-one interviews and participant-specific creative methods to directly document participants' network creation and work impact.

Major activities and research approaches adopted as part of the methodology, as they relate to the four project objectives, are outlined below:

Objective 1: **To determine research training and project management needs for scientists and technicians**

1.1 Interview ACIAR Fisheries project leaders and NFA managers to identify skills needs and gaps.

1.2 Undertake desktop analysis of current in-house research training and professional development programs.

1.3 Participants to be asked as part of their activities in the first unit to reflect on current research skills and capabilities as a critical part of reflective practice in the unit of study and for feedback into the planning of forthcoming materials and learning activities.

Interviews and desktop analysis with NFA staff and those of other relevant institutions (e.g. ACIAR Project leaders, UniTech, UNRE, NARI) examined current practice and staff development, addressing two critical aspects of the research questions:

- First, a baseline of current skills was developed against which to detect scope for improvement, and
- Second, input was sought from ACIAR project leaders and NFA managers to help identify the kinds of training needed, where bottlenecks occur, and to determine the current skills levels and training required. Project leaders and relevant NFA managers were later interviewed to determine the nature and impact of improved practice.

Both sets of interviews probed barriers inhibiting and limiting skills attainment. These interviews also considered cultural barriers, to inform and shape the design and delivery of the integrated capacity building program.

This information was augmented during course delivery by information provided by participants about their own experience, skills and practice.

Objective 2: To design, deliver and validate two formally accredited training programs integrating participatory approaches with research skills

2.1 Design and develop 4 Integrated Capability Building Program (ICBP) units for each of two programs.

2.2 Select participants for ICBP cohorts (multi-year activity).

2.3 Deliver all units to ICBP cohorts (multi-year activity).

2.4 Review all units for the ICBP based on first year evaluations (multi-year activity).

2.5 Incorporate feedback (e.g. adjust mode of delivery and mode of assessment);

2.6 Prepare report and publications.

A cyclical *plan-implement-reflect* methodology was used as a framework to design, deliver and validate the curriculum structure during this project.

- The initial ***plan*** stage of the cycle used input from the desktop analysis and interviews undertaken within Objective 1.
- This was followed by ***implementation*** - the next step in the cycle – where the training and units of study were delivered to the first cohort of approximately 15 participants. The four units were delivered sequentially over 1 year for each cohort.
  Formal training was supported by appropriate mentoring activities which included the appointment of an "online" tutor who used a range of techniques such as newsletters, Facebook, emails and chats to stay in contact with participants and encourage their participation.
- The third stage ***(reflect)*** involved participant evaluation of each unit and of the completed training package. Feedback was sought from participants and teaching staff and adjustments made to the course and units based on this feedback. Adjustment included new material, a change in approach and delivery as well as methods of assessment, and an awareness of the cultural context of learning materials.

On completion of the first learning cycle, the revised program was offered to a new cohort and similarly tested and evaluated. Three cohorts participated in the course with members of each cohort involved in on-going monitoring and evaluation activities.

Objective 3: To develop self-awareness among participants as scientists and part of the wider global community of scientists

Before discussing these activities under Objective 3 it is important to note that this objective is a variation to the original proposal and in itself is evidence of the impact of the project outcomes. As the participants' awareness of themselves as scientists grew and awareness of professional development and learning pathways emerged for them, the project partners responded by requesting a variation to the original proposal thereby adding additional activities such as graduation celebration, newsletters and information of further study. This was especially noted in the midterm review.

A critical learning outcome from the first unit of study *Learning through Practice* was to give the participants a framework within which to evaluate their strengths and weaknesses, particularly regarding their practice. There were opportunities to practice these learnings in the other units in the course.

3.1 Require participants to reflect on their prior work experience.

3.2 Participants introduced to the concept of the reflective practitioner.

3.3 Participants better understand their personal learning styles and the learning styles of others.

3.4 Participants develop a checklist of core skills in scientific practice.

3.5 Participants develop a framework to better understand self and others.

3.6 Participants consider their professional development and learning pathways.

Objective 4: To evaluate the benefits of integrated capacity building to stakeholders of the research process

4.1 Design/refine evaluation program in consultation with NFA staff (multi-year activity).

4.2 Conduct commencement, end- and post-course evaluation with each cohort (multi- year activity).

4.3 Conduct impact evaluation with external stakeholders (multi-year activity).

4.4 Prepare and circulate report on findings and recommendations including publications.

Monitoring & Evaluation Framework

The evaluation was informed by key ACIAR publications (Gordon, J. & Chadwick, K. 2007; Dugdale, A. *et al*. 2012) and framed to identify key "moments of change" in program delivery and post-course (e.g. as participants develop confidence to apply the research and management skills.) (www.ruralpracticechange.org and Mosse 1994). In addition, the Monitoring & Evaluation (M&E) team also considered the 2012 ACIAR work "Developing and testing a tool for measuring capacity building".

In this context, the evaluation framework was designed to provide data and analysis of the project effectiveness at three levels:

Individual:

- through which initial learning outcomes, application of new skills, outcomes of post-course strategies and changes in research effectiveness were assessed, as appropriate, at the end of each course and in subsequent years;

Body of Knowledge:

- through which differences in the planned delivery and outcomes were evaluated against the actual process so that subsequent years in this project – and other projects – will benefit from accurate analysis of what worked well and what could be better; and

Network Mapping:

- through which changes can be mapped in the way in which NFA staff better understand their networks and resources capital across those networks (in unit two, for example, participants were asked to map their different networks and reflect on the quality and breadth of these resources). The exit interviews afforded an opportunity for participants to reflect on these networks and the forms they might take.

M&E Methods and Approaches

The M & E was implemented throughout the delivery of the project and an overall evaluation conducted on the completion of the project. The evaluation framework comprised several approaches designed to collect data on the impact of the capacity building program on participants, projects, staff development and external stakeholders:

- Participant feedback regarding units and delivery;
- EOIs and commencement interviews to establish a "baseline" and to identify participant aspirations and goals;
- Exit interviews on completion of the units of study and attainment of a qualification;
- Post-course annual interviews with graduates during the project;
- Interviews with local aquaculture and fisheries project leaders, departmental supervisors and end users;
- Identification of critical program inputs and outputs to inform wider staff development programs within organisations like the NFA – as a mechanism for workforce planning and embedded

institutional capacity building. These will be stepped out to maximise outcomes and associated insights.

The program evaluation process commenced in Year 1, when the first cohort of participants were interviewed prior to commencing the first unit of the course. Pre- commencement interviews were also conducted for the next two cohort. The evaluation process required exit interviews of participants on completion of their course of study. Participants in cohort 1 were interviewed a year after completion. The interviews were conducted by an external party "at distance" to the project in accordance with the ethical requirements for this project (i.e. because this was an accredited university course with assessment for marking, under the UTAS ethics requirement lecturers responsible for delivering and marking the unit could not also evaluate the unit).

In addition to the ongoing monitoring and evaluation across the delivery of the course to three cohorts of NFA staff and others the external party also completed an evaluation of the overall project once all cohorts had completed assessment and graduated.

Objective 5: To identify better management strategies to embed integrated capacity building in development of the local scientific workforce in fisheries in PNG

5.1 Refine training and evaluation programs drawing on the outputs from all other objectives.

5.2 Prepare and circulate publications and reports on findings and recommendations (multi-year activity).

5.3 Conduct a workshop post training to discuss the findings and the refined implementation plan to identify how to embed these into the professional development activities and performance management processes within the NFA organisation.

5.4 Prepare final project publications, report and recommendations.

Research findings related to Objective 2 shaped the project team's thoughts on the ways that design, and delivery of capacity building and professional development programs can be tailored to maximise their effectiveness.

These findings, when linked to those from Objective 5, also informed management strategies to strengthen institutional capacity building and integration into workforce development and planning.

The project team conducted annual meetings in conjunction with the training visits, as part of the process of gauging progress and identifying any necessary variations to the work plan and continuous transfer of appropriately tested insights from the project.

The project team had also planned to hold a workshop for NFA managers and project supervisors to discuss the project in its entirety, but timing made it difficult to achieve.

6 Achievements against activities and outputs/milestones

Objective 1: *To determine research training and project management needs for scientists and technicians*

no.	Activity	outputs/ milestones	completion date	Comments
1.1	Interview ACIAR Fisheries project leaders and NFA managers to identify skills needs and gaps.	Initial report on skills needs and gaps.	Achieved: List of Basic Skills was compiled; Developed further with participants in Unit 2 of the course. Implications of skills sets for workforce planning explored in midterm and final review (see Appendix 2: Institutional Strengthening: Workforce Planning, Performance Management and Pathways to Learning).	*The discussions that took place in the midterm and end of project reviews highlighted the importance of workforce planning and skills profiles.* *The project highlighted how learning pathways link to professional development and that the understanding and development of these learning pathways are critical for staff.*
1.2	Desktop analysis of current in-house project training and professional development programs for capacity building.	Understanding of current activities and programs; Profile of skills needs and gaps in local project staff capacity and capabilities within	Achieved albeit limited as little data available in NFA.	*As per above.*

1.3	Participants will be asked as part of their activities in the first unit to reflect on current research skills and capabilities as a critical part of reflective practice in the unit of study	Profile of individual skills needs and gaps in local project staff capacity and capabilities within NFA for feedback into the planning of forthcoming materials and learning activities.	This was achieved and is seen as an important achievement in the project. In unit 1 participants reflected on their personal learning styles and the implications not only for how they learn skills but how others learn. This is critical for team work. In unit 2 participants developed a list of critical science practice skills (Appendix 3: The identified skills checklist). This checklist was an excellent and useful output and can inform skills development in NFA.	*It was ground-breaking to see the participants realise they each had their own learning styles and thus could see how others might learn differently from them.* *Equally revealing were the participant responses to the skills that they were developing, notably:* *- skills in data management, captured in the data cycle, and particularly the concept that data had a life beyond the limits of the immediate research project,* *skills in responsible research practice, and particularly the fact of codes of conduct that regulate scientific endeavour, and* *skills that underpin 'self as scientist', with the realisation that science capability is more than just technical knowledge and that there are core skills needed for the practice of science.* *The novelty of these concepts (and others) speaks to the pressing need for formalised development opportunities to address deficits in knowledge.* *Participants learned more on the so called "soft skills" developed in a framework "Me to We".*

PC = partner country, A = Australia

Objective 2: To design, deliver and validate a formally accredited training program integrating participatory approaches with research skills

no.	Activity	outputs/ milestones	completion date	Comments
2.1	Design and develop 4 Integrated Capability Building Program (ICBP) units for each of two programs	Design all units to be delivered in Year 1.	Graduate Certificate consisting of 4 approved UTAS units (see Appendix 4: Graduate Certificate Unit List).	*The inclusion of Learning through Practice as the commencing unit was an effective way to engage candidates but more importantly to show them the value of their work experience to date. The content in the two core units was easily adapted to the needs of the ICBP and the participants.*
2.2	Select participants for ICBP cohorts.	Each cohort of participants selected	Developed an EOI template (see Appendix 5: EOI Template). Good applications and by Cohort 3 a 'wait list'. Word of mouth meant staff from other ACIAR programs in PNG undertook the course.	*The EOI format was used to establish a "baseline" of participant aspirations and goals. The EOI process identified cohorts of students that were capable, with few exceptions, of achieving the academic requirements of a Graduate Certificate of Research*
2.3	Deliver all units to ICBP cohort.	Each year's training completed.	Achieved, albeit the timing proved difficult and hence all training was offered from Port Moresby rather than some delivered regionally.	*The teaching team became proficient in teaching in a pared down teaching environment, unsupported by adequate Internet, mod-cons and services. It was rewarding for all, and out of adversity arose tightly-knit communities of learners fully engaged with the material, the teaching staff and the opportunities.* *The challenges helped students and teaching staff to form a greater team, so learning and teaching was an integrated and well- supported whole.*

2.4	Review all units for the Integrated Capability Building program (ICBP) based on first year evaluations	Design for all units to be delivered in Year 2.	The course was monitored and evaluated as an ongoing process. Some key adjustments included a change to Assessment in Action, the need for two staff in the room for unit delivery, the extension of the teaching period from 3 to 4 days and the employment of an online tutor.	*Consistent monitoring of the units was effective in allowing the project team to be responsive to needs. This was especially the case with technology. The computers were plagued by viruses; the purchase of local equipment and adaptation of assessment submission was essential.* *Teaching staff found that in-class submission of assessment work helped students to manage the very normal levels of anxiety around assessment because teaching staff help was always available.*
2.5	Prepare report and publications.	Report and publications regarding outcomes and learnings from the three years' training.	Achieved. Reports on the Participant Profile (see Appendix 1) and the Course Development & Structure (see Appendix 6: The Development of the Graduate Certificate in Research) were produced for the final review. These reports formed the basis of papers for publication.	*Preparing these reports provided very useful material for the final review of the project and generated considerable discussion on how to approach workforce planning and learning pathways.*

PC = partner country, A = Australia

Objective 3: To develop self- awareness among participants as scientists and their value in the global community of scientists

no.	Activity	outputs/ milestones	completion date	Comments
3.1	Require participants to reflect on their prior work experience.	Assessment on a significant moment in working life. It is in this unit (BAA506) where participants were introduced to the Action learning cycle and the concept of a Reflective Practitioner – which could be applied to their significant moment.	Achieved	*Throughout the course students reflected on their prior practice, formally in* Learning Through Practice*, and then less formally as they assimilated new information, concepts and practices into their own working experiences and practices.*
3.2	Participants introduced to the concept of the Reflective Practitioner.	Included in the assessment for Unit 1 and used as a tool throughout the course.	The concept of *Reflective Practice* and the *Action Learning Cycle* were used by the students for self-reflection, self-assessment and monitoring – facilitating awareness of *Self as Scientist*	
3.3	Participants better understand their personal learning styles and the learning styles of others.	Participants completed the Learning Styles Questionnaire (developed& published by Peter Honey, 2006).	Application of the Learning Styles Tool in the workplace. Participants noted the adoption of the Learning Styles Tool in their workplace – in the exit interviews	*This tool is highly useful for team work. It helps participants understand that we need to design training and professional developments with a mix of learning materials as each of us can learn differently.*

3.4	Participants develop a checklist of core skills in scientific practice	Developed with participants in Unit 2 (see Appendix 3	This exercise undertaken in Unit 2 proved to have wider impact than just to build student awareness. It was used for discussion in both midterm and final review as core to professional development	*This exercise proved to be a fundamental catalyst for participants really starting to think of themselves as scientists. A very good case study was in the skills around data management (see next section).*
3.5	Participants develop a framework to better understand self and others	Participants introduced to a simple leadership tool called Me & We (see Morrison, M, 2007). It provides a useful starting point as a member of an organisation	Catalysed self-reflection	*The value of this was reflected in the post-study interviews when many interviewees alluded to their growing capabilities as leaders.*
3.6	Participants consider their professional development and learning pathways	Participants asked about their professional goals in entry and exit interviews.	Stimulated a desire for more study and qualifications. Document with suggestions developed for Final Review of project (see Appendices 1 and 2).	*This emerged as a seriously underdeveloped part of NFA.* *Through the course participants expressed a desire to access information on master's by Coursework.*

Objective 4 To evaluate the benefits of integrated capacity building to stakeholders of the research process

no.	Activity	outputs/ milestones	completion date	Comments
4.1	Design/refine evaluation program in consultation with NFA staff.	Initial evaluation criteria and process. Impact indicator matrix.	Evaluation framework implemented.	Useful evaluation feedback also provided by External Reviewers in Mid Term and Final Review (see Appendix 8 and 9)
4.2	Design/refine evaluation program in consultation with NFA staff.	End-of-year evaluation of each course in line with evaluation criteria and process. Evaluation of previous cohort/s' practice change in line with evaluation criteria and process.	Interviews completed, and data analysed. The data has proved to give rich insights into participants' aspirations and outcomes form the graduate certificate.	*On reflection, the external consultant could have probed and explored some of the participants' reactions and aspirations in a little more depth.*
4.3	Conduct impact evaluation with external stakeholders.	Evaluation of practice change and external impact in line with evaluation criteria and process.	Interviews conducted by external consultancy	
4.4	Prepare and circulate report on findings and recommendations including publications.	Report and publications regarding outcomes and learnings from each year's training.	An Evaluation Report conducted by an external independent consultant (see Appendix 10)	

Objective 5 To identify better management strategies for embedding integrated capacity building in development of the local scientific workforce in fisheries in PNG

no.	Activity	outputs/ milestones	completion date	comments
5.1	Refine training and evaluation programs – drawing on the outputs from all other objectives.	Ongoing refinement of the ICBP course and evaluation process. Note also feedback from Mid Term Review conducted by 2 external consultants nominated by ACIAR.	Improvements to course implemented such as Assessment in Action, extended teaching period from 3 to 4 days with inclusion of extra staff and appointment of online tutor. Recommendations from Mid-Term Review also provided useful evaluative feedback.	*The ongoing monitoring of both the content and structure has provided valuable insight on how to think about capacity building differently.*
5.2	Prepare and circulate publications and reports on findings and recommendation	Reports and publications to increase broad stakeholder understanding of how the process worked and how it could be implemented elsewhere.	Reports included in final review and formed basis of papers for publication (see Appendix 9)	*One interesting publication has focussed on the role of this course as a "disruption" to how scientists within ACIAR projects think about capacity building.*
5.3	Conduct workshop regarding findings and refined program with NFA	Consensus view on what was learned during project and recommendations for future projects of this nature. Workshop report and implementation plan	There were 3 attempts to run this workshop – most particularly around the time of the graduation celebration.	*Planning events in PNG was a constant challenge for UTAS staff as communication, between Australia and PNG, and within PNG, was difficult. Staff should be commended on achieving the timely scheduling and successful organisation of the unit delivery. That they were unable to achieve a similar successful outcome for any additional activities, such as this workshop, is understandable within the cultural context.*

5.4	Prepare final project report and recommendations and publications.	Report and publications regarding outcomes and learnings from the three years' training and evaluation process.	The team has produced a communications report which outlines the various ways in which the project has been disseminated. A publications plan has also been produced.	

7 Key Results and Discussions

Introduction

A discussion of the results from a project looks at how the actual results aligned with expected results. Inevitably other findings and results emerge through this process; this has been the case in this project. For the most part these have been positive.

Working in Papua New Guinea is a challenge as it is a developing economy facing issues of violence and corruption. This did circumscribe the original intentions of this project. For example, the delivery of the course outside Port Moresby (possibly in Goroka or Kavian) was proposed, but the logistics and ever- present safety issues meant this did not occur (much to the disappointment of the project team). Equally, the pervasive computer viruses and limitations of local internet/technology required the purchase of additional infrastructure and a rethink regarding assessment and interactions with the student- participants. These changes turned out to be positive for the project. These difficulties aside, other positive results included exceptional interaction with and engagement by the participants and the foundations of friendships and longer-term work relationships.

Not all unexpected findings related to the PNG situation. One team member, a researcher of some status, discovered just how much she loved teaching. Furthermore, the experience of teaching professional skills in PNG has informed her teaching practice at home. And another team member finding that the tutorial support role and the implications for self and practice were precisely where her interest and expertise lay. These examples of change illustrate flow-on benefits into Australia as well as the targeted agency in PNG. It is these kinds of results that strengthen ACIAR and the value add to be gained from its investment in international agriculture research and demonstrate that the benefits of these kinds of projects flow both ways.
In discussing the results of the project, it is appropriate to turn to the aim of the research and the specific research questions to be addressed. The overall aim of the project was to understand the mechanisms, processes and functionality of an ICBP designed to increase research and project management skills underpinning aquaculture and fisheries projects in PNG; and to embed these skills within the NFA.

The project research questions were:

- How can effective research and project management training be delivered to local scientists and technicians?
- What are the benefits of integrating research training with workplace practices (i.e. in current projects) and participatory approaches?
- Does working towards a formal qualification facilitate the capacity building process?

Learnings from each of these questions will now be addressed in turn.

7.1 How can effective research and project management training be delivered to local scientists and technicians?

The delivery of effective training requires consideration of specific issues like mode of delivery and content design cognisant of the cultural and geographical contexts within which the training occurs. But this research conducted within the framework of ACIAR's roles and responsibilities required much more. How can a more systematic focus on capacity building be delivered within ACIAR's legacy of high quality international scientific research and what constitutes an effective and useful approach to the program design? In this section the response to and results on these questions are discussed. Where appropriate, fuller evidence of results is attached as an appendix.

7.1.1 Dual transformation and disruption

For some time now ACIAR project leaders have expressed concern over the relatively slow improvement of research capability in places like PNG. While most ACIAR funded

projects do require some dimension of "capacity building", in general the projects are not and cannot be solely capacity building projects as this is not within the remit of ACIAR. Specific projects may involve *ad hoc* workshops or short-term training, associated often with the science outputs or scientific methods used in the projects. The concern of project leaders is not unsupported; within the classroom participants with years of experience in ACIAR projects were unable to articulate basic tenets of scientific practice or show understanding of what considerations underpin the responsible conduct of research. Without these unifying concepts research must be a confusing and frustrating endeavour.

In part, in response to the need to develop scientific capability, ACIAR offers postgraduate scholarships and some short-term fellowships for scientists in developing countries, all of which require participants to spend time in Australia during the training. These are executed on a small scale, are expensive and disruptive to participants, and they are not bringing about the transformation of the scientific workforce at a pace or scale needed within countries like PNG. The critical question has been how to tackle this issue without losing the quality and legacy of agricultural research excellence that has been the hallmark of ACIAR for many years.

The dilemma faced by ACIAR is the need to address the issue of scientific skills development while retaining the high-quality legacy agricultural research projects that have characterised ACIAR as a great organisation. This dilemma, of needing to maintain core, high quality activity yet to engage in responding to change and new issues, is not unique to public sector organisations or centres like ACIAR. It is one that has been faced by business particularly in the context of technological change and the digital era (Gilbert, Eyring & Foster, 2012). It is also one faced by the higher education sector, including the University of Tasmania.

An interesting and challenging response that has proved effective for industry (Gilbert, Eyring & Foster, 2012) and more recently the higher education sector (Gilbert et al., 2018) is to develop *dual transformation strategies within the organisation*. In this approach "operations act in parallel—one to develop strategies that optimize [1] the core organization to become more responsive to the new profile of demands it faces [*Transformation A*], and [2] a second to design and implement disruptive innovations that provide a basis for future growth, agility, and responsivity" [*Transformation B*] (Gilbert et al., 2018).

The concept of dual transformation provides a useful platform for ACIAR to retain and maintain its reputation for high quality research projects yet simultaneously design and develop innovative initiatives/ projects that can address emerging issues around institutional strengthening and scientific capability. Specifically, for ACIAR to develop Transformation B initiatives that maintain the commitment to high quality research while disrupting and challenging the status quo through the funding of initiatives that equip partner agencies to take leadership in scientific research and embed better scientific practice and capabilities in the scientific workforce.

In this project the research team designed and delivered an integrated capacity building program that addressed issues of training and building scientific capability by disrupting the concept of 'what capacity building is' and in parallel designed the project as action research to address specific research questions about effective capacity building within scientific/ agricultural research. The adoption of the dual transformation strategy as an appropriate framework within which to locate this project and deliver research and project management training will be examined more fully in a paper for publication (see proposed publication agenda below).

7.1.2 The Graduate Certificate in Research

For over seven years UTAS has offered a Graduate Certificate in Research – most usually for doctoral/masters candidates. The focus in the graduate certificate is explicitly on practice skills in the conduct of research, and not on core discipline knowledge. As identified earlier the issue for organisations like NFA was less about the acquisition of technical knowledge and more on the application and practice skills need needed for

scientific research projects. Two issues had highlighted the need for more effective training. First, despite ongoing investment in fisheries research there had not been a lift in the quality of scientific skills. Second, what training had been delivered had been *ad hoc* in timing, often at the end of the project and not systematic but on an as needs basis and often technical in focus.

The Graduate Certificate in Research within UTAS afforded a relevant accredited structure explicitly focussed on the practice of research. The course consisted of four units. Figure 1 below sets out the course design approach and the role that each unit played in the overall course learning outcomes. There is a good argument to suggest that this kind of course design model could inform other capacity building in ACIAR projects. The units within the Graduate Certificate in Research delivered in PNG were adapted to meet specific learning needs identified for the research but these changes were achieved within the learning outcomes framework approved for these units within the University of Tasmania. Effective delivery within the context of fisheries and PNG, however required more.

The University of Tasmania's (UTAS) Institute for Regional Development (IRD) had a track record of teaching and learning within an integrated capacity building framework and specifically an approach expressed in a unit

Learning through Practice that acknowledged prior work experience as a core building block for adult learning. Integrating the IRD approach and Learning through Practice with the UTAS Graduate Certificate aligned the course to the identified needs within NFA by acknowledging the local know-how, knowledge and prior work experience of participating scientists (which increases the probability of engagement in the training/ course) yet maintaining the formal accredited structure of the course as a capacity building activity.

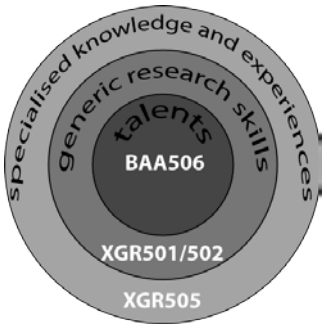

Figure 1: A diagram of research skills and the Graduate Certificate in Research Skills units that address each skills area. Course Design *(developed by Dr. Joy Rathjen, 2017)*

7.1.3 Course delivery

The Graduate Certificate in Research course as designed (and approved) for delivery in PNG was delivered intensively, with the Australian teaching staff travelling to PNG to deliver the unit in a workshop over 3 to 4 days. For the most part, teaching was delivered in Port Moresby as logistics and safety prevented alternatives. As is illustrated in Figure 1 (above) the course commenced with the "Learning through Practice" unit. In the initial iteration, to cohort 1, the unit was delivered over 3 days with the assessment to be submitted online to the teaching staff in UTAS in the weeks after delivery.

A similar approach was used for the initial iteration of the unit, Introduction to Higher Degree by Research. The submission of assessment after unit delivery proved all but impossible for most students for the following reasons. First, participants were quickly caught when back in the day to day operational activities of work and home after the course. Second, the Internet was intermittent and costly for most as a means of assignment submission. Third, the assessments sent often did not arrive because they were deleted by virus protection within the UTAS IT system. And finally, the assessment strategy required the students to create appropriate learning environments at home and to interact with the academic support provided from a distance, using email, portals and the like. The cost and reliability of Internet, the difficulty of creating learning spaces and a lack of skills in accessing online resources created barriers to private learning.

In response to this it was found that a more effective strategy was to extend the unit delivery from 3 days to 4 days and to develop an alternative strategy for the assessment on day 4. All later iterations of the units implemented Assessment in Action, where formative and summative assessment work was undertaken overnight and in class, supported by the teaching staff, and with all assessments completed by the afternoon of the fourth day. This worked well for participants.

Within the course delivery the modes of 'teaching' varied, with the use of lectures, group discussions and group work, peer to peer learning and individual reflection, as well as time for individual "clinics". A training manual was produced in USB format and given to each participant. Alongside these resources UTAS provided online access to a tutor who then produced updates, a newsletter and Facebook page, as well as resources such as the UTAS library. The Facebook page proved to be a useful tool for sharing information and updates to all participants; the library was a challenge for all students.

A final comment on the effectiveness of the program must be on the success of the graduation celebration. While the participants graduated *in absentia* the project did include a ceremony, with the Deputy Vice Chancellor Research (UTAS) and Australian High Commissioner present, students in cap and gown (in UTAS colours especially created for the occasion) and a ceremony where they received their testamurs. Family and supervisors were among the invited guests.

This too was an overwhelming success and contributed to the effectiveness of the program.

7.2 What are the benefits of integrating research training with workplace practices (i.e. in current projects) and participatory approaches?

Experiential learning or learning by doing is based on the premise that any training needs to be relevant to the individual and directly applicable in the workplace. The four units provided a scaffold of learning through which participants developed a deep understanding of and respect for:

- themselves and others as research practitioners
- data and its integrity
- communicating science and
- the research processes

Wherever possible the students were encouraged to use examples of their experiences and activities in the workplace in their assessment tasks. By adopting these work-based approaches students were able to gain insights into their current practice (what worked and what did not work and why) and afforded opportunities for practice change and the adoption of new ways of working.

7.2.1 New ways of thinking about capacity building

Too often when opportunities for capacity building are included in scientific projects it is done as an "add on" to scientific projects and expressed in project submissions as types of outputs to be achieved at the end of a scientific project. As Roberts et al. (2006) notes in a review of capacity building, there is a prevailing misconception that it is a tool to deliver external outcomes. For example, short courses and training are often an avenue for universities and other organisations to offer capacity building to a range of stakeholders outside the scientific project itself, such as farmers, fishers, community and extension officers, and is generally offered to these stakeholders on completion of a scientific project as a mechanism to transfer scientific findings. Rarely is capacity building offered to the local or in country researcher inside the project.

Further, for many years capacity building has been cast as synonymous with technology transfer. It could be argued that this largely didactic approach resonates with the approach adopted in mass education where large amounts of technical, scientific and discipline- specific information is transferred to the learner via lectures, training manuals, brochures and handouts. Probably the most comprehensive challenge to this model of technology transfer came from the work of practitioners such as Donald Schön (2006), whose work on the reflective practitioner and adult learning shaped a new approach as to how deep and sustained learning occurred. The challenges offered by Schön and others triggered a comprehensive review on the conduct, type and focus of capacity building.

Coutts et al. (2005) undertook a comprehensive review of capacity building in agricultural extension that triggered a wave of revised and new thinking about how and when capacity building might occur in agriculture for producers, the extension officers and agricultural research scientists. Coutts et al. (2005) identified five modes of capacity building (Group facilitation/ empowerment, Programmed learning, Technology development, Information access and Individual consultant/ mentor). Too frequently, in their view, when capacity building is included in a scientific project the approach adopted is that of technology transfer. There is a prevailing assumption that the local researcher will learn scientific capability through participation in the project, which has emerged as an extension of the master-apprentice model of scientific capability building that dominates in western scientific training. Building scientific capability is rarely structured, is considered a 'soft skill' and is often not a highly recognised part of scientific development in any paradigm of scientific training. However, as Roberts et al. (2007a, b) observe, building capacity is about empowering individuals to take control and manage their own futures. In this project empowering individuals proved to be a most important starting place to begin the process of practice change.

In this project the structured curriculum based on adult learning principles and informed by a work based – experiential approach challenged the ways in which capacity building had been included in many ACIAR projects to date. The evidence gained from this project suggests better engagement by students as there was something tangible "in it for them". Further, they had to take responsibility for the learning so as to complete the assessment – which, in this project, was grounded in and focussed on research skills and the practice of good science.

A further challenge to current practices in capacity building in research projects was a specific focus on other forms of knowledge and know how beyond discipline knowledge. For the most part most participants had sufficient or adequate discipline knowledge on fisheries/ aquaculture science. What they lacked were

capabilities in experimental design, application of methods, data management (beyond data collection) as well as skills in analysis and synthesis. Other capabilities identified as critical for good practice included skills in team work, negotiation, reflective practice and project management.

This research challenged not only the "what" in capacity that needs building but also the how it is delivered and more importantly learned and applied.

7.2.2 Disruptive by design

The PNG project afforded an opportunity to think about capacity building differently and design a more challenging and disruptive program to build scientific capability. The Graduate Certificate in Research is framed around the pedagogy of practice (inclusive of work- and practice-based learning and the reflective practitioner) (Schön 2006; Higgs 2011; Higher Education Quality Council Ontario 2016) and the threshold learning outcomes are designed to address the question of how to improve the practice of research.

But the course offered in this project by UTAS pushes the boundaries further by proposing that practice has two components: practice skills that are about application or "how to, why to and when to" apply the skills, and "other" practice skills that are about the researcher's understanding (tacit skills) of his or her demeanour or conduct required as a scientist. These two dimensions of practice are critical in building research capability and are integral to the research capacity needed within NFA.

The unit *Learning through Practice* is designed to address the question of conduct in the workplace. While this kind of experience is intrinsic in vocational education, such as that provided for health practitioners and school teachers, it is less frequently a part of non- vocational education, such as is found in Bachelor of Science programs. The development of this unit draws on work by Morrison (2006) and Collins (2006) and is framed around the idea of first understanding self and then others, also referred to as the ME and the WE (Morrison 2006). Within the unit participants are asked to reflect on a range of aspects of self, such as learning styles, values, leadership approaches (e.g. adaptive leadership (Heifetz et al., 2009)) and gender and diversity – the ME - and then to understand the dynamics of working with others – the WE (Appendix 6). This is reflected in the decision to commence the Graduate Certificate with *Learning through Practice*.

The two units that followed *Learning through Practice* (namely *Introduction to Higher Degrees by Research* and *Communicating Research*) were core units of the domestic Graduate Certificate in Research. Each of these units was reviewed and adapted for delivery in PNG but retained the intended learning outcomes (see Appendix 6) for a fuller discussion).

Specifically, the units were adapted to follow on from, and reinforce the learnings from, *Learning through Practice*. The units focussed on core aspects of scientific and research practice and included discussions of practice through the lenses of methodology, data, and the public. Students explored the processes of planning (for example, generating draft Research Plans), doing (with a focus on data management and responsible practice) and communicating science (such as in written and spoken formats) in the framework of a professional code of conduct. The final unit, *Research Methods*, was designed to capstone the learning and reinforce the content of *Introduction to Higher Degrees by Research* and *Communicating Research* by integrating student learning into a cohesive research process. More details on these units and outputs are included in the Appendices (Appendices 3 & 6).

The decision to offer a fixed unit Graduate Certificate in Research had three key advantages over the domestic Graduate Certificate in Research. Not only was it practical and cost- effective, it allowed the teaching staff to develop themes, for example 'a scientist as a conscious practitioner', that ran across all units, with students revisiting and building upon prior learnings. These themes, and the unit design, reflect generic scientific capabilities and as such have relevance to a range of scientific practitioners, not simply those working in fisheries. To adapt this offering to medicine/epidemiology research or environmental research would require only a reworking of the final unit, *Research Methods*, to develop a cohesive research process that was relevant to the discipline.

All participants in the Graduate Certificate in Research were working scientists, and largely embedded in ACIAR – NFA related projects. This allowed the certificate to acknowledge work activities and use them as practical building blocks in learning and situate research projects as sites of work-based or work integrated learning. While work- based skills are often implicitly understood, rarely are those skills required on/ in these projects explicitly articulated or developed as professional capabilities. This concept is an important central tenet to the approach of this Graduate Certificate in Research and goes to the heart of the issues raised by research project

managers and supervisors. Feedback from participants and evidence from the exit interviews suggests that the focus on the practice of science and the development in participants of their sense of 'self as a conscious practitioner', was timely and appropriate.

7.2.3 Change pathways as a measure to demonstrate impact and practice change

As critical as outputs and outcomes are for a project, it is the ongoing and embedded impacts which are the most critical as an indicator of the return on investment in aid development projects. This is especially the case for aid projects located in scientific research.

The question of impact and how to measure it remains a "wicked problem" for all research projects and organisations, and especially those situated in the aid and development portfolio. Impact is difficult to measure. While for ACIAR numbers of publications (with high impact factors) can be used as a surrogate to estimate the quality and quanta of research outputs, increasingly the community and elected representatives are calling for measures that demonstrate sustained changes to governance or practice resulting in greater utility. In this project there was a targeted search for evidence that the project had impacted the conduct of science by local scientists in PNG, which could provide evidence that this approach is a valuable adjunct to the capacity building agendas of Australia and others in the Global South.

Feedback was collected from participants at multiple stages of the project to provide data for evaluation. This included semi-structured exit interviews after the completion of the final unit and approximately 12 months from the end of the learning journey. These interviews provide a rich source of material on significant moments that relate to practice change. What emerged were short statements as part of personal narratives about the impact of the course, or parts thereof, in the lives and practice of those who participated. As these were interrogated, several themes emerged. Importantly these themes suggested that rather than immediate practice change, the effect on the participants was longer term with an evolving and resolving of material learned and subsequently applied after having participated in the course. The nature of these changes or effects varied across participants and some parts of specific units within the course affected some more than others.

The interviews show us that for most of the participants their change in practice was not immediate, rather it was more transformative with change occurring step by step as they introduced the learnings into their operational activities. We propose these might be framed as ***change pathways.***

The reader is encouraged to review Appendices 1, 2 and 3 which give some overview of the skills attained and understanding of learning styles. Appendices 1 and 6 comprise reports prepared as part of the documentation for the ACIAR Final Review process.

7.3 Does working towards a formal qualification facilitate the capacity building process?

There is little doubt that offering an accredited course from a reputable Australian university and the opportunity to have this on their CV was of considerable importance to the participants. The attaining of an overseas qualification was highly valued.

7.3.1 Numbers and participant profile

The initial proposal was to deliver a Graduate Certificate in Research to 45 participants, in 3 cohorts, to staff from NFA and ACIAR-NFA projects. That number of participants was achieved and at the end of the project there was a wait list. In total 37 participants graduated with a Graduate Certificate in Research, and an additional 2 participants received a formal Certificate of Completion (this recognised the significant learning journey these 2 participants had completed but reflected that the standard of assessment required for a graduate certificate was not reached). Most of the participants had a bachelor's degree from the University of Papua New Guinea, and several had diplomas from Agricultural Colleges. For the most part the participants with a bachelor's degree found the course easier to manage.

Around 30% of the participants were women. The gender balance of participants reflects the percentage of males and females entering tertiary education in PNG in the early 1990s and fits with the high levels of researchers having achieved graduate qualifications of a bachelor's degree or higher within our cohort. We saw a lower level of female engagement from the regions of PNG when compared to Port Moresby. This could be a consequence of our female participants being of reproductive age, with a high probability that they were juggling caring responsibilities with work requirements or, alternatively, this may reflect lower participation of women in research in the regions.

The project had almost equal participation from Port Moresby, the Highlands and the Fisheries College in Kavian. One pleasing feature was participation of staff from the PNG Department of Agriculture who worked on sites closely connected to the NFA-ACIAR highland aquaculture extension activities.

7.3.2 Self as Scientist

While the Graduate Certificate was designed with an explicit focus on the practice of science an unexpected result was the enthusiasm and level of strong engagement across the student-participants as they began to see themselves as scientists, which reflects a response to a focus on them and for them. This was about them and developing their self- belief as scientists, which the project team saw as a critical first step in building institutional capacity within NRA. For this project and for NFA and ACIAR this was exciting to see. Often these steps were tentative and not all participants experienced the same level of personal development.

The project team feels that commencing the program of learning by asking the participants to reflect on themselves, their values, their talents, and their modes of learning and to reflect on work experience to date "set the scene" for the subsequent units that focussed on the practice of science.

It is also clear that one of the participating teachers/presenters in the project team, who had outstanding research skills and a long-held commitment to both the quality of science and the policies and procedures underpinning the practice of responsible science, was exactly the right person for the participants to encounter. Her standards were non- negotiable and for the most part, the participants responded to this. Nowhere was this better expressed than in the sessions on laboratory books/ research journals and data management where the students were show the fundamental importance of these forms of data keeping. Too often the participants had undertaken data collection but the critical value of the data integrity, the role of secondary sources and record keeping, and the full data management cycle had rarely been fully explained or articulated for them. Thus, the students had a poor understanding of the role they played in a project and the value of the tasks they were being asked to perform. Without that knowledge and responsibility, learning is limited and rarely integrated well into practice.

At least one paper (in preparation) will explore the concept of self as scientist and its implications not only for the individual but also as a contributing factor to capacity building and the catalyst for practice change in an institution like NFA. The exit interview data reveals several kinds of ways in which practice change is occurring and suggests an outcome of embedding "self-reflection" in the workplace would seem to catalyse change and impacts. For example, a change pathway pertains to the data management cycle, suggesting that these lessons and learnings have been picked up and adopted by the course participants. Another pathway examines the importance of growing confidence and how it seems to underpin a desire to attain more qualifications and skills and feel more confident in the workplace.

7.3.3 The desire for more and learning pathways

Concomitant with the emergence of self as scientist was a desire on the part of many of the participants to access more courses especially those that offered formal qualifications. While not entirely unexpected, the level and intensity of this desire did surprise many. And it manifested itself quite early in the project.
For example, by the mid-term review participants who met with the ACIAR-Fisheries mid- term review team expressed a desire for more. This was raised by the reviewers again in the final review. While beyond the scope of this specific project the project team did produce a workforce plan and several examples of learning pathways suited to the PNG context.

7.3.4 Workforce Planning

Something that was not a specific objective or planned output for this project was the development of a workforce plan for NFA. This capacity building project had specific objectives and research questions that was focussed on whether offering a formal course would make a tangible difference to the development of science capability across NFA and associated ACIAR projects. Yet as the project gathered momentum and the participants engaged with the program of study, the ACIAR reviewers felt that the links between learning pathways, formal courses, capacity building and workforce planning needed to be strengthened. To that end for the final review the Project Team developed a basic/ draft workforce planning document which was presented at the final review and is included in Appendix 2.

This work is now a key input into the development of a new PNG ACIAR project proposal more specifically focussed on institutional strengthening (see Appendix 2).

8 Impacts

8.1 Scientific impacts – now and in 5 years

- Increased understanding of how to design and deliver regional scientific and project management capacity building projects to the maximum benefit of students and their employers.
- Improved body of knowledge regarding how to build local nuances and cultural considerations into capacity building projects.
- Improved understanding of how to integrate learning materials, activities and cultural sensitivity.

8.2 Capacity impacts – now and in 5 years

- Increased participant understanding of their own practice and relevant scientific skill gaps.
- Increased participant understanding and skills regarding the relationship between project outcomes and impact, and project management and scientific skills.
- Increased participant understanding and skills regarding framing and designing projects to deliver good scientific outcomes.
- Increased participant confidence in applying project management and scientific knowledge and in interpreting and using results.
- Increasing numbers of skilled and qualified NFA staff, thereby strengthening its institutional capacity.

8.3 Community impacts – now and in 5 years

Enter text

8.3.1 Economic impacts

Economic impacts include more skilled staff which means projects are better managed with less waste in terms of time, effort, resources and ideas

8.3.2 Social impacts

A range of social benefits and impacts will flow from improved management, delivery and communication of the NFA research projects:

- Better science that underpins practice change and improved livelihoods will contribute to more stable community and family dynamics. Projects such as FIS/2008/023 have fostered development through extension work and action research: the current project will enable other projects to maximise the social impacts of their work.
- The inclusion of participatory approaches and engagement tools strengthens the "collective voice" of fishers and aquaculture and mariculture farmers in the scoping of research projects. This leads to improved trust, understanding and "buy in" by industry, which, in turn, leads to improved co-management outcomes.
- A stable workforce of capable local scientists through access to ongoing professional skills development will strengthen community relations.

8.3.3 Environmental impacts

As part of the training, participants were encouraged to contextualise their own research role into the overall objectives of their project, program and organisation, gaining an understanding of how the success of the projects, programs and organisation depended on best-practice science *at all levels*. In this way, participants deepened their understanding of the role of research, and specifically the role of their ***own*** research activities, in developing scientifically-based sustainable development of aquaculture, mariculture and capture fisheries – they realised that their work mattered.

An improvement of practice at all levels of endeavour will lead to future improvements in all aspects of fisheries management, including the management of environmental impacts. Solutions will be informed by better science.

Over the longer term, improved environmental understanding and improved management and operating practices are likely to result in improved environmental outcomes for these and subsequent NFA-managed projects. The NFA's role in sustainable development of fishery resources will be strengthened and it will be better placed to address social needs, economic growth and environmental protection.

8.4 Communication and dissemination activities

The project links integrated capacity building in PNG to the University of Tasmania's Graduate Certificate in Research program – a program designed to stimulate participants to transfer knowledge to others (especially in the linked projects mentioned in section 2.2) in a meaningful way, and to progress to further study. The range of dissemination activities included:

8.4.1 Networking and participant learning activities

- Specific dissemination and transfer of skills and knowledge to others in the program and NFA occurred through the workplace learning and reflection components of the program and the mentoring undertaken by each cohort of graduates;
- Training workshops involving group-shared learning and dissemination of ideas;
- Incorporation of a 'Harvard Three Minute' group reflection on the previousday's learning at the beginning of each day's activities;
- In-country delivery where participants shared experiences and practice change.

8.4.2 Media including Social Media

- Development of a Facebook page;
- Numerous media stories both in Tasmania and PNG;
- Articles in UTAS staff newsletters;

- A regular project Newsletter disseminated to all participants, their study supervisors, ACIAR and NFA staff, UTAS staff, and other interested parties. Albums of photographs for dissemination to participants and others. Photographs taken at the second graduation celebration has been circulated; a second album is in progress, from the first celebration. See Appendix 7: Communication Report.

8.4.3 Reports

- Mid-Term and Final Review Reports
- Annual Reports
- Trip Reports

8.4.4 Events and Presentations

- 2 graduation celebrations attend by High Commission staff, ACIAR staff, ACIAR managers and other agencies and families, and UTAS staff, including the UTAS Deputy Vice-Chancellor of Research; (also attracted strong media coverage)
- Presentations to ACIAR staff in Canberra;
- Presentations to staff within UTAS and the UTAS University College;
- Publications in refereed scientific journals.

8.4.5 Papers for publication

The project team is currently working on the preparation of research publications. It is only on completion of the project that the research staff could access the entry and exit interview data gathered in this research. Because the participants undertook assessment as part of the program the UTAS ethics approval required that there be an appropriate distance between the students and the teaching staff regarding any evaluation data. These interviews were conducted by a third party. On completion of the training by the third participant cohort the data was accessed and transcribed.
Analysis of the data commenced in April this year (2018).

Four papers are in preparation and address the following:

- The participants – self as scientists
- The course – the design and delivery
- Challenges to how capacity building is done and delivered
- Transformation, practice change and disruption by design.

The project team have identified the following journals to be targeted for publication:

- The Journal of Agricultural Education & Extension
- Education & Training
- Community Development Journal
- Stanford Social Innovation Review

9 Conclusions and recommendations

9.1 Conclusions

This research had a dual purpose. It was to design and deliver a program of formal study to address identified skills gaps across NFA researchers involved in ACIAR funded projects. It also aimed to investigate whether offering a formal qualification would generate practice change. A post graduate certificate was adapted from a formal and accredited University of Tasmania course and delivered in PNG. The adapted course included 2 units on the practice of science, 1 unit on methods and a fourth unit requiring the participants to reflect on self and others. While the delivery of the course encountered problems relating to distance and technology, thirty-nine participants completed the course and thirty-seven graduated with a Graduate Certificate in Research from the University of Tasmania.

The course was less about the participants' discipline-based skills and more about the practice of science. Key outcomes included a shift among participants in how they viewed their work and themselves. Some stand out shifts in thinking included a skills checklist for their day to day activities, an awareness of the data management cycle and the importance of consistency in lab work and field work. In their exit interviews the participants noted the diversity in their learning styles and understanding these differences in working in teams. There was also evidence of improved networking and shifts in communication skills. It is too early to know the long-term impact in the work place, but it is in their awareness of self as scientist that some significant impact can be observed within the participants. Many participants report changes in their family and personal lives and almost all have expressed a desire for more study and professional development.

The project was not without its challenges. Computer viruses and access to technology required changes to course delivery mode and to the assessment, and safety and security continue to be an ongoing issue in PNG. That said from the outset the participants were engaged and interested in the course of study. They attended and were attentive. There was a very small attrition rate and the completion rate for the course was higher than for most courses in Australia. Further, along with the positive levels of engagement by the participants there were flow on benefits for the project team which included international teaching/ training experience, a deeper understanding of work based learning and established relationships with key staff in NFA and ACIAR projects.

Planning, preparing for and implementing the program was extremely hard work and time consuming for a lot of people (whether academic or professional staff) at UTAS but ultimately the sacrifices made were worthwhile. This is on several levels:

- For the participants – their commitment to the program and engagement with the learning material and teaching staff was exemplary. They were hungry forlearning.
- For the teaching staff – beyond our opportunity to teach was to feel like a resource that the participants could utilise through commitment and engagement. Also, our opportunity to learn, and learn we did.
- For the support offered by UTAS not only with scholarship support but through staff who went above and beyond to ensure these international students were supported.

The purpose of this training was to invite participants to deepen their skills as researchers and their understanding of the requirements of responsible research. It would have been

easy for the staff to slip into didactic models of teaching, yet the goal was to empower participants to be scientists through teaching the philosophy of research and research practice. Teaching focussed on explaining the 'why' of what we do as scientists rather than imposing the 'how' of our own research practice. This recognised the cultural and geographical richness of the students' research environments, as well as the limitations of their infrastructure, and invited them to find innovative and practical solutions that they could employ to improve their research practices and outcomes. Evidence of the success of this approach, and the development of solutions in the research environment, was found in self-reporting of change in class and in interviews and in the responses of research leaders from NFA and ACIAR.

There are important benefits in this mode of postgraduate research training in comparison to the traditional model of off shore research training. That is the cost of 37 graduands as opposed to the cost of students undertaking a PhD. These benefits, however, extend beyond cost and include:

- training cohorts generates communities of practice,
- the members have been challenged, collectively, with a need to change,
- avoiding the burden of returning masters/Ph.D. graduates that are a single voice in a larger, unresponsive organisation,
- high level of accessibility, particularly for those with family commitments and ties to PNG (the disruption of living and training overseas prevents access for many), and
- relevance – the concept of training for direct application to participants' work-place and direct relevance to the institution's research processes and the geopolitical environment.

It is exciting to see the outcomes and impacts of the project and the ways in which these learnings about and challenges to capacity building afford opportunities for new approaches to building research capability in countries needing to strengthen their research output and impact.

The value of a graduate certificate in research is that it offers a useful and strategic approach to capacity building needed stained change of practice. The evidence suggests that a formal qualification motivates the individual, but a coursework qualification also provides a building block for ongoing (masters or PhD) postgraduate study. Further, as a four-unit qualification it has the potential to link well into in house professional development where each unit could be offered as a targeted short course.

The project team wish to thank and acknowledge the students who have embarked on this journey with us. For these students this journey has required a significant commitment, one that has required courage and dedication. We hope the education they have received will be life-changing.

The teaching delivered in PNG has been life-changing for the project team. For some of us, we have emerged significantly better teachers and have had the privilege to learn in our PNG classrooms and from our PNG students. We know that the learnings we have made will be important in our careers for the rest our lives.

9.2 Recommendations

For ACIAR

- The graduate Certificate is one method of building capacity and supporting practice change. Use this method as a platform to develop multiple pillars of capacity building needed for sustained change of practice.
- Explore options to integrate courses like the Graduate Certificate (AQF 8) into Australian Master's qualifications (AQF 9) and PhD
- Explore options to integrate courses like Graduate Certificate in Research into master's and PhD programs in the developing countries – this affords opportunities to build capacity of academics in these universities as well as staff in partner agencies.

For NFA

- Develop a workforce plan and identify how capacity building like the graduate certificate can be integrated with the workforce plan to generate sustained practice change across the NFA workforce.
- Develop work-based capability building strategies which foster practice change in the workplace (e.g. research projects with “formal” embedded capacity building)

For Capacity Building

- Use the graduate certificate approach as a burning platform to *initiate multi-level approaches and initiatives to capacity building* which support sustained practice change
- Develop a proposal which looks at the learning needs of technical staff alongside the learning needs of those staff with Bachelor of Science qualifications. Consider how the approaches might differ but might also integrate in problem-based learning.
- Build on the self as scientist concept to drive other ways of thinking about practice change (i.e. begin with the individual and use the momentum to create collective impact).
- Develop further work-based capacity building with a *work to learn approach* where the capacity building is fully integrated into the research project (as a place of work).

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10.2 List of publications produced by project

The project team is currently working on the preparation of research publications. It is only on completion of the project that the research staff could access the entry and exit interview data gathered in this research. Because the participants undertook assessment as part of the program the UTAs ethics approval required there be an appropriate distance between the student and teaching staff regarding any evaluation data. These interviews were conducted by a third party. On completion of the training by the third participant

cohort the data was then accessed and transcribed. Analysis of the data commenced in April this year (2018).

Four papers are in preparation and will address the following:

- The participants - self as scientists
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- The Journal of Agricultural Education & Extension
- Education + Training
- Community Development Journal
- Stanford Social Innovation Review

11 Appendixes

11.1 Appendix 1:

Appendix 1 **Who did we teach?** An analysis of EOI and enrolment information, a Report prepared for Final Review Panel

Appendix 2 **Institutional Strengthening: Workforce Planning, Performance Management and Pathways to Learning**, A Report prepared for Final Review Panel

Appendix 3 **Skills Checklist**, A Report prepared for Final Review Panel and developed by Dr Joy Rathjen

Appendix 4 **Graduate Certificate Unit List**, Report submitted at Mid-term Review

Appendix 5 **Template for Expressions of Interest**

Appendix 6 **The Development of a Graduate Certificate in Research Skills - Course Structure & Design**, Report prepared for Final Review Panel

Appendix 7 **Communications Report**, a Report prepared for Final Review Panel

Appendix 8 **Mid-Term Review Report** prepared by Dr Geoff Allan and Mr Augustine Mobiha

Appendix 9 **Final Review Report** prepared by Dr Geoff Allan and Mr Augustine Mobiha

Appendix 10 **Final External Evaluation Report** prepared by RDS Partners

ACIAR PROJECT: FIS/2010/055
BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS
IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 1
Who did we teach? An analysis of EOI and enrolment information

Originally prepared by Joy Rathjen and Christine Angel for the Final Review Panel

Draft document – not for further distribution

Introduction

The concept of building research capacity in developing nations can be defined as the ongoing empowerment of individuals to recognise, describe and prioritise research-related problems, develop and undertake programs to find and evaluate solutions, and to share the application of this knowledge with users and stakeholders.[1] Inherent in this definition is that capacity building is a multidimensional concept, requiring development, within the individual, of:

- Enabling research skills[2] ***and*** technically-focussed skills that can be used to generate knowledge in areas of need,
- The ability to adopt new and enhanced practises throughout their working life

and

- Communication and leadership skills that will enable the sharing and exchange of knowledge generated to ensure societal benefit.[3]

Capacity building is a stated goal of the Australian Centre for International Agricultural Research (ACIAR) research and development funding.[4] There is an expectation that scientific autonomy will be developed within the in-county research workforce, such that those involved in ACIAR projects will become the research leaders of the future, able to plan, execute and translate scientific research to fulfil societal need. The process by which capacity building is to occur is through a 'learning by doing' model, so that within the ongoing, funded research programs indigenous staff will learn by example, and through mentoring, the multitude of skills required for autonomous research and efficient knowledge sharing. The 'learning by doing' model, and mentoring by scientists from the North, is a cost-effective approach to upskilling a workforce in that it requires little additional funding for implementation and it can diffuse through the entirety of the workforce employed on a project. The approach is limited in the skills that can be fostered, and there are questions raised about how effectively enabling research skills are fostered.[5]

Evidence suggests that training of the PNG research workforce in enabling research skills lags behind their training in technically-focused research skills, not only in ACIAR-funded projects but also more widely. An analysis of training needs in PNG acknowledged the need for generic skills training in the research workforce engaged on the management of fisheries resources, but failed to identify these as priority topics over the need to develop technical competencies: '*Note that communication skills, governance issues, enforcement as well as generic workplace skills were identified as priority training gaps that impede successful marine resource management occurring within countries. Therefore, for completeness sake, these training gaps are included in this scoping report. For the purposes of this project, however, priority topics must be identified from within the more technical tropical marine resource management training gaps*.[6] Similarly, a training needs assessment commissioned by the National Fisheries Authority focused on technically-focused skill needs of those working in the fisheries industries in PNG, clearly an area of great need, but did not include the need for other skillsets within the research workforce in their Terms of Reference. The report did note a paucity of formal training places (Diploma courses) for workers in the industry.

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[1] Mary Ann Lansang and Rodolfo Dennis (2004). '*Building capacity in health research in the developing world*.' Bulletin of the World Health Organisation **82** (10). p. 765.

[2] Enabling research skills are those skills that underpin research practice, which include but are not limited to competency in data management, the application of research ethics and integrity, research planning and execution and literature searchs. These contrast with technically-focussed skills which are more-specific for the research questions that are being addressed.

[3] Andy Hall (2005). '*Capacity Development for Agricultural Biotechnology in Developing Countries: An Innovation Systems View of What it is and How to Develop it*.' Journal of International Development **17**. p. 612.

[4] ACIAR Strategic Plan, 2014-2018. (2014). Australian Centre for International Agricultural Research.

[5] Lansang, p. 765-766.

[6] Strengthening in country tropical marine resources management training capacity in Papua New Guinean and the Solomon Islands; a Scoping Study (2012), Report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. p. 16.

ACIAR project leaders directing fisheries-based projects in PNG expressed concern and frustration about the difficulties they encounter in developing research skills in the participating scientists in country. The reasons for these difficulties likely include, but are not limited to, a lack of research skill competency in the PNG research organisations;[7] the priority focus on technical skills development, evident through the identified training priorities and examination of the curricula of indigenous higher education providers;[8] the lag in formalising the development of research skills in the development of the research workforce worldwide;[9] and the difficulty of incorporating high quality and consistent research skills development into the research agendas of the funded projects, particularly as Australian researcher interaction with their in country research colleagues is, by necessity, intermittent and the pathways to this training are explicitly informal.[10] Australian project leaders voiced particular concern around project development, data management, and integrity and communication skills.

The need for capacity building in PNG is acute. The country is classified as a scientifically lagging country and therefore has little capacity to conduct international-class science and limited indigenous research capacity that can be developed to participate in collaborative science with Northern partners to foster growth and expertise.[11] The growth of vibrant and world class industries in agriculture, forestry and fisheries to sustain the local workforce and create exports that will underpin economic renewal and stability is a target of the national vision.[12] The ability of country to grow a research workforce in PNG to fulfill this goal is limited, with little access to accredited Graduate and post-Graduate training for PNG nationals. The Universities within the country are over-subscribed and graduate outputs are insufficient to meet demand. Few researchers working within industry have the financial wherewithal to withdraw from paid work to attend post-Graduate opportunities in the North, or the education to enroll within these programs.

In response to this need we developed an ACIAR research program to address explicitly the deficit in enabling research skills evident in the scientific workforce in PNG, and specifically within the aquaculture and fisheries industries.[13] A formally accredited training program integrating participatory approaches with enabling research skills was developed based on the Graduate Certificate of Research program at the University of Tasmania. We were partnered in this endeavour by the University of Tasmania and the National Fisheries Authority (NFA) in PNG.

The University of Tasmania has incorporated into the candidature of all Higher Degree by Research (HDR) students a requirement to complete a Graduate Certificate in Research. The stated aim of the certificate is to develop in students the suite of research skills they will need to complete their research training, and to

[7] At the time of funding this project the partner organization, NFA, did not employ a scientist with a qualification above a Masters, and Masters level qualifications were not common amongst senior staff. This reflects the difficulty working scientists in PNG experience in participating in higher learning opportunities. A consequence of this is a paucity of research skill development throughout the organization.

[8] Scoping Study (2012), Report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. p. 16.

[9] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Supporting growth and jobs – an agenda for the modernisation of Europe's higher education systems (2011). Brussels, 20.9.2011 COM(2011) 567 final: '..*Higher education enhances individual potential and should equip graduates with the knowledge and core transferable competences they need to succeed in high-skill occupations. Yet curricula are often slow to respond to changing needs in the wider economy, and fail to anticipate or help shape the careers of tomorrow;..'* p. 4.

[10] The difficulty in actualizing the stated aim of ACIAR that *"Capacity building of institutions and individuals is integral to all ACIAR-supported research, and significantly enhances the sustainability of research outcomes. Our programs bring Australian researchers together with developing-country researchers, primarily by short or extended visits, and all research is undertaken collaboratively in the laboratory or in the field. This informal training, through learning-by-doing….'* ACIAR Strategic plan (2014). p. 13.

[11] Caroline Wagner et al. (2001). 'Science and Technology Collaboration: Building Capacity in Developing Countries.' Science and Technology Policy Institute, RAND, MR-1357.0-WB.

[12] Papua New Guinea Vision 2050 (2011). National Strategic Plan Taskforce.

[13] Prof Janelle Allison, Prof Peter Frappell, Dr Joy Rathjen. Building research and project management skills in fisheries staff in PNG. Australian Centre for International Agricultural Research and Development Grant # FIS/2010/055.

foster a range of transferable research skills that will support them as they move into the workforce.[14] The program delivered into PNG was a modified version of the existing Graduate Certificate in Research. Participants were enrolled in a Graduate Certificate that commenced with *Learning through Practice A (Workplace)*, a unit to address the specific needs of a reengaging adult student into the rigours of academic learning, followed by *Introduction to Research*, which examined the shared practises of researchers through the lenses of history, data and professional codes of conduct, *Communicating Research,* which looked at the panoply of communication practises used by researchers, and finally *Specialised Research Methods*, which acted as a capstone to the teaching and which was designed to put the theoretical development of the first three units into practical use. 48 participants were enrolled in the Graduate Certificate over three cohorts, and 39 of these participants completed the four units. Participants who successfully completed the training graduated with a Graduate Certificate in Research from the University of Tasmania.

In this report, we seek to understand the participants who undertook this training, and determine the reach of our training into the professional research workforce.

Approach

Participants expressed interest in undertaking the Graduate Certificate through an Expression of Interest (EOI) form. The EOIs and enrolment forms for the students who were accepted into the course were de-identified and the information provided analysed. 48 students in total were accepted, and of these we have completed EOIs for all, and enrolment forms for all but nine students in Cohort 1. Eight students did not participate in all four units, and will not graduate, and a further student died before course completion.

The EOI form (Appendix 1) was used as the primary source of data. The enrolment form was used to establish student age and to confirm the dates of academic courses completed where needed. The information extracted was date of birth (D.O.B.), gender, address, employer, involvement in ACIAR projects, highest qualification and total number of qualifications listed, date highest qualification was completed, information on employment and years in work. The student comments against question (5) of the EOI, '*Skills and Knowledge you hope to gain from your participation*', were analysed to understand student aspirations. Material was examined to establish any significant associations with gender, work and region of domicile, as all could be informative in understanding participation decisions.

Findings

The participants in this program were industry-based, maintained a full-time work commitment while studying, and were not embedded in an academic environment. They were adult learners (bar one continuing student) and they had a diverse range of educational experiences, but in all cases students were credited with workplace experience. All participants were working in some form of scientific endeavour and, without exception, the students were working within a primary industry (Fisheries, Agriculture, Forestry). All participants for whom information was available listed their country of citizenship as Papua New Guinea. The language of delivery was English, one of the official languages of PNG, and all participants were competent in English. It is noted, however, that for some students this is unlikely to be the language of greatest proficiency and many listed Tok Pisin as a language in their enrolment forms.[15]

Age

The average age of participants at commencement of study was 34.1 years, with a median age of 32. The age of students was consistent between the three cohorts (Figure 1) (ANOVA p=0.84). The ages of male and female participants were compared; females comprised 35% of participants. Female participants were, on

[14] http://www.utas.edu.au/courses/dvc-research/courses/x5a-graduate-certificate-in-research

[15] Simon Feeney et al. (2012). '*Measuring Attitudes to National Identity and Nation-building in Papua New Guinea*.' Political Science **64** (2). p. 129.

average 31.5 years (+/- 0.835)[16], 3.7 years younger than their male colleagues (35.2 +/- 1.69 years; $p = 0.032$). Analysis of the distribution of ages showed that the male participants had a broader age distribution than females and included participants in the 41 and over age group; this group was missing from the female participants (Figure 2). Comparison of the female participants with their comparable male cohort (those aged 40 and younger (31.63 years +/- 0.79)) showed no statistical difference ($p = 0.93$), suggesting the detected differences in age between genders can be attributed to the presence of the older cohort of males.

Distribution

The teaching programs were held in Port Moresby, and 65% of participants listed a domicile outside of Port Moresby. The listed domicile of participants was grouped into regions and each region was analysed by gender (Figure 3). Females were consistently under-represented in the participants from the non-Papua regions. 50% of the female participants lived in Port Moresby, compared with 26.5% of male participants.

Academic qualifications

The majority of participants (54%) had completed a Bachelor of Science at a local university; there were no Bachelor qualifications from any offshore Northern tertiary education providers. A surprisingly high percentage of the scientific workforce presented with lesser qualifications (31%), and only seven of the students had completed a Graduate Certificate or Master's degree (Figure 4). Major qualifications were completed, on average, 8.31 years prior to commencement. This correlated with their average time in the workforce (8.52 years)[17], suggesting that for the majority of these students their highest academic qualification was the qualification they used to enter work.

Many participants listed additional qualifications undertaken and completed during their working careers. In total, 145 courses and academic qualifications were listed. Interestingly, only 14 of these could be considered to be targeted at developing enabling research skills rather than techinically-focussed research skills. This would support the focus on technical skill development voiced in various reports on training needs for Papua New Guinea.

Participant employment at commencement

Participants were asked to record their relevant work experience on the EOI. There was little consistency of how the applicants used this section, so data was reviewed for general category descriptors. Employment has been grouped into:

- Managers and Managing Scientists – a group denoted by role description and inference of having responsibilities for the activities of others.
- Technicians and Research Assistants – a group denoted by role description and activities listed, and without indications that they had responsibilities for the activities of others.
- Other – a category that recorded other roles. These roles were largely employment in industry and community outreach and teaching.

The recorded activities of seven students were unable to be categorized and are grouped under 'Not Provided'. The results of this analysis are shown in Figure 5.[18]

Each group was stratified by gender, and the breakdown of roles within the male and female cohort determined (Figure 6). On this analysis, 35% of female participants were employed in managerial roles, equal to the proportion employed in technical research roles. This compares to only 26% of males. Male participants were much more likely to come from the technical research roles (39%). This resulted in similar numbers of male and female managers attending over the three cohorts (eight males to six females), and at least one female participant employed in a role classified as 'other' was in a role that would be considered equivalent to management. This is unlikely to describe the gender breakdown of management and technical

[16] Data will be shown with and without the standard error of the mean.

[17] Note, data on workplace participation from participants is not complete in all cases, and this figure may underestimate slightly average years in work.

[18] Analysing the descriptors of work provided, 6 of 7 participants who could not be confidently classified due to the absence of a role descriptor could be imputed to be working in technical or research assistant positions.

roles in the scientific workforce in PNG. Potentially, females in management roles are less culturally constrained from attending training opportunities than their male counterparts. Furthermore, of the older male cohort, three were employed in senior and management roles, suggesting that younger males employed in management roles were not taking advantage of the educational opportunity.

Student Aspirations

The EOIs were mined for the knowledge and skills that the students were hoping to gain from the course. Articulated aspirations were categorized against general category descriptors, and graphed (Figure 7). There was a perceived need in the participants for research training in general, and approximately 20% of participants were able to articulate this as training in research design and research implementation. Similarly, there was a perceived need for project management skills. Some participants were seeking specific specialized skills training, suggesting that they had misunderstood the purpose of the teaching. Finally, nearly 50% of the participants were looking to improve their skills so that they could enable industry/community development – a clear sense of mission was expressed by these scientists.

Participant outcomes

After the three iterations of teaching 39 of 47[19] (83%) students had completed the 4 units of study, and of these 37 had satisfied the requirements of the Graduate Certificate in Research (Figure 8). Of the 8 who failed to complete, 50% were female, suggesting a higher attrition rate (24%) from the female participants than their male colleagues (13%). The failure to complete did not appear to correlate with anyone other attribute and, particularly, did not reflect lower levels of education. Of those who commenced, 25 men and 12 women graduated with a Graduate Certificate in Research as a result of this program.

Discussion

The Graduate Certificate offered here was supported through an ACIAR program. Our aims were (a) to develop an accredited post-Graduate training course in country and to an indigenous research workforce; (b) to determine the characteristics of potential participants who would engage with a training program of this kind; and (c) to document changes to the productivity and culture of the research projects undertaken by ACIAR grant recipients and indigenous research leaders after the training of a proportion of the indigenous research workforce. Participants were supported to undertake this training by the ACIAR grant, fee waivers from the University of Tasmania and time off work from NFA or other industry organisations. 60% of the participants listed NFA as their employer and 42% mentioned past or present involvement in an ACIAR-funded research project.

The aim of the program was not to see if participants would undertake training if offered at market cost, as this is beyond the financial capacity of potential participants in PNG. The delivery of the Graduate Certificate in country, and with the support of ACIAR and the NFA, circumvented many of the barriers these participants experience if they wish to undertake further study. While recognising the importance of gaining further formal qualifications, many participants spoke of barriers to further study that included financial uncertainty, primarily the need to leave the workforce to undertake further study in another country without the security of a job to return to, and opportunity, with only a limited number of scholarship opportunities available. There are also few role models for these participants to follow, with many of those in leadership positions within the NFA and other primary industry agencies themselves lacking post-graduate qualifications. Investment in research training in country is necessary if PNG is to overcome the critical skills shortage apparent in the scientific workforce.

The majority of the participants in this project were in the 24 – 40 age group, and should include the emerging research leaders within their industries. We found that among this group approximately 30% of participants were employed in managerial positions, with responsibility for the activity of others. Somewhat surprisingly, analysing this by gender suggested that female managers were more likely to engage with this training than

[19] The student who died while enrolled in the course has been removed from the analysis of outcomes.

their male counterparts – of the females participating approximately 40% were in managerial roles compared with 26% of participating males. This may represent a greater willingness on the part of the NFA to invest in more senior women, a preference that is not manifest in investment choices for their male colleagues. On the raw numbers, an equal number of male and female leaders participated; it is highly unlikely this reflects the gender balance in these roles within the industry. These data suggest that the course did not attract and engage well with the emerging male leadership. This may be attributed to an unwillingness of emerging male leaders to engage in training, and particularly training in which their junior and female colleagues will also be engaged. PNG is a notoriously patriarchal society where such considerations could influence participation. Alternatively, this training may not have been seen by this group as beneficial for their progression in their organisations. Progression in PNG is not exclusively on qualifications, and an individual's kin or language relationship to more senior colleagues can determine success through the *wantok* system. The course EOI was explicit in inviting interest scientific *and* technical staff, pre-empting classes comprised of participants from all levels of the organisation, raising some confusion over the level of training that was to be offered and potentially deterring applications from male leaders.

The gender balance of our participants reflects well the percentage of males and females entering tertiary education in PNG in the early 1990s,[20] and fits with the high levels of researchers having achieved graduate qualifications of a Bachelor's degree or higher within our cohort (69%). NFA has been noted previously as the most functional and capable agency in PNG[21] and it is a credit that they supported such a substantial cohort of female participants in this project. We saw a lower level of female engagement from the regions of PNG when compared to Port Moresby. This could be a consequence of our female participants being of reproductive age, with a high probability that they were juggling caring responsibilities with work requirements and less able to travel for their studies. Alternatively, this may result from a smaller pool of women employed in research in the regions. We cannot discount the possibility that the greater pervasion of *wantok* and cultural practises in the regions could have impacted the ability of women to participate. Finally, an analysis of participants showed an absence of females in the 41 and over group. This is perhaps not surprising in a country in which the participation of females in education is consistently below that of males,[22] and potentially reflects the facts that very few women of this age group achieved qualifications to enter the research workforce, and that women face discrimination at nearly all levels of social and political life in PNG.[23]

The success rate achieved in this program was a greater than 80% completion, with 78% graduating with a Graduate Certificate in Research. During the EOI process applicants were asked to detail work-based experience as a basis for entry. This was in recognition that many students may not have the prerequisite academic training to enter a Graduate Certificate. The high success rate suggests that this approach was an effective way to select participants with the capacity and capability to engage with learning at the post-graduate level (AQF8), despite a lack of demonstrated academic achievement. The number of participants was not sufficient to draw any correlations between pre-entry education and success, but anecdotal experience in the classroom suggested that a lower educational attainment did not have to be a barrier to success.

At commencement, many of the participants did not identify as scientists, a sector that they described using the western stereotypical image of male, white, laboratory-based and lab-coated.[24] This characterisation excluded their own research practise and they expressed a sense of inferiority in comparison. The Graduate Certificate focused on identifying qualities that defined researchers, stressing the commonality of participant

[20] Elizabeth Brouwer, Bruce M. Harris and Sonomi Tanaka (1998). Gender Analysis in Papua New Guinea. The World Bank, Washington DC.
[21] Elizabeth Havice and Kristin Reed (2012). Fishing for Development? Tuna Resource Access and Industrial Change in Papua New Guinea. Journal of Agrarian Change, 12. p. 419.
[22] Brouwer, pp. 31-34.
[23] Feeney, p. 137.
[24] An observation taken from the authors' teaching experience and classroom activities while delivering the Graduate Certificate into PNG.

practise with the global research community, and training in enabling research skills. Consistent with the lack of self-identification as researchers, the need for enabling skills was cited by about 50% of those who participated, with others unable to recognise or articulate the need for enabling skills in their work practise. The response of all students in the classroom showed that they were willing to engage in the training and recognised the importance of the material. Two applicants observed in their EOIs that recognition of, and training in, enabling research skills was lacking in PNG. *"From my observation and experience, research methods and data analysis seems to be lacking in especially me, and my colleagues"* and *"Observation and experience has shown me that this is an area [research and project management skills] that is greatly lacking in the fisheries industry within the country"* This experience is not limited to PNG, and it is widely recognised that science graduates have a poor understanding of the professional and enabling skills required in all sectors of the research industry. Graduates in the North, however, are integrated into research workplaces that instil these values and skills; such workplace training is less common in PNG. Training of the kind developed here could be used more widely to augment workplace experience and establish a culture of research values that will underpin progressively more engagement and collaboration with the global research community.

Recommendations

The delivery of a Graduate Certificate in Research in PNG successfully engaged with a cohort of young industry-based research employees and developed within them competency in range of enabling research skills. An analysis of the cohort, however, showed that emerging male research leaders did not engage with the Graduate Certificate; this is a key group of participants if this training is to impact research practise in PNG and promote the country's 2050 vision. For future planning, it is recommended that:

- more detailed information on the course offering that describes the learning outcomes and what students can anticipate from participation is developed and distributed.
- if possible, target the offering to participants and provide separate iterations of the material offered based on work classifications. Avoid, where possible, targeting material across work classifications, for example to scientists *and* technicians together.
  and
- prior to delivery, the senior leadership of any organisation is engaged and training objectives described to ensure active encouragement of emerging male research leaders.

Figures

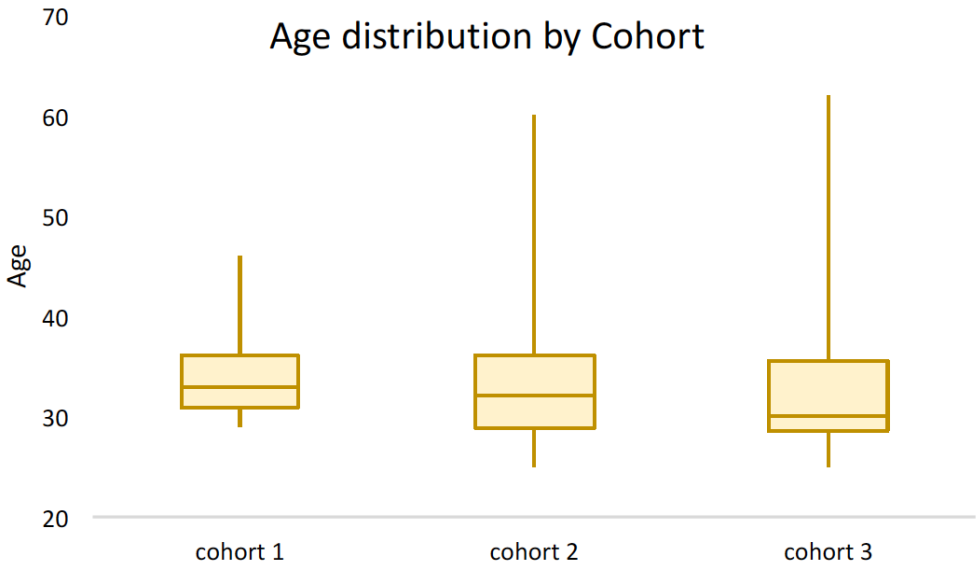

Figure 1: The age of participants in each cohort.

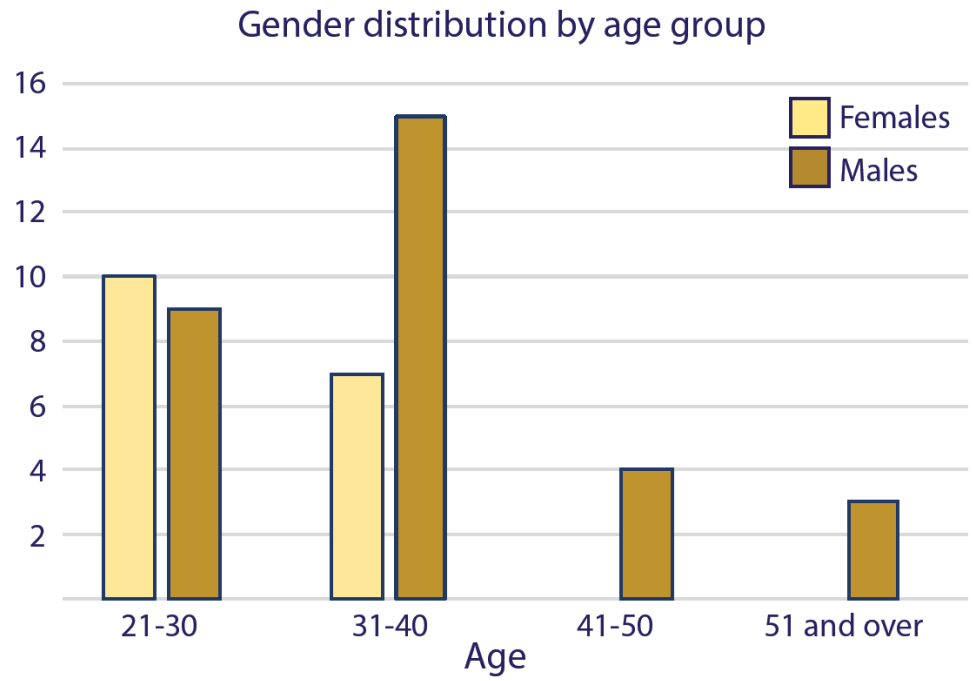

Figure 2: Gender distribution by age.

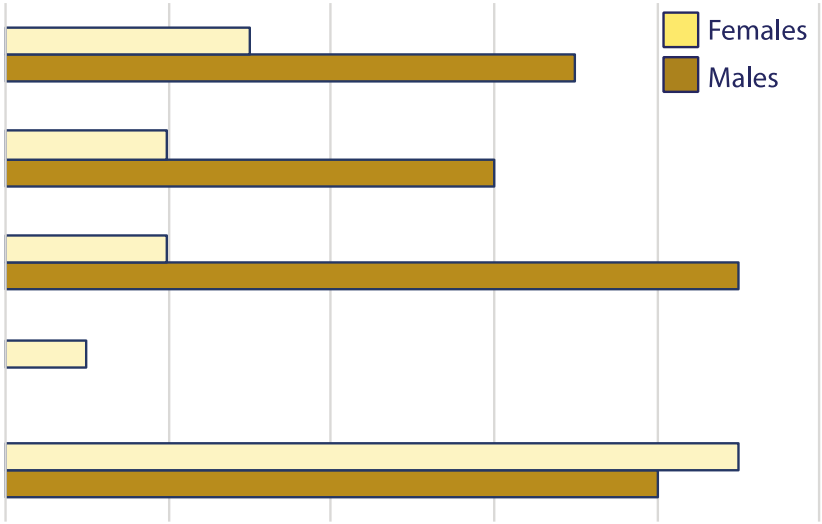

Figure 3: Female participation from the regions lagged behind their male colleagues by 33% or more.

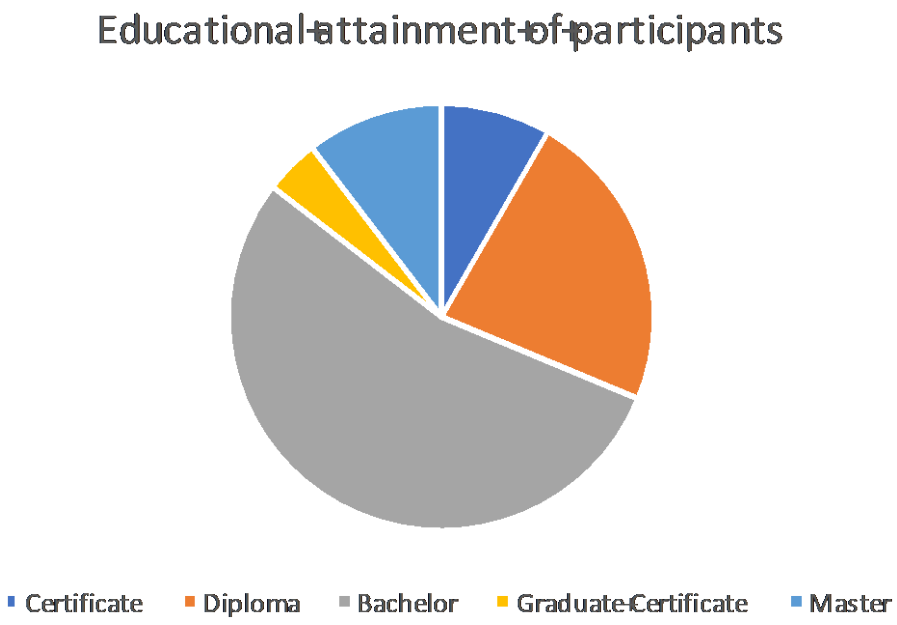

Figure 4: The highest qualification listed by participants on EOI and enrolment forms.

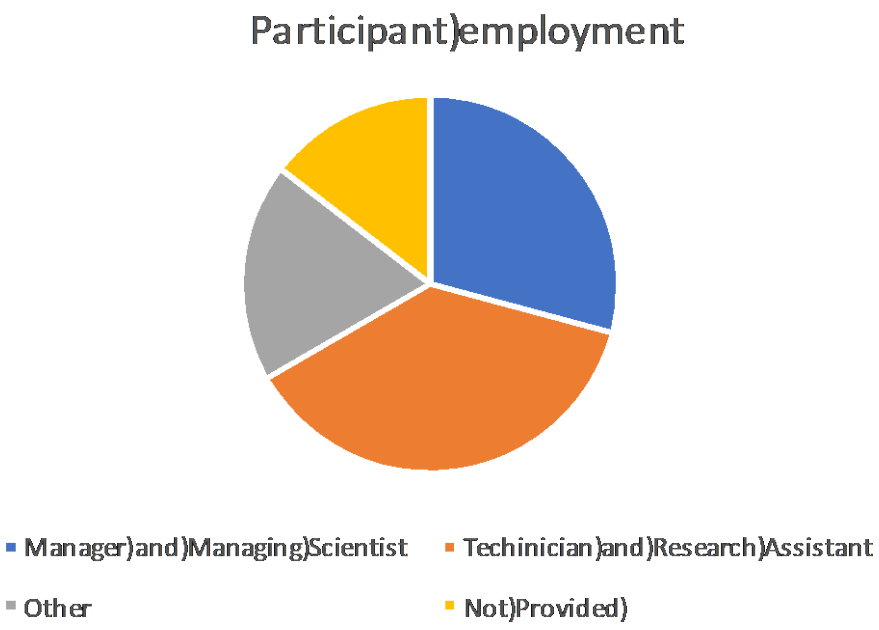

Figure 5: Participant employment

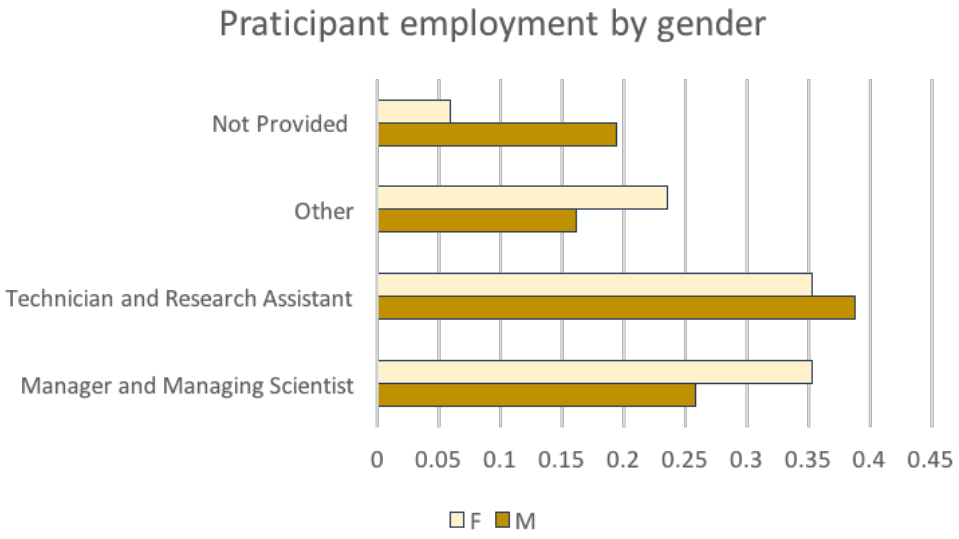

Figure 6: Participant employment by gender (as a fraction of the cohort)

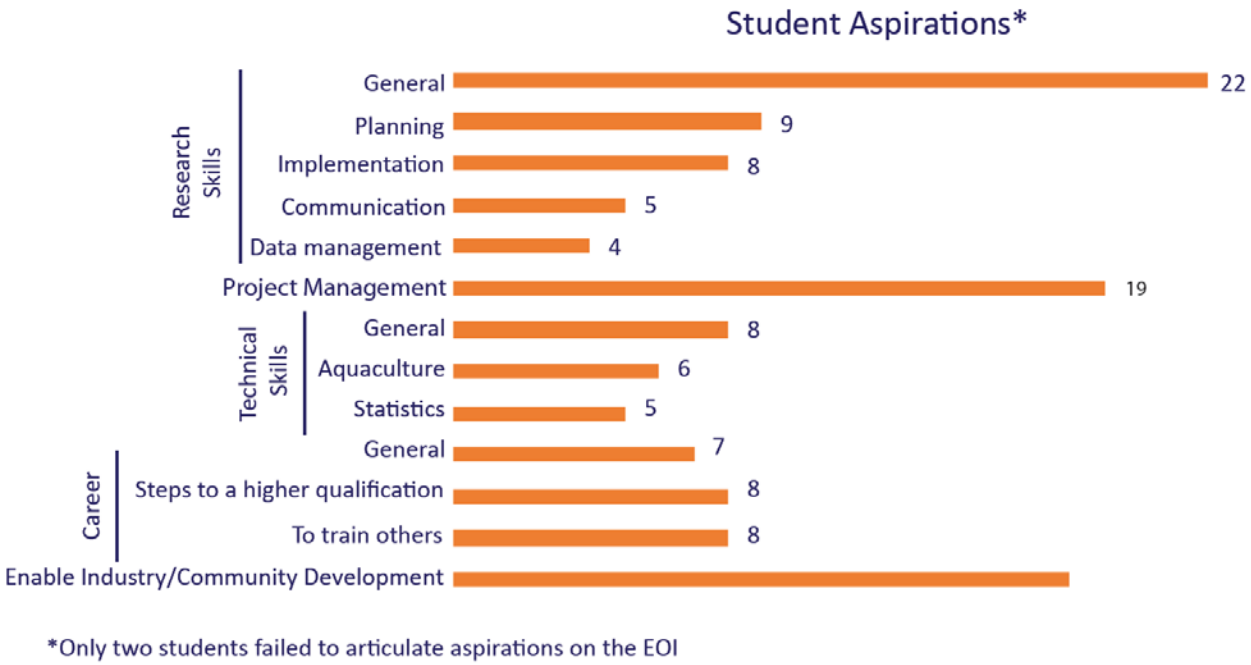

Figure 7: Summary of student aspirations. General comments were those that did not specify or sub-divide research or technical skills into more specific sub-parts.

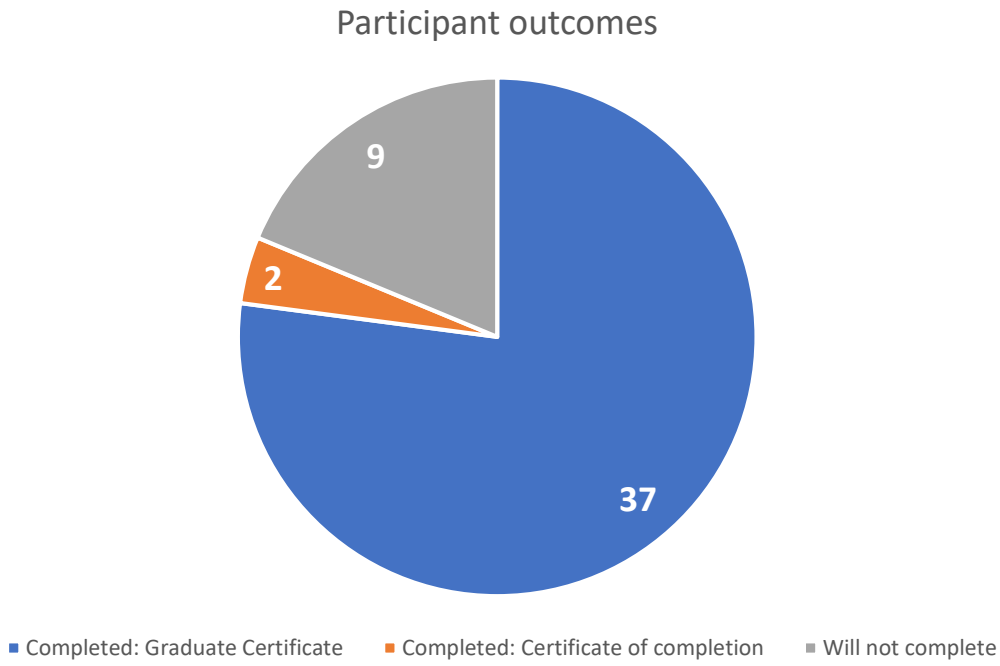

Figure 8: Summary of participant completion of the Graduate Certificate in Research.

UNIVERSITY of TASMANIA

ACIAR PROJECT: FIS/2010/055

BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 2

Institutional Strengthening: Workforce Planning, Performance Management and Pathways to Learning – National Fisheries Authority (NFA), Papua New Guinea.

A report developed by the UTAS after the project mid-term review recommended that the research team develop a proposal for further educational opportunities for NFA staff, with complementary advice on how this could link with workforce planning and performance management processes.

Institutional Strengthening: Workforce Planning, Performance Management and Pathways to Learning – National Fisheries Authority (NFA), Papua New Guinea.

The mid-term review of FIS/2010/055: BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS IN FISHERIES STAFF IN PAPUA NEW GUINEA recommended that the research team develop a proposal for further educational opportunities for NFA staff, with complementary advice on how this could link with workforce planning and performance management processes:

- Recommendation 1: Produce a "pathways to learning" document (new output)
- Recommendation 2: Provide written advice as to ways in which it can link to Workforce Planning
- Recommendation 3: Provide a basic structure around which performance management could be structured.

There is a crucial link between these three points. Workforce planning involves current and forward planning in regards to an organisation's workforce needs. Targeted capacity and capability development will help meet these needs and performance management enables staff and their managers to identify skills gaps or future skills needs, aligned to workplace goals and personal aspirations. Underpinning all of this is access to a range of learning pathways which offer accessible and relevant learning opportunities to meet NFA's and its staffs' needs.

This report places particular emphasis on these learning pathways, and positions these within the processes that could support their integration into NFA's future development and success.

Introduction

Three cohorts of students, most of them working scientists for the NFA, have now completed the Graduate Certificate in Research offered by the University of Tasmania (see Appendix 2 for information on the student cohort and FIS 2010/055 Project Proposal for information on the overall rationale and outcomes for this project).

Overall the course has been well received with positive engagement and feedback from the participants. Importantly, the certificate has reengaged a cohort of working scientists with higher education and fostered a range of skills that will prepare them for the rigours of further study. Indeed, many of the students have enquired about what they can do next.

Following this successful higher-education learning experience, NFA is keen to explore what further opportunities are available, both for this cohort and other NFA staff.

This document identifies and discusses potential learning pathways that could be offered and/or developed to provide development opportunities for NFA staff. It does this by noting how these offerings could sit within NFA's overall organisational development activities, ensuring the maximum benefit to NFA, its staff and clients.
These activities include:

1. Workforce Planning
2. Learning: Pathways to Learning
3. Performance Management

1. Workforce Planning

Workforce planning is a process that helps to shape the workforce, ensuring skills and capabilities are on hand to best deliver the outcomes being sought. For NFA, workforce planning must be informed by NFA's strategic plan and priorities, while also considering financial, operational and staffing implications.

At its least complex, workforce planning has three parts:

1. Forecast skills and capabilities
    - With reference to NFA's strategic priorities, identify the skills needed to achieve current and future goals
    - Identify what roles – new, existing or evolving – would best deliver these skills

2. Current skills and capabilities – skills and capabilities audit
    - Identify what skills you have within NFA
    - Identify how these relate to existing roles
    - Identify how these relate to individual staff members

3. Gap analysis and development strategies
    - Identify any gaps in skills and capabilities
    - Identify the best way to move from 2 (current) to 1 (best and future scenario), including staff development opportunities for identified individuals.

For NFA, workforce planning involves identifying the best mix for an interdisciplinary organisational structure comprising scientists (many skilled in a variety of fisheries contexts) as well as technical and other qualified support staffs (such as those needed in HR, legal matters, policy making and community engagement). The workforce within the NFA also consists of staff who have entered as career public servants upon completing

year 12 schooling and potentially now looking for or requiring higher / tertiary education. Other staff include technicians wishing to upgrade skills as well as graduates now looking to advance their skills to masters and doctoral levels.

An audit of current skills levels and an assessment of growing/future workforce needs will assist in identifying the best pathways to learning.

2. Pathways to learning

There are many learning options available for NFA staff, with opportunities dependent on experience and qualifications held. The best options for NFA will come into focus once it identifies the skills gaps in its current workforce (see Workforce Planning, above), and has a better understanding of the pathways available to different cohorts. For example, those who have completed the Graduate Certificate of Research have opportunities to pursue further postgraduate coursework studies, with higher degree research a possibility for some. Other staff will be better suited to Associate Degree studies in, for example, aquaculture and agribusiness. This section provides more information on these pathways. The University of Tasmania is well positioned to assist with all of these options, and its University College is a
leader in the provision of industry focused associate degrees.

➢ Postgraduate Options

For the cohorts who have completed the Graduate Certificate in Research a number of options can be explored. These are outlined below.

Graduate Diploma and Masters Options

Within the Australian higher education sector the Graduate Certificate is a nested qualification in the Masters pathway. Thus students who complete a graduate certificate (particularly those with industry work experience) can use this as a pathway to a Graduate Diploma and then to a
Masters, with credit being offered for each (dependent on the nature of studies undertaken).

These are Masters by coursework (rather than research) programs, and there is a vast array of these available to choose from. The most relevant options for NFA and ACIAR projects are likely to be:

- Graduate Diploma in Business and Masters in Business
- Masters of Applied Science

In addition to these coursework postgraduate programs, for some higher education institutions the graduate certificate might be recognised for entry into a Masters by Research.

The Professional Doctorate (Prof Doc)

A Prof Doc is a professional research qualification which has an equivalent status to a PhD. This degree is ideal for mid-career and senior managers who wish to integrate advanced research into their professional lives.
This degree structure:

- allows students to undertake the research component of their degree in the workplace,
- recognises the skills and expertise workplace-based students can bring to their research,
- can be undertaken as a part-time study program that is integrated into the student's work practice and is completed while employed.

Prof Docs are usually completed over three or four years' full-time study, or part-time equivalence.

Students are assessed by coursework and a thesis. The thesis is of up to 80,000 words and reports the significant contribution to the discipline made by the student's research.

Students at NFA who have completed a B.Sc. and worked within a research environment could use outputs from their research practice to demonstrate that they are 'research ready' and have the necessary experience to enter and complete a Higher Degree by Research.

Successful completion of the Graduate Certificate in Research could be used as evidence of research readiness.

For a Professional Doctorate at the University of Tasmania, students are required to:

- complete a number of coursework offerings. These could be completed on line in many cases, but students would need to be able to travel to Hobart to complete coursework and for key Ph.D. milestone meetings (for example, Confirmation). Annual travel would need to be accommodated and budgeted.
- deliver a thesis of original research that will contribute to knowledge in their area of professional practise. This work can be undertaken as part of their work practice.

Students would be supported by a University of Tasmania supervisory team and would require consistent workplace support (such as time allocation for study, access to

equipment and access to data) at NFA or other participating organisations. They would also need adequate funding for the research and required travel.

It is tempting to think that a small, ACIAR-funded research project scheme or similar could be developed to support selected students with appropriate entry qualifications in their professional doctorate journey. This approach would build on the existing strong relationships between the University of Tasmania, NFA, ACIAR and Australian researchers (note: the supervisory team can include co-supervisors from other Universities, including the University of PNG).

The ability of the research work to be undertaken in the workplace and, ideally, as part of the students work practice, means students do not need to relocate to Australia for study and the workplace does not need to maintain a position for the student's return.

➢ Applied Pre Degree Options

Our work with industry-based scientists at NFA has revealed there is a paucity of higher education places in Papua New Guinea, and that there is a cohort of capable scientists working at the NFA who have not achieved Bachelor level education. These scientists, and others working in other organisations that partner with ACIAR, would benefit from the opportunities offered by higher education.

Associate Degrees

The University of Tasmania Associate Degrees have been developed in consultation with Tasmanian industry groups to produce industry relevant and career oriented programs, as well as offering up to two-years credit into a specified University of Tasmania bachelor degree.

Associate Degree courses are:

- focused on the student experience, teaching, learning and support,
- delivered flexibly to provide easier access for students in regional areas,
- developed using the latest approaches to digital technology. (Where digital technology is less accessible, alternative delivery can be offered. This would involve intensives of several days duration, as with the Graduate Certificate of Research),
- innovative in their learning approach, equipping graduates with academic knowledge as well as practical skills,
- a pathway to enter higher education for students who may not have considered this a possibility.

For PNG, the Associate Degree program opens up pathways to Diplomas, Associate Degrees and, potentially, Bachelor degrees, depending on the number of units offered (8, 16 and 24 units for these pathways, respectively, each nested within the other).

These courses offer a unique opportunity to develop a higher education offering that can be delivered to students in NFA, PNG and more broadly across our neighbouring regions. Development of courses and delivery could occur in collaboration between the University of Tasmania's University College (which delivers the Associate Degree programs), ACIAR and regional industry partners (e.g. NFA), with curriculum responsive to industry needs and regional geopolitics, and would represent a fundamental investment in capacity building.

We are conscious that for students in PNG the cost of education is as prohibitive as the social cost of studying in another country. The development of Associate Degree programs which can be delivered in-country would need to be supported financially by aid and in-country partners.

3. Performance Management

Performance management is more than its name implies. At its best, it is a process which enables staff and their supervisors to discuss how a staff member has been performing, how they can make any required improvements to performance, and any learning opportunities that can help strengthen performance and build the skills and capabilities an organisation will need to achieve its current and future goals. All of this is contextualised by an honest and respectful conversation about the staff member's personal aspirations alongside organisational goals. Formal performance management conversations best occur at least annually, with informal ongoing conversations taking place throughout the year. Breaking down the content and purpose of performance manager, it become evident how this fits with workplace planning and learning:

Conversation:

- How is a staff member going with their work? (self-assessment and supervisor's assessment)
- What is a staff member keen to do in the future?
- What are you (supervisor) keen for them to do in the future? (based on Workforce Planning needs and an assessment of their current and potential skills and capabilities)
- What learning opportunities could assist? (based on Learning Pathways)

Outcomes:

- Agreed, and documented, tasks and responsibilities for the period ahead
- Agreed, and documented, development pathways for the period ahead

Conclusion

This project grew from a body of work conducted originally in North West Tasmania, a region with a strong history of technical and vocational training. Facing the challenges and opportunities of technological change and a highly competitive global economy required local industries to change their training options and to upskill workers. Recognition of prior

learning was an important part of encouraging these often highly skilled workers to engage in further education. The success of a Graduate Certificate which built on prior skills and work experience demonstrated the value of such an approach and provided a similar foundation for the approach adopted with NFA in PNG.

We have learned that starting with the recognition of and respect for current skills and capability and using this as the fundamental building block for further learning is of critical importance. This approach has underpinned the success of the Graduate Certificate of Research. It is strongly recommended that, following some initial workforce planning at NFA, any steps towards implementing future pathways to learning for NFA staff commence with the staffs' current skills and a performance conversation which documents these skills and facilitates identification of relevant learning pathways to grow these skills for the mutual benefit of NFA and its staff.

The learning pathways offered in this report provide a potential guide for managers conducting these performance management conversations with staff, especially those staff who have completed the Graduate Certificate in Research as part of the ACIAR Project FIS/2010/055.

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ACIAR PROJECT: FIS/2010/0-55
BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 3

The identified skills checklists: Material prepared in class – in Introduction to Higher Degrees by Research

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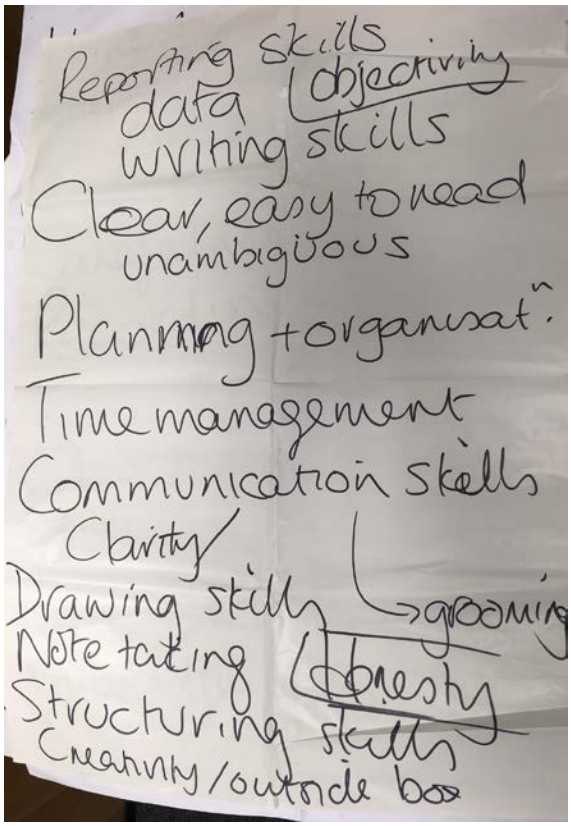
A Report prepared for the Final Review panel and developed by Dr Joy Rathjen

Draft document – not for further distribution

Skills checklists

The third assessment of *Introduction to Higher Degree Research (for PNG)* is a reflective task. The students are asked to self-assess their skills against a skills checklist.

The skills checklist is a ***student product*** developed during teaching. At the end of each formative session the students brainstorm the skills that scientists need in their work practice and as related to the topic of the session. This results in a pile of butcher paper records of skills produced by the students within the class. These are generally very vocal sessions and all students actively participate.



On evening 3, the facilitator of the course compiles these skills into a table for the students to use as a tool to reflect on the skills they use within their own practice. They are guided in this process to be honest – we would expect a group of scientists to have expertise in the skills that they have identified.

The format of these checklists has evolved during course development (in the following pages the last checklist (2017) is shown first). There is a degree of interpretation required to group similar skills into a single line – the exercise would lose value if the process was too long or too repetitive. It is interesting to note that some skills are consistently identified by the students whilst others are class specific.

Below is the assessment description, taken from the unit outline, that describes what is required for assessment.

Task description	A list of skills required by scientists in the workplace will be developed in class. This list will form the basis of a checklist for use in this assessment task. The checklist will prompt reflections on your information-seeking and information management skills, to highlight any areas requiring further development.
Assessment criteria	Single page of statements for annotation; approx. 30 minutes.
Links to unit's intended learning outcomes	4. Find, acquire, evaluate, manage and use research data. 5. Identify, evaluate and implement personal learning strategies.
Task length	Completion of self-assessment checklist.

Skill/attribute	When I consider these questions of myself, is this skill/attribute					If poorly developed or not thought about, do you need this skill	
	Well developed	Developed	Present	Poorly developed	Never thought about it	Now?	In 5 years' time?
You as a scientist – are you….							
Curious?							
Creative?							
Objective?							
Rigorous?							
Observant?							
Knowledgeable?							
Organised?							
Accurate?							
Confident?							
Authorative?							
Responsible?							
Focussed?							
Honest?							
Trustworthy?							
Reliable?							
Accountable?							
Clear thinker?							
Fair/courteous in your dealings with others?							
You as a research scientist – are you a….							
Experimental designer?							
Technical researcher?							

Problem finder?							
Specialised/highly trained?							
An independent thinker?							
Protocol developer?							
Protocol follower?							
Forward planner?							
An organised and systematic worker?							
A good time manager?							
Confident with your IT and software tools?							
You as a data manager – are you a……							
Responsible data collector/use research methods?							
Data analyser?							
Data interpreter?							
Honest recorder and reporter?							
A person aware of, and practiser of, ethics/integrity?							
Practiser of good note taking?							
Careful with data (data management skills)?							
Diligent collector and preserver of data/metadata?							
Ready to share your date with others?							
You as a scientific communicator – are you a……							
Confident in your ability to engage with the community?							
Inform your communication with your data?							
Confidant with how you work with others?							
Skilled in report writing?							
Good written communicator?							
Confident with your leadership skills?							
Well presented?							

Able to structure and organise information?							
Able to write with a clear, easy to read, style?							
A confident writer of reports?							
Able to place your work in context?							
Responsible?							
Person who acknowledges others work?							
Do you enjoy being a scientist? Yes or no?							

Skill/attribute	**When I consider these questions of myself, is this skill/attribute**					If poorly developed or not thought about, do you need this skill	
	Well developed	Developed	Present	Poorly developed	I have never thought about it	Now?	In 5 years' time?
You as a scientist – are you….							
Curious?							
Creative?							
Objective?							
Rigorous?							
Consistent?							
Organised?							
Committed?							
Persistent?							
Passionate?							
Knowledgeable?							
Details focussed?							
Outcomes focussed?							
Keen to learn?							
A decision maker?							
Clear thinker?							
You as a research scientist – are you a….							
Experimental designer?							
Technical researcher?							
Problem finder?							
Specialised/highly trained?							

Critical thinker?							
Protocol developer?							
Protocol follower?							
Consistent worker?							
Forward planner?							
Trouble shooter?							
Systematic worker?							
You as a data manager – are you a……							
Responsible data collector?							
Data analyser?							
Data interpreter?							
Honest recorder and reporter?							
Practiser of good note taking?							
Careful with data?							
Diligent preserver of data?							
Respecter of the requirements of confidentiality as pertains to your data?							
You as a scientific communicator – are you a……							
Confident in your interactions with others?							
Skilled in report writing?							
Good written communicator?							

Confident with your management skills?							
Confident with your project management skills?							
Able to structure and organise information?							
Sensitive to confidentiality?							
Happy team player?							
Do you enjoy being a scientist? Yes or no?							

Identified skill Rate your performance.
Rate your requirement Is this a skill that you against this skill for this skill in your need to develop to (1=poor / 5=fantastic, current position (1=low support your career n/a not applicable) relevancy / 5=essential) ambitions (yes/no)

Objectivity			
Analytical Thinking			
Awareness of the environment (metadata)			
Observational Skills			
Statistics			
Research / Experimental Skills			
Visualisation			
Project Planning			
Development of Guidelines			
Commitment			
Critical Thinking			
Accountability			
Good Stewardship			
Effective Delegation (trusting others)			
Adaptive Management			
Organisational Skills			
Teamwork			
Project Management			
Time Management			
Logistical Management			
Record Keeping			
Abel to Recognise Opportunities to Influence			
Courage of your Beliefs			
Disciplined			
Speak with Confidence/ project the voice			
Responsible Adaptability			
Self-Discipline			
Leadership			

Integrity			
Self-Awareness			
Networking			
Ability to Influence			
Common-sense			
Honesty			
Curiosity			
Patience			
Perseverance / Tenacity			
Healthy			
Responsible			
Being succinct and clear in writing			
The ability to plan writing			
Writing, the ability to identify your audience			
Writing, the ability to identify your purpose			
Creativity			
Details orientated			

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BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS
IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 4

Graduate Certificate in Research Unit List

FIS/2010/055: ACIAR Capacity Building Research and Project Management Skills in Fisheries Staff in PNG UNIT LIST

Unit	Lecturer	Support Lecturer/Tutor
Unit1: BAA506	Prof Janelle Allison	Dr Joy Rathjen or Dr Christine Angel
Unit2: XGR501	Dr Joy Rathjen	Prof Janelle Allison or Dr Christine Angel
Unit3: XGR502	Dr Joy Rathjen	Prof Janelle Allison or Dr Christine Angel
Unit4: XGR505	Professor Peter Frappell or Dr Stephen Ives	Dr Christine Angel

Unit One - BAA506

Through a wide range of activities in the workplace, potential post graduate students grow professional skills and capabilities relevant to both leadership and management. The unit seeks to recognise this experience by developing with the student the frameworks and tools to understand how they, as adults, can acknowledge and understand what deeper learning has occurred, what capabilities have been developed, and how these skillsand capabilities might be applied.

The unit is designed to foster skills and capacity in:

- Adult learning (approaches and styles).
- Reflective and deliberative practice - as manager and supervisor.
- Awareness of leadership and management approaches and styles.
- Building effective organisational and workplace cultures.

Unit Two - XGR501

Introduction to Research introduces candidates to research practises. Candidates will be introduced to a range of topics including what it means to be a researcher; what it means to be a scientist; research integrity; planning and managing a research project; roles and responsibilities of members of a research team; moral rights and protecting and commercialising research; data management and occupational health and safety.

The unit will be taught in intensive mode over three days and assessment tasks will focus on meeting key objectives of a researcher.

Unit Three - XGR502

Communicating Research (Papua New Guinea) introduces principles of professional communication and scientific communication (including academic writing and broad presentation skills) to industry-based students enrolled through the University of Tasmania. This unit focuses on a range of topics including: managing and reviewing the literature, report writing, appropriate communication styles, presentation skills (presentations for conferences, seminars, discussions and poster presentations), principles of academic writing (developing responsible writing skills, structuring extended writing, technique and writing style and incorporating the work of other scholars into your writing) and preparing research results for publication.

Unit Four - XGR505

Specialised research methods aim to equip candidates with the generic skills needed to conduct experimental research. Candidates will be introduced to a range of topics including effective experimental design; collection of data (integrity, precision, accuracy); data processing and analysis; and impact, interpretation and communication of data. The unit will be taught in intensive mode over four days and practical, hands on activities will introduce the essentials of designing, conducting, analysing and communicating an experiment.

ACIAR PROJECT: FIS/2010/055
BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 5

Expression of Interest Template

CALL FOR EXPRESSIONS OF INTEREST (EOI)

FIS/2010/055: Building research and project management skills in fisheries staff in PNG

Partner Country	Papua New Guinea
Australian Project Leader	Prof Janelle Allison, University of Tasmania
Partner Country Project Leader	Mr Jacob Wani, National Fisheries Authority

Participation in the Graduate Certificate in Research

UTAS and NFA invite staff in NFA and its partners in ACIAR funded projects to submit expressions of interest to enrol in research training – a course offered by the University of Tasmania - the **Graduate Certificate in Research.**

Enrolment is limited to 15 students a year in 2014, 2015 & 2016. Minimum entry requirements include:

- an undergraduate degree

OR

- at least 3 years work experience in projects or work relevant to NFA and related projects
- The due date for Expressions of Interest is COB **5 May 2014** (Please see note below).

EOI Application Details

Please submit your EOI to ACIAR.PNG@utas.edu.au. - ***Please note your EOI should be no more than 2 pages***. ***The DUE DATE to submit your EOI is COB 5 May 2014.***

In submitting your expression of interest please address the following:

EOI Details (and entry requirements)	**Explanation as to what is required**
1. Name	
2. Contact details	*Please ensure these details are for an email address or postal address that is regularly checked by you.*
3. Qualifications	*Please ensure you include professional development courses as well as any undergraduate degree or other (if relevant).*
4. Relevant work experience	*In this project we* ***strongly encourage applications from participants who may not have an undergraduate degree but have been involved in the NFA and fisheries projects over a few years****. Work experience is highly valued and your local know how and applied experience are important.*
5. Skills and knowledge you hope to gain from your participation	*Please tell us about your goals and objectives for undertaking this course of study.*
6. Institutional support	*Please confirm that you have institutional support (e.g. time release) to undertake this course of study. Please provide the name and contact details*

	of this person authorising this support (preferably your supervisor.)

A brief outline of the ACIAR project and the Graduate Certificate in Research is provided overleaf.

Project Outline/Background/Context

Scientific and technical staff in the Papua New Guinea (PNG) National Fisheries Authority (NFA) involved in aquaculture and fisheries have had limited opportunities for program-based research training within their workplace. This research project will explore how to increase effectiveness of training opportunities and link content to ensure that personal development and long-term benefits to the institution are fully realised. The research project has two elements: the training course and evaluation of the impact and effectiveness of this type of training. Specifically, this research project will investigate ways to teach research and project management skills to industry-based research workers. To do this, the project will engage 40-50 National Fisheries Authority (NFA) staff in training over 3 years.

The training course is titled **Graduate Certificate in Research** and is open to those who are involved in ACIAR and other projects including those in Head Office, in a formal course of study.

The focus of the research of the project is to understand how training of this type will impact on NFA/ACIAR projects.

The following research questions will be addressed.

1. How can effective training in research and project management be delivered to industry-based scientists and technicians in PNG?
2. What are the benefits of integrating research training with workplace activities
3. Does working towards a formal qualification foster better research?

The research objectives are:

1. to determine research training and project management needs for industry-based scientists and technicians;
2. to design, deliver and validate a formally accredited training program aimed at developing management, workplace and research skills;
3. to evaluate the benefits of staff training to the projects and the institution;

Participation in the research is voluntary. All participants will have the research explained to them and will be asked to sign a consent form to indicate their willingness to participate.

Graduate Certificate

Participation in the training affords an opportunity to obtain formal academic qualifications on completion of course and assessments – a Graduate Certificate in Research from the University of Tasmania (UTAS).

If you agree to participate in the research you will be periodically asked to reflect on the value of the training. The focus is on how to develop the most worthwhile and effective training, not any focus on the individual participant.

The training of the Graduate Certificate in Research comprises of 4 units of study that will be usually completed within a 12 month period.

The units are:
Learning Through Practice – offered in 2 x 2 day workshops and assessment applied to work experience

Research & Project Design – offered as a 4 day course and assessment applied to current research project

Methods and Data Analysis – an initial 2 day workshop and includes application of skills in work project

Communication – 2 day workshop as well as presentations to NFA staff and relevant industry partners.

UNIVERSITY of TASMANIA

ACIAR PROJECT: FIS/2010/055
BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS
IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 6
Development of the Graduate Certificate in Research

Prepared by Joy Rathjen

Draft document – not for further distribution

The need for research skills training.

> *Postgraduate training is now seen as moving beyond merely training the next generation of academics. Instead it is accepted as a means of equipping an advanced workforce with the skills necessary for critical thinking and team work.*[1]

Capacity building is a stated goal of ACIAR research and development funding.[2] Within the scope of capacity building is the development of scientific autonomy within the in country research workforce, such that those involved in ACIAR projects will become the research leaders of the future, able to plan, execute and translate scientific research to fulfil societal need. This development is to be incorporated into the research question-focussed projects funded through ACIAR. Scientific autonomy requires researchers to have well-developed abilities in a range of generic research skills, like research planning, data management and analysis and communication, not simply knowledge and experience in the technologies relevant to their specialisation.

Evidence suggests that the development of generic research skills training lags behind the training in specific technical skills in the PNG research workforce, not only in ACIAR-funded projects but also more widely. An analysis of training needs in PNG acknowledged the need for generic skills training in the scientific workforce engaged on the management of fisheries resources, but failed to identify these as priority topics over the need to develop technical competencies.[3] Similarly, a training needs assessment commissioned by the National Fisheries Authority focused on technical skill needs of those working in the fisheries industries in PNG, clearly an area of great need, but did not include the needs of the scientific workforce in the ToRs.[4] The report did note a paucity of formal training places (Diploma courses) for workers in the industry.

ACIAR project leaders directing fisheries-based projects in PNG expressed concern and frustration about the difficulties they encounter in developing research skills in the participating scientists in country. The reasons for these difficulties likely include, but are not limited to, a lack of research skill development in the staff of PNG research organisations; [5] the priority focus on technical skills development, evident through the identified training priorities and examination of the curricula of indigenous higher education providers;[6] the lag in formalising the development of research skills in the development of

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[1] University of Tasmania 2017, 'Graduate Certificate in Research', viewed 13 September 2017, http://www.utas.edu.au/courses/dvc-research/courses/x5a-graduate-certificate-in-research

[2] ACIAR Strategic Plan, 2014-2018. (2014). Australian Centre for International Agricultural Research.

[3] '*Note that communication skills, governance issues, enforcement as well as generic workplace skills were identified as priority training gaps that impede successful marine resource management occurring within countries. Therefore, for completeness sake, these training gaps are included in this scoping report. For the purposes of this project, however, priority topics must be identified from within the more technical tropical marine resource management training gaps.*' in Strengthening in country tropical marine resources management training capacity in Papua New Guinean and the Solomon Islands; a Scoping Study (2012), Report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. p. 16.

[4] Jeff Kinch and Grant Carnie (2011). Training Needs Assessment for the Fisheries Sector in Papua New Guinea. Report prepared for the National Fisheries Authority, PNG.

[5] At the time of funding this project the partner organization, NFA, did not employ a scientist with a qualification above a Masters, and Masters level qualifications were not common amongst staff. As far as we are aware this is still the case. The corrorolary of this is that, with the exception of staff who had completed a higher degree by research, NFA staff had little or no specific research skill training in their eduction.

[6] Scoping Study (2012), Report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. p. 16.

the research workforce worldwide;[7] and the difficulty of incorporating high quality and consistent research skills development into the research agendas of the funded projects, particularly as Australian researcher interaction with their in country research colleagues is, by necessity, intermittent and the pathways to this training are explicitly informal.[8] Australian project leaders voiced particular concern around project development, data management, and integrity and communication skills.

The grant developed with ACIAR identified as a priority the gap in research skills training evident in the scientists working in fisheries management. Specifically, the gap identified that '*scientific and technical staff members in PNG generally commence their employment in aquaculture and fisheries with limited research qualifications and skills, and with limited opportunities for program-based training within the department, especially for research. Subsequent training may be so tightly linked to the activities of specific projects that long-term institutional benefits and personal development are not fully realised*.'[9]*

The resulting funded program aimed to design, deliver and validate a formally accredited training program integrating participatory approaches with research skills. The program was to be developed to explicitly address the gap in research skills training evident in the scientific workforce of the National Fisheries Authority (NFA) in PNG.

A Graduate Certificate in Research.

The University of Tasmania has incorporated into the candidature of all Higher Degree by Research (HDR) students a requirement to complete a Graduate Certificate in Research. The stated aim of the certificate is to develop in students the suite of research skills they will need to complete their research training, and to foster a range of transferable research skills that will support them as they moved into the workforce.[10]

The Graduate Certificate in Research comprises two compulsory units (*Introduction to Higher Degrees by Research* and *Communicating Research*) and two electives that can be chosen from a wide range of compatible units. The certificate is strongly grounded in the research practices and procedures of the University, with reference to broader national and international agendas.

As initially conceptualised in the project application, a Graduate Certificate in Research was to be delivered to 45-50 scientists in Papua New Guinea over a 3-year period in a total of six iterations of 4 units/iteration - *This program is based around the delivery of a training program, offered in two locations each year (Port Moresby and 3 regional locations depending on need over the 3 year period) which on successful completion will qualify participants for a Graduate Certificate in Research.*

The program to be developed in PNG was originally intended to be a modified version of the existing Graduate Certificate in Research. The modifications included changing the compulsory units to *Learning Through Practice (A) Workplace* and a second, to be developed unit, *Approaches to Research*. These were to be accompanied by two additional units to be chosen and developed in response to a needs survey. It was an early decision that, for the first iteration of teaching, the unmodified structure of the Graduate Certificate in Research would be adopted.

education enhances individual potential and should equip graduates with the knowledge and core transferable competences they need to succeed in high-skill occupations. Yet curricula are often slow to respond to changing needs in the wider economy, and fail to anticipate or help shape the careers of tomorrow;..' p. 4.

[8] The difficulty in actualizing the stated aim of ACIAR that *"Capacity building of institutions and individuals is integral to all ACIAR-supported research, and significantly enhances the sustainability of research outcomes. Our programs bring Australian researchers together with developing-country researchers, primarily by short or*

[7] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Supporting growth and jobs – an agenda for the modernisation of Europe's higher education systems (2011). Brussels, 20.9.2011 COM(2011) 567 final: '..*Higher*

extended visits, and all research is undertaken collaboratively in the laboratory or in the field. This informal training, through learning-by-doing….' ACIAR Strategic plan (2014). p. 13.

[9] ACIAR grant # FIS/2010/0-55

[10] http://www.utas.edu.au/courses/dvc-research/courses/x5a-graduate-certificate-in-research

This resulted in a Graduate Certificate in Research that started with the *Learning through Practice (A) Workplace* unit, followed by *Introduction to Higher Degrees by Research* and *Communicating Research* units, and finishing with a unit that would be developed on a needs analysis and used to populate the unit shell XGR505 (*Specialised Research Methods*).

The advantages of this approach were a Graduate Certificate based on existing and validated educational offerings designed specifically to grow research skills in developing researchers, the provision of a shared experience with developing researchers in UTAS (with consistent intended learning outcomes (ILOs) over the offerings) and creation of a qualification with recognition value outside of this training space. The incorporation of *Learning through Practice (A) Workplace* as the introductory unit addressed the specific needs of reengaging an adult student cohort into the rigours of academic learning. This existing unit has been used for this purpose and the effectiveness of the education independently reviewed and validated.

Adaptation of the Graduate Certificate in Research to PNG

It was recognised that a degree of adaption was required to prepare the units for local delivery in PNG. In the initial development phase there were a number of issues that were addressed to facilitate in country delivery. Each unit was to be delivered in a 3-day workshop, and the initial delivery was to be in Port Moresby. The workshops were designed to be highly interactive with most material delivered through a variety of media and reinforced with group exercises and discussions in class.

Flexibility:

As delivered in Tasmania, the Graduate Certificate in Research is a flexible offering, with 50% of the course to be comprised of units of the student's choice, and with the ability to create custom units if required. There was no ability to provide this level of flexibility to students studying in PNG. The Graduate Certificate in Research (PNG) was a fixed unit offering, with units chosen, adapted and delivered to address identified research skill deficits.

Cohort:

The student cohort in PNG differed from the majority of their domestic counterparts in several significant ways – they were industry-based, maintaining a full-time work commitment while studying, and they were not embedded in an academic environment. They were invariably adult learners. They had a diverse range of educational experiences, but in all cases students were credited with workplace experience as only seven participants had achieved an educational level higher than a Bachelor degree. They were all working in some form of scientific endeavour and, without exception, the students were working within a primary industry (Fisheries, Agriculture, Forestry). For these reasons, the Graduate Certificate in Research (PNG) was ordered to start with *Learning through Practice A (Workplace)*, rather than *Introduction to Higher Degrees by Research* (as is the norm in Australia), to reengage this cohort with learning.

Industry-based vs academic students:

The assessments used in *Introduction to Higher Degrees by Research* and *Communicating Research* were designed to support learning within a Higher Degree by Research, and as such, were not necessarily directly relevant to the needs and aspirations of industry-based students. In these units the assessments were modified to provide similar, but more relevant, educational experiences (Table 1). A secondary consideration was to develop assessment that built from one unit to the next – for example the assessment task 1 in *Introduction to Higher Degrees by Research* (Table 1) used the text mining skills and matrix development skills that were introduced in *Learning through Practice A (Workplace)*. The Graduate Research Office approved modifications prior to delivery.

Task	Introduction to Higher Degrees by Research Tasmania	Introduction to Higher Degrees by Research Papua New Guinea
1	Research Integrity and Ethics	Research Integrity and Ethics*
2	Draft Research plan	Draft Research plan
3	Work Health & Safety Quiz	**
4	Information Skills Checklist	Research Skills Checklist***

*In the Graduate Certificate in Research (PNG) this assessment comprises a case study exercise, in which students mine a piece of text for potential breaches of Section 2 of the Australian Code for the Responsible Conduct of Research, and submit a 500 word assignment on their findings.
** There are very few resources available in PNG for the development of such a quiz, and the WHS quiz used at UTAS is of little relevance given the different legislative environments. To address WHS we invited an in country WHS specialist, Mr Ovia Tarube of the NFA, to talk about WHS and WHS at NFA to the students. This is followed by a robust question and answer session.
*** Throughout teaching the class is involved in gathering and discussing a list of research skills. These are tabulated at the end of teaching and students assess their own research skills against those they have identified.

Table 1: A comparison of assessment for *Introduction to Higher Degrees by Research* as delivered in at Tasmania and in Papua New Guinea.

Internet access and use of online learning:

Internet access in PNG is very poor and very expensive. At the time of starting the teaching project, Internet access was not even guaranteed in the hotels used for teaching (staff spent a memorable three days without access). The teaching program was not able to rely on, or use, any of the online learning resources developed for and used in the units delivered. Material was developed to replace those modules reliant on online learning resources.

The parochial nature of the UTAS Graduate Certificate:

In addition to the role in developing research skills in the UTAS HDR cohort, the Graduate Certificate in Research aims to provide a uniform induction process for all HDR students. Included in the ILOs of the core units, and *Introduction to Higher Degrees by Research* in particular, are outcomes related to the procedures, policies and practises relevant to enrolled HDR students. As an example of how the ILOs were modified, those outcomes that referred exclusively to HDR induction were removed (Table 2, ILOs 1, 5), but the remaining ILOs, which encapsulate research skill development, were maintained in an essentially unchanged form.

Work integrated learning:

It was an original intention to embed the Graduate Certificate in Research into the work practises of the students and integrate course delivery and work practise. In practise, this aim proved too difficult to achieve. The students did, however, rely on their work experience and practise in all aspects of the course – their reflections, Research Plans and major communication assignments were all grounded in their experiences as researchers, and in the final unit they used their skills to run and analyse a group experiment.

ILO	Introduction to Higher Degrees by	Introduction to Higher Degrees by

	Research Tasmania	Research Papua New Guinea
1	Understand the relevant policies and procedures applicable to higher degree by research candidates enrolled at the University of Tasmania.	*
2	Design and present a detailed research plan for an extended research project.	Design and present a detailed research plan for an extended research project.
3	Demonstrate awareness and understanding of the relevance and importance of occupational health and safety as it applies in your own workplace.	Demonstrate awareness and understanding of the relevance and importance of occupational health and safety as it applies in your own workplace.
4	Demonstrate an understanding of the social and ethical implications of research and appropriate professional behaviour consistent with the Australian Code for the Responsible Conduct of Research and other relevant guidelines.	Demonstrate an understanding of the social and ethical implications of research and appropriate professional behaviour consistent with the Australian Code for the Responsible Conduct of Research and other relevant guidelines.
5	Demonstrate awareness and understanding of key intellectual property concepts and the various stages of commercialisation.	**
6	Find, acquire, evaluate, manage and use information in a range of media.	Find, acquire, evaluate, manage and use relevant research data. ***
7	Identify, evaluate and implement personal learning strategies.	Identify, evaluate and implement personal learning strategies.

*This ILO was deleted from the PNG iteration as the students involved were not enrolled in an HDR program.
**This ILO was removed from *Introduction to Higher Degrees by Research* as the IP and commercialisation strategies for industry-based students are set by their employing organizations. A more general discussion of IP, and the responsibilities of students to confidentiality is included in *Communicating Research*.
*** *Introduction to Higher Degrees by Research* 1 is delivered to students from all disciplines. The alteration in wording here is intended to focus on information as defined in scientific disciplines and, therefore, to make it more directly relevant to the PNG student cohort.

Table 2: A comparison of ILOs for *Introduction to Higher Degrees by Research* as delivered in Tasmania and Papua New Guinea.

Learnings from the initial delivery.

Communication:

The ability to remain in contact with students over the course of the year proved to be difficult. The reasons for breakdowns in communication proved to be many, and included:

- The transience of student email addresses. Students did not adopt their UTAS email addresses, and were likely to use many different and changing email addresses. Maintaining a current and workable address database proved challenging.
- The isolation of some working environments (boats, highland villages) meant that some students were not in a position to maintain consistent, or, in one case, any contact through email.
- Much of the computer infrastructure used by students was old, poorly maintained and riddled with viruses (see Appendix 1). In many cases, contaminated email communications with attached assignments failed to reach teaching staff.

To address this issue the program has employed Dr Christine Angel to work as a dedicated tutor to all units. Christine has been able to provide a point of consistency through the teaching program, work with the students to maintain the email database, developed the use of alternate modes of communication to reach 'hard to reach' students, such as text messages and our Facebook page. As a last resort, we have used project leaders to act as conduits but this approach has been met with mixed success.

Assessment:

It was an expectation, perhaps naïve, that students in PNG would undertake the units in a manner analogous to domestic students. That is, they would attend the 3-day workshop and then use free time in the weeks following to complete the assessment tasks. This proved to be an unrealistic expectation. At the commencement of the first iteration of *Introduction to Higher Degrees by Research* 7/16 students had failed to complete and submit their assessment for *Learning through Practice A (Workplace)*. As might be predicted, submission rates for the assessment for *Introduction to Higher Degrees by Research* were equally low. The reasons for this may be many but likely include:

- An inability of students to create within their lives a functional learning environment in which to study.
- A lack of advice and mentoring to support continued learning – in the absence of a supportive academic environment, a feature of all HDR students at UTAS, students in PNG struggled to complete and submit a draft Research Plan for assessment, for example. This problem was compounded by the difficulties many students experienced in communicating with teaching staff electronically. For several students successful submission was only achieved after bringing them back into the classroom in subsequent iterations of the course. ☐A fear of failure and retribution.

To address the issues related to assessment, the delivery of units was modified to enable students to complete and submit all assessment items within the workshop. Specifically, the units were lengthened from three to four days, time was made in the program to work on assessments in class, and a team of two taught each unit to ensure all students were ably supported in their assessment preparation. Students worked through break times and reported working well into the night to complete assessment tasks. All assessment was to be submitted on the final day of teaching, as a hard copy.[8]

Assumed knowledge:

At the start of this project it was anticipated that knowledge of research skills would be low, but a degree of commonality of practise on which these skills could be developed was assumed. This was based on the knowledge that all students worked in some capacity as a scientist and most had worked with Australian project leaders on ACIAR-funded projects. In many areas the assumption of commonality of practise was misplaced and the majority of students did not appear to self-identify as scientists. Concepts and practises we would consider fundamental (for one example, the need for record-keeping

[8] The project invested in a printer. When the process of preparing assessments in class was started all students were required to print their work for submission. This approach avoided the issues of viruses, which stymied email submission and electronic submission via USB sticks. In the last iteration of teaching, communication had improved and each student brought a fairly reliable laptop to class. For *Communicating Research* and *Specialised*

and use of a laboratory or field notebook) were not shared. Although this made for some of the most rewarding teaching experiences, it necessitated that many topics were explored in more depth than was initially anticipated in the teaching plans.

Teaching plans and group activities were modified in *Introduction to Higher Degrees by Research* and *Communicating Research*, in particular, to address this particular challenge. In addition, each day started with an interactive session in which students reflected on 'what they had most enjoyed from the day before' and 'what they had found most challenging from the day before.'[12] In these sessions the extent of learning achieved could be gauged, any immediate issues of comprehension talked through, and teachers could modify material to revisit troublesome concepts if needed.

The Graduate Certificate in Research Skills.

Through this project we have developed a Graduate Certificate for the development of research skills in students outside of the HDR program – the Graduate Certificate in Research Skills.

Underpinning our pedagogy is the conceptualisation of a researcher as one who brings to the workplace their talents, their specialised knowledge and experiences, and a suite of generic research skills that underpin their practise (Figure 1). The aim of the Graduate Certificate in Research Skills is to ***prioritise*** the development of the generic research skills and practises required for successful research. This is an acknowledged area of deficit in the scientific workforce of PNG. The research question behind this work posits that the development of these skills will translate into research productivity on ACIAR and other projects across PNG. This research is ongoing.

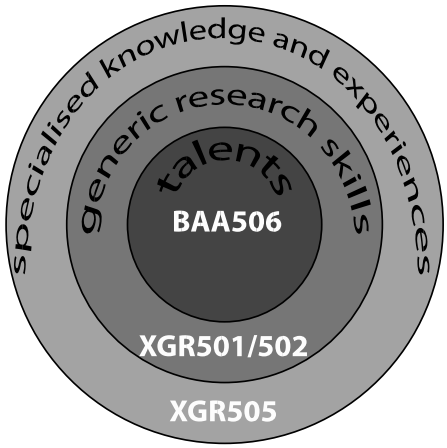

Figure 1: A diagram of research skills and the Graduate Certificate in Research Skills units that address each skills area.

Research Methods, most submissions were made by email directly to teaching staff while in the classroom, which meant that any issues could be dealt with immediately. Only a few assessments needed to be submitted in hard copy (printed out, or in handwriting).

[12] In this project this session is termed the 'Harvard 3-minute' as it has been based on a similar experience of Prof. Janelle Allison while on a course at Harvard Business School.

The design of the certificate allows it to be delivered to researchers in any scientific field, with only the final unit, *Specialised Research Skills*, having content specific to the specialised knowledge and experience of the students. This final unit could be replaced with a unit focussed on a different specialisation (for example, epidemiology) or an additional unit of material related to generic research skills. This could be, for example, a unit on 'Research Methods' and cover experimental design, responsible use of statistics, a deeper coverage of data management, the literature search and, if appropriate, animal and human ethics. It would take minor modifications to adapt this model to research skills in other, non-scientific, fields.

Recommendations:

- The Graduate Certificate in Research Skills be created as an entity separate from the existing Graduate Certificate in Research (X5A) and listed through the Institute for Regional Development.
- That a terrestrial version of the course be marketed to research agencies, aid and government agencies and to large companies working in the Global South, as a vehicle for research personnel development.
- That a course of similar structure and teaching program be developed online and offered as a stand-alone Graduate Certificate for developing industry-based researchers in any area of the world.

Appendix 1: Unit details

To achieve a Graduate Certificate in Research from the University of Tasmania students are required to undertake and pass four units of study at post-graduate level (AQF 8), two core units and two supporting units. The units studied during this project were:

BAA506: Learning Through Practice A (Workplace)
XGR501: Introduction to Higher Degree by Research (core unit)
XGR502: Communicating Research (core unit)
XGR505: Specialised Research Methods

Below are brief summaries of each of the units, taken from the Unit Outlines.

BAA506: Learning Through Practice A (Workplace)

Unit Description

Through a wide range of activities in the workplace, potential post graduate students grow professional skills and capabilities relevant to both leadership and management. The unit seeks to recognise this experience by developing with the student the frameworks and tools to understand how they, as adults, can acknowledge and understand what deeper learning has occurred, what capabilities have been developed, and how these skills and capabilities might be applied.Participation in the unit requires deep reflection on, and articulation of, the skills and knowledge gained through these different learning and life experiences. The unit is designed to foster skills and capacity in:

- Adult learning (approaches and styles).
- Reflective and deliberative practice - as manager and supervisor.
- Awareness of leadership and management approaches and styles. ☐ Building effective organisational and workplace cultures.

Through a number of different learning approaches students are given the opportunity to reflect on their experiences, and to draw from these experiences examples of skills learned and where they have been applied.

Intended Learning Outcomes

1. Have a greater understanding of how your work life and experiences have developed lifelong adult learning skills.
2. Be aware of the significance and impact of your adult learning styles and approaches in the workplace and management activities.
3. Have a framework for identifying and understanding the depth and breadth of different skills, know-how and learning approaches used in the workplace.
4. Have the capacity to reflect on and clearly articulate your skills, how and where your skills were learned and how they can be applied.
5. Have a framework within which to reflect on your own practice (how decisions are made, negotiated and implemented).
6. Ability to research, discuss, reflect and evaluate to produce effective portfolio entries.
7. Feel confident in applying these skills and capabilities in other work settings and locations.

XGR501: Introduction to Higher Degree by Research

Unit Description

Introduction to Higher Degree by Research (for PNG students) will introduce candidates to research practises for use in their workplaces.

Candidates will be introduced to a number of topics including what it means to be a researcher; what it means to be a scientist; research integrity; planning and managing a research project; roles and

responsibilities of members of a research team; best practice in data management and occupational health and safety. The unit will be taught in intensive mode over four days and assessment tasks will focus on meeting key objectives and developing research skills.

Intended Learning Outcomes

1. Design and present a detailed research plan for an extended research project.
2. Demonstrate awareness and understanding of the relevance and importance of occupational health and safety as it applies in your own workplace.
3. Demonstrate an understanding of the social and ethical implications of research and appropriate professional behaviour consistent with the Australian Code for the Responsible Conduct of Research and other relevant guidelines.
4. Find, acquire, evaluate, manage and use research data.
5. Identify, evaluate and implement personal learning strategies.

XGR502: Communicating Research

Unit Description

Communicating research is good scientific practice. It helps the researcher/scientist to articulate their ideas and hypotheses, and to let the wider scientific community know of the research that they are undertaking. It not only helps the researcher/scientist to build on the work of others (or even initiate work in an entirely new field), but it also provides a sound, scholarly basis on which others can build.

Communicating Research (for PNG Students) introduces students to professional and scientific communication by developing an understanding of the *who – what – when – how – why –* of communication. As the students explore these concepts they will develop an appreciation of styles and protocols that can be used to report research findings in reports (formal and informal reporting), in scientific fora (abstracts, conferences and papers), and to the community (lay writing vs technical writing). These concepts will be embedded into a framework of responsible reporting behaviour.

The unit builds on the work of the previous units to encourage students to adopt good communication habits. It will show students how they can share research findings responsibly, and encourage them to seek ways to communicate with wider audiences. The University of Tasmania has several platforms available to their graduates to aid researchers to publish their work, formally and informally, which are available for student use.

Intended Learning Outcomes

1. Demonstrate the ability to convey ideas and information clearly and fluently in appropriate written form.
2. Find, acquire, evaluate, manage and use relevant information in a range of media.
3. Present well-reasoned arguments and ideas, using technology as appropriate.
4. Demonstrate knowledge of ethics and ethical standards in academic writing, and other forms of presentation especially as they pertain to conducting research.
5. Demonstrate the acquisition of research skills that enable candidates to make their own contribution to knowledge.
6. Access, organise and present information clearly and purposefully for a specific audience.

XGR505: Specialised Research Methods

Unit Description

This unit is mandatory for the Graduate Certificate in Research and introduces a range of topics that aim to equip you with the generic skills needed to conduct experimental research.

Intended Learning Outcomes

1. Understand the relevant policies and procedures applicable to higher degree by research candidates enrolled at the University of Tasmania.
2. Develop a hypothesis and design an experiment to answer the hypothesis.
3. Demonstrate integrity in data collection and an understanding of the importance of sampling periods, data accuracy and precision.
4. Demonstrate an ability to effectively manage and manipulate data using Excel.
5. Demonstrate an ability to write concisely and with appropriate levels of detail when preparing a report/paper on research – introduction, methods and materials, results and discussion.
6. Place the results of your research in context.
7. Present a succinct verbal overview of the relevance and impact of your research to an intelligent lay audience.

UNIVERSITY of TASMANIA

ACIAR PROJECT: FIS/2010/055

BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS

IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 7

A condensed Communication Report

A snapshot of a report prepared by Dr Christine Angel for the Final Review Panel

Regular communication was maintained with students and others through Newsletters and a Facebook page.

Summary

Newsletters were emailed to student participants, project leaders, NFA, ACIAR, DFAT and UTAS personnel, and other interested parties. They were also emailed to student supervisors with the exception of a few for whom an email address was not available. The Newsletters, from No. 4 (November 2016), were also uploaded to the ACIAR PNG Facebook site which was created and managed by Christine Angel (UTAS) from 2 November 2016. A copy of all seven Newsletters to date is included here. Also included is a selection of emails received from ACIAR and from students expressing appreciation for receipt of the Newsletter. The latter, in particular, demonstrate that the students engaged well with the Newsletter.

The students also expressed their appreciation of the Newsletter through the Facebook page. The Facebook page is a 'closed group', open to student participants, project leaders, NFA and UTAS personnel, and other interested parties. Membership is by invitation only. Its description is as follows:

> This is a place for students and others to connect, share information and talk about their experiences of the project in an environment of mutual respect. Students, the academic team, NFA and ACIAR staff, and other individuals supporting this program are invited to join this group and participate in a collegial environment.

The site currently has 35 members, most of whom have engaged actively.

We have attached below a selection of four project Newsletters.

NEWSLETTER

FIS/2010/055: ACIAR Capacity Building Research and Project Management Skills in Fisheries Staff in PNG

Dear Colleagues,

We are now into teaching the second cohort of students in the capacity building project. We feel it's timely to give you some insights as to the learnings – both for us and for the participants. We've chosen to do this because we have now commenced the second year of delivery and feel we are in a position to give us some idea of material covered and the stand outs which may have implications for your projects.

I write this as I sit as an observer in Dr Joy Rathjen's unit, XGR501 Introduction to Research, which in effect is designed to have participants think of themselves as scientists. This builds nicely on the first unit of the course, Learning Through Practice (BAA506) which is very much asking the participants to reflect on themselves – their talents, their values, and their management and leadership skills. These two units work well together, and are then followed with more technical input relating to Science Communication and Research Design and Methods.

So what is there to share with you……?

"I now think of myself as a scientist …"

We have experienced some terrific moments where we work with the group to develop and create an awareness of themselves "as scientists". We find that BAA506 is a unit that builds confidence and basic self-awareness. Then, when Joy commences her units by asking them to think about what is a scientist, and finishes the unit by asking them to develop the scientist skill set and to consider in that context where their strengths and weaknesses lie, we see a discernible shift in the way they view themselves. It would be great if you could build on this thinking.

Scientific practice

Alongside a measure of self-awareness and leadership skills, which are the focus of my unit Learning Through Practice, Joy's unit XGR501 really begins to challenge the participants to think about their portfolio of skills that constitute the scientist skill set. Something I enjoy is the way Joy traverses the *landscape of science* (and remember we have in Joy a stem cell scientist extraordinaire and someone deeply committed to science and the joy of good science – excuse the pun). Slowly over the week Joy pieces together the core elements of scientific practice including the data cycle, the importance of Lab books and field notes, the Research Plan (they have to write one), reporting against milestones, integrity, ethics and workplace health and safety. It's like seeing the pieces of a puzzle being fitted together – and it's so interesting watching the "light bulb" come on as the participants – your staff – realise the importance of these matters and how they constitute the practice of being a scientist.

Please encourage your staff who are participating in the course to share with you the **Data Cycle** and the **Templates** they developed for **Report Writing (against milestones**). Encourage them to write the **Research Plan** for your projects. Joy has demonstrated the value of **Lab books and field notes.** And ask your staff to talk about integrity and what makes good science and the importance of experimental design (Joy has a terrific TED talk on this on spurious claims)!

What is the scientist's skill set?

From these activities, at the end of each day, we discuss with the participants the kinds of skills reflected in scientific practice; that is, the skills set for good science. We then ask the participants to self-assess the quality and level of their skills in the context of this portfolio of skills and identify where they might need to address some gaps in their skills.

This is a personal reflection for the participants and we have asked them to use this to identify what kinds of additional professional training they would like. Please respect that this is a selfassessment and thus confidential for the participant.

A bit more about the graduate certificate course - a list of units

Unit One - BAA506 Learning Through Practice A (Workplace)

Through a wide range of activities in the workplace, potential post graduate students grow professional skills and capabilities relevant to both leadership and management. The unit seeks to recognise this experience by developing with the student the frameworks and tools to understand how they, as adults, can acknowledge and understand what deeper learning has occurred, what capabilities have been developed, and how these skills and capabilities might be applied. The unit is designed to foster skills and capacity in: adult learning (approaches and styles); reflective and deliberative practice - as manager and supervisor; awareness of leadership and management approaches and styles; and building effective organisational and workplace cultures.

Unit Two - XGR501 Introduction to Higher Degree by Research

Introduction to Higher Degree by Research introduces candidates to research practices. Candidates are introduced to a range of topics including what it means to be a researcher; what it means to be a scientist; research integrity; planning and managing a research project; roles and responsibilities of members of a research team; moral rights and protecting and commercialising research; data management and occupational health and safety. The unit is taught via an intensive mode over four days and assessment tasks focus on meeting key objectives of a researcher.

Unit Three - XGR502 Communicating Research

Communicating Research (Papua New Guinea) introduces principles of professional communication and scientific communication (including academic writing and broad presentation skills) to industry-based students enrolled through the University of Tasmania. This unit focuses on a range of topics including: managing and reviewing the literature, report writing, appropriate communication styles, presentation skills (presentations for conferences, seminars, discussions and poster presentations), principles of academic writing (developing responsible writing skills, structuring extended writing, technique and writing style and

incorporating the work of other scholars into your writing) and preparing research results for publication.

Unit Four - XGR505 Specialised Research Methods

Specialised research methods aims to equip candidates with the generic skills needed to conduct experimental research. Candidates will be introduced to a range of topics including effective experimental design; collection of data (integrity, precision, accuracy); data processing and analysis; and impact, interpretation and communication of data. The unit will be taught in intensive mode over four days and practical, hands on activities will introduce the essentials of designing, conducting, analysing and communicating an experiment.

Assessment in action

Evaluation of teaching, learning, and assessment processes by the course delivery team during the first year of the project resulted in the early adoption of "assessment in action". Assessment in action is when assessment of learning is incorporated into teaching and learning activities within the classroom. Students complete and submit assignments during, or closely after, the teaching and learning session rather than at a later date. Assessment activities remain at the required academic levels to assist students to successfully attain the unit's intended learning outcomes.

Traditionally, a student attends classes (lectures, seminars and so forth), undertaking activities to guide them through the learning process for that unit. Assessments are for the most part submitted at a later date, allowing the student to have sufficient time for selfdirected research and writing. This method works well within the traditional milieu, particularly when the student has access to resources such as the Internet and adequate research materials. It is also useful in non-oral cultures.

In an oral culture, and when resources are not always readily available post-classroom, the activities for teaching and learning can include provision of those resources and of assessment activities – thus "assessment in action". The student has direct access to research material, but with the additional advantage of the presence of the person leading the teaching and learning process, and of their fellow-students, to aid them in the assessment processes.

Next units and dates

23-26 May 2016: Unit Three - XGR502 Communicating Research

18-21 July 2016: Unit Four - XGR505 Specialised Research Methods

Hold the date – graduation ceremony

A graduation ceremony for Cohorts One and Two is being planned for September 2016. The date will be confirmed as soon as possible.

The final cohort – Cohort Three

In March 2016 we will start the process of calling for Expressions of Interest for Cohort Three. We are planning to start teaching Cohort Three in September 2016.

Best regards, The

Project Team

17 February 2016.

NEWSLETTER NO. 2

FIS/2010/055: ACIAR

Capacity Building Research and Project Management Skills in Fisheries Staff in PNG

Dear Colleagues,

After a successful delivery of XGR501 Introduction to Higher Degree by Research in early February, we are now working towards the next unit, XGR502 Communicating Research, which is due for delivery from Tuesday, 24 May to Friday, 27 May, 2016. Cohort 2 are halfway through their course; the assessment in action is working well and, added to student enthusiasm and hard work, is achieving encouraging results. We are well on track for successful students in Cohorts 1 and 2 to graduate later this year.

UNIT 3: XGR502 COMMUNICATING RESEARCH

Communicating research is good scientific practice. It helps the researcher/scientist to articulate their ideas and hypotheses, and to let the wider scientific community know of the research that they are undertaking. It not only helps the researcher/scientist to build on the work of others (or even initiate work in an entirely new field), but it also provides a sound, scholarly basis on which others can build.

The unit introduces students to professional and scientific communication by developing an understanding of the '***who – what – when – how – why – of communication'***. As the students explore these concepts they will develop an appreciation of styles and protocols that can be used to report research findings in reports (formal and informal reporting), in scientific fora (abstracts, conferences and papers), and to the community (lay writing versus technical writing). These concepts will be embedded into a framework of responsible reporting behaviour.

The unit is integral to the course because there are many facets to research, including:

- Knowing *what* to research.
- Knowing *how to* research.
- Knowing how to *record* the processes and findings.
- Knowing how to *analyse* (interpret) the results of the research.
- Knowing how to *synthesise* (make meaning of) the results.
- ***Knowing how to communicate the results, analysis, and synthesis to others.***

XGR502 builds on the work of the previous units to encourage students to adopt good communication habits. It will show students how they can share research findings responsibly, and encourage them to seek ways to communicate with wider audiences. The University of Tasmania has several platforms to aid researchers to publish their work, formally and informally, which are available to our students.

Supervisor suggestions for papers for student practice at critical thinking

As part of the assessment for the communication unit, Joy asks the students to critically examine a scientific paper and to prepare a short oral presentation, supported by visual aids, to give to the class. Last year she chose a small selection of papers reporting research related to the students' fields of research.

This year Joy is hoping that project managers can help with the selection of the papers. Could you please let her know as soon as possible (joy.rathjen@utas.edu.au) if there are any papers you would like to be included in this activity – there may be a journal article that particularly focuses on the field of study of students in your projects. You do not need to agree or disagree with the contents of the paper – as long as it is peer-reviewed (and not too long) it can give students a chance to practise critiquing, and become familiar with the wealth of information that is available to researchers.

THE FINAL UNIT – 18 TO 21 JULY 2016

Unit Four – XGR505 Specialised Research Methods

This final unit in the course builds upon the understandings and knowledge gained in the first three units. It aims to equip students with the generic skills needed to conduct experimental research. Students are introduced to a range of topics, including effective experimental design; collection of data (integrity, precision, accuracy); data processing and analysis; and impact, interpretation and communication of data. The unit is taught in intensive mode over four days and practical, hands-on activities introduce the essentials of designing, conducting, analysing and communicating an experiment.

THE FINAL COHORT – COHORT THREE

EOIs by Friday, 3 June 2016

We have started the process of calling for Expressions of Interest for the third and final cohort in this project.

Attached to this Newsletter are the required forms: First, the Call for EOI form, to be completed by the intending student and second, the Supervisor form, to be completed by the supervisor of the intending student.

You will note that the completed forms need to be received by us by **Friday, 3 June, 2016**. Delivery of the course to Cohort 3 will commence in September 2016 with the first unit, BAA506 Learning Through Practice A (Workplace).

HOLD THE DATE – GRADUATION CELEBRATION – SEPTEMBER 2016

Plans for our first Graduation celebrations are advancing.

More details will be available following the Annual Coordination Meeting on 23 May.

> Graduation is a formal process at which students who have successfully completed their course requirements are admitted to degrees and awarded diplomas. This usually happens at the end of a course of study at a public ceremony, with the Chancellor presiding, the High Officers and staff attending, and family and friends observing as witnesses to the formalities. The process of graduating should not be confused with course completion. One cannot graduate without completing all course requirements …

From ‘The Process of Graduation’, UTAS Graduation Office, 18 March 2016, http://www.utas.edu.au/graduation/what-is-graduation2

Best regards,

The Project Team

April 2016.

CALL FOR EXPRESSIONS OF INTEREST (EOI)

FIS/2010/055: Building research and project management skills in fisheries staff in PNG **Course commencing September 2016**

Partner Country	Papua New Guinea
Australian Project Leader	Prof Janelle Allison, University of Tasmania
Partner Country Project Leader	Mr Jacob Wani, National Fisheries Authority

Participation in the Graduate Certificate in Research

UTAS and NFA invite staff in NFA and its partners in ACIAR funded projects to submit expressions of interest to enrol in research training – a course offered by the University of Tasmania – the **Graduate Certificate in Research.**

Enrolment is limited to 15 students. Minimum entry requirements include:

☐ an undergraduate degree
OR
☐ at least three 3 years' work experience in projects or work relevant to NFA and related projects.

The due date for Expressions of Interest is COB **Friday 3 June, 2016** (Please see note below).

EOI Application Details

Please submit your EOI to ACIAR.PNG@utas.edu.au ***Please note your EOI should be no more than 2 pages***. ***The DUE DATE to submit your EOI is COB Friday 3 June, 2016.***

In submitting your expression of interest please address the following:

EOI Details (and entry requirements)	**Explanation as to what is required**
1. Name	
2. Contact details	*Please ensure these details are for an email address or postal address that is regularly checked by you.*
3. Qualifications	*Please ensure you include professional development courses as well as any undergraduate degree or other (if relevant).*
4. Relevant work experience	*In this project we **strongly encourage applications from participants who may not have an undergraduate degree but have been involved in the NFA and fisheries projects over a few years**. Work experience is highly valued and your local know how and applied experience are important.*
5. Skills and knowledge you hope to gain from your participation	*Please tell us about your goals and objectives for undertaking this course of study.*
6. Institutional support	*Please confirm that you have institutional support (e.g. time release) to undertake this course of study. Please provide the name and contact details of this person authorising this support (preferably your supervisor.)*

A brief outline of the ACIAR project and the Graduate Certificate in Research is provided overleaf.

Project Outline/Background/Context

Scientific and technical staff in the Papua New Guinea (PNG) National Fisheries Authority (NFA) involved in aquaculture and fisheries have had limited opportunities for program-based research training within their workplace. This research project will explore how to increase effectiveness of training opportunities and link content to ensure that personal development and long-term benefits to the institution are fully realised. The research project has two elements: the training course and evaluation of the impact and effectiveness of this type of training. Specifically, this research project will investigate ways to teach research and project management skills to industry-based research workers. To do this, the project will engage 40-50 National Fisheries Authority (NFA) staff in training over three years.

The training course is titled **Graduate Certificate in Research** and is open to those who are involved in ACIAR and other projects including those in Head Office, in a formal course of study.

The focus of the research of the project is to understand how training of this type will impact on NFA/ACIAR projects.

The following research questions will be addressed:

1. How can effective training in research and project management be delivered to industry-based scientists and technicians in PNG?
2. What are the benefits of integrating research training with workplace activities?
3. Does working towards a formal qualification foster better research?

The research objectives are:

1. to determine research training and project management needs for industry-based scientists and technicians;
2. to design, deliver and validate a formally accredited training program aimed at developing management, workplace and research skills;
3. to evaluate the benefits of staff training to the projects and the institution.

Participation in the research is voluntary. All participants will have the research explained to them and will be asked to sign a consent form to indicate their willingness to participate.

Graduate Certificate

Participation in the training affords an opportunity to obtain formal academic qualifications on successful completion of course and assessments – a Graduate Certificate in Research from the University of Tasmania (UTAS).

If you agree to participate in the research you will be periodically asked to reflect on the value of the training. The focus is on how to develop the most worthwhile and effective training, not any focus on the individual participant.

The training of the Graduate Certificate in Research comprises four (4) units of study that usually will be completed within a 12 month period. Each unit is offered in a 4 day workshop, including assessment activities.

The units and delivery times are:

- **Unit One: Learning Through Practice A (BAA506)** – 13-16 September 2016 (to be confirmed)
- **Unit Two: -Introduction to Higher Degree by Research (XGR501) –** February 2017
- **Unit Three: Communicating Research (XGR502) –** May 2017
- **Unit Four: Specialised Research Methods (XGR505) -** July 2017

Partner Country	Papua New Guinea
Australian Project Leader	Prof Janelle Allison, University of Tasmania
Partner Country Project Leader	Mr Jacob Wani, National Fisheries Authority

Participation in the Graduate Certificate in Research

UTAS and NFA invite staff in NFA and its partners in ACIAR funded projects to submit expressions of interest to enrol in research training – a course offered by the University of Tasmania – the **Graduate Certificate in Research.**

Enrolment is limited to 15 students. Minimum entry requirements include:

- ☐ an undergraduate degree
  OR
- ☐ at least three 3 years' work experience in projects or work relevant to NFA and related projects.

The due date for Expressions of Interest is COB **Friday 3 June, 2016** (Please see note below).

Supervisor Support

As a supervisor for a prospective participant in the Graduate Certificate in Research we require a letter of support from you by ***Friday 3 June, 2016***. In this letter we need:

(1) Verification that you are willing to give the course participant release from work to attend classes and participate in the research and evaluation, and

(2) Details of how participation in the training course is relevant to NFA activities and projects.

Please submit your letter of support ACIAR.PNG@utas.edu.au by ***COB Friday 3 June, 2016***

EOI Details	**Explanation as to what is required**
1. Name	*Please insert your name*
2. Contact details	*Please ensure these details are for an email address or postal address that is regularly checked by you.*
3. Name of prospective course participant	*Please provide the name of the prospective course participant whom you are supporting.*
4. Relevant to project of roles in NFA	*Please provide a brief outline as to how participation in this course by your staff member will be beneficial to the NFA and its projects.*
5. Skills and knowledge you hope to gain from your participation	*Please tell us about the skills you feel will be gained by your staff member participating in the course of study.*
6. Institutional support	*Please confirm your support for your staff member being a course participant and your willingness to provide release time to undertake studies and participation in the research.*

Project Outline/Background/Context

Scientific and technical staff in the Papua New Guinea (PNG) National Fisheries Authority (NFA) involved in aquaculture and fisheries have had limited opportunities for program-based research training within their workplace. This research project will explore how to increase effectiveness of training opportunities and link content to ensure that personal development and long-term benefits to the institution are fully realised. The

research project has two elements: the training course and evaluation of the impact and effectiveness of this type of training. Specifically, this research project will investigate ways to teach research and project management skills to industry-based research workers. To do this, the project will engage 40-50 National Fisheries Authority (NFA) staff in training over three years.

The training course is titled **Graduate Certificate in Research** and is open to those who are involved in ACIAR and other projects including those in Head Office, in a formal course of study.

The focus of the research of the project is to understand how training of this type will impact on NFA/ACIAR projects.

The following research questions will be addressed.

4. How can effective training in research and project management be delivered to industry-based scientists and technicians in PNG?
5. What are the benefits of integrating research training with workplace activities?
6. Does working towards a formal qualification foster better research?

The research objectives are:

4. to determine research training and project management needs for industry-based scientists and technicians;
5. to design, deliver and validate a formally accredited training program aimed at developing management, workplace and research skills;
6. to evaluate the benefits of staff training to the projects and the institution.

Participation in the research is voluntary. All participants will have the research explained to them and will be asked to sign a consent form to indicate their willingness to participate.

Graduate Certificate

Participation in the training affords an opportunity to obtain formal academic qualifications on successful completion of course and assessments – a Graduate Certificate in Research from the University of Tasmania (UTAS).

If you agree to participate in the research you will be periodically asked to reflect on the value of the training. The focus is on how to develop the most worthwhile and effective training, not any focus on the individual participant.

The training of the Graduate Certificate in Research comprises four units of study that usually will be completed within a 12 month period.

The units and delivery times are:

- **Unit One: Learning Through Practice A (BAA506)** – 13-16 September 2016 (to be confirmed)
- **Unit Two: -Introduction to Higher Degree by Research (XGR501) –** February 2017
- **Unit Three: Communicating Research (XGR502) –** May 2017
- **Unit Four: Specialised Research Methods (XGR505) -** July 2017

NEWSLETTER NO. 5

FIS/2010/055: ACIAR
Capacity Building Research and Project Management Skills in Fisheries Staff in PNG

Dear Colleagues,

The last couple of months have been exciting ones for the team and for our students. Not only did seventeen of our cohorts one and two students graduate, but another twenty started on the journey to their certificate.

OUR FIRST GRADUATES

Seventeen students from the first two cohorts graduated on 6 December 2016 with their Graduate Certificate in Research. Although protocols meant that the names of the seventeen graduates were not read out during the ceremony (because they graduated *in absentia* – in other words, they could not be present in Burnie for the occasion), their names did appear in the graduation booklet. Here is a copy of page 6:

GRADUATE RESEARCH — Tuesday, 6 December 2016

PROFESSOR CLIVE BALDOCK, BSc(Hons) *Suss*, MSc *Lond*, MTEM *Melb*, PhD *Lond*, FACPSEM, FAIP, FIPESM, FInstP, Dean of Graduate Research, will present the graduates.

GRADUATE CERTIFICATE IN RESEARCH
Cornelius **Aiyapi**
Joe **Alois**
Dave **Anan**
Micah **Aranka**
Justine **Bongne**
Jennifer Diana **Evans**
Robert **Kenove**
Billy **Kerowa**
Angela Orama **Kwapena**
Esther Caroline **Leini**
Rickson **Lis**
Ian Molika **Liviko**
Kevin **Namba**
Gideon **Pama**
Lina Ynnaha **Pandihau**
Tamieka Lee **Pearce**
Benthly **Sabub**
Ellison **Semi**
Rosyntha **Zebilong**

GRADUATION CELEBRATION – MONDAY, 20 FEBRUARY 2017

We will be celebrating with our seventeen graduates in person (and not *in absentia*!) and with Tony Umba, who will receive a Certificate of Completion, on Monday, 20 February 2017 at the Stanley Hotel, Sir John Guise Drive, Port Moresby at 2pm. This will be a solemn but exciting and enjoyable occasion, for the graduates, for their families, friends, and colleagues, and for our team. Our next newsletter should hold a few photos!

UNIT 1: BAA506 LEARNING THROUGH PRACTICE A (WORKPLACE)

Twenty keen students in the third cohort undertook their first unit at the Ela Beach Hotel from Monday, 21 November to Thursday, 24 November, 2016, with Janelle Allison and Christine Angel. Between introduction to theories on adult learning and leadership, in-class activities, and assessments, for many of the students this was the first taste of intensive, post-graduate academic life. Despite a few hiccups with technology, and with the help of the goodwill of the students, the good assistance of Jacob Wani, and the good refreshments provided by the hotel, the unit ran most successfully and enjoyably. A warm welcome made Christine's first visit to PNG (indeed, first trip out of Australia) a real pleasure.

Photo taken Thursday, 24 November 2016 by Dr Kiros Hiruy

Back L-R:	Nicholas Daniels - Arthur Roberts – Christine Angel – Janelle Allison – Jacob Wani – Sai Ugufa – Kenneth Kumul
Middle L-R:	Richard Tangudal – Venna Pokana (slightly to front) – Lorel Dandava-Oli – Luanah Yaman – Georgina Bernard – William Nano – Joshua Noiney – Sharon Maiseveni – Francis Gove – Matilda Pahina – Sylvester Kulang
Front L-R:	Philomena Sinkau – Esther Karahure – Mark Winai – Bonny Koke – Maima Sine

We have had the sad news that our student Luanah Yaman passed away on Monday, 23 January 2017. Our sympathies go out to Luanah's family, friends and co-workers.

UNIT 2: XGR501 INTRODUCTION TO HIGHER DEGREE BY RESEARCH

When: Tuesday, 21 February to Friday, 24 February, 2017

Where: Stanley Hotel, Sir John Guise Drive, Port Moresby

Introduction to Higher Degree by Research introduces students to research practices for use in the workplace. Students are introduced to a range of topics including what it means to be a researcher; what it means to be a scientist; research integrity; planning and managing a research project; roles and responsibilities of members of a research team; moral rights and protecting and commercialising research; data management and occupational health and safety. The unit is taught in intensive mode over four days and assessment tasks focus on meeting key objectives of a researcher, and developing research skills.

Introducing the unit delivery team:

Joy

Christine

FACEBOOK

Just a reminder that we now have a Facebook page. Here is the link to request membership of the group: https://www.facebook.com/groups/1885751018320629/

This is a place for students and others to connect, share information and talk about their experiences of the project in an environment of mutual respect. Students, the academic team, NFA and ACIAR staff, and other individuals supporting this program are invited to join this group and participate in a collegial environment.

A couple of requests, please:

- If your Facebook name is different from your usual name, please let us know by email who you are: Christine.Angel@utas.edu.au
- If you suggest to a colleague that they might like to join the group, and they are not on our Newsletter list, perhaps you could notify us of that, too.

That way we will know who you/they are and be able to accept you/them into the group.

2017 TIMETABLE

The timetable for the year is as follows:

Mon 20 Feb 2017	Graduation celebration
Tue 21 to Fri 24 Feb 2017	XGR501 Introduction to Higher Degree by Research
Mon 15 to Thu 18 May 2017	XGR502 Communicating Research
July 2017 (dates to be advised)	XGR505 Specialised Research Methods

Best regards,

The Project Team

February 2017

NEWSLETTER NO. 6

FIS/2010/055: ACIAR

Capacity Building Research and Project Management Skills

in Fisheries Staff in PNG

Dear Colleagues,

It has been an interesting and exciting few months since our last Newsletter. We have not only held a celebration for our graduates from the first and second cohorts of students, but have delivered two more units to our third cohort. The final unit will be delivered to the third cohort later in August. It is hoped that these students will graduate in December 2017. More on this at a later date.

GRADUATION CELEBRATION – MONDAY, 20 FEBRUARY 2017

It was indeed a proud and inspiring day for the graduates and their family and friends, the teaching staff, representatives of NFA, ACIAR, and UTAS, and Cohort 3 students who had

arrived for delivery of XGR501. Among the approximately eighty people who attended were NFA Managing Director John Kasu; the Australian High Commissioner, His Excellency Bruce Davis; and the Deputy Vice-Chancellor (Research) of UTAS, Professor Brigid Heywood. The speeches were uplifting and focused on the graduating participants and their future careers as scientists. The graduates received their testamurs (legal proof of university qualification) or certificate to the click and flash of dozens of cameras, including local television and newspapers. The relaxed afternoon tea that followed allowed all to mingle and share experiences.

Here again is the list of those who received their Graduate Certificate in Research, as shown in the formal UTAS graduation booklet:

GRADUATE CERTIFICATE IN RESEARCH

Cornelius **Aiyapi**
Joe **Alois**
Dave **Anan**
Micah **Aranka**
Justine **Bongne**
Jennifer Diana **Evans**
Robert **Kenove**
Billy **Kerowa**
Angela Orama **Kwapena**
Esther Caroline **Leini**
Rickson **Lis**
Ian Molika **Liviko**
Kevin **Namba**
Gideon **Pama**
Lina Ynnaha **Pandihau**
Tamieka Lee **Pearce**
Benthly **Sabub**
Ellison **Semi**
Rosyntha **Zebilong**

UNIT 2: XGR501 INTRODUCTION TO HIGHER DEGREE BY RESEARCH

Listening intently

XGR501 was delivered to Cohort 3 by Dr Joy Rathjen, assisted by Dr Christine Angel, over four days from Tuesday, 21 February to Friday, 24 February, 2017 at the Stanley Hotel, Port Moresby. Students were introduced to research practices for use in the workplace. They acquired a deeper

understanding of what it means to be a scientist and researcher, including the importance of research integrity and ethics; how to plan and manage research projects; their rights and responsibilities as members of a research team; and occupational health and safety.

UNIT 3: XGR502 COMMUNICATING RESEARCH

The third unit in the course was delivered to Cohort 3, over four days, from Monday 15 May to Thursday 18 May 2017 at the Crowne Plaza Hotel, Port Moresby. Unfortunately Joy was unwell, and unable to travel to deliver the unit. We were fortunate enough to obtain a last-minute replacement in Dr Stephen Ives, who stepped in and delivered the unit, assisted by Christine. In this unit, students learned more about good scientific practice in communicating research, including their communication networks; communicating in clear (plain) language; and how to analyse other peoples' research findings and present the key messages through a PowerPoint presentation.

UNIT 4: XGR505 SPECIALISED RESEARCH METHODS

The final unit in the course (and in this project), XGR505 Specialised Research Methods, will be delivered later this month. Here are the details:

Dates:	Monday 28 to Thursday 31 August, 2017
Place:	Stanley Hotel, Port Moresby
Teaching staff:	Dr Stephen Ives and Dr Bikram Ghosh

Stephen

Bikram

This final unit builds upon the understandings and knowledge gained in the first three units. It aims to equip students with the generic skills needed to conduct experimental research. Students are introduced to a range of topics, including effective experimental design; collection of data (integrity, precision, accuracy); data processing and analysis; and impact, interpretation and communication of data. The unit is taught in intensive mode over four days and practical, hands-on activities introduce the essentials of designing, conducting, analysing and communicating an experiment.

INTERVIEWS

This project was designed not only to assist young fisheries scientists to increase their skills in research, but to discover how much positive effect such up-skilling might have in the workplace. To this end, Dr Kiros Hiruy has the pleasant task of interviewing students and their study supervisors at various points along the way, before, during, and after the delivery of the course. As we come closer to the conclusion of the project, Kiros will be ringing students and supervisors to ask for their input. Some of you may already have been contacted – others will be contacted over the next few months. We take this opportunity of thanking all those who have assisted Kiros in the past, and those who will continue to help him in the future.

HOLD THE DATE – GRADUATION CELEBRATION – 12 DECEMBER 2017

We are investigating the possibility of holding the graduation celebration for the final cohort on Tuesday, 12 December 2017, video-linked through to the actual ceremony in Burnie, Tasmania. If processes, protocols and technologies allow this, which we hope they do, this will mean that our graduands will receive their testamurs on the day their Graduate Certificates in Research are awarded.

We will keep you informed.

FACEBOOK

Here is the link to request membership of the group:

https://www.facebook.com/groups/1885751018320629/

This is a place for students and others to connect, share information and talk about their experiences of the project in an environment of mutual respect. Students, the academic team, NFA and ACIAR staff, and other individuals supporting this program are invited to join this group and participate in a collegial environment.

- If your Facebook name is different from your usual name, please let us know this by emailing Christine: Christine.Angel@utas.edu.au
- If you suggest to a colleague that they might like to join the group, perhaps you could notify us of that, too.

That way we will know who the person is who is asking to join, and we won't inadvertently block someone who should be part of the group.

Best regards,

The Project Team

1 August 2017

UNIVERSITY of TASMANIA

ACIAR PROJECT: FIS/2010/0-55: BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS IN FISHERIES STAFF IN PAPUA NEW GUINEA

FINAL REPORT

Appendix 8: Mid-Term Review Report prepared by Dr Geoff Allan and Mr Augustine Mobiha

Mid-Term Review of FIS/2010/055

Project number:	FIS/2010/055
Project title:	Building research and project management skills in fisheries staff in Papua New Guinea
Project leaders:	Professor Janelle Allison
Commissioned Organisation:	The University of Tasmania
Country:	PNG
Project start date and duration:	Project launch Feb 2014

Table 1. Personnel

Countries involved	Institution	Personnel*
PNG	The National Fisheries Authority	Mr Jacob Wani Mr Peter Minumulu** Mr Jeff Kinch** Mr Ovia Tarube Mr Ludwig Kumoru** Mr Leban Gisawa Ms Luanah Yaman
Australia	The University of Tasmania	Professor Janelle Allison Dr Joy Rathjen Professor Peter Frappell
	RDS Partners – engaged under contract	Dr Kiros Hiruy Dr Tom Lewis Ms Maree Fudge

*Provided from Personnel Table of the Project Document and post-launch reports.
**Personnel have played little or no role in project to date.

Review team members:

Name: Dr Geoff Allan Contact: Geoff.allan@dpi.nsw.gov.au
Name: Augustine Mobiha Contact:Augustine.malboujup@gmail.com

Dates of review (in-country): 21-29 May 2016 (see Appendix I for itinerary)

Methodology/approach adopted for review:

Reviewed project documentation, joined project coordination meeting and participated in active discussion (Port Moresby - 23 May 2016), interviewed project leaders, ACIAR managers and some students.

Documentation reviewed:

- Project document
- Agenda - Project launch and inception meeting (18/02/2014)
- Report – Trip report 17-20/02/2014
- Report – Trip report 3-7/08/2014
- Report – Trip report 5-10/10/2014
- Report – Trip report 31/01-05/02/2015
- Report – Trip report 08-12/03/2015
- Report - Trip report 28-30/07/2015
- Report – Trip report 24-27/08/2015
- Report – Annual coordination report 2014
- Report – Annual coordination report 2015
- Annual report May 2014
- Annual report July 2015
- Report – Final evaluation report February 2016 (includes evaluation framework)
- Newsletter #1 February 2016
- Newsletter #2 April 2016
- List of materials provided on USB for students (course outlines)
    - BAA506 Learning through practice
    - XGR502 Communicating research
    - XGR505 Specialised research methods
    - XGR501 Introduction to higher degrees by research

The review team joined the annual coordination meeting on 23 May 2016

The project coordination meeting was run as a free-flowing conversation and used to discuss the projects, potential ways to improve outcomes and to address perceived shortcomings. The following people participated:

- Professor Janelle Allison (UTAS)
- Dr Joy Rathjen (UTAS)
- Dr Kiros Hiruy (RDS)
- Jacob Wani (NFA)
- A/Prof Jes Sammut (ACIAR)
- Lachlan Dennis (ACIAR)
- Rebecca Bogosia (ACIAR Country Office)
- Augustine Mobiha (Reviewer)
- Dr Geoff Allan (Reviewer)

Interviews:

The review team formally interviewed a number of people. Key questions were: 1) What has been working well? 2) How has the project made a difference? 3) What can be improved? 4) How have the relationships worked and how could they be improved?

The following people have been interviewed:

- Janelle Allison
- Joy Rathjen
- Jacob Wani
- Jes Sammut
- Kiros Hiruy

- John Kasu (MD NFA)
- Grace Bayak (Manager Corporate Services NFA)
- Ovia Tarube (Manager HR, NFA)
- Luanah Yaman (NFA)
- Brian Kumasi (NFA – Student 1st cohort)
- Bentley Sabub (NFA – Student 1st cohort)
- Havini Vira (NFA/ACIAR)

1. Background

Scientific and technical staff members in PNG generally commence their employment in aquaculture and fisheries with limited research qualifications and skills, and with limited opportunities for program-based training within the department, especially for research. Subsequent training may be so tightly linked to the activities of specific projects that long-term institutional benefits and personal development are not fully realised.

This project aims to develop and test a capacity building program for up to 45-50 fisheries researchers and technicians. The research focus of the project is to evaluate the methodology employed to deliver both direct benefits to participants and spillovers to the broader stakeholder community.

In parallel with the research objectives, this project also plans to build capacity in course participants and offer an opportunity to obtain formal academic qualifications. The degree of capacity change is proposed as a measure of the effectiveness of the methods under investigation.

The following research questions are being addressed:

1. How can effective research and project management training be delivered to local scientists and technicians?
2. What are the benefits of integrating research training with workplace practices (i.e. in current projects) and participatory approaches?
3. Does working towards a formal qualification facilitate the capacity building process?

The research objectives are:

1. To determine research training and project management needs for scientists and technicians;
2. To design, deliver and validate a formally accredited training program integrating participatory approaches with research skills;
3. To evaluate the benefits of integrated capacity building to stakeholders of the research process;
4. To identify better management strategies to embed integrated capacity building in development of the local scientific workforce in fisheries in PNG.

3. Review Executive Summary and Recommendations

FIS 2010/055 is a four year project currently due for completion December 2018. A mid-year review was scheduled to review progress and recommend ways the project can be improved.

The review team comprised Dr Geoff Allan (Australia) and Augustine Mobiha (ex-PNG). The team reviewed all project documents and reports, participated in a full-day project meeting, observed elements of a training unit and interviewed a range of project team members, students and NFA staff.

The need for the project is apparent and the original justification sound. This project aims to develop and test a capacity building program for up to 45-50 fisheries researchers and technicians. The formal qualification chosen by the project team, Graduate Certificate, was the appropriate qualification given the range of qualifications among students prior to the training.

The Units adapted to PNG are consistent in terms of content with those delivered in Tasmania although changes to improve the training outcomes in PNG have been adopted. Changes include conducting assessment when students are present with the trainers ("assessment in action") and increased tutorial assistance. The Project Leader and project staff from UTAS consider this new approach, taken in PNG, an improvement that could also benefit students from Tasmania.

The contents and training delivery have been of a high standard and positive, effective relationships have been developed with students. The UTAS team in particular deserve recognition for this achievement.

The expectations of the PNG Project coordinator were initially higher than the Graduate Certificate although he now recognises that his expectations were unrealistic. Similarly, some of the students were hoping the training would provide a higher qualification.

It is recommended that the project team produce a "pathways to learning" document that clearly articulates the qualifications from certificate level to PhD, the qualifications required to enrol and successfully complete each level, and the capacity expected on completion of each level. This document will assist NFA (and others in PNG) with workforce planning and help ensure expectations from senior managers and more junior staff are aligned with Australian educational standards. Additional outputs to assist NFA with workforce planning, particularly organisational training needs, and to help NFA develop a Performance Management Framework for staff that builds on lessons from the student evaluations, are recommended to help deliver outcomes from the project. Note that NFA has specifically requested the written advice on work force planning, as it would like to develop a plan for training needs for staff.

Recommendation 1: Produce a "pathways to learning" document (new output).

Recommendation 2: Produce explicit written advice to NFA to assist with workforce planning (new output).

Recommendation 3: Assist NFA to develop a Performance Management Framework for staff including but not limited to students (new output).

Unfortunately, the relationship between UTAS and NFA has not developed and this will impede delivery of project outcomes and benefits unless it is addressed as an urgent priority.

This issue has been compounded by the priority given to developing the training component (justified) and the lack of involvement of NFA in student management due to restrictions imposed by the ethics approval obtained through UTAS. It has been further exacerbated by the fact that the UTAS team have had little opportunity to understand the context within which NFA managers and students, and indeed all potential beneficiaries of future training, work and live. Effective communication with ACIAR PLs and PNG Coordinators for other Projects in PNG has also been limited and needs to be improved.

Recommendation 4: Project team give urgent priority to building effective, collaborative relationships with NFA, and to improving their understanding of PNG culture, as it influences the project, and to engaging more effectively with other ACIAR project PLs for PNG.

Communications are often problematic within PNG and this project has experienced significant problems. Email communications have often not reached their destination, sometimes due to IT viruses preventing delivery. In addition, NFA managers have requested more advanced planning and notification of training dates so they can better align field work so staff do not miss course units. The recent project newsletters (1st edition Feb 2016, 2nd edition April 2016) were well received and they should be disseminated more widely. The construction of a project Facebook page is recommended.

Recommendation 5: Project team to increase efforts to ensure email communication is received, including by copying NFA Corporate Services Manager in communications as well as the PNG project coordinator, and working more closely with ACIAR PNG Coordinator (A. Prof Jes Sammut) and ACIAR Country Office to strengthen communication.

Recommendation 6: Disseminate newsletter more widely and construct and maintain a project Facebook page.

The research focus of the project is to evaluate the methodology employed to deliver both direct benefits to participants and spill-overs to the broader stakeholder community. This project also plans to build capacity and offer an opportunity for participants to obtain formal academic qualifications. The degree of capacity change is proposed as a measure.

To date, the research component has included development of an evaluation framework that summarises research methodology. This has been developed by the UTAS project team but will rely on data collected by a collaborator, RDS Partners. Methodology appears appropriate although until it has been tested using project data this remains largely unknown.

The Project Leader, Professor Janelle Allison, signalled to the team that she is likely to have to reduce her contribution to the project because of new directions her career is taking. While the delivery of training is unlikely to be affected, there is a higher risk that delivery of planned research outputs and outcomes will not be fully realised. It is recommended that ACIAR work with UTAS (and RDS Partners) to expand RDS Partners' role beyond just collecting data to producing research outputs. It may be necessary to identify a new Project Leader or someone (ideally from among the project team) who can increase their contribution

to take on a more leadership role. It is recommended that this potential setback be used as an opportunity to increase the focus on the research and relationship building.

Recommendation 7: ACIAR work with UTAS to expand the role of RDS Partners to analyse data and produce research outputs.

Recommendation 8: Due to the announcement by the Project Leader that she is likely to have to reduce her role in the project, ACIAR should work with the Project team to replace or augment her contribution, with a focus on research and relationship building.

Project activities scheduled for this stage of the project are a little behind schedule and warrant a six-month extension. All should then be achieved. Some changes to the training methodology, carrying out assessments during class time ("assessment in action") and supplying additional classroom tutorial assistance, warrant consideration of additional budget, or reallocation of existing funds. If recommendations 1, 2, 3 & 6 are accepted, additional budget support is warranted.

Recommendation 9: Extend finishing date by six months to July 2019.

Recommendation 10: Increase budget support to deliver on review recommendations 1, 2, 3 & 6.

Table 2: List of recommendations.

FOR ACIAR	**FOR PROJECT LEADERS**
Rec 7: ACIAR work with UTAS to expand the role of RDS Partners to analyse data and produce research outputs.	Rec 1: Produce a "pathways to learning" document (new output).
Rec 8: Due to announcement by the Project Leader that she is likely to have to reduce her role in the project, ACIAR should work with the Project team to replace or augment her contribution, with a focus on research and relationship building	Rec 2: Produce explicit written advice to NFA to assist with workforce planning (new output).
Rec 9: Extend finishing date by six months to July 2019.	Rec 3: Assist NFA to develop a Performance Management Framework for staff including but not limited to students (new output).
Rec 10: Increase budget support to deliver on review recommendations 1, 2, 3 & 6.	Rec 4: Give urgent priority to building effective, collaborative relationships with NFA, to improving their understanding of PNG culture, as it influences the project, and to engaging more effectively with other ACIAR project PLs for PNG.
	Rec 5: Increase efforts to ensure email communication is received, including by including NFA Corporate Services Manager in communications as well as the PNG project coordinator, and working more closely with ACIAR PNG Coordinator

	(A/Prof Jes Sammut) and ACIAR Country Office to strengthen communication.
	Rec 6: Disseminate newsletter more widely and construct and maintain a project Facebook page

Section 4: Project outputs and project specific issues (Yr1, m1 = Jan 2014)

Objective 1: To determine research training and project management needs for scientists and technicians.

Overall output: *Profile of skills needs and gaps in local project staff capacity and capabilities*

Activities: Objective 1	Outputs/ milestones	Due date of outputs / milestones	Status report	Comments
1.1: Interview ACIAR Fisheries project leaders and NFA managers to identify skills needs and gaps	Initial report on skills needs and gaps	Y1, m6	1.1 Not complete (needs to be documented).	1.1: Skills and Needs Gaps Report. Informally addressed through summary of needs identified by ACIAR rpm and Jes Sammut, ACIAR PLs, NFA Project leader from PNG (Jacob Wani). Supported by exercise in Unit BAA506 "where are we now" that students from PNG complete allowing comparison with global standard. Formal analysis needs to be documented.

Activities: Objective 1	**Outputs/ milestones**	**Due date of outputs / milestones**	**Status report**	**Comments**
1.2: Desktop analysis of current in-house project training and professional development programs for capacity building.	Understanding of current activities and programs; Profile of skills needs and gaps in local project staff capacity and capabilities within NFA.	Yr 1, m6	1.2 Not completed.	1.2: Training needs assessment should be undertaken by NFA – to be made available to Project team. Recommend involving Grace Bayak (Manager Corporate Services, NFA) with support from Jes Sammut. Recommend Project team develop "pathways to learning" document, and document to assist NFA with workforce planning and Performance Management Framework. For NFA staff.
1.3 Participants will be asked as part of their activities in the first unit to reflect on current research skills and capabilities as a critical part of reflective practice in the unit of study.	Profile of individual skills needs and gaps in local project staff capacity and capabilities within NFA for feedback into the planning of forthcoming materials and learning activities.	Yr 1, m71.3	1.3 Complete	1.3: Completed. Included as component of Unit BAA506: o Reporting on a Significant Moment: Postcard (data collection) o Experiential Report: Research and data collection o Learning Portfolio – comprised of a matrix, a mind map and an essay plan (Interrogation of Examination of the data). Findings from first cohort, first unit have shaped all subsequent units and assessment (e.g. Adjustment to format of assessment). Moreover, class time has been extended by one day for each unit.

Objective 2: To design, deliver and validate a formally accredited training program integrating participatory approaches with research skills

Activities: Objective 2	**Outputs/ milestones**	**Due date of outputs / milestone**	**Status report**	**Comments**
2.1: Design and develop 4 Integrated Capability Building Program (ICBP) units - for each of two programs	Design all units to be delivered in Year 1	Y1, m7.	2.1 Achieved.	2.1 Completed for one program (always the intention, some mistake in wording for objective 2.1 indicating "…. For two programs"). Program design described - see Unit Outlines. Kept unit outline as for other UTAS Grad Cert products but changed all delivery to face-to-face, changed assessment process ("assessment in action"), adapted course content to PNG context through use of relevant examples, used exercises relevant to PNG. Entry criteria similar for other UTAS Grad Cert students and progress by PNG students compares well with other students from Tasmania.
2.2: Select participants for ICBP cohorts	Each cohort of participants selected	Y1, m7; Y2, m4; Y3, m4.	2.2 Delayed. Revised milestones as follows: Y1, m8; Y2, m12; Y3, m8.	2.2 Complete for cohorts 1& 2 • Cohort One – participants selected and teaching started August 2014 (Y1,m8) • Cohort Two – participants selected and started November 2015 • Cohort Three – call for EOIS completed to close June 2016. Propose to start first Unit in Sep 2016.

Activities: Objective 2	**Outputs/ milestones**	**Due date of outputs / milestone**	**Status report**	**Comments**
2.3: Deliver all units to ICBP cohort.	Each year's training completed	Y1, m12; Y2, m12 Y3, m12	2.3 Delayed. Revised milestones as follows: Y2, m7; Y3, m7 Y3, m7	2.3 • Cohort One completed. Units delivered as follows: BAA 506 – August 2014 XGR 501 – November 2014 XGR 502 – February 2015 XGR 505 - July 2014 • Cohort Two – started as follows: BAA 506 – August 2015 XGR 501 – February 2016 XGR 502 – Planned for May 2016 XGR 505 – Planned for July 2016
2.4: Review all units for the Integrated Capability Building program (ICBP) based on first year evaluations	Design for all units to be delivered in Year 2	Y2, m2; Y3, m2.	2.4 Delayed. Revised milestones as follows: Y2, m 8-9; Y3, m8. .	2.4 Completed. Design was updated as follows: • Assessment altered to Active Assessment • Tutorial Online support if needed (Year 1) • Tutorial Support • Changes to unit outlines to reflect learning • Extended intensive mode by one day

Activities: Objective 2	**Outputs/ milestones**	**Due date of outputs / milestone**	**Status report**	**Comments**
2.5: Prepare report and publications.	Report and publications regarding outcomes and learnings from the three years' training	Y4, m12.	2.5 On track but outputs will be improved if 6 m extension granted.	2.5 Interim skills update based on learnings midway through project Ongoing reporting recommended: 1. Skills analysis, 2. Existing activities & programs (Obj 1.2) 3. Pathways for training to allow students and managers to understand study/learning requirements to achieve at different levels p to PhD.

Objective 3: To evaluate the benefits of integrated capacity building to stakeholders of the research process

Activities: Objective 3	Outputs/ milestones	Due date of outputs / milestones	Status report	Comments
3.1: Design/refine evaluation program in consultation with NFA staff	Initial evaluation criteria and process Impact indicator matrix	Y1, m4; Y2, m4; Y3, m4. .	Milestone Y1, m4 achieved. Remainder delayed as follows: Y2, m7; Y3, m4	3.1 Research Methodology Framework developed by Project Team Involves three parts: 1. **Student evaluation** framework including applications/ commencement interviews, exit interviews (on completion of program), and at yearly intervals after completion (0,1&2 yrs for cohorts 3,2 & 1 in that order). Also includes internal evaluation by UTAS team based on ongoing student feedback. Design, delivery and completion of course by students meets research question #1' additional evaluation data collected to address this research question. 2. **Practice Change –** Research methods designed to address project research questions 2 & 3) Research Assessment survey instruments delivered by RDS Partners 3. **Overall evaluation** (research assessment) to understand success of project to address research objectives – RDS Partners also provided a verbal overview.

Activities: Objective 3	**Outputs/ milestones**	**Due date of outputs / milestones**	**Status report**	**Comments**
3.2: Conduct end- and post-course evaluation with each cohort	End-of-year evaluation of each course in line with evaluation criteria and process; Evaluation of previous cohort/s' practice change in line with evaluation criteria and process.	Y1, m12; Y2, m12; Y3, m12; Y4, m8.	3.2 Delayed by approximately 6 months due to delays in delivering Objective 2.	3.2 Interview data collected but will not be analysed until completion of all courses.
3.3: Conduct impact evaluation with external stakeholders	Evaluation of practice change and external impact in line with evaluation criteria and process	Y2, m12; Y3, m12; Y4, m8.	3.3 Delayed by approximately 6 months due to delays in delivering Objective 2.	3.3 Practice change by students not yet formally evaluated. One NFA leader (HV) has recognised practice improvements by students from cohort 1.
3.4: Prepare and circulate report on findings and recommendations including publications	Report and publications regarding outcomes and learnings from each years' training	Y1, m12; Y2, m12; Y3, m12; Y4, m12.	3.4 Delayed by approximately 6 months due to delays in delivering Objective 2.	Annual and Trip reports completed Some data collected for future evaluation. Report on internal team reflections Research reports documenting learnings from courses will be prepared when 2 cohorts completed.

Objective 4: To identify better management strategies for embedding integrated capacity building in development of the local scientific workforce in fisheries in PNG

Activities: Objective 1	**Outputs/ milestones**	**Due date of outputs / milestones**	**Status report**	**Comments**
1.1: Interview ACIAR Fisheries project leaders and NFA managers to identify skills needs and gaps	Initial report on skills needs and gaps	Y1, m6	1.1 Not complete (needs to be documented).	1.1: Skills and Needs Gaps Report. Informally addressed through summary of needs identified by ACIAR rpm and Jes Sammut, ACIAR PLs, NFA Project leader from PNG (Jacob Wani). Supported by exercise in Unit BAA506 "where are we now" that students from PNG complete allowing comparison with global standard. Formal analysis needs to be documented.
1.2: Desktop analysis of current in-house project training and professional development programs for capacity building.	Understanding of current activities and programs; Profile of skills needs and gaps in local project staff capacity and capabilities within NFA.	Yr 1, m6	1.2 Not completed.	1.2: Training needs assessment should be undertaken by NFA – to be made available to Project team. Recommend involving Grace Bayak (Manager Corporate Services, NFA) with support from Jes Sammut. Recommend Project team develop "pathways to learning" document, and document to assist NFA with workforce planning and Performance Management Framework. For NFA staff.

Activities: Objective 1	Outputs/ milestones	Due date of outputs / milestones	Status report	Comments
1.3 Participants will be asked as part of their activities in the first unit to reflect on current research skills and capabilities as a critical part of reflective practice in the unit of study.	Profile of individual skills needs and gaps in local project staff capacity and capabilities within NFA for feedback into the planning of forthcoming materials and learning activities.	Yr 1, m71.3	1.3 Complete	1.3: Completed. Included as component of Unit BAA506: o Reporting on a Significant Moment: Postcard (data collection) o Experiential Report: Research and data collection o Learning Portfolio – comprised of a matrix, a mind map and an essay plan (Interrogation of Examination of the data). Findings from first cohort, first unit have shaped all subsequent units and assessment (e.g. Adjustment to format of assessment). Moreover, class time has been extended by one day for each unit.

Section 5: Project Evaluation

In completing the following table, the reviewers are requested to synthesise the information listed in the Project Outputs table (Section 4); quantitative evidence from reviews, reports, etc; as well as qualitative information from interviews, case studies and the like. The first four questions (Group A) relate to the specific outcomes of the project. The next six (Group B) concern best practice and longer term impact. The final two (Group C) are specifically for ACIAR's learning processes. Be sure to include where appropriate the recommendations that are listed in the Executive Summary.

As this is a mid-term review, many of the comments below will be of a preliminary nature. Scoring may be as much or more related to the trajectory of the project than as against the achievements to date.

The scoring for Groups A and B is defined using the following evaluation system:

Satisfactory		Less than satisfactory	
6	**Exceptional quality** Equal to or greater than 90%. Beyond normal project expectations; an example of a project team delivering significantly more than anticipated at the time of project design.	**2**	**Less than adequate quality** Project did not deliver on several areas of core expectations. Reviewers consider that, given the circumstances of the project, outputs and outcomes should have been at a higher level.
5	**High quality** 80-89% performance. Overall very good work, with virtually all outputs achieved, although possibly some minor gaps that could have been closed. Strong, positive cooperation across the entire project team.	**1**	**Poor quality** Unacceptable performance, even after consideration of all mitigating factors.
4	**Good quality** 65-79%. Performance quite good. Project team has delivered on the majority of the activities, with valid justifications for those not achieved.		
3	**Adequate quality** 50-64%. Some areas of core expectations probably not achieved, although factors, external or outside of the control of the project team, may have been responsible.		

A – Specific activities and outcomes of the project		
A1 – Skills and knowledge change	***Guidance:*** *Evaluate the extent to which the project has increased knowledge and skills of researchers in PNG, through their participation in the project and the training elements. Given that some participants are in rural areas with limited access to the internet, are current or planned changes in communication methods appropriate?*	
	Results Statement: Training has increased skills of course participants. Although formal course evaluations have not been completed and long-term benefits not yet assessed, it is apparent students have increased knowledge and skills. Statements like "guys are now talking like scientists", the team "demonstrates a better understanding of data", and team members "have grown in confidence" have been expressed by at least one NFA Manager (HV) whose staff are among those from cohort 1, and from the RDS Partners independent evaluator This view is supported by interviews with some of those students who have completed the training from cohort 1. Communication remains a challenge at all levels of the project although changes in communication methods between students and UTAS project staff have improved greatly. (Training score 6, but overall score reduced because strong, positive cooperation across all the team has been lacking.)	**Score:** **5**
A2 – Monitoring and Evaluation	***Guidance:*** *Has the Monitoring and Evaluation (M&E) been effectively undertaken? Has the role of RDS Partners as an independent organisation enabled impartial evaluation? Have the outputs of the evaluation process led to changes in how the project is managed and how content is structured and delivered?*	
	Results Statement: Appropriate monitoring and evaluation methodology has been developed and our interviews with RDS Partners independent evaluator and UTAS project leader indicate the monitoring and evaluation has been effectively undertaken. No formal results are yet available. Evaluation to date has not involved PNG partners (partly due to ethics considerations) but this needs to be addressed if full benefits from the project to NFA are to be realised. Other ACIAR PLs for projects in PNG have not been effectively engaged.	**Score:** **4**
A3 – Communication / extension / dissemination processes and strategies	***Guidance:*** *Are the communication activities and strategies appropriate for the content of the project? How effective is communication between project personnel, project leader/coordinator and ACIAR, and project personnel and the project participants?*	
	Results Statement: Project communication is good between students and the UTAS project staff although there have been some problems with communication of training times. The teaching is of a high standard (score 5). Issues were reported with access to UTAS online support program and clearly submission of assignments in PNG was negatively affected by computer viruses, however,	**Score:** **3**

	these have been effectively addressed. Communication between UTAS and RDS Partners now appears good (score 5). Communication between UTAS and NFA is poor and the "partnership" approach requires considerable effort from all parties for the remainder of the project to fully realise planned outcomes particularly from objectives 1, 3 &4 (score 2-3). Discussions with NFA MD, new NFA Corporate Services Manager and a number of NFA Managers were all positive and there appears to be renewed support for the project. UTAS Project Leader (Janelle) and collaborator (Joy) have committed to building this relationship. Communication between UTAS and ACIAR (PNG coordinator, Country Manager and Assistant and other ACIAR PLs for PNG) also leaves room for improvement (score 3). The introduction of a newsletter (two editions produced to date) is positive and needs to be disseminated more widely. It is recommended a new project Facebook page be developed, following success in the PNG inland aquaculture project. Several recommendations address these points.	
A4 – Publications, scientific outputs	***Guidance:*** Considering the project is at its midpoint, and only one Cohort has completed the program of training, what research has been undertaken or planned? *Is the research methodology quantitatively or qualitatively robust such that it will lead to publications in high impact journals? What changes could be made to the research approach to improve the quality of the planned research outputs?*	
	Results Statement: A thorough "evaluation" framework has been prepared and research outputs scoped. These are appropriate and data collection and proposed methods of analysis appear sound. The leadership of the research component is likely to become an issue following the Project Leader's announcement that she will reduce her input to the project. Although currently RDS Partners is only contracted for data collection, it is recommended that ACIAR explore increasing its involvement to deliver more of the actual research outputs. Changes in the form of additional outputs are recommended (and agreed by team): 1) A "pathways to higher learning" output to explicitly map the different requirements for different levels of qualifications (from certificate through to PhD), including the entry requirements for each and the capabilities expected at each level. This is recommended to manage expectations from potential and existing students, new and existing NFA employees and others from PNG. 2) An output to provide explicit written advice to NFA to assist with workforce planning. This has been requested by NFA, as it would like to develop a plan for training needs for staff. The outcomes from the planned research and experience gained by the project team (both UTAS and NFA) would inform this process.	**Score:** **5**

	3) Assist NFA to develop a Performance Management Framework for NFA to better capture benefits from training and follow on with ongoing career assessment for students after graduating and to assist with performance for other employees.	
B – Best practice and longer term impact		
B5 – Governance	***Guidance:*** *Comment on the management (practices, policies and procedures) of the project by ACIAR and by UTAS and NFA, including the adequacy of reporting and financial administration. What improvements could be made to the way the project is managed, delivered and implemented?*	
	Results Statement: The practices, policies and procedures established by UTAS to conduct the training are professional and appropriate. Procedures for evaluation have been established. There have been some issues where NFA Project Coordinator has felt uniformed due to constraints imposed on sharing progress by individual students by UTAS ethics approval. This has contributed to the disconnect between UTAS and NFA, not only with Project Coordinator but also other NFA managers. There have been communication problems within the team and this has caused some problems, e.g. scheduling uncertainty, particularly for NFA. Recommendations to help address this issue include more effort on advance scheduling delivery of course units and increased attention to ensuring emails have been received by utilising NFA corporate services manager, in addition to NFA Project coordinator and working with the Country Office when communications are not received. Reports from UTAS have been received although in general input from NFA has not been included. The Project Leader, Janelle Allison, has indicated she will have to reduce her contribution to the project because of new directions her career is taking. This increases the risk that delivery of planned research outputs and outcomes will not be fully realised. It is recommended that ACIAR work with UTAS (and RDS Partners) to expand the role of RDS Partners beyond just collecting data to producing research outputs. It may be necessary to identify a new Project Leader or someone (ideally from among the project team) who can increase their contribution to take on a more leadership role. It is recommended that this potential setback be used as an opportunity to increase the focus on the research and relationship building.	**Score:** **4**
B6 – Appropriateness	***Guidance:*** *Is the project well targeted to the needs of the beneficiaries and NFA?*	
	Results Statement: The project is well conceived and the course offered (Graduate Certificate) and the units delivered are appropriate and teaching is of a high standard. Although this qualification is	**Score:**

	not exactly what the PNG Project Coordinator had intended when the project was conceived, he now realises that the course and units are appropriate. The research, if carried out as planned, plus the additional outputs agreed by project team, will meet the needs of NFA and other beneficiaries.	**5**
B7 – Efficiency	***Guidance:*** *Are the inputs (money, time, personnel, and equipment) appropriate in terms of the outputs and outcomes likely to be delivered by the project?*	
	Results Statement: From a superficial analysis, the funding seems appropriate also if recommendations are accepted there is a case for a relatively modest increase. The in-kind contribution by both UTAS and NFA reflect the importance both project partners place on the outcomes. Changes during the first half of the project, including "assessment in action", additional tuition, additional recommended outputs, and also recommended focus by UTAS project staff on improving relations with NFA and better understanding the context of the research justify additional budget or reallocation of expenditure. Additional time (approximately six months) is recommended to allow planned post-training evaluation of cohort 3 students.	**Score:** **4**
B8 – Effectiveness	***Guidance:*** *To what extent is the project likely to deliver on its overall aim? To what extent will the four main objectives of the project be achieved? What can be improved?*	
	Results Statement: The overall aim will be achieved providing increased attention is now paid to the research component of the project and a short extension granted. Project staff are aware of this need. Objective 1 – Needs to be documented but should be achieved (L-M risk of not being achieved). Objective 2 – Need to change objectives to correct apparent mistake where "two" programs were referred to rather than one. The objective relating to one program will be achieved (L risk of not achieving). Objective 3 – Methods to achieve objective are in place but risk that the current capacity within team is not sufficient (M risk of not achieving objective, mitigated if recommendations accepted). Objective 4 – Delayed by approximately six months and reduced time available to Project Leader a concern (M risk of not achieving objective, mitigated if recommendations accepted).	**Score:** **4**
B9 – Impact	***Guidance:*** *Indicate how the outcomes may benefit NFA in its implementation of fisheries research and management in PNG.*	
	Results Statement: Provided improving the relationship between UTAS and NFA is given absolute priority and recommended additional outputs (pathway to learning, workforce planning, and performance evaluation) are delivered, this project will be of major benefit to NFA and has the potential to establish effective methodology to deliver wider benefits to PNG.	**Score:** **5**

B10 – Legacy	***Guidance:*** *Will there continue to be impacts over time and after the project ceases? Why or why not?*	
	Results Statement: Project will deliver benefits well after project ceases as graduates realise the benefits of their training. Outputs from the project could assist PNG with improved capacity building to deliver must wider benefits well after the project ceases.	**Score:** **5**
C – ACIAR Learning		
C11 – Lessons learnt	***Guidance:*** *The intention is to capture experiences and learning which are not dealt with elsewhere in the review and which should be brought to the attention of ACIAR. It could cover, for instance, difficulties with capacity building, complex or changing institutional arrangements that impact of delivery of outcomes, personnel arrangements, difficulties in managing projects across multiple countries, infrastructure inadequacies inhibiting project implementation, risk management, impacts of uncontrollable events, etc.*	
	Results Statement: Lack of fully understanding the ACIAR partnership approach compounded by communication difficulties and lack of cultural awareness (compounded by time and security constraints) have compromised the first half of this project. We believe these issues can be addressed provided clear priority is given to doing so. Additional expenditure and/or refocus on current allocations is warranted to help ensure this occurs. There was no question, in our minds, that the project team correctly identified the training needs and adapted and are delivering first class training that will be of major benefit to NFA and PNG. Delivering the research component of the project is at risk from increasingly overcommitted project staff, particularly at UTAS. Consideration to increasing input from RDS Partners to better deliver on research outputs, as recommended, is warranted.	
C12 – Follow-up	***Guidance:*** *Advise ACIAR on what, if any, follow-up activities and support are desirable to ensure successful completion of this project and long-term benefits from the project (including spill over to other countries/regions).*	
	Results Statement: 1) Increasing focus on building relationships with NFA. Recommendations include involving NFA Corporate Services Manager in the project and all communications, increasing communication with ACIAR Country Office to assist with communication difficulties with NFA, spending more time with NFA managers (formally through workshops and informally through visiting during training, inviting NFA managers to informal briefings about the project and spending more time building relationships with PNG Project Coordinator), and briefing the NFA Board on ACIAR and project. This was supported by the NFA MD. 2) Increasing the understanding of UTAS project team of PNG and the context within which students work and study. This should include field visits by UTAS team and regional delivery of training components. 3) Increasing engagement with other ACIAR PLs in PNG	

	4) Increasing focus on delivering research component during second half of project. Recommendations include increasing role of RDS Partners to produce research outputs rather than just data collection, as is currently the case. 5) Producing additional outputs including a "pathways to learning" document, an output providing explicit written advice to NFA to assist with workforce planning, and assistance for NFA to develop a Performance Management Framework. (See section A 4 for more details). 5) Six month extension and adjustment in budget to facilitate 1-4 above.

Alignment with current Australian Official Development Assistance policy and key success indicators

In completing the following table, the reviewers are requested to synthesise the information listed in the Project Outputs table (Section 4); quantitative evidence from reviews, reports, etc; as well as qualitative information from interviews, case studies and the like. The indicators are taken from "Making Performance Count: enhancing the accountability and effectiveness of Australian aid" Australian Government, 2014.

Strategic level indicators	
Promoting Prosperity	***Guidance:*** *Economic development is at the centre of Australia's aid program. A key element of this strategy is to promote and support sustainable economic growth and prosperity in the Indo-Pacific region through increased trade and investment. The evidence is clear that economic growth is the most effective means of reducing poverty. Evaluate the extent to which the project has or will contribute to promoting prosperity.*
	Results Statement: The project has the potential to effectively build capacity for up to 50 PNG nationals. The alignment with ACIAR/NFA projects will help facilitate direct translation of that increased capacity to projects that will increase economic growth.
Engaging the Private Sector	***Guidance:*** *The private sector plays a critical role in reducing poverty and promoting prosperity. The project may have engaged with the private sector in different ways, including: the design or delivery of the project; innovative approaches to project financing; public-private partnerships; improving the regulatory environment for private sector participants; or addressing other constraints to economic growth. To what extent has or will the project engaged with the private sector?*
	Results Statement: To date, the project has not engaged directly with the private sector although several of the students have improved their engagement due to the training they have received.
Reducing poverty	***Guidance:*** *To what extent has the project promoted private sector-led growth and to enable the poor to participate and share in the benefits of greater economic prosperity?*
	Results Statement: This is beyond the scope of the current project.

Empowering women	***Guidance:*** *One of the best ways to promote economic growth is to empower and make better use of the skills and talents of women and girls, and to advance gender equality. This might mean ensuring women participate in decision-making throughout implementation, identifying and pursuing opportunities for women to be employed through an investment, or addressing particular challenges to implementation that exclude women. To what extent has the project targeted the empowerment of women, and has it been successful?*
	Results Statement: The training component has included both women and men.

Appendix - Itinerary of review team

Itinerary – Geoff Alan
21 May- arrival in Port Moresby
23 May – Annual Meeting/Review & Team Interviews
24 May – Interviews with Unit Managers, Cohort 1 participants and other stakeholders
25 May – In-country write up
29 May – Depart

Itinerary – Augustine Mobiha
21 May – arrival in Port Moresby
23 May – Annual Meeting/Review & Team Interviews
24 May – Interviews with Unit Managers, Cohort 1 participants and other stakeholders
25 May – In-country write up
28 May – Depart

Signature: 

Name: Dr Geoff Allan

Designation: Project reviewer

Date: 27 May 2016

Signature: 

Name: Augustine Mobiha

Designation: Project reviewer

Date: 27 May 2016

UNIVERSITY of TASMANIA

ACIAR PROJECT: FIS/2010/055
BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS
IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 9
Final Review Report

Report prepared after the Final Review Meeting by Dr Geoff Allan and Mr Augustine Mobiha

FINAL PROJECT REVIEW

Project number:	**FIS/2010/055**
Project title:	**Building research and project management skills in fisheries staff in Papua New Guinea**
Project leaders:	

Commissioned agency:	Prof. Janelle Allison, University of Tasmania
Papua New Guinea:	Mr. Jacob Wani, National Fisheries Authority

Countries involved	**Institution**	**Personnel**
Australia	University of Tasmania	Prof. Janelle Allison
Papua New Guinea	National Fisheries Authority	Mr. Jacob Wani

Review team members:

Name: Dr Geoff Allan Contact: Geoff.Allan@dpi.nsw.gov.au

Name: Mr Augustine Mobiha Contact: augustine.malbojup@gmail.com

Dates of review: 24-25 October 2017

1. Methodology/approach adopted for review

The review team read project documentation, participated in a final review meeting, with key members of the project team in Hobart in October 2017. The reviewers had previously (May 2016) conducted a mid-term project review during which numerous interviews with project participants, including course participants, were conducted. A series of recommendations were made. Progress against those recommendations was also assessed.

Documentation reviewed:

Date Sent	Topic	Attachments
25/9/17	Intro and Annual Reports	8 documents: 2016 Annual Report and 3 Attachments; 2017 Annual Reports and 3 Attachments.
28/9/17	Cohort 2: Delivery Timetable and Trip Reports	5 documents: 1 timetable; 4 Trip Reports
28/9/17	Cohort 3: Delivery Timetable and Trip Reports	5 documents: 1 timetable; 4 Trip Reports
29/9/17	Evaluation Program: Reports	7 documents: • 1 Evaluation Program Outline • 1 Project Sub Contract Agreement (2015) • 3 RDS Milestone Reports • 2 UTAS Evaluation Milestone Reports
5/10/17	Mid Term Review May 2016	3 documents: UTAS Mid Term Review Update Appendix 7: Pathways to Learning

	Recommendations Update	Appendix 8: Project Publication Plan
	UTAS submission to the Final Review Meeting Report: Section 4	1 document: Section 4 of Final Review Terms of Reference document
16/10/17	Final Review Meeting Section 4: Appendices 1,2,3	3 documents: Appendix 1: Development of Grad Cert Appendix 2: Who Did We Teach Appendix 3: Skills Checklist
16/10/17	Final Review Meeting Section 4: Appendix 4: Communication Report	1 document: Appendix 4: Communication Report
	Final Review Meeting Section 4: Appendix 5: Media Report	1 document: Appendix 5: Media Report
16/10/17	Final Review Meeting Section 4: Appendix 6, 7 and 8	3 documents: Appendix 6: Scientist …. Self as Scientist Appendix 7: Pathways to Learning Appendix 8: Project Publication Plan
16/10/17	Newsletters	5 documents

The review team participated in a final review meeting in Hobart, 24-25 October 2017. The meeting included detailed discussion on key outcomes and question and answers on project objectives, activities, outputs and outcomes.

Core questions were: What are the key things that have been achieved, what was not achieved, and what are the priorities for follow-on work?

The following people participated:

- Professor Janelle Allison (UTAS)
- Dr Joy Rathjen (UTAS)
- Ms Sandra Knowles (UTAS)
- Dr Christine Angel (UTAS)
- Dr Kiros Hiruy (RDS Partners)
- Dr Stephen Ives UTAS)
- Jacob Wani (NFA)
- Havini Vira (NFA)
- A/Prof Jes Sammut (UNSW)
- Augustine Mobiha (Reviewer)
- Dr Geoff Allan (Reviewer)
- Dr Chris Barlow (ACIAR)

2. Background

Scientific and technical staff members in PNG generally commence their employment in aquaculture and fisheries with limited research qualifications and skills, and with limited opportunities for program-based training within the department, especially for research. Subsequent training may be so tightly linked to the activities of specific projects that long-term institutional benefits and personal development are not fully realised.

This project (FIS/2010/055) aimed to develop and test a capacity building program for up to 45-50 fisheries researchers and technicians. The research focus of the project was to evaluate the methodology employed to deliver both direct benefits to participants and spillovers to the broader stakeholder community. In addition to research objectives, this project planned to build capacity in course participants and offer an opportunity to obtain formal academic qualifications. The degree of capacity change was proposed as a measure of the effectiveness of the methods under investigation.

The following research questions were to be addressed:

1. How can effective research and project management training be delivered to local scientists and technicians?
2. What are the benefits of integrating research training with workplace practices (i.e. in current projects) and participatory approaches?
3. Does working towards a formal qualification facilitate the capacity building process?

The research objectives were:

1. To determine research training and project management needs for scientists and technicians;
2. To design, deliver and validate a formally accredited training program integrating participatory approaches with research skills;
3. To evaluate the benefits of integrated capacity building to stakeholders of the research process;
4. To identify better management strategies to embed integrated capacity building in development of the local scientific workforce in fisheries in PNG.

3. Review Executive Summary and Recommendations

This project (FIS/2010/055) aimed to develop and test a capacity building program for up to 45-50 fisheries researchers and technicians. This was achieved. The Project Team from UTAS developed and delivered an accredited Graduate Certificate in Research, comprising four Graduate Level units: BAA501 Delivery of Learning through Practice, XGR501 Introduction to Higher Degree by Research, XGR502 Communicating Research, and XGR505 Specialised Research Methods. The courses selected/developed were appropriate for the Project and were highly valued by the PNG project partner, the National Fisheries Authority(NFA), and by course participants and their managers.

The research focus of the project was to evaluate the methodology employed to deliver both direct benefits to participants and spillovers to the broader stakeholder community. Third Party evaluation has clearly demonstrated the benefits to participants. This is evident from comments made by participants like “I stand tall” and “I now know what it means to be a scientist”. Increased confidence was the most common perceived benefit among participants. Participants also reported an improved understanding of the importance of data and scientific methodology. Those supervisors interviewed described a visible improvement in course participants, including more pride in their work and an increase in awareness in the importance of their roles. The proposed publications from the Project Team will document the project benefits.

The willingness of the UTAS Project Team to modify delivery of courses to better suit the PNG context was an important factor in the success of the project. Insights such as how the

oral culture in PNG influences learning and practice, and the importance of understanding the need for course participants to have a "key learning space" led to a better tailored education program. Lessons from these insights should be shared within ACIAR project leaders to enhance capacity building within existing or new ACIAR projects.

This project planned to build capacity in course participants and offer an opportunity to obtain formal academic qualifications. Participants placed very high importance on attainment of *formal* (recognised) qualifications from an Australian University. This came through very strongly in the third party evaluation. The successful attainment of a Graduate Certificate by the majority of course participants demonstrates how important formal qualifications were to course participants.

Although the evaluation program for supervisors was not as comprehensive as it was for course participants, positive feedback from those interviewed was very encouraging. Further evaluation of the benefits arising from the training from the perspective of participants' supervisors is recommended and should be possible within the remainder of the project.

Immediate benefits for course participants are evident from the project. However, the longer term benefits are not as certain and there is a possibility that unless follow up communication and reinforcement of learnings from the Graduate Certificate are implemented, benefits may dissipate over time. Ongoing engagement of course participants is recommended to help reinforce the positive benefits from the Graduate Certificate. Understanding longer term impacts should be investigated during a longitudinal study, possibly as part of a follow on project.

Apart from the PNG Project Coordinator, engagement from other Managers at NFA and the Corporate Services Division of NFA was less than ideal. This is understandable given changing priorities at NFA and that benefits to course participants will accrue to NFA managers even without their active engagement. However, there is benefit in ensuring NFA managers are aware of project outcomes. It is recommended a workshop be held for NFA Managers to discuss project outcomes before the end of the Project (June 2018). The planned second graduation is an ideal time to re-engage senior NFA staff.

One of the Project Outputs was a "Pathways to Learning" document. This addressed a need expressed by staff in PNG to understand potential opportunities for further study, how existing qualifications, including the Graduate Certificate, fit into the range of available University qualifications in Australia, and how units completed for the Graduate Certificate might be credited against further education. It is recommended the "Pathways to Learning" document be expanded to address these questions from course participants (using requirements for UTAS qualifications as an example for the Australian University sector generally).

Experience from the approach taken and successes achieved in this project have relevance to the broader priority within ACIAR for capacity building. There is potential for a major new ACIAR research sub-program on capacity building. Such a program should build on learnings from this project (FIS/2010/055), and utilise a "pathways to learning approach" to identify the required educational programs (including diploma, graduate and post-graduate) that best strengthen institutional capacity. An emphasis on in-country delivery, linked to ACIAR research where appropriate, is recommended. There is a body of research needed to guide such a program to ensure long term investment from Australia in partner country "capacity building" delivers long-lasting benefits to institutions, partner countries and

Australia. This concept might be explored initially through a seminar at ACIAR by the Project Leader from FIS/2010/055 on "The potential for a new approach to capacity building within selected ACIAR partner countries".

RECOMMENDATIONS:

During existing project

1. Further evaluation of benefits from supervisors of course participants.
2. Hold a workshop for NFA Managers to discuss project outcomes.
3. Expand project output document "Pathways to Learning" to include how various qualifications might contribute to higher qualifications.

Follow on activities

4. The potential for a major new theme of research on capacity building should be examined by ACIAR.
   Such a program could build on learnings from this project (FIS/2010/055), and utilise a "pathways to learning approach" to identify the required educational programs (including diploma, graduate and post-graduate) that best strengthen institutional capacity. An emphasis on in-country delivery, linked to ACIAR research where appropriate, is recommended. There is a body of research needed to guide such a program to ensure long term investment from Australia in partner country "capacity building" delivers long-lasting benefits to institutions, partner countries and Australia. Arguably, the current practice of short courses delivered on specific topics within projects, most often fails to realise the targeted long-term capacity improvement in technical and scientific staff.
5. This concept might be explored initially through a seminar at ACIAR by the Project Leader on "The potential for a new approach to capacity building within selected ACIAR partner countries".
6. Lessons from project insights about successful teaching in PNG should be shared with ACIAR Research Program Managers, with a view to enhancing the approach to capacity building within existing or new ACIAR projects.
7. Ongoing engagement with course participants is recommended to help reinforce the positive benefits from the Graduate Certificate. Understanding longer term impacts should be investigated during a longitudinal study, possibly as part of a follow on project.
8. A follow-on project with NFA be considered, if this is a priority arising from the workshop held with senior NFA managers (recommendation 2 above).
   It is likely the focus would be on taking present graduates through to graduate and higher degrees, as well as expanding the course to engage the range of professional disciplines within NFA. Alternatively, ACIAR could consider the range of courses being delivered to participants from the full spectrum of ACIAR's programmatic work in PNG.

4. Project outputs

The overall aims of the project are to understand the mechanisms, processes and functionality of an integrated capacity building program (ICBP), through research that will increase research and project management skills underpinning aquaculture and fisheries projects in PNG; and to embed these skills within the NFA.

Objective 1: To determine research training and project management needs for scientists and technicians

No.	Activity	Outputs/ milestones	What has been achieved?	Reviewers' comments
1.1	Interview ACIAR Fisheries program project leaders and NFA managers to identify skills needs and gaps	Profile and report on current skills and knowledge gaps.	1. Correspondence was undertaken with all project leaders when course development commenced. All feedback was incorporated into the course.	A sound basis for course design was established despite the limited input from some NFA managers and ACIAR project leaders
1.2	Desktop analysis of current in-house project training and professional development programs for capacity building.	Understanding of current activities and programs, skills needs and gaps in local project staff capacity and capabilities within NFA.	1. Analysis of a previous NFA training activities was supplemented by detailed discussions with PNG project sponsor Mr Jacob Wani to discover what processes were currently in place and explain why our approach would be different. Discussions were also held with Assoc. A/Prof. Jes Sammut from the University of New South Wales (Australian ACIAR Project Leader) to determine how previous capacity building had been conducted (example: intermittent workshops on topics such as writing papers). 2. Meeting with HR Director of NFA and based on positive feedback from participant staff proposed to conduct a workshop for NFA Managers. Proposed twice to NFA but did not proceed.	As above. Unfortunately the managers workshop did not proceed due to other work priorities within NFA. This was an opportunity missed by NFA.

1.3	Participants will be asked as part of their activities in the first unit to reflect on current research skills and capabilities as a critical part of reflective practice in the unit of study and for feedback into the planning of forthcoming materials and learning activities.	Understanding of current activities, skills needs and gaps at an individual level in local project staff capacity and capabilities within NFA.	1. Analysis of EOI documents to identify the key aspirations of the students as they approached this learning opportunity (Appendix 2: Figure 7) 2. Undertaken as part of two units of study: 3. BAA506 Learning Through Practice A (Workplace) The skills development in BAA506 comprises 3 components. First, there is a focus on the student knowing themselves; for example, the students are asked to undertake a survey which helps reflect their learning styles and form this discuss and reflect on how this affects their interactions, personnel skills, negotiation skills etc. Second, the students are then asked to document their professional practice skills: how they conduct themselves at work, to consider significant moments and why they went well or not so well. Students are given a number of tools to assist in this reflection process (understanding their values, meaning making, people skills, talents, race and diversity). Third, the students are then asked to consider leadership and the characteristics of leaders, types of tools they might need, and the types of skills they might need to develop as leaders. a) XGR501 Introduction to Higher Degree by Research. Over the 3-4 days of teaching, and at the conclusion of each formative session, students as a group brainstormed those skills that they identified with the practise of science and as associated with scientists. At the end of the formative sessions the facilitator aggregated the identified skills, and each participant assessed their competency against the skills. Example Skills lists can be found in Appendix 3. These lists are under analysis to retrospectively identify those areas of practise that they perceived as wanting in themselves. This data will drive any further adaptation of the coursework. These learning activities were conducted for all 3 cohorts. All units of study also introduced new skills and capabilities as described in the intended learning outcomes of the units (Appendix 1).	Valuable method of incorporating feedback from course participants in to planning learning methods for subsequent cohorts.

			These skills were aligned to the need to develop research capabilities, and the need to see 'self as scientist' Appendix 6).	

Objective 2:To design, deliver and validate a formally accredited training program integrating participatory approaches with research skills

No.	Activity	Outputs/ milestones	What has been achieved?	Reviewers' comments
2.1	Design and develop 4 Integrated Capability Building Program (ICBP) units for each of two programs	Learning units comprising material on research design and project management, research methods, participatory approaches and community engagement tools.	1. All 4 units designed, developed and delivered to 3 cohorts of students. The process of course development and a description of the final teaching product can be found in Appendix 1. 2. Unit review was an active and ongoing process, with teaching staff debriefing and discussing the issues raised within the classroom to (a) address these issues in future iterations of the unit and (b) to change practise in the other units to ensure quality and consistency. The certificate was reviewed after each iteration to incorporate feedback and refine and improve. A discussion of key issues encountered and solutions can be found in Appendix 1. 3. All units designed to align with the stated course learning outcomes developed for this Graduate Certificate in Research.	Choice of units outstanding. Adaptation of teaching and assessment methodology based on participant feedback and experience was a genuine strength of this project. The delivery of teaching was of an extremely high standard.
2.2	Select participants for ICBP cohorts (multi-year activity)	Participants selected	1. The EOI process was developed and 3 cohorts of students were selected over the 3 years of the project from the information provided. 2. Standard EOI profile developed and used to select participants. 3. The EOIs, and accompanying enrolment, have been analysed to understand the qualities of the students that have been taught (Appendix 2: Who did we teach?). This analysis demonstrates that the EOI process successfully identified a cohort of students with the capability to complete a Graduate Certificate in Research despite their rich and varied background experience.	Selection process successful although additional clarity for potential participants to guide them what to expect and assist them in completing the EOI recommended for future courses.

2.3	Deliver all units to ICBP cohorts (multi-year activity)	Learning projects; Postgraduate Qualifications	1. All units for 3 courses have now been delivered to 3 cohorts of students. Where students needed additional assistance or were unavailable to complete a unit every possible action has been taken to ensure they could complete. 2. Very high completion rate was achieved (greater than 80%) and 78% of students graduated with a Graduate Certificate in Research from UTAS (Appendix 2: Who did we teach?).	Excellent
2.4	Review all units for the Integrated Capability Building program (ICBP) based in first year of evaluation (multi-year activity) (refer to Appendix D)	Annual analysis of the training program with regards to what has worked well and what needs to be improved.	1. All units and each course upon completion have been reviewed. 2. Trip and Annual reports, and Appendix 1: The Development of a Graduate Certificate in Research Skills, document when and how adjustments and refinements to course have been made. 3. The most significant change to the teaching product was to change the timing of assessment, adapting the course to incorporate all assessment into the teaching plan (a process we term '*assessment in action*'). This was possible with a modest extension of the teaching program, from 3 to 4 days for each unit.	Assessment methodology changed for the better to reflect participant needs.

2.5	Prepare reports and publications	Report and publications regarding outcomes and learnings from the three years' training	1. Two Reports (Appendices 1 & 2) have been prepared. These focus on a. the development of the Graduate Certificate in Research into an offering that can be delivered successfully and with effect to industry-based students in the Global South (Appendix 1: The Development of a Graduate Certificate in Research Skills) and b. the participants we taught, using the EOIs, enrolment and progress data to understand the qualities and aspirations of our participants (Appendix 2: Who did we teach?). 2. A completed, but draft, paper has been prepared, which examines the difference in this course from other kinds of "capacity building" adopted in development projects. 3. Transcription of participant commencement and exit interviews has now commenced – to enable in-depth papers and publications on impact of the formal course of study. 4. Documentation of media coverage of the program and the student stories of their experience. 5. Proposal outlining interest in further courses of study to foster institutional strengthening.	Reports and publications in draft are worthwhile. Expert advice on how lessons from this project might be applied more broadly to capacity building in PNG would be most useful.

Objective 3: To evaluate the benefits of integrated capacity building to stakeholders of the research process

No.	Activity	Outputs/ milestones	What has been achieved?	Reviewers' comments
3.1	Design/refine evaluation program in consultation with NFA staff (multi-year activity)	Map of flow on benefits – impact indicator matrix; Data to validate learning outcomes.	1. Detailed Evaluation Program developed comprising Evaluation of units and course of study (Part A) as well as evaluation of impact on participants and research projects conducted by NFA (Part B) – undertaken by RDS. 2. Submitted as part of the midterm review.	Framework developed is appropriate, particularly for participants. The Third Party evaluation was robust and provides confidence about this aspect of the project for partners and ACIAR
3.2	Conduct end- and post-course evaluation with each cohort (multi-year activity)	Evaluation report	1. Data collection undertaken – questionnaire/ survey conducted by a third party as students commenced study and upon exit. These interviews are in the process of being transcribed. 2. Final evaluation of cohort 3 can now be completed as all units have now been delivered.	Summary results indicate success of project for participants.
3.3	Conduct impact evaluation with external stakeholders (multi-year activity)	Evaluation report	1. Underway by a third party (RDS Partners) to ensure appropriate distance. The final evaluation report is expected to be delivered in December 2017.	Evaluation of project success for NFA managers and other PNG stakeholders an ongoing priority, complicated by other NFA priorities.

3.4	Prepare and circulate publications and report on findings and recommendations (multi-year activity)	Report and publications for dissemination regarding outcomes and learnings from each years' training	1. Media reports highlight student satisfaction and pride as well as documentation of benefits (e.g. examples of promotion as a result of studying this course). In particular, articles in newspapers in both PNG (*National*, *Post Courier*) and Australia (*Advocate*, Burnie) highlighted the achievement of 17 graduates who graduated in December 2016 and received their testamurs in a formal celebration on 20 January 2017. This occasion was also televised by PNG stations (no copy is available) and photographs shared on both the UTAS PNG Facebook site, and the ACIAR Facebook site. See Appendix 5. Further student pride was evidenced by the willingness of two graduates to be interviewed by phone from Tasmania by Australia's ABC Rural Radio on the day of the celebration, and also by their willingness to address the audience at the celebration. Transcriptions of interviews undertaken by RDS Partners is underway and it is expected that the results will add positive feedback here. 2. Class photos were taken during unit delivery, both by staff and by students. Examples were included in unit and other reports, Newsletters, and Facebook. Students not only occasionally requested copies to be sent to them, but circulated them widely. A selection is provided in Appendix 5. 3. A Newsletter was sent to a wide audience including participants and project leaders, and NFA, ACIAR, DFAT, and UTAS personnel. It was also disseminated to student in-work supervisors, predominantly in NFA but also reaching to the PNG Forest Research Institute, PNG University of Technology, PNG University of Natural Resources & Environment, National Department of Agriculture & Livestock, National Fisheries College, University of NSW, University of Sunshine Coast (Australia), Wildlife Conservation Society, and the Foundation for People & Community Development. The Newsletter is also uploaded into the project Facebook page. See Appendix 5. 4. Facebook page. This was mooted mid-2016 and went live on 2 November 2016. There are strict protocols around setting up UTAS Facebook sites and the process took longer than anticipated. Permission was gained from NFA to use their name on the site. The site was set up as a closed group. See Appendix 5.	Communication materials produced to date are excellent.

			5. As per above, reports on the course (Appendix 1: Development of a Graduate Certificate in Research Skills) and the participants (Appendix 2: Who did we teach?) have been compiled. 6. One draft paper completed: *Strengthening Research Capability in Developing Countries: Looking Beyond the Technical to the Practice of Science and Self as Scientist* (Appendix 6).	

Objective 4: To identify better management strategies for embedding integrated capacity building in development of the local scientific workforce in fisheries in PNG

No.	Activity	Outputs/ milestones	What has been achieved?	Reviewers comments

4.1	Prepare and circulate publications and reports on findings and recommendations (multi-year activity)	Reports	1. Media reports of cohorts 1 & 2 graduation provides documentation of the personal impact of the formal course on participant pride in achieving an overseas post graduate qualification. Articles in newspapers in both PNG (*National*, *Post Courier*) and Australia (*Advocate*, Burnie) highlighted the achievement of 17 graduates who graduated in December 2016 and received their testamurs in a formal celebration on 20 January 2017. This occasion was also televised by PNG stations (no copy is available) and photographs shared on both the UTAS PNG Facebook site, and the ACIAR Facebook site. Two graduates were also interviewed by ABC Rural Radio by phone from Tasmania. This strategy will be adopted for the final cohort in February 2018. (Appendix 5: Media Report) 2. Report on course (Appendix 1: Development of a Graduate Certificate in Research Skills) outlines lessons learned in regards to content and delivery and recommends a number of actions for UTAS. This will be circulated to NFA, ACIAR and UTAS. 3. Report on student attributes (Appendix 2: *Who did we Teach*?) reveals useful information on gender and participant background relevant to NFA and ACIAR, and makes recommendations on strategies to capture a broader spectrum of the scientific workforce. 4. Proposal prepared on future opportunities identified for institutional strengthening for NFA. Participants are “asking for more”. Several participants have approached UTAS following their study enquiring about extending their studies into Masters and other post-graduate work. UTAS also has maintained a list of potential participants in this or a similar course. These enquiries include those who submitted EOIs previously but did not gain a place; a student who had to withdraw due to serious family illness; and approaches through Facebook following word of mouth. The list currently numbers eight.	Communication materials produced to date are excellent.

4.2	Conduct workshop to discuss findings and refined implementation plan to identify how to embed these into organisational professional development activities and performance management processes	Workshop participation; Workshop report; Agreed implementation plan	1. Proposal to conduct a workshop in February 2018 after the cohort 3 graduation ceremony to discuss findings and feedback form final review. 2. Request to develop a proposal for Associate Degree offering suitable for mid-level staff in NFA as part of institutional strengthening. See Appendix 7: *Institutional Strengthening: Workforce Planning, Performance Management and Pathways to Learning – National Fisheries Authority (NFA), Papua New Guinea*.	Not completed. Important for NFA
4.3	Prepare final project publications, report and recommendations	Final report	Final project publications are in development as set out in Appendix 8. Draft publications are attached to this report as follows: • Appendix 1: The Development of a Graduate Certificate in Research Skills • Appendix 2: Who Did We Teach ?: An Analysis of EOI and Enrolment Information • Appendix 5: What Does It Mean to be a Researcher? • Appendix 6: Strengthening Research Capability in Developing Countries: Looking Beyond the Technical to the Practice of Science and Self as Scientist	In preparation.

Response to recommendations from mid-term review:

#	Output	by	Update	Reviewers comments
1	Produce a "Pathways to Learning" document	UTAS/ NFA	**See Final Review Attachment 7**	Extremely high value to students from PNG, NFA and ACIAR.
2	Workforce Planning Advice: Produce explicit written advice to NFA to assist with workforce planning (new output).	UTAS/ NFA	A more effective approach is to show the links between Workforce Planning, performance Management and pathways to learning. Recommendations 1, 2, and 3 have been incorporated into a single report. **See Final Review Attachment 7**	Good advice, uptake from NFA compromised by other priorities
3	Assist NFA to develop a Performance Management Framework for staff including but not limited to students (new output).	UTAS/ NFA	**See Final Review Attachment 7**	Required NFA to drive this recommendation. Uptake by NFA compromised by other priorities
4	Give urgent priority to building effective, collaborative relationships with NFA, to improving their understanding of PNG culture, as it influences the project, and to engaging more effectively with other ACIAR project PLs for PNG.	UTAS/ NFA	**Project Tutor engaged (PD submitted at Mid-Term Review).** **See Final Review Report – Section 4 in particular Appendix 4: Communication Report and Appendix 5: Media Report**	Engagement of project tutor excellent initiative. New emphasis on communication materials, e.g. newsletters, facebook page, very successful.
5	Increase efforts to ensure email communication is received, including by including NFA Corporate Services Manager in communications as well as the PNG project coordinator, and working more closely with ACIAR PNG Coordinator (A/Prof Jes Sammut) and ACIAR Country Office to strengthen communication.	UTAS/ NFA	As above	As above
6	Disseminate newsletter more widely and construct and maintain a project Facebook page	UTAS/ NFA	As above.	As above
7	ACIAR work with UTAS to expand the role of RDS Partners to analyse data and produce research outputs.	ACIAR	We have incorporated the project management budget with the evaluation budget for the project to enable RDS to produce and Enhanced Evaluation Program. We expect the Final Evaluation Report to address this recommendation. See **Appendix 8**: Project Publication Plan for predicted research outputs.	Role clarified
8	Due to announcement by the Project Leader that she is likely to have to reduce her role in the project, ACIAR should work with the Project team to	ACIAR	The UTAS Academic Project Team has worked to ensure the research agenda and relationship building	Addressed

	replace or augment her contribution, with a focus on research and relationship building		has continued under the supervision and support of the Project Leader.	
9	Extend finishing date by six months to July 2018.	ACIAR	Underway - UTAS has sent ACIAR an updated Project Proposal for consideration.	Addressed
10	Increase budget support to deliver on review recommendations 1, 2, 3 & 6.	ACIAR	Underway – UTAS has sent ACIAR an updated project budget document for consideration.	Addressed

5. Project Evaluation

In completing the following table, the reviewers are requested to synthesise the information listed in the Project Outputs table (Section 4); quantitative evidence from reviews, reports, scientific publications etc; as well as qualitative information from interviews, case studies and the like. The first four questions (Group A) relate to the specific outcomes of the project. The next six (Group B) concern best practice and longer term impact; the criteria align with the "aid quality check" processes of Australia's aid program. The final two (Group C) are specifically for ACIAR's learning processes. Be sure to include where appropriate information to support the recommendations that are listed in the Executive Summary.

The scoring for Groups A and B is defined as follows:

Satisfactory		**Less than satisfactory**	
6	**Exceptional quality** Equal to or greater than 90%. Beyond normal project expectations; an example of a project team delivering significantly more than anticipated at the time of project design.	**2**	**Less than adequate quality** Project did not deliver on several areas of core expectations. Reviewers consider that, given the circumstances of the project, outputs and outcomes should have been at a higher level.
5	**High quality** 80-89% performance. Overall very good work, with virtually all outputs achieved, although possibly some minor gaps that could have been closed. Strong, positive cooperation across the entire project team.	**1**	**Poor quality** Unacceptable performance, even after consideration of all mitigating factors.
4	**Good quality** 65-79%. Performance quite good. Project team has delivered on the majority of the activities, with valid justifications for those not achieved.		
3	**Adequate quality** 50-64%. Some areas of core expectations probably not achieved, although factors, external or outside of the control of the project team, may have been responsible.		

FROM MID TERM REVIEW

A – Specific activities and outcomes of the project		
A1 – Skills and knowledge change	***Guidance:*** *Evaluate the extent to which the project has increased knowledge and skills of researchers in PNG, through their participation in the project and the training elements. Given that some participants are in rural areas with limited access to the internet, are current or planned changes in communication methods appropriate?*	
	Results Statement: Training has greatly increased skills of course participants. Although long-term benefits have not been assessed, it is very apparent students have increased knowledge and skills. This has been noted by supervisors and has led to some pleasing promotions and self-directed ongoing professional development. The increase in confidence of participants is profound.	**Score:** **6**
A2 – Monitoring and Evaluation	***Guidance:*** *Has the Monitoring and Evaluation (M&E) been effectively undertaken? Has the role of RDS Partners as an independent organisation enabled impartial evaluation? Have the outputs of the evaluation process led to changes in how the project is managed and how content is structured and delivered?*	
	Results Statement: Appropriate monitoring and evaluation methodology has been developed for participants providing a very useful database from which to further develop this approach to capacity building (if ACIAR agrees). The monitoring and evaluation by NFA supervisors and managers has been of lower intensity, partly because competing priorities within NFA have restricted time available for the project.	**Score:** **5**
A3 – Communication / extension / dissemination processes and strategies	***Guidance:*** *Are the communication activities and strategies appropriate for the content of the project? How effective is communication between project personnel, project leader/coordinator and ACIAR, and project personnel and the project participants?*	
	Results Statement: Project communication is good between students and the UTAS project staff although there were some early problems with communication of training times. The teaching is of a high standard (score 6). Issues were reported with access to UTAS online support program and clearly submission of assignments in PNG was negatively affected by computer viruses, however, these have been effectively addressed. Some communication between UTAS and NFA has been compromised by limited available time for the project from NFA corporate service managers and some participant supervisors. Planned outcomes have still been delivered. New communication between UTAS, ACIAR (PNG coordinator, Country Manager and Assistant and other ACIAR PLs for PNG) greatly improved by the introduction of a newsletter and new project Facebook page.	**Score:** **4**

A4 – Publications, scientific outputs	***Guidance:*** *Is the research methodology quantitatively or qualitatively robust such that it will lead to publications in high impact journals? What changes could be made to the research approach to improve the quality of the planned research outputs?*	
	Results Statement: A thorough "evaluation" framework was prepared and implemented. This is a robust third party evaluation providing data of excellent quality. The research will achieve objectives. Additional research outputs, beyond those initially planned, will allow the project team to fully utilise the quality data available and provide insights in a broader context.	**Score:** **5**
B – Best practice and longer term impact		
B5 – Governance	***Guidance:*** *Comment on the management (practices, policies and procedures) of the project by ACIAR and by UTAS and NFA, including the adequacy of reporting and financial administration. What improvements could be made to the way the project is managed, delivered and implemented?*	
	Results Statement: The practices, policies and procedures established by UTAS to conduct the training are professional and appropriate. Procedures for evaluation have been established. Problems with most communication, including differing expectations of the project, that were identified during mid-project review have been addressed.	**Score:** **5**
B6 – Appropriateness	***Guidance:*** *Is the project well targeted to the needs of the beneficiaries and NFA?*	
	Results Statement: The project is well conceived and the course offered (Graduate Certificate) and the units delivered are appropriate and teaching is of a high standard. Although this qualification is not exactly what the PNG Project Coordinator had intended when the project was conceived, he now realises that the course and units are most appropriate. The research, if carried out as planned, plus the additional outputs agreed by project team, will meet the needs of NFA and other beneficiaries.	**Score:** **6**
B7 – Efficiency	***Guidance:*** *Are the inputs (money, time, personnel, and equipment) appropriate in terms of the outputs and outcomes likely to be delivered by the project?*	
	Results Statement: From a superficial analysis, the funding seems appropriate also if recommendations are accepted there is a case for a relatively modest increase. The in-kind contribution by both UTAS and NFA reflect the importance both project partners place on the outcomes. Changes during the first half of the project, including "assessment in action", additional tuition, additional recommended outputs, and also recommended focus by UTAS project staff on improving relations with NFA and better understanding the context of the research justify additional budget or reallocation of expenditure.	**Score:** **5**

B8 – Effectiveness	***Guidance:*** *To what extent is the project likely to deliver on its overall aim? To what extent will the four main objectives of the project be achieved? What can be improved?*	
	Results Statement: The overall aim will be achieved on the basis that the team is paying increased attention to the research component of the project.	**Score:** 5
B9 – Impact	***Guidance:*** *Indicate how the outcomes may benefit NFA in its implementation of fisheries research and management in PNG.*	
	Results Statement: This project will be of major benefit to NFA particularly if the "Pathways to Learning" document is used to assist with formal workplace planning. The project has the potential to establish effective methodology to deliver wider benefits to PNG and other countries ACIAR engages with.	**Score:** **6**
B10 – Legacy	***Guidance:*** *Will there continue to be impacts over time and after the project ceases? Why or why not?*	
	Results Statement: Project will deliver benefits well after project ceases as graduates realise the benefits of their training. Outputs from the project could assist PNG with improved capacity building to deliver much wider benefits well after the project ceases.	**Score:** **5**
C – ACIAR Learning		
C11 – Lessons learnt	***Guidance:*** *The intention is to capture experiences and learning which are not dealt with elsewhere in the review and which should be brought to the attention of ACIAR. It could cover, for instance, difficulties with capacity building, complex or changing institutional arrangements that impact of delivery of outcomes, personnel arrangements, difficulties in managing projects across multiple countries, infrastructure inadequacies inhibiting project implementation, risk management, impacts of uncontrollable events, etc.*	
	Results Statement: Lack of fully understanding the ACIAR partnership approach initially led to some communication difficulties and the lack of cultural familiarity (compounded by time and security constraints) marginally reduced some benefits from the project. These issues were largely addressed following the mid-term review but one of the lessons learnt is to emphasise the importance of understanding the work and home life of project participants before or during the project. There was no question, in our minds, that the project team correctly identified the training needs and adapted and delivered first class training that will be of major benefit to NFA and PNG. The experience gained from this project could underpin a new approach to capacity building in PNG and other countries by ACIAR.	
C12 – Follow-up	***Guidance:*** *Advise ACIAR on what, if any, follow-up activities and support are desirable to ensure successful completion of this project and long-term benefits from the project (including spill over to other countries/regions).*	

	Results Statement: **During existing project** 9. Further evaluation of benefits from supervisors of course participants. 10. Hold a workshop for NFA Managers to discuss project outcomes. 11. Expand project output document "Pathways to Learning" to include how various qualifications might contribute to higher qualifications. **Follow on activities** 12. The potential for a major new theme of research on capacity building should be examined by ACIAR. Such a program could build on learnings from this project (FIS/2010/055), and utilise a "pathways to learning approach" to identify the required educational programs (including diploma, graduate and post-graduate) that best strengthen institutional capacity. An emphasis on in-country delivery, linked to ACIAR research where appropriate, is recommended. There is a body of research needed to guide such a program to ensure long term investment from Australia in partner country "capacity building" delivers long-lasting benefits to institutions, partner countries and Australia. Arguably, the current practice of short courses delivered on specific topics within projects, most often fails to realise the targeted long-term capacity improvement in technical and scientific staff. 13. This concept might be explored initially through a seminar at ACIAR by the Project Leader on "The potential for a new approach to capacity building within selected ACIAR partner countries". 14. Lessons from project insights about successful teaching in PNG should be shared with ACIAR Research Program Managers, with a view to enhancing the approach to capacity building within existing or new ACIAR projects. 15. Ongoing engagement with course participants is recommended to help reinforce the positive benefits from the Graduate Certificate. Understanding longer term impacts should be investigated during a longitudinal study, possibly as part of a follow on project. A follow-on project with NFA be considered, if this is a priority arising from the workshop held with senior NFA managers (recommendation 2 above). It is likely the focus would be on taking present graduates through to graduate and higher degrees, as well as expanding the course to engage the range of professional disciplines within NFA. Alternatively, ACIAR could consider the range of courses being delivered to participants from the full spectrum of ACIAR's programmatic work in PNG.

Signature: 

Name: Dr Geoff Allan

Designation: Project reviewer

Date: 26 October 2017

Signature: 

Name: Augustine Mobiha

Designation: Project reviewer

Date: 26 October 2017

UNIVERSITY of TASMANIA

ACIAR PROJECT: FIS/2010/055

BUILDING RESEARCH AND PROJECT MANAGEMENT SKILLS

IN FISHERIES STAFF IN PAPUA NEW GUINEA

Final Report: Appendix 10

Final Evaluation Report prepared by RDS Partners

Building research and project management skills in fisheries staff in Papua New Guinea (FIS/2010/055): Evaluation Report

Evaluation Report | June 2018

Prepared by RDS Partners
Author: Dr Kiros Hiruy

Evaluation of the project 'Building research and project management skills in fisheries staff in Papua New Guinea', February 2018.

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About RDS Partners

RDS Partners is a small team of consultants specialising in social research, evaluation and project development services. RDS Partners' Directors Tom Lewis, Maree Fudge and Kiros Hiruy focus on positive social, economic and environmental outcomes with communities. Maree, Kiros and Tom work with a team of associates and project partners who share this sense of purpose. To us, the key to positive and sustainable change is working in partnership with all stakeholders: residents, companies, industries, governments and not-for-profit organisations.

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Acknowledgements

Evaluation can be a challenging process, and we would like to acknowledge the University of Tasmania (UTAS) and the Papua New Guinea (PNG) National Fisheries Authority (NFA) staff, who engaged fully with us through the ups and downs of the evaluation project processes.

Our thanks go to the UTAS Graduate Certificate in Research students in Papua New Guinea for their time and willingness to share their experiences with us.

We would also like to thank the project manager Professor Janelle Allison, and Project Team members Associate Professor Joy Rathjen, Dr Christine Angel and Sandra Knowles.

We hope that the report will strengthen UTAS's learning culture and contribute positively to similar research capacity building projects in developing countries. We also hope that the lessons learned from the project would be useful to the Australian Centre for International Agricultural Research (ACIAR), NFA and other agencies who are interested in research capacity development in developing countries.

Kiros Hiruy

RDS Partners' Evaluation Team Leader

June 2018

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Summary of findings

The '*Building research and project management skills in fisheries staff in Papua New Guinea (FIS/2010/055)'* project is a collaboration between the National Fisheries Authority (NFA) in Papua New Guinea (PNG) and the University of Tasmania (UTAS) and funded by the Agricultural Centre for International Agricultural Research (ACIAR) to address research capacity development needs in PNG. The project offered a four-unit Graduate Certificate in Research as an in-country professional development program for researchers (scientists) involved in scientific work in other ACIAR-funded projects within NFA and other organisations. The course was delivered to 48 students (researchers) in three cohorts, one cohort per year between 2014 and 2017 and 40 students have completed the four units.

Participants from the three cohorts were interviewed at the beginning and the end of the course. In addition, participants from the first cohort were interviewed two years after completion to assess the cognitive and practice changes that resulted. We also interviewed supervisors of participants to understand their perception of the cognitive and practice changes.

This report provides an assessment of the impact of the Graduate Certificate program on participants' attitude and practice changes about project management and science at the individual and organisational levels. Overall, our assessment shows that the program was beneficial to researchers and that it has contributed to increased technical capability as well as to the 'soft-skills' required to work in teams in PNG.

Findings include:

- Increased understanding of the importance of good data management practices and the importance of accurate data collection led to improvement and practice change in data management. These significant capacity building gains are likely to enhance technical and research capabilities and enable PNG to attract investment to drive research outcomes and improve the productivity and sustainability of its resources.
- Increased confidence in scientific and technical capability, along with a validation of their personal and professional standing. Enhanced self-reflection and validation of professional capabilities significantly contributed to participants' professional identification as 'scientists': bolstering their confidence in problem-solving and enhancing their ability to adopt and implement research skills.
- The provision of core writing and communication skills built an understanding of written and technical communication processes and led to a general improvement in communication skills. It is anticipated these improvement gains to contribute to

improvements in management processes of participating organisations, encourage knowledge sharing and contribute to publication outputs.

- Improvement and practice change based on participants' self-generated learning experiences resulted in an improvement of research and project management in participating organisations (e.g. NFA).
- The course has opened the possibility for participants to form new networks and create awareness of the value of networks in research. This heightened awareness is likely to open up opportunities for participants to collaborate with researchers from different institutions and countries to share knowledge and increase their research outputs.

1. Introduction

1.1 The context of the evaluation

This evaluation covers the University of Tasmania's (UTAS) Australian Centre for International Agricultural Research (ACIAR) funded project 'Building research and project management skills in fisheries staff in Papua New Guinea' (FIS/2010/055) work in research capacity building between 2014 and 2017.

The program enrolled three cohorts of students over three academic years (2014, 2015, and 2016). Students were researchers and technicians working with various organisations including the National Fisheries Authority (NFA) and the National Agricultural Research Institute (NARI) in PNG. Each cohort took four units of study, namely: BAA506 – Learning Through Practice A (Workplace); XGR501 – Introduction to Higher Degree by Research; XGR502 – Communicating Research; and XGR505 – Specialised Research Methods. Each unit was delivered in either a three or four-day intensive mode.

Within this context, this evaluation assessed the impact of the Postgraduate Certificate in Research on participants' attitude and practice changes about project management and science (research), both at the individual and organisational levels.

1.2 Purpose and scope

The overall objective of the evaluation is to determine how access to postgraduate education and subsequent qualification in research training impacted on the quality of research undertaken by staff of the participating organisations, such as NFA. As indicated in section 1.1, the specific purpose of this report is to assess the impact of the program on participants' attitudes and practice changes about project management and science at the individual and organisational levels. The assessment is based on interviews conducted pre- and post-course delivery. The assessment is part of a broader evaluation that includes course delivery and content. However, this evaluation report does not include course content and delivery.

2. Literature Review

2.1 Development and research capacity building in PNG

The United Nations Millennium Development Goals identify the development of regional Science, Technology and Innovation (STI) frameworks as crucial drivers in Less Developed Countries (LDC) for a reduction in life domain vulnerabilities and the establishment of local innovation leading to economic development (ITU et al., 2011; UNCTAD, 2007). There are significant amounts of research tied to New Growth Theory and the value to LDCs in the creation of new, innovative products and technologies as a means of increasing productivity and driving economic growth; this literature review will not examine these.

In 2011, the UN System Task Team on the Post 2015 UN Development Agenda noted that participatory approaches should more fully engage all facets of LDC communities to realise their full potential to participate in STI activities. Moreover, external support is needed to build STI capacity (ITU et al., 2011). For example, countries with robust embedded STI frameworks can capitalise on technological advancement and attract significant levels of investment to drive research outcomes. The effectiveness of investment can be measured using metrics such as publications, patents and licencing (UNCTAD, 2007).

The 2005 World Bank review of Healthcare R&D Capacity Building identified three key priority areas of investment: a) individual capacity building, b) institutional capacity building, and c) targeted capacity-building efforts, which are intended to strengthen operating environments, as critical success factors. This approach encourages increasing skills development effort more generally, which includes specialised postgraduate degree training and the development of leadership skills. Of particular importance in this approach are timeframes (UNDP, WHO, & World Bank, 2002), and the need to take a long-term view, such as implementing programs over a five to a ten-year timeframe to build sustainable workforce skill transition effectively.

UNDP, in the 2016 Human Development Briefing Note included the Sustainable Development Dashboard which places PNG in the bottom third of equivalent Nation States in relation to factors such as Government investment in Research and Development (UNDP, 2016). For countries like PNG, some of the typical barriers standing in the way of developing a strong STI sector include:

> *chronic underinvestment in universities and research institutions, lack of access to current research findings, low wages and poor career prospects for researchers are just some of the factors that can hold back research in LDCs, with many researchers*

opting to work abroad or forced to devote more time to other activities such as teaching and consultancy (ESSENCE on Health Research, 2014, p. 8).

This theory argues that investing in STI without investing in the capacity of its associated workforce will not achieve meaningful economic gains.

The contrary is also true. The right investment in the capacity development of individual researchers, as well as organisations that conduct and manage research, can improve the productivity and sustainability of a country's resources, such as fisheries and aquatic resources. Research capacity can be built through formal and informal processes and activities. Formal processes may entail training and other forms of learning, such as Work Integrated Learning (WIL), that enhance the knowledge, understanding and competencies (skills) of individuals (Gordon & Chadwick, 2007).

As Gordon and Chadwick (2007) note, formal capacity building processes and activities increase labour productivity, capital productivity and total factor productivity. They also point out that training both enhances individual capability and improves labour productivity. This enhanced individual capability, in turn, enables people to utilise equipment, machinery and new technologies, which increases capital productivity. Improving the design and management of these processes cultivates a trained labour force that is more adept at using appropriate equipment, machinery and technology. This develops tailored innovation suited to local context based on increased scientific capacity.

2.2 Research capacity building and Work Integrated Learning (WIL)

The Australian University landscape has seen an upsurge in support for the Work Integrated Learning (WIL) model. Through this partnerships have formed with industry and community (Edwards, Perkins, Pearce, & Hong, 2015). The Australian Council for Educational Research noted that WIL links theoretical coursework to well organised and choreographed industry-student partnerships (Edwards et al., 2015). The approach taken in the University of Tasmania partnership mirrors many research capacity building approaches in LDCs, in which a range of technical and soft skills are taught in a postgraduate setting to scientists and researchers (Vogel, 2011). The advantage of this approach is that tailored instructional design when adapted to the in-country situational context can have significant outcomes for the program recipients.

However, much of the literature asserts the need to approach the individual capacity building alongside institutional and targeted approaches. Otherwise, the efforts of building individual skillsets are quickly lost. Additionally, the uneven power structure of capacity building partnerships can undermine the effectiveness of outcomes with Developed Countries (DC). In providing the technical and administrative muscle to the partnership, DCs effectively make decisions—be it directly or indirectly (Barretta, Crossleya, & Dachib, 2010).

Many evaluations of science capacity building come from health research capacity building in LDCs (Bates et al., 2006). Research undertaken by Bates et al. (2006) indicates that historical science capacity building approaches, where learning and development were a bolt on to an existing project, were ineffective. They note that a phased approach with consistent stakeholder engagement throughout the development and implementation of the WIL program was most likely to be successful. There are also institutional barriers to effective science partnership development in DC's academic institutions, whereby the existing institutional reward systems focus on 'the principal investigator of a grant and the first or last author on a publication' (Harris, 2004, p. 11). This reduces the incentives for full stakeholder engagement, and with it, the formation of long-term collaboration prospects.

Irrespective of the regional context for science and research capacity building, the learnings around effective development-centred program design were similar. These included:

- *The need to understand the country-specific context, and existing capacity and constraints from the start to allow for sustainable long-term improvement.*
- *Programme managers must also be prepared to re-design programmes to consider changing political, social and environmental contexts.*
- *Projects should build on existing capacity, avoid using parallel processes and enable local ownership where possible.*
- *Mentoring is vital for individual development and needs to be built-in to the institution with incentives, resourcing and succession planning, so that new mentors are produced* (ESSENCE on Health Research, 2014).

WIL frameworks for undergraduate students in Australian Universities vary significantly, but most models identify that late stage undergraduates' best WIL outcomes require the professional capstone course that is workplace-based (Figure 1) (Leong & Kavanagh, 2013). The same applies to LDC researchers and scientists, where embedding learnings from coursework are best done in applied project work that actively utilises new learnings in problem-solving through direct application.

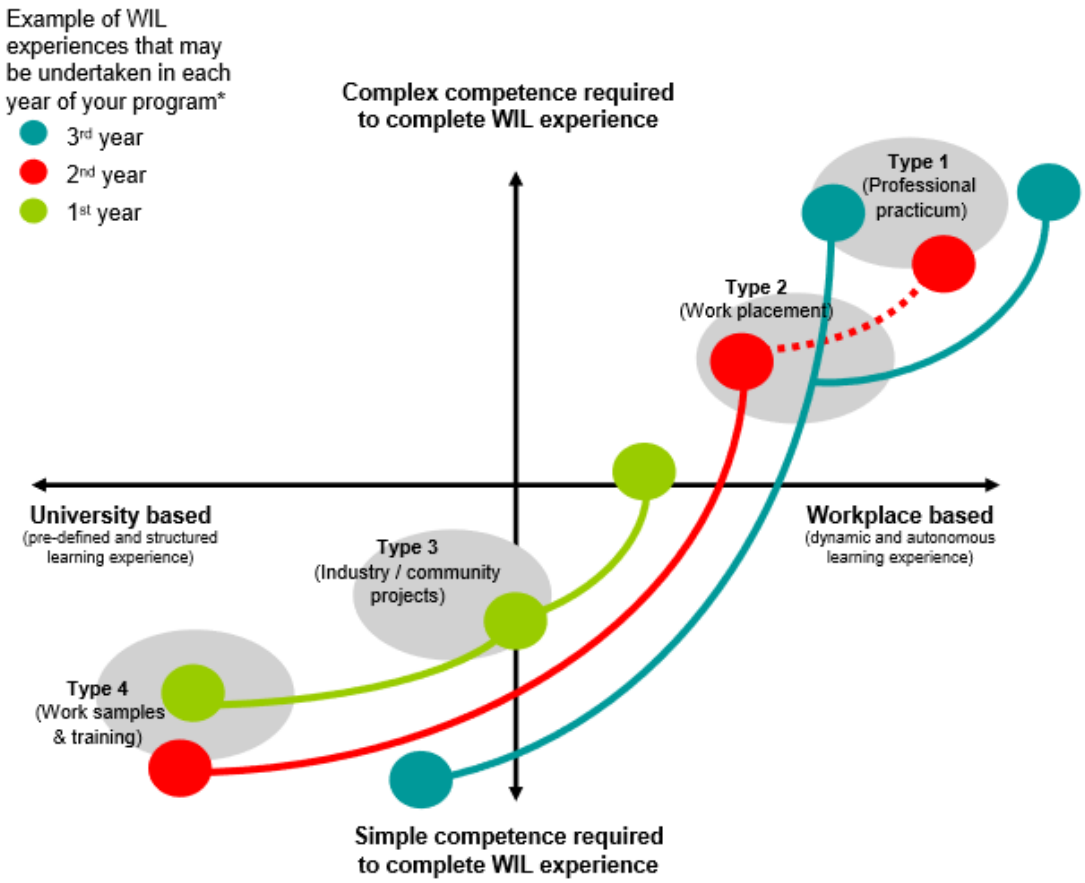

Figure 1: A work integrated learning model (*Source LEONG & KAVANAGH (2013, p. 7))*

2.3 Evaluation of research capacity building in developing countries

Capacity building is a dynamic and multidimensional process where a complex set of factors, both internal and external, interplay (Gordon & Chadwick, 2007; Longmore, Bantilan, Gordon, & Australian Centre for International Agricultural, 2007; Simister & Smith, 2010). Thus, no standard method of evaluation can be applied to measure impact. Several reasons are given for this. To start with, 'human capital is used jointly in research with other inputs such as machinery, chemicals, labour …' (Mullen, Gray, & Meyer, 2015, p. 2). It is therefore problematic to attribute all changes in the capacity of an individual or an institution to a single course, such as the UTAS Graduate Certificate in Research. Secondly, other projects, programs, and developments (including technological developments) are also likely to contribute to the capacity of individuals and organisations in that area (Vallejo, 2015). Again, such a reality problematises the attribution of an impact of a single course, program or project. On the other hand, improved capabilities in a field have broader ramifications by way of enabling individuals and organisations to contribute to the broader society and other projects or programs. Conversely, it is worth noting that capacity change is dynamic: it can

increase as people gain experience and develop expertise; and it can also erode and be lost over time, as the role and focus of organisations change and researchers leave or change positions. Thus, it is challenging to assess the capacity building impact or practice change over time (Simister & Smith, 2010; Vallejo, 2015).

The literature also suggests exercising caution when qualifying and quantifying capacity building impacts to a course or a program (Gordon & Chadwick, 2007; Longmore et al., 2007; Simister & Smith, 2010; Vallejo, 2015). Research on the diffusion of knowledge in innovation systems does, however, indicate that building and applying skills stimulate research outcomes, such as publication development, new process design, and innovation (Holi, Wickramasinghe, & Van Leeuwen, 2008). Given the complexity and multidimensional nature of the capacity building context in PNG, a framework was developed for this project.

The framework uses an integrated approach that considers course content and delivery, cognitive elements and diffusion of knowledge to demonstrate practice changes and overall capacity building impact of a course on individual participants, institutions and communities. Figure 2 shows a schematic representation of the evaluation framework used. This framework was developed to demonstrate the contribution of the UTAS Graduate Certificate in Research delivered in PNG. However, as stated above, it is essential to recognise that attribution of a given capacity building impact to a single course, or an individual program alone can be problematic, and due caution in this regard must be exercised.

3. Methodology and evaluation framework

3.1 Overview

The methodology adopted for this evaluation is qualitative, and data were collected through semi-structured interviews of students and supervisors. The evaluation framework (Figure 2) developed for the overall project was used to assess skills, knowledge, and practice changes at the individual and organisational levels.

3.2 Evaluation Objective and Questions

The focus of the research project (FIS/2010/055) was to determine whether access to post-graduate education and the gaining of a formal qualification in research training, made an impact on the quality of research undertaken by NFA staff. However, as indicated in the context of the evaluation (1.2), this report focuses on the assessment of the impact of the program on participants' attitude and practice changes at the individual and organisational levels.

The objective is to evaluate the benefits of this model of staff training to participants' own research projects and their institutions. Moreover, this evaluation contributes to answering at least two of the research questions of the project,

1. What are the benefits of integrating research training with workplace activities? and
2. Does working towards a Graduate Certificate in Research foster better research outcomes in the workplace in PNG?

3.3 Evaluation framework and perspective

Within the broader context of this project, the framework developed encompassed three elements: 1) course content and delivery; 2) cognitive elements, and 3) diffusion of knowledge. However, this evaluation is limited in scope as discussed earlier and only contributes to the evaluation of the cognitive and diffusion of knowledge elements as part of the broader assessment of the program. Thus, course content and delivery will not be considered further.

Cognitive outcomes of the course are assessed by looking at both the uptake of information by individual students and the way in which students used the information and knowledge gained in class and practice in their workplace. As such, this report documents the skills acquired by participants because of the course, and how that realised changes in the workplace.

Furthermore, the framework allowed us to evaluate the diffusion of the cognitive outcomes of the course. These included the way in which participants transferred knowledge and information for use in practice; and the subsequent changes in leadership, communication, confidence, and developing a sense of team.

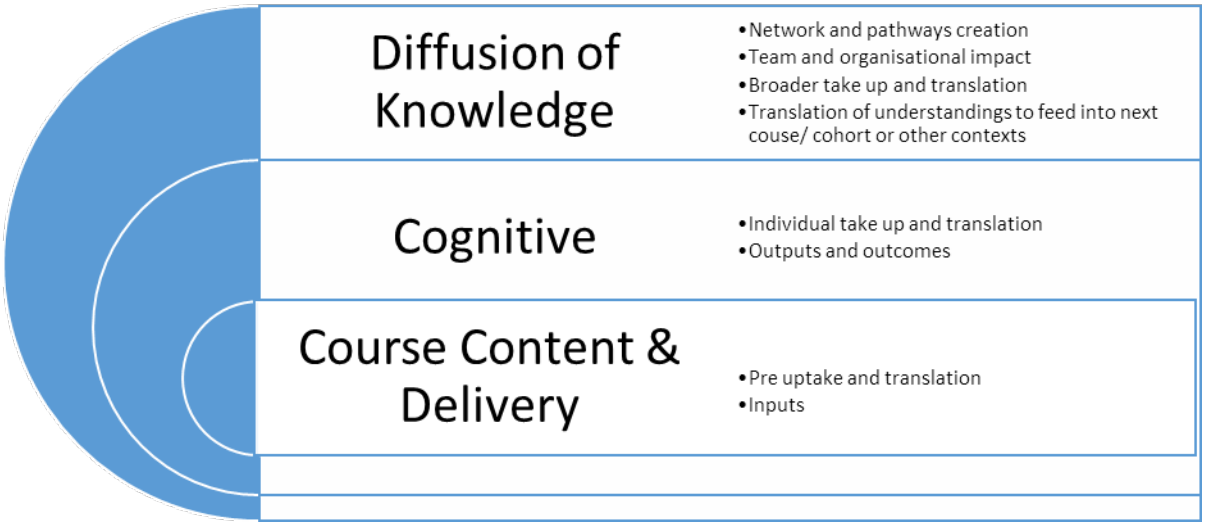

Figure 2: Evaluation Framework

The report assesses whether the course has contributed to the improvement of research practice of participants by examining two aspects of practice change:

1. *Practice change as it pertains to the self*: This aspect speaks to an individual's capacity (and interest) to integrate the course materials, experiences and other learnings into their daily practice. There is an explicit emphasis on how the participant perceives him/herself as a scientist and how this influences engagement in research projects and application of research methodology;
2. *Practice changes as it pertains to the participant's role and place* in a project team, organisation and community more broadly. This includes the way in which participants transfer knowledge and information for use in practice. It also refers to the positive increase in leadership, effective decision-making, communication, confidence, conflict management and resolution skills, role modelling and mentoring and developing a sense of team.

The latter part of the evaluation requires careful consideration of the multiple roles participants may have had. For example, as a student in the project under assessment and as employees in other ACIAR and NFA projects.

3.4 Evaluative Criteria

The data collected were assessed using the framework to understand the impact of the program on participants' attitude and practice changes at the individual and organisational

levels. Table 1 shows the data required for each domain of the framework relevant to this evaluation, the methods used, and criteria used to code the data.

Table 1: Evaluative Criteria

1. Cognitive (Outputs)

Content	Data	Method	Criteria (code statements)
Skills attainment	Seeks to determine what skills participants feel they have attained and their reflections on quality of these skills	Commencement, exit and 24-month interviews with course participants	Skills acquired through the course
Skills retention	Seeks to determine what learning is happening	Exit and 24-month interviews with course participants; interviews with supervisors	Statements aligned with skills retention and learning
Impact on project design and implementation	Seeks to understand changes in capacity to design research projects and communication and other skills informed by participants and supervisors perception of those changes	Commencement, exit and 24-month interviews with course participants; interviews with supervisors	Perceived and observed changes in research design, communication, and data management.
Aspirational trajectory	Self-reflection on aspirations related to course impact and change over time	Commencement, exit and 24-month interviews with course participants	Aspirations stated as a result of the course
Impact of project management	Shifts in practice Significant moments of change	Exit and 24-month interviews with course participants; interviews with supervisors	Statements indicating changes in practice and perceived substantial changes in attitude and self-identity
Impact on project skills implementation	Changes in skills recognised by participants and noticed by supervisors	Exit and 24-month interview with course participants; interviews with supervisors	Changes in skills and attitudes observed by supervisors and identified by self
Impact on Communications	Improvements in communication skills	Exit and 24-month interview with course participants; interviews with supervisors	Improvements in communication skills

2. Diffusion of Knowledge (network and pathways creation)

Content	Data	Method	Criteria
Communication	Reflections on changes in communication styles or approaches.	Exit and 24-month interview with course participants; interviews with supervisors	Changes in communication style
Leadership	Reflections on aspirations to leadership and changes in leadership styles or approaches.	Exit and 24-month interview with course participants; interviews with supervisors	Aspirations or changes in leadership styles
Networks	Changes in the participant's network over time.	Commencement, exit and 24-month interview with course participants	Changes in networks

Pathways of knowledge	Change in knowledge over time.	Commencement, exit and 24-month interview with course participants	Statements showing changes in knowledge

3.4.1 Data collection

We conducted interviews with students at three stages: at the start of the course (commencement interviews), after the completion of the course (exit interviews), and one year after completing the course (24-month (second year) interviews). We also interviewed supervisors at the end of the course. Commencement interviews were conducted in person in PNG. Exit, 24-month and supervisors' interviews were conducted by telephone. All interviews were recorded and transcribed.

Overall, we conducted 48 commencement interviews, 31 exit interviews, 11 second year interviews and five supervisor's interviews. Interviews were tape-recorded and transcribed.

3.4.2 Challenges in data collection

Initially, we anticipated conducting all interviews in PNG. However, given the time-intensive nature of the interview process, the research team determined that only commencement interviews would be conducted in person, and all others by telephone from Australia. This included the exit, 24-month and supervisors' interviews. Additionally, organising and scheduling interviews was a challenging process, as participants were spread across PNG and working on various projects. Response to emails was slow and, in some cases, non-existent, and telephone calls were interrupted intermittently due to poor reception. Maintaining the quality of recordings was also challenging due to interruptions. These challenges made transcribing some of the records problematic. However, to mitigate such challenges, interview notes were used to complement the data.

3.5 Data analysis

The data sources for this evaluation were transcriptions of semi-structured interviews with students and supervisors at different levels – commencement, exit (one year after enrolment) and 24 months after enrolment.

Interviews were transcribed using professional transcription services and coded using themes extracted from the overall evaluation framework and relevant questions. We also reviewed recent peer-reviewed publications and 'grey' literature regarding research capacity building in developing countries to inform our selection of evaluative criteria and data analysis.

We used open, axial and selective coding to explore the data in relation to the relevant evaluation questions (Gobo, 2008). We also used the evaluation framework to inform the

analysis process. At the open coding stage, transcripts were read and ‘used to think with' (Hammersley & Atkinson, 1983) to identify developing or emerging patterns and ideas that required further attention and exploration in the evaluation process. At the axial coding stage, the evaluative criteria were used to seek comments from the interviews against the evaluation questions. At the selective coding stage, we analysed the identified emerging themes and key findings and investigated whether there was sufficient evidence—both in our data and in the literature—to support preliminary findings. Both triangulation of data and reflexivity were employed (Hammersley & Atkinson, 1983).

Overall, the evaluation framework and associated criteria were used to analyse the data objectively.

3.6 Limitations

Notwithstanding the comprehensive nature of this evaluation, two key limitations underpin this report.

1. The data for 24-month interviews are only from the first cohort

The 24-month interviews were designed to assess the ways students used information and knowledge gained in class and through practice in their workplace, and to document the changes in research skills acquired because of the course. However, due to time constraints, it was not possible to conduct 24-month interviews for all cohorts before project completion in 2017.

2. Long distance telephone interviews might have affected the quality of data

As discussed in section 3.4.3, it was agreed to conduct long-distance telephone interviews for exit, 24-month and supervisors’ interviews because of budgetary constraints and to avoid the potential disruption associated with bringing students who are spread across the country to a central location for interviews. Although the action was well considered given the situation, the tyranny of distance and the complications related to the quality of telephone reception in PNG might have affected the quality of data.

4. Evaluation findings

The initial proposal for project FIS/2010/055 indicated that earlier discussions with 'executive managers within the NFA, ACIAR Project Leaders and recommendations from the ACIAR Country Consultation process conducted in 2011, identified the need to strengthen organisational research capacity, and to build leadership and management skills in PNG'. A scoping report prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) also identified a need for research capacity building in this area in PNG (Australian Tropical Marine Alliance, Coral Triangle Center, & The Nature Conservancy, 2012). Similarly, a recent roadmap for coastal fisheries and marine aquaculture produced by the NFA also identified research capacity, particularly at the provincial level, as one of the institutional barriers for the growth of the sector (Government of PNG & Pacific Community, 2017).

Cognisant of these institutional and individual capacity gaps, the project used the UTAS Graduate Certificate in Research as a means of improving the knowledge and skills in the design, conduct, interpretation and reporting of scientific research within the NFA and associated organisations. The purpose of delivering the Graduate Certificate in PNG was to determine if this approach could increase the numbers of skilled and qualified NFA staff, thereby strengthening NFA's institutional capability and enhance NFA's and its stakeholders capacity to manage and develop the national and local aquaculture, mariculture and fisheries sectors.

Consistent with the original objective of the project, our findings suggest that the delivery of the Graduate Certificate program in PNG has been instrumental in strengthening NFA's capacity for research through the training of three cohorts of researchers. The critical mass of researchers trained through the course is expected to improve research capability through the NFA and its stakeholders by establishing professional networks and common language at the organisational level. Supervisors' interviews indicated that staff and supervisors were able to discuss, in increasing depth, research projects, research protocols and reporting with participants because of the course. '*There is [already] a change in people's [participants'] attitude about research, deadlines, objectives, and result*s' and this supports a good working relationship (04001).

In this section, we will present the findings against cognitive outcomes and diffusion of knowledge (see Table 1).

4.1 Cognitive outcomes – changes in knowledge, skills and practice

The Graduate Certificate in Research involves two core units and two additional units. These units were designed to enhance participants' understanding of their practice and to address the relevant scientific skill gaps by increasing participants' scientific knowledge and improving their skills in the design, delivery, interpretation and reporting of scientific research. It also aimed to develop participants' understanding and skills in project management and leadership and increase their confidence in applying those skills.

When asked whether the knowledge and skills acquired through the course had influenced or changed their research practices in the field, most participants responded in the affirmative. We found a strong sense of accomplishment regarding learning new skills and knowledge in research expressed through the language of interviews. Overall our analysis indicates that the course enabled participants to acquire and retain skills in research design, data management, and communication; improved their research project design, implementation and management skills; and contributed to changes in participants' aspirations and attitudes.

4.1.1 Skills attainment and retention – the role of the course in building research capacity (knowledge and skills

The project aimed to strengthen the research capability of the NFA and associated organisations to manage and develop the national and local aquaculture, mariculture and fisheries sectors. Central to this undertaking was the upskilling of individuals (their skills and competencies). Thus, it is critical to understand whether the program contributed to upskilling of researchers in PNG and whether researchers applied the knowledge and skills gained through the course and changed their behaviour as a result (cognition).

1. ***Changes in participants' knowledge of data and data management***

Data and data management are vital parts of the role of all participants who attended the course. The commencement interviews revealed that the majority had dealt with data collection, management and analysis in the past. However, this does not mean that participants had a good understanding of best practices in data and data management. It was evident that the course had changed the participants' perceptions regarding data and data management. The following responses provide the evidence.

> Yes, before then, there was kind of a carelessness involved, which means I did not care much about what I was doing. However, now after the course, I think very carefully (02010).

> The course has opened my mind in knowing the importance of data and properly storing it, able to present it better. So, yes in all aspects it has changed my mindset

> on how I keep data and where to keep it. Finding the safest place to keep data, not lose it; so that we can be able to go back to it and retrieve it to use later on as well (03007).
>
> Definitely. I was not good at data management and how to organise data and collect data. But, with this training, I was able to understand how to prepare data collection sheet and collect data in the field and then put data into excel and how to organise that on excel sheet. So that was one of the highlights (02025).
>
> I learned that I had to take care of it [data] and look after it properly by making multiple copies and backups and all these (02006).

There were also some emergent understandings of the shift in the roles that occurred as a result of the knowledge gained through the course.

> I used to be a data collector only, and after the course, I understand the data cycle, and this has changed my role to data manager (02013).
>
> The course has entirely changed my perspective of collecting and keeping a good record for future references (02017).

Changes in the knowledge and practice of data management were also demonstrated through participants' understanding of the research ecosystem as an integrated work.

> I think this course has helped me to consider more seriously the connection between data and research (02012).
>
> That has really changed the way I do things, especially at looking at research in general and the reason for doing the research, why we are doing it and how we are going to answer the research questions. Also, collecting metadata, the type of data that we are collecting and like developing framework around trying to understand why [we] are doing the research and objectively looking at how it is going to be answered and presented. The overall framework was something that gave us, [and] critically equipped us with what we should know and [what needs to] be done (02023).

Other participants have also reinforced the relevance of the course to their work by recounting how the course has changed the way they viewed and worked with data.

> For me, how to keep data safe is important. I used to have only one place for storing my data, but now, I have learnt that it is important to share data with people you trust and who can keep data for you, and to save backups for the different places, yeah that is useful to the organisation (02005).
>
> Before going through the course, data management for me has just been collecting but now I can … come up with results that I can show my bosses. Yes, that has to do

> with data management. It has impacted a lot how I [handle] data. I work with data …, and I know I have to put the data in [order] before I can interpret it (02003).

Overall, there was substantial evidence to suggest that the course had been instrumental in changing the way participants viewed the importance of data and data management. Participants reflected that the technical skills they acquired through the course were relevant and consequential to the quality of research done in their organisations. All participants stated that the course had changed the way they work with and manage data. Some also reported to have operationalised new protocols of data management because of the course. These changes suggest that data management skills have been enhanced both at the individual and organisational levels.

There was also ample evidence to suggest that the course has contributed to the improvement of participants' technical skills in research design and communication. These will be discussed in sections 4.1.2 and 4.1.3 below.

Our findings indicate that the course has opened up opportunities for participants to gain relevant research skills and new knowledge in data management, research design and communication including research proposal writing. These are significant capacity building gains not only for the individual researchers involved but also for the participating organisations such as NFA and NARI who required the skilled workforce to manage both nationally and donor-funded research projects. Such upskilling of research staff is likely to enhance technological advancement and enable PNG to attract investment to drive research outcomes and improve the productivity and sustainability of its resources, such as fisheries and aquatic resources (Gordon & Chadwick, 2007; UNCTAD, 2007).

4.1.2 Improvements in communication skills

Many participants stated an increased understanding of the value of communication and improvement in communication skills as their most significant learning. For example, one pointed out that the course gave him an edge in relating with managers and the community he worked with, because he reflected about his communication more, which in turn developed his interpersonal skills.

> Yes, the course has helped me do my job better. I am communicating my research and findings more. It made me better in communicating my research through the data report and then my projects and finding (02001).

Other participants also testify that the course has enabled them to learn how to communicate better both verbally and through their writing.

> Like I said before, communication is a critical component of work that not all colleagues do well. However, going through the course enabled me to see how important it is to

> communicate whether it is with my boss or it is a casual employee that help me with my fieldwork, communication is a critical part of work (03003).
>
> I think it [the course] has helped me to communicate better and changed the way I write emails (02015).

Analysis of the interviews suggests that there was an improvement in communication skills among participants and reflections from supervisors confirm this. We will discuss detailed account of the impact of the course in improving communication skills of participants further in section 4.2.1 below.

4.1.3 Improvements in research project design, implementation and management skills

The course has enabled participants to gain technical skills in research project design, implementation and management. Some participants reflected that the technical skills they acquired through the course, such as research design and management skills, were relevant to their work and had transformed the way they work.

> The course has changed the way I do things. Like for example I am drafting a project design and trying to capture what I have learned (02004).
>
> I am trying to put what I learned from the course into practice. I am designing experiments using those exercises or the course skill sets I [gained] (02006).
>
> Firstly, it [the course] changed my outlook…. to be able to do the right design of the experiment… and set up my data correctly and analyse it quickly (02024).

A response from one of the participants also demonstrates that they were given responsibilities in research design and management as a result of their participation in the course.

> As I said earlier, I was not involved in project research planning before. Right after the course, the supervisor decided to involve me in writing our research plans, which I was able to carry out (02008).

Our assessment has identified supporting evidence to suggest that the course has contributed to the improvement of research know-how and skills in the design and conduct of research, albeit the majority of the participants may not necessarily be involved in designing research projects due to the nature of their current positions in their organisations. Thus, it is likely that some of the capacity building gains in research design be lost over time.

4.1.4 Aspirational trajectories and change in attitudes

All participants indicated that the course had practical implications and applications for them

and their work, although there were differences in the responses of each interviewee.

1. Understanding self and others better

In one of the units, students were provided with the opportunity to learn about self and to understand different learning styles. This seemed to trigger a more comprehensive discussion about understanding self and how one relates to others in the workplace. For example, some reflected that the course provided them with the opportunity to understand themselves and their colleagues better. As one participant expressed, understanding oneself helps to understand others better and improve the working environment.

> I think I have … a better understanding of my skills, I am able to understand myself more in many areas and [this has helped me] to understand myself … and other colleagues. The impact in my practice is that …, I can communicate with [my collegues] more appropriately. It [the course] has made it easier (02003).

Another participant recounts:

> Yes, I think it has changed my attitude at my place of work. These course outcomes have enabled me to see my work from a wider perspective like sharing ideas, building a team of people with similar interest so that each team member can use their learning styles to achieve the goal of the project (02010).

Participants explained how a better understanding of self and others had translated to better outcomes at work.

> The most useful lesson was understanding myself and how I get along with my colleagues and stuff, and how we approach different situations and try to work together to accomplish things. So, it is just like me understanding myself and my colleagues as well (03009).

> Yes, the course has impacted a lot in my daily operations; it has enabled me to understand the work environment and the different learning styles possessed by my colleagues (02017).

There was also a claim that the course helped to understand one's current skill sets and areas for self-improvement.

> ‘Okay, it [the course] has helped me know myself and the qualities I have, which I thought would not be that much useful but knowing my skills has helped me [do better]’ (02005).

2. Identifying self as a ‘scientist’

Participants have repeatedly indicated that one of the most significant changes was the change in their attitudes toward their professional identity and how they interacted with their

daily work. In the past, many professed that they did not consider themselves to be 'scientists'. However, this seemed to have shifted because of the course. This can be gleaned from how participants professionally identify themselves or addressed others. For example, several participants identify themselves as 'scientists.'

> This course gives us an opportunity to get out and meet with other people, other fellow scientists from different provinces (02011).
>
> I am networking with other scientists and with other organisations (02001).

Other participants were also referring to their colleagues as fellow 'scientists.'

> I did appreciate the course. I do like it. I believe there should be more of these kinds of courses held for researchers and scientists. Not only in fisheries but in other sectors as well, to help them in research and becoming scientists, as well (03009).
>
> I see myself as a scientist or a researcher working in the fish section or fisheries scientist working with fish (02031).

The responses show a significant shift regarding how participants identified themselves as being part of the scientific community, as 'scientists'. One of the supervisors observed that self-identification as a 'scientist' had affected participants deeply and made them realise that they were 'it' for the scientific projects they work for,

> There was a change in people's attitude about the conduct of research…. In the past, many of them did it [research work] because we told them to. However, I think many of them have now realised that they are the scientists. They are not doing it for their managers. In the past, the attitude was as if they were doing it for their managers or the project, or for someone else. However, they have changed for most of the part now (04001).

Participants claimed that their participation in the course and interaction with teachers helped them to understand their roles as researchers and scientists better and the majority now identify themselves as 'scientists' and 'researchers'.

3. Becoming more reflective

Interviewees identified that the course made them more reflective and helped them see their work situations differently. This notion of reflection and 'seeing differently' was expressed in several ways. For example, the following two participants pointed out that learning to reflect changed the way they operated personally and at the workplace.

> Firstly, it [the course] changed my personal life. In the course, we reflected, and we brought that to the workplace, that can affect the workplace, and the way we do things in the workplace (02006).

> I think reflection. Yes, after the course I allow myself to reflect on my decisions which had a great impact on the outcomes of my work (02008).

While another interviewee associated the relevance of the course to him as a person and his work to one technique learned in a class called 'the balcony view'.

> I liked 'the balcony view', where [one] can look at everything from the outside through reflection. Putting myself out of the picture frame and seeing the picture better from the outside and then trying to get [understand] everything. Stuff like that was useful for my work (02011).

Similarly, other participants have related the relevance of the course to their learning styles.

> These course outcomes had enabled me to see my work from a wider perspective like sharing ideas, building a team of people with similar interest so that each team member can use their own learning styles to achieve the goal of the project (02017).

Overall, the results indicate that participants were able to understand themselves and others better, become more reflective and develop confidence as they identified as scientists and researchers. These changes and moments of learning and self-discovery were useful to individuals—either to strengthen their technical knowledge and skills, develop their confidence as researchers or to cultivate their interest in learning continuously. In this regard, the findings suggest that the course was successful in providing the space, knowledge and skills required to enhance awareness of participants learning styles and preferences, skills and capabilities, and that of others. Thus, by increased confidence in scientific and technical capability, along with a validation of their personal and professional standing, it can be argued that the course has contributed to participants' professional identification as 'scientists': bolstering their confidence in problem-solving and enhancing their ability to adopt and implement research in a team environment.

4.2 Networks and pathways creation – Diffusion of knowledge

Among others, participants were asked to reflect on the impact of the course in their communication style, leadership aspirations, changes in their networks and changes in knowledge over time. The response from participants was overwhelmingly positive. All participants noted the value and relevance of the course to their personal development and the work they do. The majority indicated that the course had been instrumental in helping them understand themselves better – their communication and learning styles, and their leadership capability and interest. They also noted that the course enabled them to build broader professional networks. On the other hand, supervisors who were asked about the changes in knowledge among their staff reflected that their staff had gained relevant knowledge or skills from the course. This section will present these findings.

4.2.1 Reflections on changes in communication approaches

Various course participants identified the opportunity to build practical communications skills across multiple communication channels as a ‘game changer’ as they moved beyond the theories of emotional intelligence to practical impactful communication. Participants consistently reported an increased value on clear and considered communication.

Participants expressed that the course was instrumental in changing:

1) Their confidence to communicate with peers and supervisors;

> I have changed the way I do things because of the course especially when communicating with my superiors. It was not something that I was very confident in doing, but now I have the knowledge acquired from this course. It has made me more confident to discuss and exchange ideas with my bosses. I can be a timid sort of person, [but] the skills and knowledge that I have learnt from this course have changed the way I communicate (02003).

2) Their style of communication;

> The way I send my emails, the way I address people - I think the way I communicate, so, it has helped a lot (02005).
>
> How to do things more harmoniously than before. Moreover, I get to write research proposals and sign research proposals now (02012).
>
> Mostly I deal with people; I hope it has improved my communication effectively. When I talk to my bosses, farmers, and getting the message across to everyone (02011).
>
> One of the things I am using now is how to properly write an email where the recipient of the email will understand what the message I am trying to bring across is and the usage of tone and the words. Like layman's language, for them to understand what I am trying to convey across. So that is something I am using every day now, like properly structuring an email and ensuring that my message got across to my reader (02018).

Supervisors also noted these changes.

> I think the course has helped them write better. Attending the class has helped them do some specialist writing when it comes to report writing. Yes, generally I have seen some positive feedback from participants. They have written some reports, and I am quite happy and impressed with what they have produced so far (04003).

These findings show that the course has improved the way participants understood communication and communicated across the board, via emails, verbally and in writing.

Although it is difficult to assess the extent to which such improvements might have increased research outcomes without citing written materials from participants, we anticipate the improvement gains to contribute to management processes at NFA and other participating organisations and encourage participants to share and exchange knowledge and contribute to increased publication outputs.

4.2.2 Articulation of leadership aspirations

When participants were asked if they had any ambition to be leaders, the majority answered in the affirmative, although their perceptions of what type of leader they wanted to be or in which area they wanted to assume leadership varied.

For some, the sense of community and the desire to support their community members seem to inspire them to be leaders.

> Yeah, I do aspire to be a leader and it depends where I will be, and it depends on the community that I will be working with, but I do aspire to be a leader (02002).
>
> Yes, I am a very ambitious leader. I like to drive people to do something. Moreover, I do not know what leadership it will be, but I am very interested in leading village people to help them improve their livelihood and improve their economy and stuff like that. So that is the leadership that I am presently interested in (02024).

For others, it was the desire to do better in their current occupation that encapsulated their ambition to lead.

> One of the examples was like there was a time when I was asked to oversee a unit and I believe the course has helped me to become a better leader, a better manager. I did perform some of the tasks which I thought I would not have done so, but it has given me the confidence in myself. I was able to perform things which if I hadn't taken the course, I know I would not even be able to feel confident about. It was a challenge. I accepted the challenge and I did what had to be done, so that was helpful to me, as well (03009).
>
> Yes, I do have ambitions in leadership. I am a leader myself in my workplace and organisation, and very reliable in that. So, I do have big ambition in leadership (02028).
>
> I would say that I am a team leader, and I love being a leader. I mean, with my job, I must be an example to those who are below me. So being a leader is someone that stood out and who can lead, who can give ideas (02032).

Supervisors also noticed the leadership ambitions and skills.

> I am the manager here and sometimes when I want to go away for leave or some

> field trips, I delegate one of the staff. And that is one of the students from UTAS. She has done well. I am so pleased that she has taken on some leadership and decision-making, which I have high regard for. So yes, when it comes to decision-making and management of the facility here, which takes control of about 11 staff, I am well pleased (04003).

The findings demonstrate that the course has inspired the majority of participants to express their desire to be leaders, be it in their workplace or community. However, it is not possible to assess whether the course has contributed to changes in leadership styles and approaches without observing participants in leadership positions. It is also worth noting that the articulation of aspiration in leadership does not necessarily translate to people assuming leadership positions and becoming good leaders in their workplace or their communities. The transition from being an aspiring leader to an actual one is likely to require both an opportunity and specific attributes such as interpersonal skills.

4.2.3 Broadening networks and understanding the strategic value of networks

Our analysis suggests that the course has expanded the networks of participants. For example, the following participants indicated that the course had enabled them to meet new people and they had maintained contact with their fellow participants since.

> Earlier I said I had a chance to mix around with people from other industries in this country and this expanded my network. Now, I have contacts from the guys in forestry. Also, some guys in universities, also horticulture. My network has become broader now. I can talk to them and we have been exchanging emails, talking about other research topics and how to do publications and whatnot. So, it did expand my network, yes (02028).

> Yes, now I can communicate with you guys and with my other colleagues that I have not met before, like the guys from my cohort. Most of them, I did not know them before. But during the course, I knew most of them, and we communicate through emails and phone calls. And, you guys at the University of Tasmania (02033).

> Yeah, that is right, yes. That is one thing I have acquired now it has been good. I can be able to get a fisheries department and all these things. So, I extend the network, which I am pleased about (02024).

Others also indicated that the course not only provided them with the opportunity to network with colleagues, but also created an avenue for them to learn from each other and collaborate.

> I think I did not know some of my fisheries colleagues. Within this course now, I think I know some of my [fisheries] colleagues. And before, we did not work closely

> together, but now I think that will change (02025).
>
> After going through the training, I was [actively] networking with other scientists and collaborating with organisations (02001).
>
> Especially those scientists or those participants that came over for the course change our perspective or what we do back at our workplace. Moreover, we see there is a need for some networking. We have already exchanged email and phone numbers and stuff like that (02020).

In general, the immediate and obvious outcome was that the course gave every participant an opportunity to meet and create a collegial relationship with other participants who worked in different provinces, projects and even organisations. However, it was also apparent that the sessions on networking created more awareness of the value of networks in research. This seemed to have created interest among participants to seek broader collaboration outside their organisations. Although we were unable to cite any evidence to suggest that participants had formed or joined new networks, networks among researchers are likely to create the opportunity for researchers from different institutions and countries to share knowledge, work together and increase research outputs (Puljak & Vari, 2014).

4.2.4 Changes in knowledge over time

Supervisors' testimonials suggested that students were more likely to engage in research activities after they attended the course. This was most apparent in a testimonial from a project manager who supervised two participants and who had direct dealings with several others.

> I have two students, but if I may speak about one of them, [X] is taking the initiative to do [X's] own research activities …. Yeah, [X] is [now] doing independent research, because of the skills that [X] has obtained from the program that UTAS has been running (04002).

Another supervisor argued that the changes in knowledge and skills he observed on the staff who attended the course had already contributed to improvements in research work in his unit. He also argued that the changes attained are relevant to NFA and other organisations' capacity needs in PNG.

> I would think it [the course] to have a positive influence on the attitude and confidence of the staff from NFA. Of course, they have been doing some work already, but when it comes to managing data, they have been collecting so much information and data, but I think this course has helped them to start analysing it and it will help build up confidence in the staff. So yes, I would say it has benefited NFA (04003).

All interviewed supervisors reported improvements in research skills, confidence and enthusiasm among participants after their return from the course. However, this spike in interest might be because they were interviewed only 12 and 24 months after completion. It may thus be beneficial to check whether this enthusiasm is sustained three to five years from completion. Further exploration will also provide opportunities for the organisations themselves to consider whether a refresher course or a master class of previous students might be warranted, to most effectively retain these skill improvements.

Many participants also indicated that their role or responsibility changed because of the course. However, some of the changes were substantive, while others were related to changes in the activities performed.

> After the course, my manager has given me certain tasks. For instance, I am now coordinating data collection in the field. I have been given the leadership to lead the team for a survey (04004).
>
> Before the course I was not involved in project and research planning, after the course, the supervisor decided for me to be involved in writing our research plans, which I was able to carry out. It did change my work on the project (02008).
>
> I was given new responsibility in community-based development this year in January (02003).
>
> I believe the course has helped me in respect of communication with my workmates, with my supervisors and other scientists as well, yeah, so, it has helped a lot (02005).

These changes in roles and responsibilities could have occurred because supervisors recognised the newly acquired or enhanced skills in participants and wanted to utilise that. Participants' renewed interest in research and research-related activities, stemming from a higher confidence and improvement in skills, can also motivate participants to initiate changes in roles and responsibility in the workplace.

5. Evaluation observations and remarks

1: An opportunity for UTAS to invest in a long-term partnership with NFA and ACIAR to support the research capacity development efforts in PNG and other Pacific Island countries

We understand that the current program is finalised. However, given the experience and success of this project, we see an opportunity for UTAS to consider investing in a long-term partnership with NFA, ACIAR and other stakeholders to support research capacity building in PNG and other Pacific Island countries. The experience gained through this pilot course has indicated that a skills-focused course like the Graduate Certificate in Research run in-country is effective in enhancing the research capacity of the workforce in developing countries without displacing them from their current workplace and country.

2: Consider engaging participating institutions to open the possibilities for refresher courses to sustain the research capacity building gains in PNG

The improvements in research know-how and skills in the design and conduct of research and the confidence and enthusiasm among participants might be high immediately after participants returned to their workplace. However, there is no guarantee that participants would retain and continue to use the knowledge and skills attained through the course. In fact, it is likely that some of the capacity building gains would be lost over time. It may thus be beneficial for UTAS to consider engaging NFA and other participating institutions regarding the possibility of refresher courses for graduates to sustain the capacity building gains attained through the project.

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Appendix 1: Commencement interview questions

Building Research and Project Management Skills in Fisheries staff in PNG – FIS/2010/055

Commencement Interview – guiding questions

1. EOI related follow-up questions
    a. Can you expand on what you have put in your EoI and tell me more about what you did in the past? Your work experiences?
    b. Tell me more about your qualifications?
    c. When was the last time you did formal training or education?
    d. Was it here in PNG or abroad?
2. Can you tell me about your experience in fisheries (aquaculture)?
    a. How long have you been working in the sector?
    b. Do you feel that you have the skills you need to do your job?
    c. Have you done any on-job training since you started working in the sector?
    d. If yes, when, where and by who? (Ask additional questions based on the answer)
    e. What do you think are the issues in the sector?
    f. Do you think that the sector will play a significant role in the future of PNG? If no, why not? If yes, how?
    g. Tell me what you feel like will happen in the sector in PNG in the future?
3. What kind of support do you get to do your job? (ask follow-up connection to explore support networks)
4. Do you have any link with people doing similar things in PNG or overseas? (ask follow-up question to study the input from local professional and overseas networks)
5. You are now accepted to do the current study with an Australian University.
    a. What do you hope to achieve through this course?
    b. Do you think that this will help you do your job better? If no, why not? If yes, how?
    c. What are the skills and knowledge you hope to gain from this course?
    d. What do you hope to do after graduating from this course?
    e. If this course was a success, what would it look like? What would it create for you?
    f. Where do you see yourself say in 5 or 10 years?
    g. Do you have any ambitions in leadership?
6. Access to resources to support the study.
    a. Depending on the unit, you may be required to submit assignments online, do you have a computer to do your assignment on? (follow-up based on answer)
    b. Is accessing internet easy or difficult? (explore further to find out ease of internet

access and cost)

   c. Will your organisation be happy for you to take time off work to read materials and to work on you assignments?

7. As part of this research, we hope to conduct follow-up interviews or surveys in-between units, at the end of the course; and at the end of one year, two years and three years.

   a. Are you happy for us to contact you to conduct these interviews?

   b. What is the best way to communicate with you and conduct interviews? By telephone, online or face-to-face?

8. Do you have any question?

Appendix 2: Exit interview questions

Exit Interview – guiding questions

A. Course delivery and environment

a. Thinking about when you were studying, did you find ideas and concepts within the material as being relevant to your work? If so, what do you particularly remember?

b. What do you like most about being part of this course? Why?

c. Were the internal feedback sessions (Harvard 3 minutes) useful for you? If yes, in what way?

d. Given the opportunity would you change anything? If yes, what would that be, and why?

e. What were the learning barriers, if any, for you?

f. How did you create time and space to study outside of the learning environment?

g. What kind of support did you receive from your project to help you with your study?

h. Now that you have completed the course, what did you see to be the reward for you?

B. Evaluation of practice change

a. Thinking about your work, have you changed the way you do things because of what you learnt through this course? If, yes, can you elaborate?

b. Thinking about your work, what do you think was the most useful lesson that you learnt?

c. If you think about your work in relation to one of the intended learning outcomes of the course, can you reflect if you believe that this course has changed the way you work with and manage data? If so, how has this change impacted your practice?

d. Again, if you think about your work in relation to one of the intended learning outcomes of the course, do you think that you have a better understanding of your skills and how these skills can be applied in the workplace? If so, how has this impacted your practice?

e. Has the course helped you do your job better? If yes, how?

f. Has your participation in this course changed or enhanced your role in your project? If yes, how?

g. Have you been given more responsibility as a result of your involvement in this course? If yes, explain.

C. Expectations and Achievements

a. At the beginning of the course, you were asked about your expectations for the course. Has the course met your expectations? If yes, in what way? If not, why not?

b. Has this course expanded your networks? If yes, in what way

c. What do you hope to do after graduating from this course?

d. Do you have any aspirations of continuing tertiary education (particularly through UTAS)?

e. Has your experience as a student inspired others (family, friends, work colleagues) to undertaking a similar course, or other courses?

f. How would you see your community as benefiting from you participating in this course?

g. Where do you see yourself say in 5 to 10 years?

h. Do you have any ambitions in leadership?

Do you have any question?

Appendix 3: 24 months interview

24-months follow-up Interview Questions for Cohort 1 Students

The purpose of the interview is to examine students' application of learnings and level of practice change two years after graduating.

The discussion will explore practice change as it pertains to the self and discusses aspects of an individual's capacity to integrate the course materials, experiences and other learnings into their daily practice. There is a specific emphasis on how the participant perceives him/herself as a scientist and how this influences engagement in research projects and application of research methodology. We will also need to gauge if there have been any changes in responsibility or role of students because of the training.

Note: some of the questions are repetitions of the exit/12-months interviews

Guiding questions

1. It has been nearly two years since you attended the Graduate Certificate in Research. Thinking about your training and your work, do you say that you have changed the way you do things because of what you learned through the course? If, yes, can you elaborate?
2. Thinking about your current work, what do you say was the most useful lesson that you learned?
3. Thinking about your current practice/job, do you think that you have a better understanding of your skills and how these skills can be applied in the workplace? If so, how has this impacted your practice?
4. Do you believe that completing the course has changed the way you design research and work with and manage data? If so, how has this shift impacted your practice?
5. Do you believe that your capacity to write reports has changed for the better? If yes, can you provide an example?
6. Has there been any change in your overall capacity to communicate with you and other team members for the better? If yes, please provide an example?
7. What about changes in leadership, decision-making, and conflict resolution skills?
8. Has your completion of the course in this course changed or enhanced your role in your project? If yes, how?
9. Have you been given more responsibility because of your completion of the course? If yes, explain.
10. Before the graduation, you were asked what you hope to do after graduating. Have you followed-up/realised any of your dreams? If yes, can you elaborate? If not, why not?
11. What is your overall impression of the UTAS Graduate Certificate in Research?

Appendix 4: Supervisors interviews

Interview Questions for Supervisors

As you know UTAS has been running the ACIAR funded Graduate Certificate in Research in the last three years. Through this program, some of your employees have gained a formal qualification in research training, and we expect this qualification to make an impact on the quality of work undertaken in your project/organisation.

The purpose of this interview is to have a candid conversation with you whether you think the training had an impact on your project; particularly regarding changes in design and conduct of research and report writing, leadership and communication.

Guiding questions

1. Where you aware of the post-graduate training program that was being developed by ACIAR?
2. If so, when you supported staff to participate, what did you hope to gain from staff participation in the training?
3. Thinking about the last two years, do you think that the UTAS Graduate Certificate program had any impact on your projects? If not, why not? If yes, what were those changes?
4. Thinking about the last two years, do you think that the UTAS Graduate Certificate program had any impact on your organisation? If not, why not? If yes, what were those changes?
5. In your opinion what were the three most significant contributions of UTAS Graduate Certificate program to your project/organisation?
6. Has there been any change in your project/organisational capacity to design research, because of the UTAS Graduate Certificate program? If yes, please provide an example(s)?
7. Has there been any change in your project's/organisation's capacity to conduct research and manage data because of the UTAS Graduate Certificate program? If yes, please provide an example(s)?
8. Has there been any change in your project's/organisation's capacity to write reports because of UTAS Graduate Certificate program? If yes, please provide an example(s)?
9. What about changes in leadership, decision-making, and conflict resolution skills?
10. What is your overall impression of the UTAS Graduate Certificate program?
11. If the training was to be offered again, would you encourage participation in the program?

Appendix 5: Graduate Certificate in Research [PNG] – Unit details

To achieve a Graduate Certificate in Research from the University of Tasmania students are required to undertake and pass four units of study at post-graduate level (AQF 8), two core units and two supporting units. The units studied during this project were:

BAA506: Learning Through Practice A (Workplace)

XGR501: Introduction to Higher Degree by Research (core unit)

XGR502: Communicating Research (core unit)

XGR505: Specialised Research Methods

Below are brief summaries of each of the units, taken from the Unit Outlines.

BAA506: Learning Through Practice A (Workplace)

Unit Description

Through a wide range of activities in the workplace, potential postgraduate students grow professional skills and capabilities relevant to both leadership and management. The unit seeks to recognise this experience by developing with the student the frameworks and tools to understand how they, as adults, can acknowledge and understand what deeper learning has occurred, what capabilities have been developed, and how these skills and capabilities might be applied.Participation in the unit requires deep reflection on, and articulation of, the skills and knowledge gained through these different learning and life experiences. The unit is designed to foster skills and capacity in:

☐Adult learning (approaches and styles).

☐Reflective and deliberative practice - as manager and supervisor.

☐Awareness of leadership and management approaches and styles.

☐Building effective organisational and workplace cultures.

Through different learning approaches students are given the opportunity to reflect on their experiences, and to draw from these experiences examples of skills learned and where they have been applied.

Intended Learning Outcomes

1. Have a greater understanding of how your work life and experiences have developed lifelong adult learning skills.

2. Be aware of the significance and impact of your adult learning styles and approaches in the workplace and management activities.

3. Have a framework for identifying and understanding the depth and breadth of different skills, know-how and learning approaches used in the workplace.

4. Have the capacity to reflect on and clearly articulate your skills, how and where your skills were learned and how they can be applied.

5. Have a framework within which to reflect on your own practice (how decisions are made, negotiated and implemented).

6. Ability to research, discuss, reflect and evaluate to produce effective portfolio entries.

7. Feel confident in applying these skills and capabilities in other work settings and locations.

XGR501: Introduction to Higher Degree by Research

Unit Description

Introduction to Higher Degree by Research (for PNG students) will introduce candidates to research practices for use in their workplaces.

Candidates will be introduced to a number of topics including what it means to be a researcher; what it means to be a scientist; research integrity; planning and managing a research project; roles and responsibilities of members of a research team; best practice in data management and occupational health and safety. The unit will be taught in intensive mode over four days and assessment tasks will focus on meeting key objectives and developing research skills.

Intended Learning Outcomes

1. Design and present a detailed research plan for an extended research project.

2. Demonstrate awareness and understanding of the relevance and importance of occupational health and safety as it applies in your own workplace.

3. Demonstrate an understanding of the social and ethical implications of research and appropriate professional behaviour consistent with the Australian Code for the Responsible Conduct of Research and other relevant guidelines.

4. Find, acquire, evaluate, manage and use research data.

5. Identify, evaluate and implement personal learning strategies.

XGR502: Communicating Research

Unit Description

Communicating research is good scientific practice. It helps the researcher/scientist to articulate their ideas and hypotheses, and to let the wider scientific community know of the research that they are undertaking. It not only helps the researcher/scientist to build on the work of others (or even initiate work in an entirely new field), but it also provides a sound, scholarly basis on which others can build.

Communicating Research (for PNG Students) introduces students to professional and scientific communication by developing an understanding of the *who – what – when – how – why* – of communication. As the students explore these concepts they will develop an appreciation of styles and protocols that can be used to report research findings in reports (formal and informal report

ing), in scientific fora (abstracts, conferences and papers), and to the community (lay writing vs technical writing). These concepts will be embedded into a framework of responsible reporting behaviour.

The unit builds on the work of the previous units to encourage students to adopt good communication habits. It will show students how they can share research findings responsibly, and encourage them to seek ways to communicate with wider audiences. The University of Tasmania has several platforms available to their graduates to aid researchers to publish their work, formally and informally, which are available for student use.

Intended Learning Outcomes

1. Demonstrate the ability to convey ideas and information clearly and fluently in appropriate written form.

2. Find, acquire, evaluate, manage and use relevant information in a range of media.

3. Present well-reasoned arguments and ideas, using technology as appropriate.

4. Demonstrate knowledge of ethics and ethical standards in academic writing, and other forms of presentation especially as they pertain to conducting research.

5. Demonstrate the acquisition of research skills that enable candidates to make their own contribution to knowledge.

6. Access, organise and present information clearly and purposefully for a specific audience.

XGR505: Specialised Research Methods

Unit Description

This unit is mandatory for the Graduate Certificate in Research and introduces a range of topics that aim to equip you with the generic skills needed to conduct experimental research.

Intended Learning Outcomes

1. Understand the relevant policies and procedures applicable to higher degree by research candidates enrolled at the University of Tasmania.

2. Develop a hypothesis and design an experiment to answer the hypothesis.

3. Demonstrate integrity in data collection and an understanding of the importance of sampling periods, data accuracy and precision.

4. Demonstrate an ability to effectively manage and manipulate data using Excel.

5. Demonstrate an ability to write concisely and with appropriate levels of detail when preparing a report/paper on research – introduction, methods and materials, results and discussion.

6. Place the results of your research in context.

7. Present a succinct verbal overview of the relevance and impact of your research to an intelligent lay audience.