The contribution of the Teaching and Learning Research Initiative to building knowledge about teaching and learning: A review of school sector projects, 2003–2012

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1.   Introduction

The Teaching and Learning Research Initiative (TLRI) seeks to enhance the links between educational research and teaching practices to improve outcomes for learners. Recent reviews (Nuttall, 2010; Zepke, 2011) have addressed the question "What contribution have TLRI (early years/tertiary sector projects) made to building knowledge about teaching and learning in these sectors?" Building on each of these reviews, symposia were convened to identify research priorities in each field and for the TLRI for the next few years. In early 2012, the New Zealand Council for Educational Research commissioned this review of the 49 completed school sector projects funded by the TLRI between 2003 and 2012. The research question guiding the review was "What and how has the TLRI contributed to cumulative knowledge about teaching and learning in the school sector?" As with the earlier reviews, this review will be discussed at a symposium of experienced school sector researchers in November 2012 with the purpose of identifying future research priorities.

In commissioning this school sector review, five "ideas" were included by the TLRI for consideration. In summary, these asked the reviewers to look for evidence that TLRI projects are identifying and addressing thematic concerns in the school-based field nationally and internationally; investigate the extent to which the school sector projects are using TLRI specifications to move the field forward in contrast with pursuing personal intellectual projects; and consider how the TLRI programme and findings have (or could) afford richer individual and collective trajectories. To address the research question, and the ideas summarised above, this review is organised in five sections. Following this introduction, there is a brief section on the history and principles of the TLRI. The review approach and methods used are outlined next, followed by the findings in two sections. A final section concludes the review and includes suggestions for discussion at the symposium to be held on 16 November 2012. Details about, and links to, the 49 studies included in the review are listed in the appendix.

1.1   History and principles of the Teaching and Learning Research Initiative

A brief introduction to the TLRI and previous reviews is provided here, including a summary of two issues central to the nature of the TLRI: knowledge about teaching and learning, and knowledge about *researching* teaching and learning. Readers interested in a general introduction to the TLRI should consult the initiative's comprehensive website, http://www.tlri.org.nz, where the principles and aims of the programme are described, and information about the management of funding applications and an archive of current and past project publications can be found. In summary, the TLRI's research projects and related activities are guided by five principles. Two relate to the *strategic value* of the projects: they will address themes of strategic importance to education in New Zealand; and they will build upon New Zealand-based research evidence, draw on related international research, and be forward looking. Two further principles address the *research*

value: TLRI research projects will be designed to enable substantive and robust findings; and projects will be undertaken as a partnership between researchers and practitioners. The last principle, that "projects will recognise the central role of teachers and students in learning and the importance of the work being useful in practice" (TLRI, n.d.a) explains the *practice value* potential of each project be considered.

This is the fifth review commissioned by NZCER addressing the concern of the TLRI Advisory Board regarding the building of cumulative knowledge about teaching and learning. The first was a discussion paper, written by Alison Gilmore (2007). That first review was commissioned to inform discussions about the future development of the TLRI. It included a range of suggestions and recommendations. Germane to this review, it recommended that the intent of the TLRI fund be clarified and aligned with other national initiatives funding educational research. It commented upon the framework and elements of the TLRI and recommended a re-examination of the "researcher–practitioner partnerships" and suggested that these partnerships be interpreted as ensuring *collaboration* between researchers and practitioners in such a way that researchers conduct "research *with* practitioners", rather than to "research *on* practitioners". In order to optimise what had been learnt through projects to the end of 2007, it recommended a review of the funding categories and drew attention to the variability in research quality across projects. In this regard, the review suggested, among other things, reviewing and clarifying the proposal assessment criteria to better reflect the importance of a detailed and justified research design, a more rigorous approach to the final report guidelines, paying more attention to the cumulative knowledge building around *learning* (as opposed to *teaching*) to give more emphasis to *learners* as well as *teachers.* Gilmore's report also suggested introducing a peer review process for the final reports, and providing stronger research leadership in projects to produce more robust findings.

Following that review, changes were made to the funding categories, the guidelines for proposals, the assessment criteria for proposals, and guidance to proposers about strategic issues that could produce a cumulative approach to knowledge building through commissioned papers published on the website and circulated in the call for proposal process. More emphasis was placed on the importance of a quality research design, and the partnership requirement was clarified in line with Gilmore's suggestion. Attention was drawn to the need for projects to benefit learners as well as teachers.

In 2010, two reviews were completed in the early childhood sector. As noted above, Nuttall (2010) reviewed the contribution of the TLRI and Meade (2010) reviewed the contribution of the Centres of Innovation programme to building knowledge about teaching and learning. A further review by Zepke & Leach (2011) reviewed the contributions of the TLRI in the tertiary sector. As noted by Zepke & Leach (2011), Nuttall's review provides "an insightful analysis of the history and principles of the TLRI" (p.1). In this, Nuttall (2011) draws attention to the fact that the kinds of research that can and cannot be carried out within the programme are constrained by the nature and rules of the TLRI and highlights "an epistemological tension

underpinning the TLRI principles in the way knowledge and practice are separated; and the complexity required of TLRI researchers who have to generate knowledge, inform practice, as well as manage collaborations between researchers and practitioners" (Zepke & Leach, 2011). These tensions and complexities also exist within the school sector projects. They influenced both the process and the outcomes of this review as well and are therefore summarised from Nuttall (2010) next.

In contrast with other sources of funding for educational research such as the Marsden Fund (http://marsden.rsnz.org/) or the Australian research Council (http://www.arc.gov.au/), "the knowledge problems that can and cannot be addressed within the TLRI are constrained by the concept of *effectiveness*" (Nuttall, 2010, p. 2) as reflected in the aims of the TLRI which are to:

- build a cumulative body of knowledge linking teaching and learning
- enhance links between educational research and teaching practices – and researchers and teachers – across the early childhood, school, and tertiary sectors
- grow research capability and capacity in the areas of teaching and learning (Teaching and Learning Research Initiative, n.d.b)

and confirmed in TLRI Principle Five, which states that "projects will recognise the…importance of the work being *useful in practice*" (Teaching and Learning Research Initiative, n.d.a, emphasis added). Although some changes, noted above, have been made by the TLRI co-ordination team to ensure that the research since 2007 "adds new value rather than continues to repeat established patterns" (Nuttall, 2010, p. 3), there is a continuing epistemological tension underpinning the TLRI principles, namely that of what constitutes knowledge. Quoting from Nuttall's (2010) review:

> The TLRI, in pairing 'knowledge and practice' in its documents, implies that 'practice' is a different object to 'knowledge' rather than practice constituting, in itself, one form of knowledge. This is complicated by the dual agenda of the TLRI, to both link research (as a mode of generating knowledge) and teaching practice (as a form of enacted knowledge), whilst fostering the development of core expertise (Edwards, 2010) in the educational research community. This is further complicated by the requirement for TLRI projects to be collaborations between researchers and practitioners, demanding a level of relational expertise (ibid) that must in itself be developed and enacted within the complex social, political, cultural, environmental and economic agendas facing the educational sector. The core and relational expertise of researchers must not only be applied to their own research endeavours, in collaboration with practitioner colleagues, but must result in a higher level of research consciousness *amongst those practitioners*, adding yet another level of complexity—the professional development of practitioners through locally-appropriate research training—to the work of TLRI researchers. (Nuttall, 2010, p. 3)

As Nuttall (2010) and Zepke and Leach (2011) acknowledge, this is an ambitious agenda. It is similar to a

programme of research in England, the Teaching and Learning Research Programme (TLRP). The TLRP aimed to "make sure that the knowledge it developed was applied in practice and policy" and to "enhance capacity for all forms of research on teaching and learning" (Teaching and Learning Research Programme [UK], n.d.). Other than the considerably larger funding for the TLRP, an important difference between the TLRI and the TLRP was the explicit and staged process the TLRP implemented to build capacity in the educational research community. Supported by a large research directorate, this aspect of the TLRP resulted in a legacy of research training resources now hosted by Scotland's Applied Educational Research Scheme website (www.aers.org.uk) which has the aim of enhancing educational research capability to benefit school education. In this way, the TLRP has had far greater resources to address such a complex and ambitious agenda. The TLRI has, however, despite far lower levels of funding, pursued this agenda and has to date funded 49 completed projects in the schooling sector, and a further 10 projects are in progress.

The two previous reviews regarding the completed TLRI projects (Nuttall, 2010; Zepke & Leach, 2011) approached the process through different theoretical lenses. Nuttall drew on cultural-historical activity theory (CHAT) to address the (at least) four overlapping systems involved in each of the 14 funded early years projects. In contrast, Zepke and Leach located their review within an interpretivist perspective and employed an inductive analysis of the 15 projects completed in the tertiary sector. In contrast with these two previous reviews, by March 2012, 49 school sector projects had been completed across both the primary and secondary school sectors.

2.   Review approach

The approach taken in this review was an inductive analysis. Inductive analyses are used in evaluation and review exercises where, although there may be general or guiding questions, the purpose of the exercise is to establish concepts, themes or a model within the materials to answer the research question supported by the information in the reports (Thomas, 2006). While this is consistent with Strauss and Corbin's (1998) description of grounded theory, where "the researcher begins with an area of study and allows the theory to emerge from the data" (p. 12), the primary purpose may not be to generate theory. In this case, the primary purpose was to use a general inductive analysis of the TLRI reports to describe how this fund had contributed to cumulative knowledge and understanding in the school sector.

2.1   Review focus questions

As stated above, the research question guiding the review was, "What and how has the TLRI contributed to cumulative knowledge about teaching and learning in the school sector?" Taking account of this question and the five ideas from the TLRI co-ordination team at NZCER noted in the introduction, three focused evaluation questions were constructed to guide the study. These were:

1. What is the scope of the completed studies in terms of such aspects as: the balance of primary and secondary studies; investigation of teaching and assessment practices, content/pedagogical content knowledge and notions of learning and achievement; curriculum coverage; and, particular groups of learners?
2. What is the evidence for TLRI projects identifying and addressing thematic concerns in the school-based field nationally and internationally?
3. What evidence is there that the researchers are looking at the specifications of a fund such as the TLRI and using this to move the field forward, that is to build *cumulative* knowledge and/or what evidence is there that the focus is on using the fund to move personal intellectual projects forward and/or some combination?

Once these focus questions had been established and agreed, the detailed process of reading and inductively analysing the information in the 49 reports and summaries supplied by the TLRI co-ordination team at NZCER began.

2.2   Analysis and trustworthiness procedures

Firstly, all 49 reports, summaries, posters, and related outputs from the projects were assembled, listed and a summary spreadsheet was established. It should be noted that a report and a summary were available for projects initiated before 2008 but because projects from 2008 did not need to provide a comprehensive

report, for those projects we had access only to summary reports and any other outputs (such as posters, related articles and conference papers) submitted to the TLRI and posted on the website. Initially, all of the project summaries were read and a profile of the nature of the field represented by the reports was established. Reading all the summaries also provided an overview of possible themes within the corpus of the projects funded and completed between 2003 and March 2012. These ideas were recorded and used as a guide for more in-depth reading and analysis of the full reports and project outputs supplied by TLRI.

Next, multiple readings of the summaries, reports and other outputs were undertaken to fill out the spreadsheet with information from each of the studies. During this process possible themes began to emerge regarding the answers to the focus questions. The materials were grouped within these themes and reread to test the evidence for these themes. More detail about both the focus questions and our process are included in section 4. To improve the trustworthiness of the analysis process, three consistency checks were made, each at a different stage of the process. These were independent parallel coding, a check on the clarity of the categories, and stakeholder checks.

Independent parallel coding took place at the early stages of the process. Following the initial reading and coding of the reports by the first author, the second author read a wide-ranging sample of the summaries and created an independent coding of the possible themes against the focus questions. Her set of categories was then compared with the first author's and discrepancies were discussed. Following this, the coding categories were merged and a revised set of coding categories for the review was constructed.

In the next stage of the analysis, a research assistant who is a doctoral student at the University of Auckland was given some of the texts, and asked to read and identify thematic concerns in these texts. To check on the clarity of the coding, her analysis was compared with the authors' themes to establish the extent to which we were consistent in our theme decisions. The analyses were very similar and we also noticed that we had similar opinions about the quality of some reports and the lack of clarity in some regarding descriptions of the research design, methods and findings. After this, the research assistant was asked to reread all of the reports and summaries and undertake a detailed coding of the materials based on categories derived from the agreed guiding questions.

The next stage of the review comprised detailed reading of the complete set of reports against the themes by the research assistant and the first author. During this stage of the analysis new themes arose in answer to the focus questions. These themes were added to the analysis and both the research assistant and the first author reread for further evidence to support these themes.

Finally, as the report was completed, the second author read, provided feedback and discussed the processes and findings of the review with the first author. The report was fine-tuned and further explication of the

themes and links to the literature were added. NZCER undertook peer review of the report, thus performing the stakeholder check. Revisions were made to the final draft report before it was confirmed.

2.3 Reading the associated literature

At the same time as the inductive analysis was undertaken, national and international literature related to the emerging themes was sought and consulted. Given the wide-ranging nature of the 49 projects, time and funding did not allow for a review of the national and international literature, however. This reading, therefore, extended to known sources such as the schooling sector New Zealand Best Evidence Syntheses, reports from the United Kingdom Teaching and Learning Research Programme (TLRP), OECD reports on member countries' evaluation and assessment systems released to date, and other sources indicated by literature used in some of the projects.

To answer the third research question, we also undertook a search of all the researchers named in the school sector projects in Google, Google Scholar, and Microsoft Academic Search, as well as university profiles. Although we acknowledge that this is an imprecise way of learning about the evidence for using the fund to build cumulative knowledge and/or move personal intellectual projects forward, these sources provided information about these aspects and also provided some evidence about research capability building and how involvement in research can have an effect on teachers who participate in these projects. A second research assistant systematically used the search tools and constructed a record for each participant in every project regarding: the projects each participated in; whether they were listed as the principal investigator or as a researcher; and their career status at the beginning and end of the funded project/s. The research assistant counted books, refereed journal articles, chapters in books, conference presentations and reports published since the funding year of the project/s. He also collated topics within the published work so we could see how the body of the work related to the funded project/s (if at all), and made a collection of the documents found.

Further reading was undertaken towards the end of the review to investigate briefly how the knowledge gained in the school sector TLRI studies was being used by the New Zealand education system to inform policy and support teaching and learning. For example, searches for information from the projects were made on Te Kete Ipurangi, 'Down the back of the chair', NZEI and PPTA websites, and in Ministry of Education publications for schools and teachers such as the *New Zealand Education Gazette* and the *New Zealand Curriculum Update* pamphlets.

2.4 Limitations

Several caveats should be kept in mind about the analysis and interpretation of these studies. Firstly, full reports were not available for all of these studies. A full report and a summary were available for those

funded before 2008. Those funded from 2008 were required to provide materials to convey results of the study to practitioners, and submit at least one paper to a refereed journal and one presentation to a national or international conference each year that the project was funded. Although these changes post-2008 are practical and make sense in terms of disseminating the results to a range of audiences, the change has also resulted in less information being available about some of these later projects for the purposes of this review. In cases where no full final reports exist, we drew on summaries of each project, and articles and presentations from the TLRI website (where they existed) to inform this review. Therefore, while every effort was made to draw together the thematic concerns of these projects, the review is the best that could be done in the circumstances, given missing information about some projects. Furthermore, even though there was inter-rater agreement about the themes we identified across these projects, other readers may well find further, or different, thematic concerns.

Another constraint in reviewing these studies, mentioned above, is that with the resources available, it was not possible to make a thorough search of the international or national literature regarding the various thematic concerns. In a review such as this, where the projects are those funded in a particular time period, the "field" referred to in the five ideas is rather hard to define. A narrow reading of the research question might have confined our review to the findings of the projects. A somewhat broader interpretation would include the ways that the TLRI school sector projects have contributed to the TLRI aims and principles: that is, the strategic, research and practice values. The broadest interpretation of the research question for the review could include the professional learning and practice changes brought about in the school sector by these projects. To undertake this review in the time frame and within the resources available, we have confined our focus to the *cumulative knowledge* contributed to the TLRI aims and principles and have not extended this to include the professional learning and practice changes.

3.   Findings: Scope of the school sector studies

The findings from the inductive analysis are presented using the three focus questions (see section 2.1)) as an organisational framework. The first question is addressed here, while the second and third questions are addressed next in section 4 of the report.

As noted above, the first focus question asked "What is the scope of the completed studies?" Answering this question provides an overview of the scope of school sector studies funded and completed between 2003 and 2012. It also provides a foundation on which to base the thematic analysis and the evidence about the cumulative contribution of the TLRI projects that follows in section 4. While every effort has been made to be as accurate as possible in coding and counting these results, it was not always possible to find equivalent information in each of the reports. Therefore, although 49 studies had been completed and are included in this report, the findings should be taken as indicative only.

3.1   Number and duration of projects funded

Forty-nine school-sector studies were completed between the first funding year, 2003, and the end of February 2012. The number and duration of studies varied year by year over this period. As shown in Figure 1, three three-year-long studies were funded for school sector studies during this period in comparison with 24 two-year studies and 21 one-year studies.
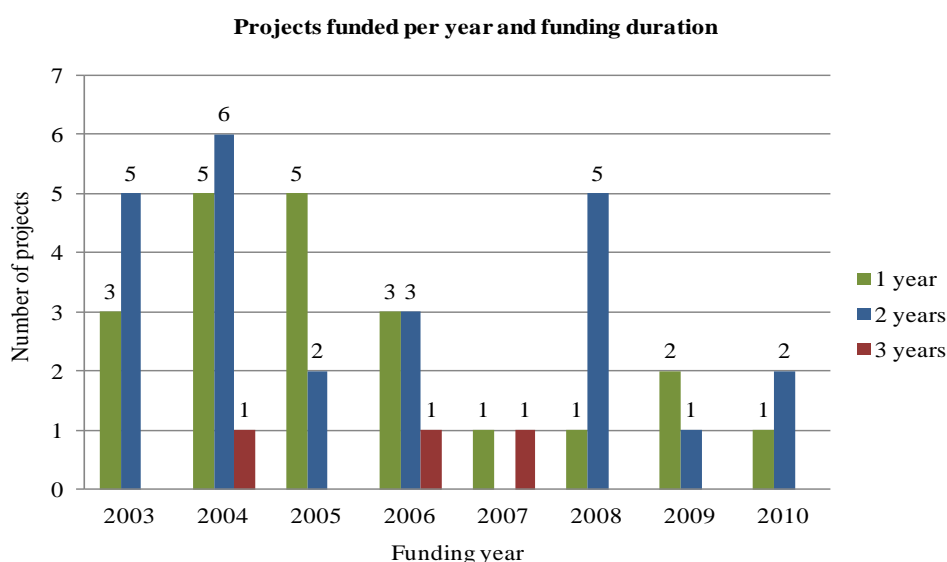
Figure 1: Projects funded per year and funding duration

Up to 12 projects have been funded in any one year. However, in three of the four years between 2007 and 2010, only three school sector studies were funded.

3.2   Size of projects

Most of the school-level studies funded in this period included up to six schools (n = 34), and up to 15 teachers (n = 37). Some projects reported in terms of the number of schools involved, and others reported the number of teachers (see Figures 2 and 3).

Size of funded projects - by schools participating
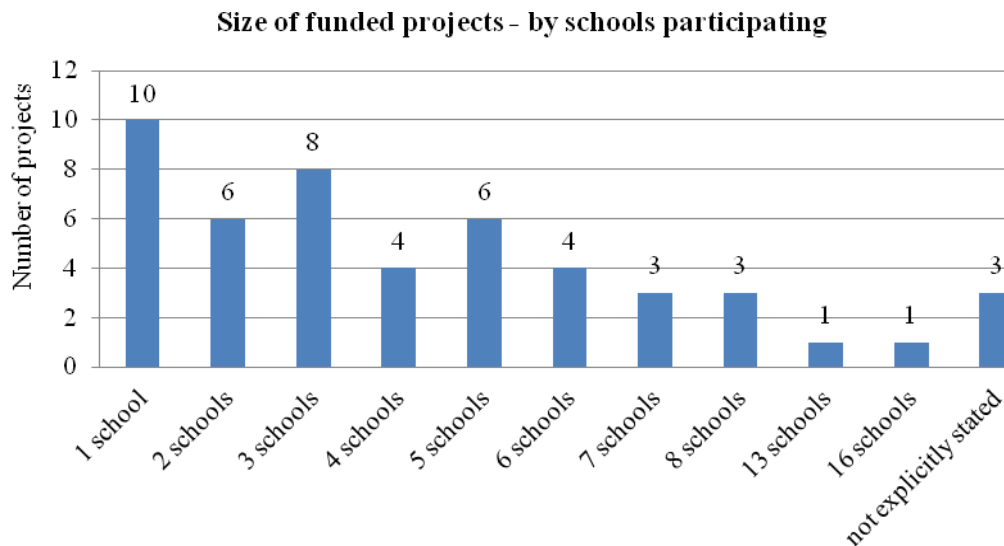
Figure 2: Size of funded projects – by schools participating

Size of funded projects - by teachers participating
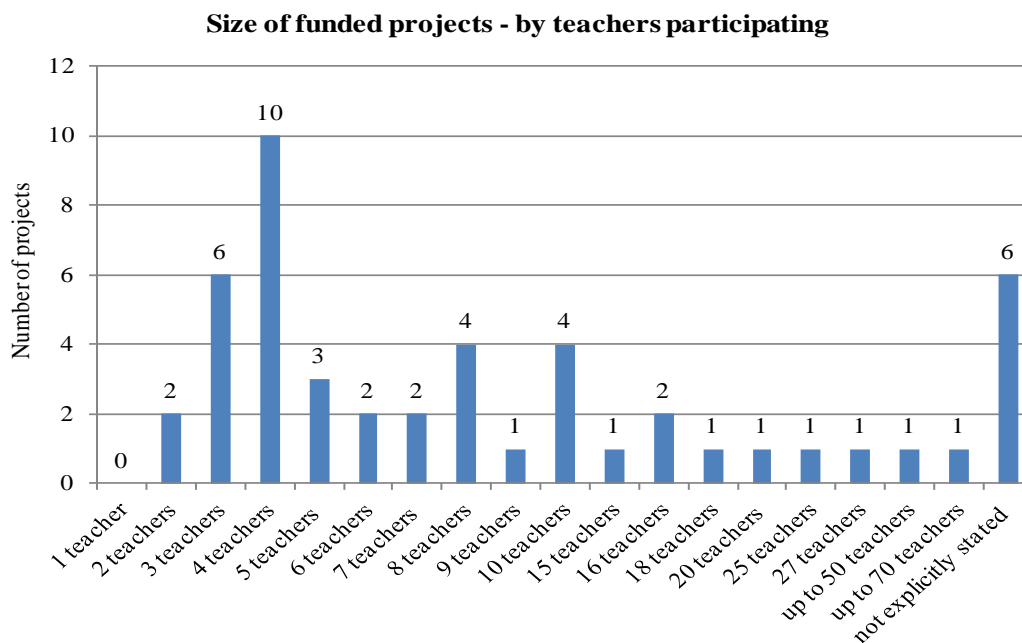
Figure 3: Size of funded projects – by teachers participating

In terms of researchers from universities, most of the studies reported the involvement of between one and five. The majority of projects (n = 32) reported the involvement of two or three university researchers. Three

studies reported involving six university researchers, and one reported that eight were involved. Figure 4 displays this data. A caveat here is that these figures refer to the university researchers but in almost all of these projects, teachers were also involved as partners in the research process. From the reports, it was often difficult, if not impossible, to work out how many teacher researchers were involved.

Number of university-based researchers involved
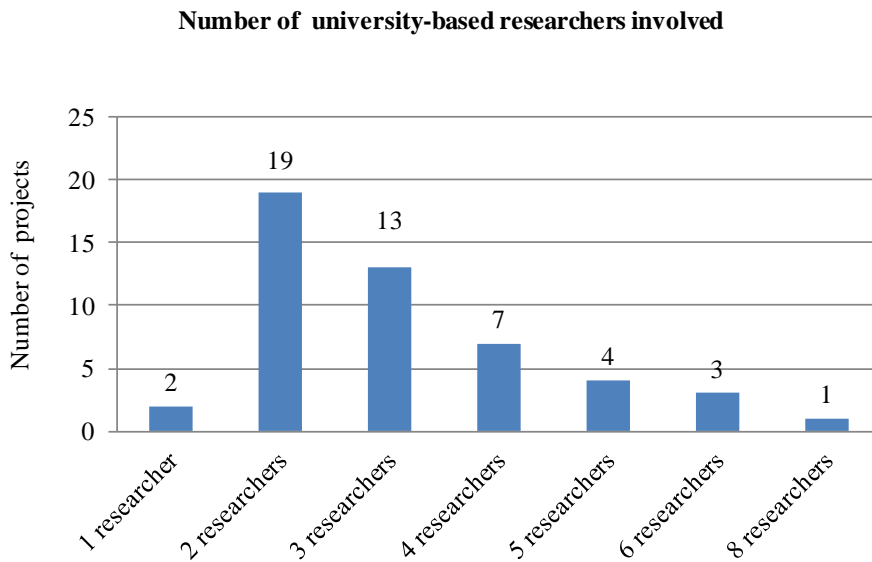
Figure 4: Number of university-based researchers involved

3.3   School level involved

Of the 49 projects funded, 20 investigated aspects of teaching and learning in primary schools (this includes intermediate schools), and another 20 were set in secondary school contexts. Eight spanned both primary and secondary levels of schooling and one included secondary and undergraduate tertiary students. Figure 5 indicates when these projects were funded and what level or levels of schooling were involved.

School level involved by funding year
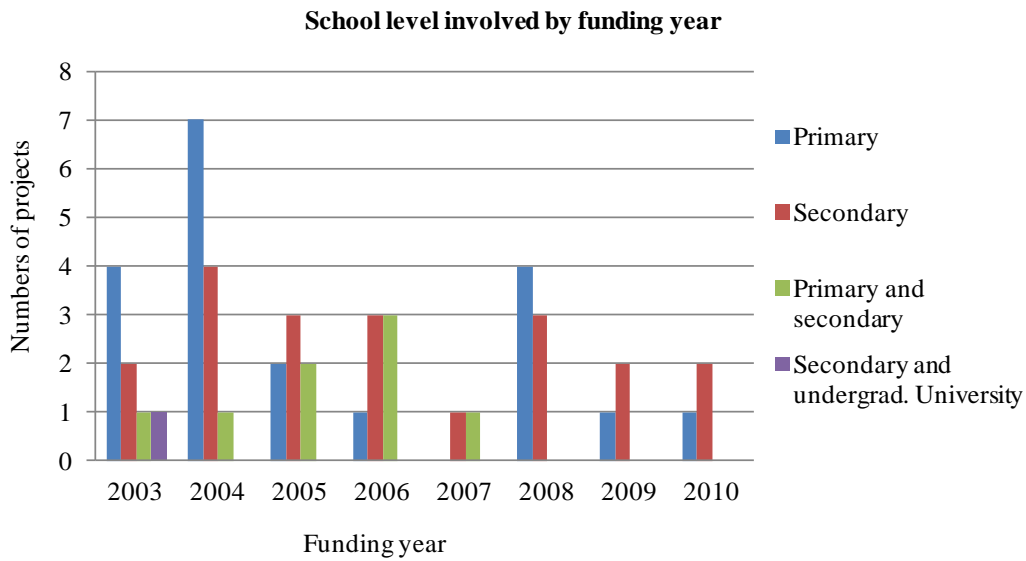
Figure 5: School level involved by funding year

Figure 6 shows the proportions by school level.

School level involved
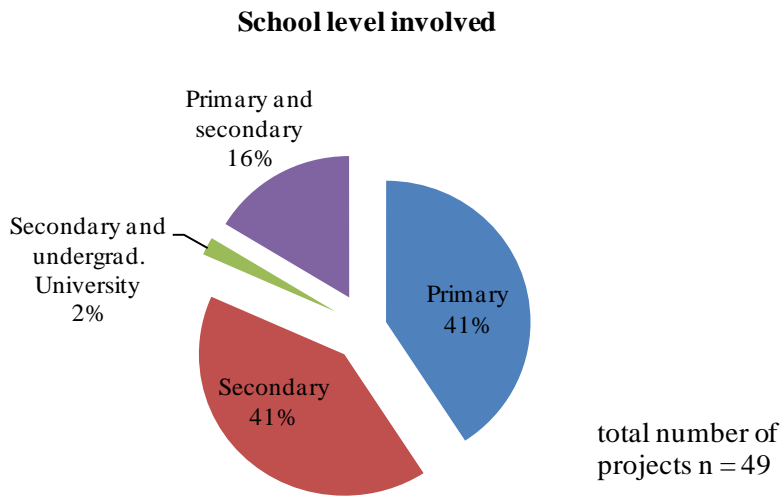
Figure 6: School level involved (percentage)

3.4   Organisations funded

In almost all the studies, the contract holder was connected with a university. The only exceptions were studies involving the South Learning Centre, Alfriston College and Education Associates (see Figure 7).

Organizations funded
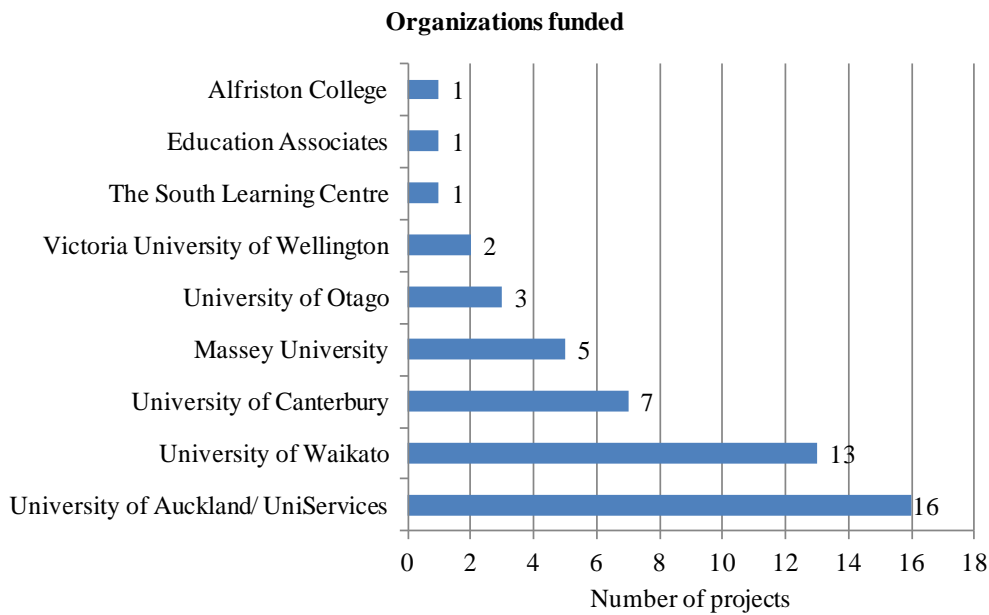
Figure 7: Organisations funded

3.5 Curriculum coverage

As depicted in Figure 8, 36 studies investigated teaching and learning in curriculum areas. Mathematics (n = 14) and literacy and literature (n = 11) were the most frequently investigated, followed by science and technology (n = 4), the arts (n = 3), environmental education (n = 2), and one study in outdoor education. The outdoor education project involved four secondary school teachers working with two university academics to investigate learning and teaching in place-based contexts. One further primary level study, involving university-based researchers working with teacher researchers in six schools, investigated learning and teaching across the curriculum with an emphasis on mathematics and literacy learning. Each curriculum area in which there were multiple projects is explained in more detail next. Thirteen did not address a particular curriculum area.

Curriculum coverage
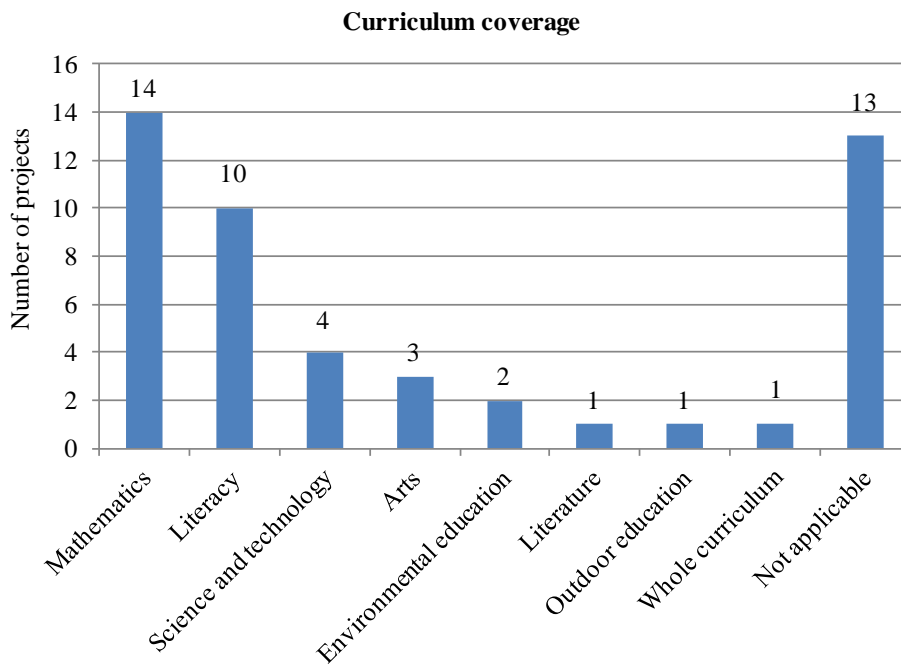
Figure 8: Curriculum coverage

3.5.1 *Mathematics*

Eleven of the mathematics projects were undertaken in a secondary context or included secondary contexts. Three of these eleven studies investigated the relationships between mathematics and language learning in te reo Māori or non-native English speakers. Two studies investigated statistics learning. One study investigated early learning of algebra and another investigated the use of technology for teaching mathematics in the secondary classroom. All three primary level studies that focused on mathematics investigated teacher knowledge and communication strategies, such as questioning, explanations, the use of argumentation, and mathematical inquiries.

3.5.2 *Literacy*

Eleven projects focused specifically in the literacy and literature field. Of these, six were in the primary sector, two in the secondary sector and two spanned both sectors. Four studies investigated literacy development and teaching through reading and reading comprehension. These four linked studies investigated how disparities in reading achievement, particularly in reading comprehension, might be addressed and gains sustained in low decile schools in Auckland with large proportions of Māori and Pasifika students. Two further studies investigated primary teachers' classroom practices in literacy and their capacity to analyse students' writing. Two studies, one primary and the second spanning the primary and secondary sectors, explored teaching and learning in critical literacy. One project investigated teaching literature in multicultural and multilingual primary and secondary classrooms.

3.5.3 Science, technology and environmental education

Four studies investigated aspects of science and technology and two were focused on environmental/sustainability education. Both environmental education projects worked with primary and secondary schools, the science and technology project also included both levels, and the science projects were all conducted with primary schools. All of these projects included teams from one university working collaboratively with teachers.

3.5.4 The arts

Three projects had been completed in this area by the time the review took place. The same university-based team led two of these. The first project investigated how the development of ideas in the arts could be promoted and enhanced, and in doing so, build teachers' knowledge in arts pedagogy and research. The second project had a focus on curriculum integration when the arts form the basis of an integrated curriculum. The third project investigated the effect of an e-learning environment on dance and drama teaching at the primary level. All of these projects involved university researchers working with teachers as researchers in primary schools.

3.6 Teaching and/or learning as the focus

Although it was not always easy to specify exactly where the emphasis lay, the studies were also read to analyse where the predominant focus of each study was in terms of teaching practices, assessment practices, teacher professional learning or student learning. As shown in Figure 9, most of the studies investigated teaching practices (n = 29). Six studies reported a predominant focus on student learning and five on professional learning communities. Four nominated culturally responsive pedagogy as a focus. Assessment for and of learning, and extending time periods for learning in a secondary school, were also mentioned as the focus in studies.

Because only six projects reported a focus on student learning as the primary emphasis, a secondary analysis of the projects was carried out. Nineteen were found to have either stated a focus on student learning, used standardised instruments to assess learning and/or achievement, or both. The availability of nationally standardised assessment tools in literacy and numeracy appears to be one factor enabling a closer focus on documenting student achievement and learning in those areas.

Teaching or learning focus of the funded projects
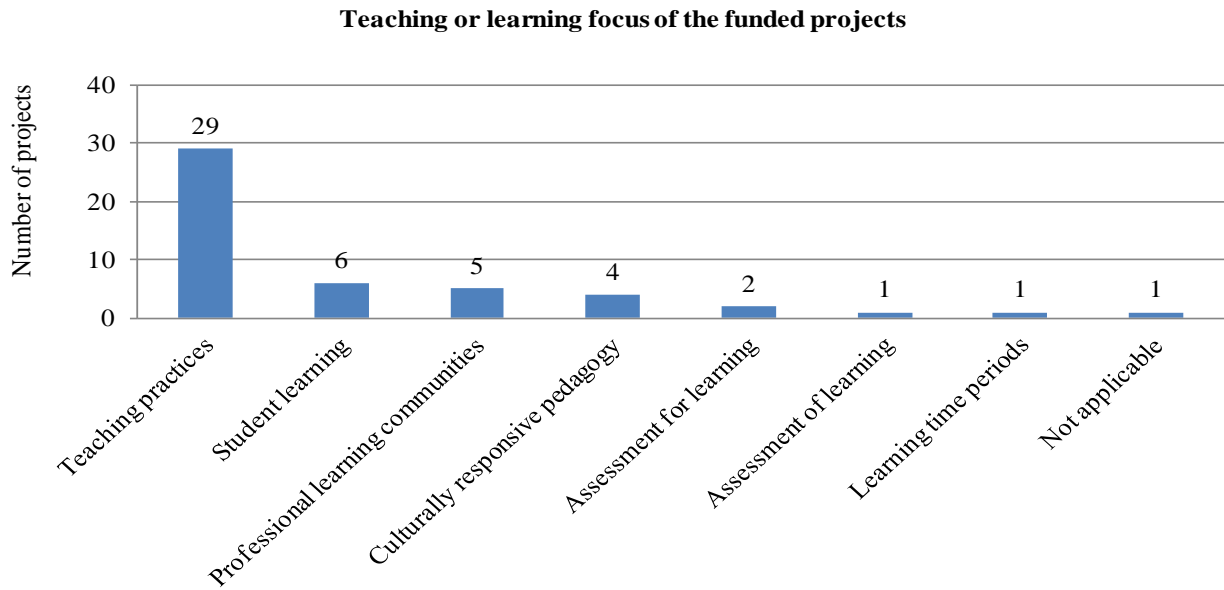
Figure 9: Teaching or learning focus of the funded projects

3.7 Studies with a focus on particular groups of learners

The TLRI principles emphasise the need to focus on diverse learners and address equity issues. A total of 21 of the 49 completed studies reported a focus on particular groups of learners. In Figure 10, some groups of learners are included in more than one category because projects often focused on more than one particular group of learners. When projects focused on more than one group, this was mostly on Māori and Pasifika, or Māori, Pasifika and students in low decile schools.

Projects focussing on a particular group of learners
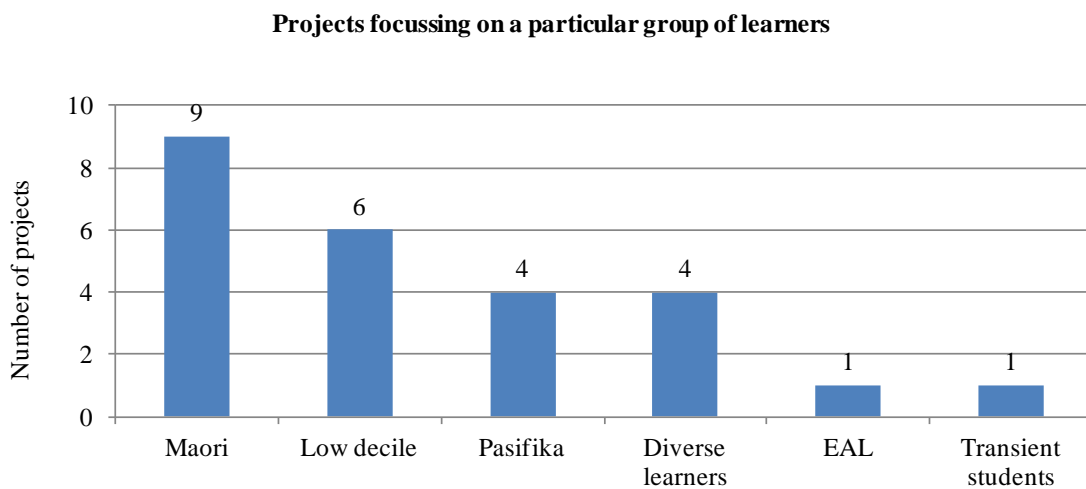
A total of 21 out of 49 projects reported to have focussed on particular groups of learners. Some are named in more than one group.

Figure 10: Projects focusing on a particular group of learners

As Figure 10 shows, nine studies had a focus on Māori learners, six focused on low decile schools, and four had a focus on Pasifika students. The more general term of "diverse learners" was used for the focus in four projects. "English as another language" (EAL) students and transient students were the focus of two further studies.

3.8   Achievement measures used

Thirteen of the 49 studies indicated the use of achievement measures to ascertain learning and learning progress. These were mostly standardised tests available to all schools. Some studies used more than one of these instruments. Five studies indicated that they had used some other form of achievement tool, most often a teacher made test. As Figure 11 shows, the Standardised Test of Achievement in Reading (STAR) was used in seven studies. Assessment Tools for Teaching and Learning (asTTle) were used in four. Progressive Achievement Tests were employed in three studies and the Global Strategy Stage (GloSS) measure was used in one.

However, as stated above in section 3.6, it was easier to include achievement measures in projects with a focus on mathematics and literacy due to the availability of standardised achievement measures in these areas. Projects in other curriculum areas, and those that conceptualised learning as much broader than cognitive/conceptual achievement, investigated aspects such as learning as a multimodal activity, how learning progressed, what motivated it, where it took place and under what circumstances, and how it had an effect on what students thought about themselves.

Achievement measures used
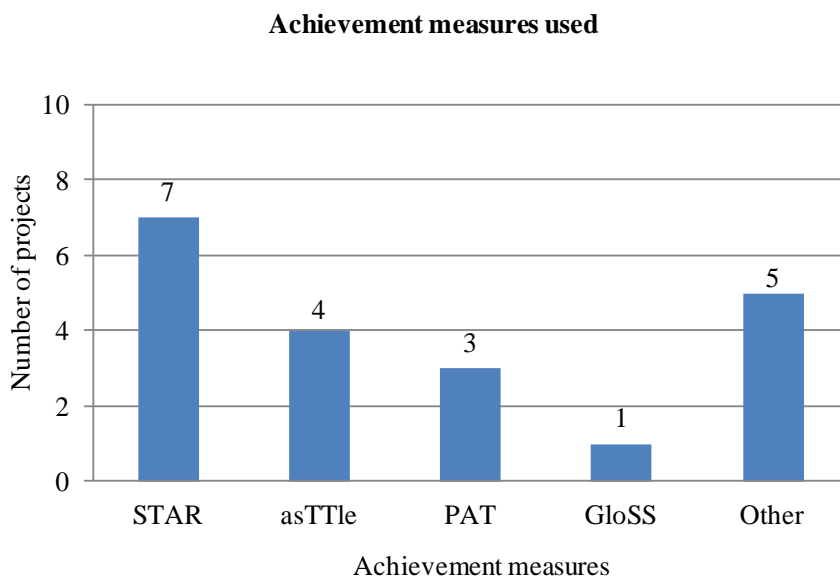
Only 13 out of the 49 projects reported using achievement measures. Most used more than one, thus these are cumulative results.

Figure 11: Achievement measures used

3.9 Theoretical research perspectives

It was difficult to gain a clear picture of the range and type of theoretical research perspectives guiding many of the studies. Some reports were explicit about theoretical aspects. For example, three noted working within a sociocultural frame and another three indicated a social constructivist frame. Two groups of researchers classified their work as kaupapa Māori and another as guided by Pasifika education research guidelines. Other theoretical positions or approaches stated were: activity theory (n = 1), critical theory (n = 1), and social constructionism (n = 1).

Reports that included terminology such as "ethnographic" (n = 5) and "naturalistic" (n = 1) suggested several projects were framed by an interpretivist paradigm. The research design and methods employed (see section 3.10) and the stated analysis methods (see section 3.11) tended to confirm this picture. Thirty project reports did not explicitly state a theoretical research perspective.

Theoretical perspectives
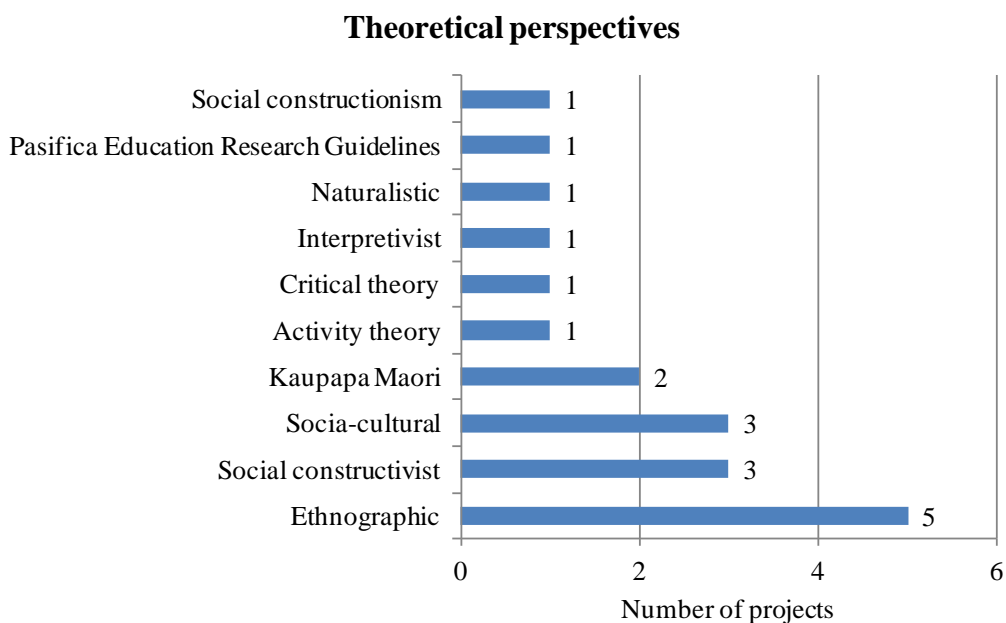
Only 19 projects out of the total of 49 projects explicitly stated an underlying theoretical framework in their reports.

Figure 12: Theoretical perspectives

3.10 Research design and methods employed

While 18 of the projects did not explicitly state an approach to their research or labeled this with a term such as mixed methods, naturalistic, multimethod, or scientific and investigative, the most commonly stated research design was action research (n = 17). What it meant to undertake action research was interpreted in different ways by different research teams. Case studies (n = 5), and design research (n = 4) were the next most commonly stated (see Figure 13).

Research design of projects funded
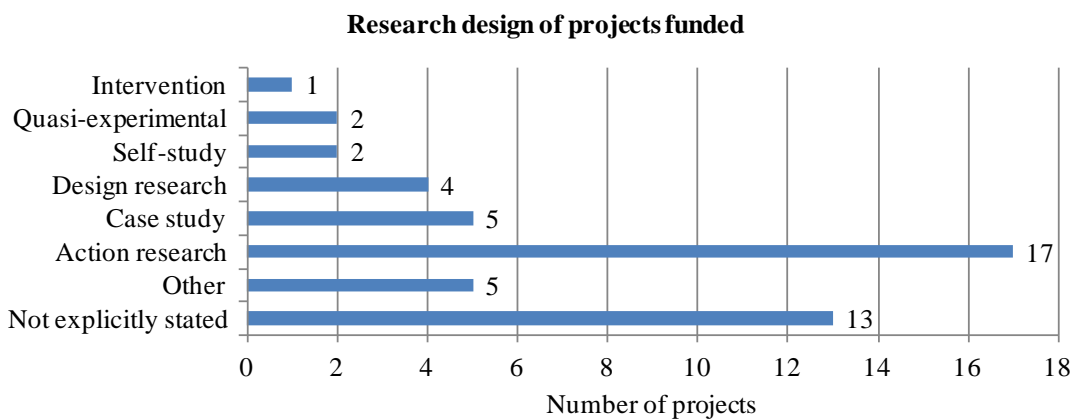
Figure 13: Research design of projects funded

Reading the reports revealed that most of the studies had collected qualitative research data. As Figure 14 indicates, the vast majority of studies stated that they used interviews (n = 38) and observations (n = 25). Other popular sources of data were surveys and questionnaires (n = 19), video recordings (n = 18) and field and meeting notes (n = 17).
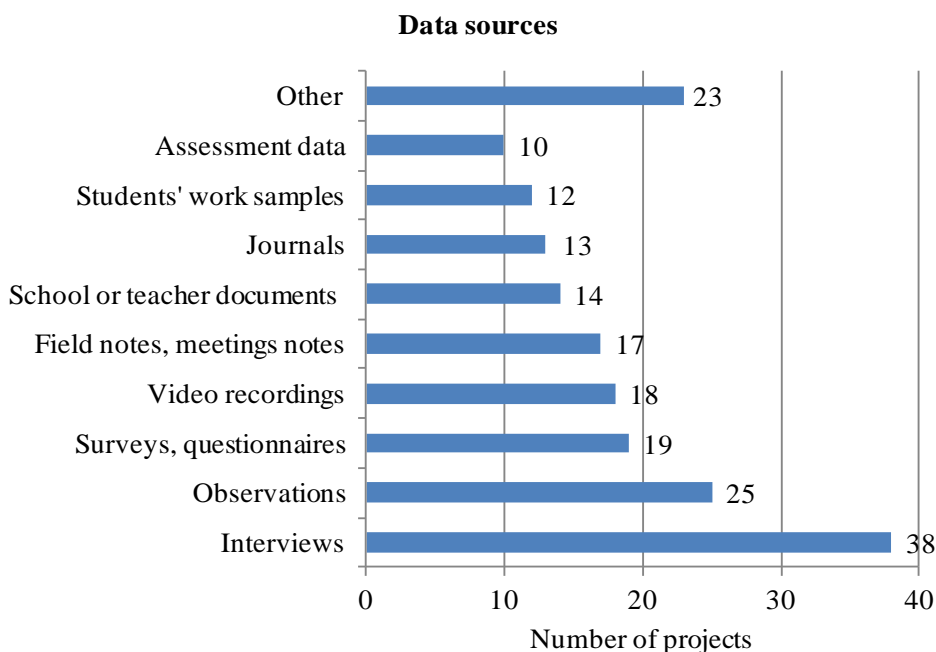
Data sources

Figure 14: Data sources

3.11   Stated analysis methods

There was a lack of clarity in most of the reports about how data was organised, reduced and analysed. For reports from projects funded after 2008, this may be a consequence of the short report template. "Joint"

analysis was most commonly stated as the data analysis approach used (n = 16), with the implication that teachers/research participants contributed to the analysis. Nine reports included mention of thematic analysis, five referred to grounded theory and two each talked of using inductive analysis and video analysis. Six studies reported undertaking statistical analysis coupled with thematic coding (see Figure 15).
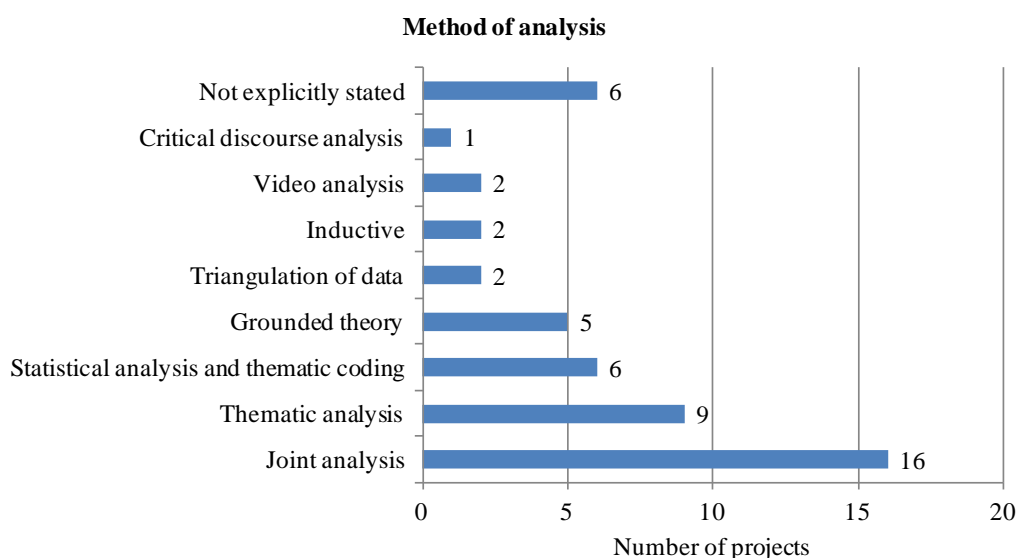
Method of analysis

Figure 15: Method of analysis

Of interest was the finding that although 18 studies reported using video recordings as a research method, only two explicitly mentioned video analysis as a way of analysing the data. This is an area that would benefit from cumulative collaborative exploration across teams and studies.

3.12 Summary

As indicated in the analysis of the reports in this section, the school sector projects completed to date were pretty evenly split between a focus on Years 1–8 and Years 9–13. Research regarding mathematics and literacy/literature were the most commonly funded curriculum areas, with an emphasis on the secondary years in mathematics and on literacy in primary education. Although other curriculum areas (science, outdoor education and the arts) were included, there was far less emphasis on these areas and virtually no investigation into the wider curriculum such as in the social sciences, health, or physical education.

The emphasis across the sector was on investigating teaching rather than learning. These findings raise the issue of what counts as learning, the scope of the learning that we value and are interested in, and how to document or make this learning visible and communicable to learners and to others. Twenty-one of the 49

projects had a focus on particular groups of students. However, it was difficult to identify themes across the studies that had a focus on a particular group or groups due in part to their situation-specific nature.

Thirty projects did not state a research design. Those that did, tended to specify a sociocultural or social constructivist frame. The most commonly stated research approach was action research, although this was interpreted in different ways by different research teams. While qualitative methods were the most commonly reported form of data collection, in many reports there was a lack of clarity about both data and analysis. Given the number of projects using video to record observational data, there is space for a collective focus on video analysis processes. Our analysis also suggests that there is scope to explore how different modes of data are triangulated, combined and analysed.

4.   Findings: Evidence for TLRI projects identifying, addressing and building cumulative knowledge around national and international thematic concerns

This section addresses the second and third focus questions that guided the analysis. The first part explores the second focus question: "What is the evidence for TLRI projects identifying and addressing thematic concerns in the school-based field nationally and internationally?" The second part reports the findings for the third focus question: "What evidence is there that the researchers are looking at the specifications of a fund such as the TLRI and using this to move the field forward, that is to build *cumulative* knowledge and/or what evidence is there that the focus is on using the fund to move personal intellectual projects forward and/or some combination?

4.1   Identifying and addressing thematic concerns nationally and internationally

As noted earlier, the scope of this review did not enable a review of the international or national literature. However, we conducted a search of known sources to gauge the extent to which these TLRI projects had identified and addressed international and national thematic concerns. The search included sources such as the New Zealand Ministry of Education, OECD, New Zealand Best Evidence Syntheses Iterations and the Teaching and Learning Research Programme (TLRP) in the United Kingdom for their match to the themes that emerged from reading the TLRI reports. Other sources, such as 2011 and 2012 AERA abstracts, NZARE programmes and asking those with expertise in these areas, were used for trends in the research literature, regardless of whether or not these were themes in the TLRI reports.

The school sector TLRI projects completed by March 2012 are wide-ranging in their scope. After an initial reading of the summaries of the projects, we drafted a set of questions to use as a guide to reading the reports and articles supplied for each project. These questions were then discussed and confirmed with NZCER, the commissioning body for this review. The guiding questions were:

- What do these studies say about teacher knowledge, understanding and practices regarding aspects such as curriculum, teaching, assessment and pedagogical content knowledge?
- What tools have projects used or constructed to investigate teaching and learning?
- What evidence is presented about how changing teachers' knowledge, understanding and practices enhanced learning?
- Do these projects provide (new) ways to "see" learning and improvement in learning?

Using these questions to guide the reading of materials available from each project, we generated a coding system. The coded categories were then grouped under four major themes:

- teaching and learning across curriculum areas

- teaching particular groups of learners

- using ICT for learning and teaching

- practitioner research and professional learning.

Subheadings are used within each of these themes to organise the discussion and make links to trends in the national and international literature. There are, of course, other ways the evidence from these reports might have been categorised, and as a result different thematic concerns might be identified. Throughout the report, the project numbers have been included to identify the studies referred to. All the projects are listed and summarised, with their project numbers, in the appendix. Links are embedded in each summary so that readers can access the web pages for projects cited. A chart summarising these themes is provided as Table 2 in the summary at the end of section 4.1.5.

4.1.1   Teaching and learning across curriculum areas

As explained in section 3.5 above, 36 studies included a focus on investigating teaching and learning in a curriculum area. The most often investigated were mathematics (n = 14) and aspects of literacy and literature (n = 11). Six studies had a focus on science, technology and environmental education, and three investigated teaching and learning in the arts. It is noticeable that there was only one project addressing education outside the classroom, and no projects in health, physical education or the social sciences.

The emphasis on mathematics and literacy in the funded projects, and other evidence within some of the projects, suggests a trend towards a two-tier curriculum priority structure within primary schools at least. For example, one project team explained that "the location of science and technology outside the core of the primary school curriculum proved to be a constraint: science and technology were not often taught more than once or twice a year" (9215).

This focus on literacy and mathematics could be reflective of the strength of policy focus on literacy and numeracy over the time these studies took place. During these years, the New Zealand Ministry of Education's National Administration Guidelines required schools to give priority to student achievement in literacy and numeracy, especially in Years 1–8. A series of numeracy development projects took place between 2000 and 2009 (Holton, 2010). There was focus over a similar time period on the development and introduction of new literacy initiatives including the *Report of the Literacy Taskforce* (1999), the report of the Literacy Experts Group (1999), the New Zealand government's literacy strategy (introduced to schools in 2000) and the *Literacy Learning Progressions* (Sewell, 2009). As well, a series of professional development initiatives in literacy supported these reports and initiatives: Literacy Leadership (from 2000); Literacy Enhancement (from 2001); Literacy Professional Development Project (from 2004). In 2009, the government

announced the introduction of national standards in literacy and mathematics for Years 1–8 (Ministry of Education, 2009) and also, during the years between 2000 and 2007, the Best Evidence Synthesis (BES) in pāngarau/mathematics (Anthony & Walshaw, 2007) was commissioned and written. This BES drew together the international literature on how mathematics teaching makes a positive difference to the life chances of students and should enhance their participation as citizens in an information- and data-driven age. Given the focus on these areas at this time, it is likely that researchers targeted them as aligning with the TLRI requirement of having a strategic focus.

4.1.1.1 Teacher knowledge and pedagogy

Across the projects much of the focus for investigation was on teacher content, pedagogical and pedagogical content knowledge. Internationally, there is a great deal of evidence "that the single most significant means of improving the performance of national education systems is through excellent teaching (and that) the quality of pedagogy, of what teachers do, is thus firmly on the contemporary agenda" (Pollard, 2010, p. 4). In the Teaching and Learning Research Programme commentary, Pollard (2010) cites his work with Mary James that "distilled findings from 22 school-based research projects, trawled international research and consulted widely to produce … ten principles of effective teaching and learning" (James & Pollard, 2006). Principle 2 holds that "teaching and learning should engage with the big ideas, facts, processes, language and narratives of subjects so that learners understand what constitutes quality and standards in particular disciplines" (p. 8). Teachers, therefore need knowledge of these aspects of the subjects they are teaching in order to "provide activities which support learners as they move forward, not just intellectually, but also socially and emotionally, so that once these supports are removed, the learning is secure" (James & Pollard, 2006, p. 8). Evidence from New Zealand sources, too, supports the argument that school-based studies should be concerned with teacher subject and pedagogical content knowledge (Alton-Lee, 2003; Hattie, 2009; Hattie, 2012; Timperley et al., 2007).

Most of the school sector studies concerned with curriculum teaching and learning either explicitly investigated and sought to extend teacher subject content knowledge and pedagogical content knowledge, or assumed the critical importance of these types of knowledge. Examples of the former include the group of studies in reading comprehension conducted in low decile South Auckland schools (9206, 9220, 9258). Although focused on building students' reading comprehension, these projects put considerable effort into teachers' professional learning about the nature of reading comprehension, and how to teach reading comprehension. Similarly, in writing, two projects (9239, 9240) spent considerable effort equipping teachers with more knowledge about writing and the writing process to assist them in improving their teaching and analysis of student writing.

In the mathematics projects, there was focus on teachers' knowledge of statistics, algebra, and numeracy/strategies in conjunction with the inquiries regarding how these might best be taught. Teachers were often focused on developing and learning to use pedagogical tools to support student learning (and in the process, increase both their subject and pedagogical content knowledge). Some examples include the "data detective" poster to improve statistical questioning (9270), a communication and participation framework to support children's development of "friendly arguing" in numeracy (9269), and work with teachers to construct and trial diagnostic interview questions regarding algebraic thinking (9242). In a similar vein, an exploratory study (9256) with seven secondary mathematics teachers who purposefully chose aspects of knowledge about, and teaching of, mathematics they wanted to improve.

The science and technology projects also placed emphasis on both teachers' subject content knowledge and pedagogical content knowledge. A three-year project (9215) and two two-year projects (9268, 9271) all reported the need for teachers to have the scientific knowledge as a basis for building and extending teacher pedagogical content knowledge, as well as knowledge about children's conceptions in science and their learning about these concepts. A further finding from this set of projects related to scaffolding early career teacher pedagogical content knowledge using a content representation (CoRe) matrix (9289) and to investigating technological pedagogical content knowledge that involves integrating knowledge about the affordances of information communications technology (ICT) with pedagogical and content knowledge. A small study with two Year 7 and 8 teachers confident in using ICT within their science teaching (9271), found that how teachers prepare for classroom instruction in science depends upon their knowledge of science and what they know to be potentially difficult for their students. But whether or not they can support science learning through the use of ICT also depends on the teachers' knowledge of the affordances of ICT including the skills the students need to use such tools.

In the arts, teacher knowledge on which to base an integrated pedagogy was the focus of three projects (9218, 9281, 9273). The case was well made in all of these projects that primary teachers often need support to extend and enrich their knowledge in the arts. A project focusing on outdoor education (9286) found that using local places and facilities for activities outside the school led secondary teachers to increased knowledge of place, culture and work in an interdisciplinary way to meet students' needs and interests.

In most of the projects noted above, links were made to current thinking and research in the relevant curriculum field. There were several projects in which the principal investigators were working with leading thinkers and researchers in their field internationally. Examples include (but are not limited to): studies regarding communication in mathematics (9201, 9251) that articulate with international research by Ball and colleagues (2008), Sherin and colleagues (2004) and links nationally with the work of Thomas and Tagg (2005) and others; and, two studies in critical literacy (9231, 9237) that link to leading researcher and thinkers in this field. McNaughton and colleagues are world leaders in the reading comprehension field. All

of these researchers, and others such as Cowie, Fraser, Pratt and Yoon, to mention just a few, have linked their TLRI work to their own long-term, established research programmes that draw from, and build upon, current national and international thematic concerns.

Consistent findings across the corpus of these studies, although not ubiquitous, are that increased subject content knowledge interacts with pedagogical and pedagogical content knowledge. Together these funds of teacher knowledge increased the variety and quality of the learning opportunities offered to students. In most of these projects, the teachers were linked with researchers experienced in the curriculum area under investigation and undertook an evidence-based or systematic inquiry. For most teachers, the reports stated that this resulted in increased knowledge and more effective teaching practices.

4.1.1.2 Learning progressions

A second thread running through the school-based TLRI projects is that of learning progressions. Learning progressions have been described as "road maps for learning" (Black et al., 2011) in that they form the intersection of curriculum, assessment and learning. Educational authorities worldwide are developing learning progressions to provide teachers with the scaffolds necessary to guide and support student learning effectively, see for example the Department of Education (2012, p. 21). In contrast to some of the progressions currently included in policy documents, assessment and curriculum experts argue that learning progressions "should be developed from a strong research base about the structure of knowledge in a discipline and how learning occurs" (Heritage, 2010, p. 40). Learning progressions are identified as an important issue for learning and teaching, and for teacher learning in the Teaching and Learning Research Programme commentary (Pollard, 2010).

From a New Zealand perspective, Alton Lee (2003) identifies the need for research to develop and refine our understandings of student learning progressions to support teaching and learning in the *Best evidence synthesis: Quality learning for diverse students in schooling*. While standards have been around as the building blocks of progression in learning for almost as long as formal schooling (Hill, 2000), the trend towards performativity and accountability in education since the introduction of the *Tomorrow's Schools* (Lange, 1988) reforms and the New Zealand curriculum (Ministry of Education, 1993) has accelerated the development of more, and more detailed, learning progressions. In recent years, detailed iterations of learning progressions have been developed and used as a basis for both learning and teaching (for example, literacy and numeracy strategy progressions) and for assessment programmes (for example, the national standards in primary schooling). For example, the 2012 OECD country report for New Zealand on evaluation and assessment systems (Nucshe et al., 2012) notes: "The Standards are essentially a set of learning progressions designed to help teachers make overall teacher judgments on student achievement and progress based on a range of assessment evidence" (p. 21). Given the ubiquity of the progressions discourse about learning, it is no surprise that some of the TLRI school sector studies investigated and suggested learning

progressions based on their findings. Some of the studies recommended the need for the development of learning progressions and diagnostic tools that use these (9231, 9237) while others drew on earlier research to trace learning; for example, in statistics (9270) and in early algebraic learning (9242). This focus on learning pathways may well reflect the international and New Zealand emphasis on understanding student learning pathways so teachers can be more responsive to the diversity they encounter in their classroom day by day to work with their students to enhance learning.

One project (9221) developed an observational tool to assist teachers to understand how their learning about literacy developed over time and with experience. The work with teachers to improve the tool (over 11 iterations) and the use of the tool for professional learning provides a useful description to inform further development, as well as evidence of how learning progressions in teaching can be helpful in describing and self-regulating teacher learning.

Two projects focused on the development of whole-school learning in environmental education (9224, 9245) and developed learning progressions to describe progress towards embedding a school-wide culture of education for sustainability (EfS). These two projects also suggested that it would be necessary to articulate student learning progressions in sustainable action competence before they could further explore the relationship between whole-school EfS and student learning.

The development and use of learning progressions as a thematic concern in the TLRI projects aligns with international interest in progressions as a means for enhancing teaching and learning. The TLRI school-level studies completed to date have contributed new knowledge to constructing and using learning progressions in several curriculum areas. Just as importantly, studies have expanded the focus to consider teacher and school learning progressions and the potential interplay between student, teacher and school learning progressions, thereby enhancing the contribution of the TLRI programme to this emerging field.

4.1.1.3 Assessment conceptions and practices

Global trends regarding performativity, accountability, standards and progression, and the use of assessment for improving learning can all be traced in the literature and have influenced the thematic concerns of the school sector TLRI studies reviewed in this report. The interrelated processes of assessment conceptions and practices discussed here are closely related to the previous two thematic concerns of teacher knowledge and learning progressions. Assessment for learning and giving feedback are prominent discourses nationally and internationally at this time (OECD, 2005, 2010). Hattie's report on meta-analyses relating to achievement supports the focus on the formative use of assessment and feedback strategies (Hattie, 2009), as do the best evidence syntheses by Alton-Lee (2003) and Timperley et al. (2007). The *New Zealand Curriculum* (Ministry of Education, 2007) and the position paper on assessment (Ministry of Education, 2010) also promote these practices. The recent OECD report of New Zealand's assessment and evaluation systems

affirmed that a strength of New Zealand's policy and practice is the focus on effective assessment as a circle of inquiry, decision-making, adaptation and transformation, rather than summative end-point testing (Nucshe et al., 2012). The report states that assessment should be "a process of learning, for learning" (Nucshe et al., 2012, p. 133). Consistent with this view, the principles for effective teaching and learning (Pollard, 2010) from the findings of the TLRP projects in the United Kingdom include the need for assessment to be congruent with learning and the need to provide feedback for future learning.

One project had conceptions of assessment and feedback as the central focus (9222). This project investigated secondary school students' conceptions of assessment, feedback and learning using inventories, and worked with teachers to design and trial a series of classroom activities to use to identify students' conceptions of specific assessment and feedback practices. This work is part of an expanding international programme of research in teachers' and students' beliefs about assessment and their influence on learning. As stated in this project's summary, "Finding out about what students think are the purposes of assessment and feedback is important because what they believe will influence the way they behave, study, and learn, and ultimately their academic outcomes" (Peterson & Irving, 2007, p. 1). This project enabled teachers to gain greater insight into their students' conceptions of assessment and feedback. Three questionnaires and a set of classroom activities were produced for teachers to use to access student conceptions.

Several other projects examined the use and development of classroom assessment and feedback tools and practices that support teaching and learning within curriculum contexts. Among these, five explicitly reported on this aspect. Diagnostic tests of secondary students' algebraic and statistical thinking were developed and used to investigate how to stimulate and support mathematical reasoning (9275, 9242). Two projects investigating science and technology worked with primary teachers to enhance teaching and learning through using assessment for learning (9268, 9215). One of these projects (9268) investigated assessment for learning in cultural and community settings to understand more about how teachers can provide and privilege diverse ways for children to express, develop and gain feedback on their growing knowledge and expertise. Another project (9221) focused sharply on the problem of how to assist teachers to improve their formative assessment and feedback practices in the literacy context. In this project, the researchers and teachers constructed an observation tool that teachers can use to examine and improve their practice. A communication and participation framework (CPF) was constructed to elicit and scaffold students' ability to discuss and debate numeracy strategies (or "friendly argue", as it was called) to improve their mathematical competence (9269). And a tool was developed to assist teachers to understand students' progress towards taking action for sustainability in environmental education (9224). Like some of those currently available on Te Kete Ipurangi (TKI), the Ministry of Education's website for teachers and school leaders, and elsewhere through Google and in academic and teachers' journals, these tools have been developed evidentially. They hold promise for improving learning and are aligned with thematic concerns in literacy, mathematics and sustainability nationally and internationally. What is not clear from reading across the school-based studies,

however, is how these frameworks and activities might be more widely disseminated and used. A search of TKI and Down the Back of the Chair (another Ministry of Education site for teaching resources) did not locate these tools.

4.1.1.4 Learner outcomes

The notion of "learner outcomes" is a contested one. In discussing the evidence from the TLRP projects in the United Kingdom, for example, James and Brown (2005) noted that, as in the TLRI projects, a range of phenomena counted as "learning outcomes" within the programme. They suggested that because of the accountability discourses prevalent in society, concepts of such outcomes as well as the process of learning itself need to be:

> better understood among all the stakeholders in this very important area. Traditionally, for example, and especially recently, there has been considerable emphasis on performance and bureaucratic models of learning which focus on measurable skills and attainment targets. What is clear, not least through the work of this programme, is that the limitations of such perspectives constrain thinking about, and divert attention from, other valuable forms of learning. Furthermore, their requirements of objective, quantitative measurement techniques for assessment divert attention from consideration of broader issues such as how to make judgments about process learning, long-term retention of learning, unintended learning outcomes and self assessment of learning. (James & Brown, 2005, p.8)

Other authors (Daugherty et al., 2005; Threadgold, 2005) identified similar issues with understanding the relationships between teaching, curriculum, assessment and learning and understanding the nature of learning outcomes in the TLRP projects and more broadly. In reviewing the first 30 of the TLRP projects, seven categories of learning outcomes were proposed. These included: attainment; understanding; cognitive and creative; using; higher order learning; dispositions; and membership, inclusion and self worth (Daugherty et al., 2005).

Education policy in New Zealand is highly focused on improving educational outcomes especially for those students most at risk of under-achievement. Perhaps because the TLRI requires that projects must align with "current and future priorities for teaching and learning" and "how we might address current inequities in educational outcomes", the focus in some of the projects reviewed was more focused on attainment than other learning outcome types. As noted above in section 3.8, at least 13 projects used standardised measures to evaluate learning in these projects. Eight projects that had a focus on student learning that could not be assessed with existing standard measures found or constructed methods by which to assess learning. For example, two linked projects investigating critical literacy recommended and then constructed rubrics for assessing learning and progress based on the findings about how learners progressed (9231, 9237).

Most of the projects with a focus on attainment, though not all, investigated how learning was related to teaching and teaching interventions. For example, one set of four studies was building knowledge about how to support students in low decile Auckland schools to improve reading and reading comprehension (9206,

9220, 9258, 9292). These studies used a quasi-experimental approach and have been able to demonstrate with reasonable confidence that it is possible to develop more effective reading teaching that has a direct effect on reading comprehension achievement of Year 4–8 children in culturally and linguistically diverse decile 1 schools in South Auckland. These studies demonstrated that through professional learning and changes to specific aspects of instruction and attention to the evidence of learning, schooling can and does make a difference.

Other projects clearly understood learning outcomes more broadly. Two studies investigated how school structure and processes affect learning for secondary school students. An early project in the TLRI programme involved teachers collecting data in a multimethod design about what teachers and students in three secondary schools believed facilitated student learning (9205). The findings identified that respectful relationships, relevance of content, appropriate preparation, clear and open communication and supportive classroom climates are essential to student learning. Responding appropriately to diverse learners was also critical. A project in one newly established secondary school investigated the effect on learning of the way in which the day and week was divided into lessons (9255). As a result of this project, three-day episodes of learning were trialed and consequently new approaches to teaching attempted. Through this project, the teachers realised that transformative shifts in thinking are needed, not simply structural changes, that deep change to practice is hard, and that it takes careful support and time. The findings also led the school to include a specific focus on independent learner qualities and it planned to pursue this as an ongoing design principle for learning and teaching.

While several TLRI projects within the school sector offer promising approaches to documenting, investigating and improving learner outcomes, there was less coherence across the projects in this aspect as almost all were one-off studies, most were small, and they were often school-based teacher-researcher studies. As mentioned above, this has thus far also proved to be a largely intractable issue elsewhere. These findings also raise the issue that in considering "learner outcomes" our society is presently focused upon structured measures, such as assessment tools. In contrast, some of the projects that investigated learning outcomes, such as one of those with a focus on culturally responsive pedagogy, conceptualised students bringing their funds of knowledge into the classroom and curriculum as a key outcome. Other studies may also have conceptualised learner outcomes in such broader ways. For example, key competency learning, although not highlighted especially within the completed studies, may be worthy of further investigation.

4.1.2   Teaching particular groups of learners

For some projects, the focus was on the teaching and learning of particular groups of learners. As described in section 3.7, 21 projects investigated learning and teaching:

- in bilingual and multilingual classroom settings
- in settings with mainly Māori learners

- in settings with mainly Pasifika learners
- in low decile contexts
- in classrooms that were described as including diverse learners.

This theme included projects that stated they had a focus on culturally responsive pedagogy as well as those that aimed to improve learning in bilingual contexts. Culturally responsive pedagogies (CRP) as explained by Bishop et al. (2009) are employed "when the learner's own culture is central to their learning activities" (p. 741). Others focused on the role of language.

Six projects explicitly stated they were investigating CRP or teaching and learning that explicitly included the cultural well-being of learners. One of these investigated ways to engage students from diverse cultural backgrounds in science learning (9268). This project provided the clearest explanation of CRP. The findings from this project demonstrated that teachers employing CRP need to affirm and respect the diversity of knowledge and expertise of their students, and the families and communities of their students. They need to explore ways to build bridges to encourage and enable their students and their families to bring their "funds of knowledge" (Gonzalez et al., 2005) into the science classroom. Thirdly they need to ensure that their students have multiple and diverse opportunities to develop, express and receive feedback on their understandings of science, including opportunities to privilege oral and visual presentations (from both individuals and groups) alongside, and in addition to, individual written presentations. And for many students from Māori and Pasifika backgrounds, teaching other students younger and older than themselves, and teachers being learners too, embodied the spirit of ako and added to cultural responsiveness.

The main research question of a second project in this group asked how the culturally responsive pedagogy of marae ā-kura operates, and what effect this pedagogy makes on the educational achievement of Māori learners and their whānau (*9283*). This project built upon and illuminated what Bishop et al. (2003) referred to as visible and invisible cultural elements, and deepened understandings of the nexus of culture pedagogy and outcomes through the use of pūrākau—narratives similar to case studies (Lee, 2008). The major findings of this project indicate that marae ā-kura have the potential to address Māori aspirations to teach, learn and live as Māori within mainstream secondary schools, and that policy and research agendas would be advised to have a focus on marae ā-kura because of their significant potential to enhance educational achievement for Māori students within mainstream schools.

Two further projects stated that culturally responsive pedagogy was a focus in their work (9269, 9208) and three reported supporting teachers to use pedagogies that were responsive to student diversity (9241, 9228, 9204). While these projects took place in culturally diverse settings and used pedagogies that are arguably responsive to the needs of diverse groups, such as building mathematical argumentation abilities in groups (9269) and finding out about the needs and prior learning of their students (9228), there was less emphasis on CRP as described in the national and international literature.

Alongside a concern with culturally responsive pedagogy, five studies investigated the role of language in mathematics learning where English was not the students' first language or where the students were learning in te reo Māori. The findings from the studies of secondary and tertiary students for whom English is an additional language (EAL) found that these students suffer a disadvantage of about "10–15% in mathematics learning due to language difficulties" (Neville-Barton & Barton, 2005, p. 13). One study also indicated that Pasifika students might overestimate their facility with English, even when English is their first language. Ways to boost English use and understanding with these students was advised (9211).

Two projects investigated developing rich mathematical language, including writing, in Māori immersion contexts (9230, 9252). Interestingly, the authors of these projects commented that by focusing on familiarising students with the mathematics register, the teachers developed their own content and pedagogical knowledge.

Overall, it was difficult to identify themes across the studies that had a focus on a particular group of learners, due in part to their situation-specific nature. There was a trend to report that teacher research and teacher involvement in research can be an effective strategy through which to enhance teaching and learning for Māori students, Pasifika students, and students from diverse backgrounds, as well as those from low decile schools. These projects also highlighted the need to connect whānau, families and the community with school learning.

4.1.3 ICT for learning and teaching

Six projects explored how the use of information communication technologies affected teaching and learning. The ICTs employed were of various different kinds, including:

- digital classrooms where all students used computers as learning tools throughout the school day
- the use of a web-based programme that made it possible for dance and drama experts to interact with Year 6–8 classrooms about their performances and learning
- the use of a learning activity management system to teach primary students collaboratively and interactively online
- student use of various ICTs (interactive whiteboards, digital cameras, and the internet, for example) to learn science
- school students' experiences of blended learning, where they are taking classes in multiple formats from multiple providers
- how secondary school students learn mathematics using ICT tools such as calculators, spread sheets and interactive whiteboards.

As the list above demonstrates, there was very little crossover in these topics and they ranged across primary and secondary education, and were located throughout New Zealand. Most of these were relatively small studies conducted over one or two years, although one did include a national survey with responses from mathematics teachers in 193 secondary schools (9225). This study provided useful findings about progress in using technology to teach mathematics in comparison with a similar study 10 years earlier. A main finding about good practice in this study was the need for teachers to know when and how to use technology appropriately in teaching a given mathematical concept. Perhaps unsurprisingly, all the ICT studies consistently found the teachers' knowledge and familiarity with ICTs as well their curriculum content knowledge increased the potential for ICTs to be used to support learning beyond traditional classroom activities. In the projects where teaching and learning took place online, and teachers felt confident in its use, students appeared to enjoy and learn meaningfully across a range of media. One study (9280) that compared blended learning with traditional classrooms through a mixed methods design found that online and distance learning can increase students' independent study skills and that all students, whether in traditional or blended learning contexts, learn best when well supported. Learning with and through ICTs is a topic of international interest and debate, although in a brief search we found more studies of this kind at tertiary level. These TLRI studies begin to explore the potential of a variety of ICTs to support and encourage learning, particularly when used by confident knowledgeable teachers. The studies highlight that teachers need to be knowledgeable about content, teaching and the affordances of the particular technology. They raise important issues about how well schools are prepared, and how teachers are supported, to use technology for the range of purposes that fall within a teacher's professional responsibilities.

4.1.4 Practitioner research and professional learning

Internationally, educational practitioners have embraced their role as professionals engaged in knowledge generation, decision making and educational improvement through inquiry (Beckett & Struthers, 2011; Cochran-Smith & Lytle, 2009; Pollard, 2010; Robinson & Lai, 2006). The TLRI was established by the Ministry of Education in New Zealand with the specific intent of supporting researchers and practitioners to collaborate on research as a strategic change tool (Gilmore, 2007). In the first phase of the TLRI (2003–2006), 35 school sector projects were funded and most of these emphasised building research capability and capacity among teachers through positioning teachers as co-researchers (Gilmore, 2007). While the emphasis on teachers also being researchers seems to have reduced somewhat since changes were made to the TLRI guidelines for proposals since 2008, the TLRI continues to promote partnerships between teachers and researchers in and through which teachers are encouraged to inquire into their practice. Such partnerships encourage teacher inquiry and support professional learning.

4.1.4.1 Teaching (and learning) as inquiry

Teaching as inquiry has a high profile within the New Zealand Curriculum (Ministry of Education, 2007) and these TLRI school-based studies have no doubt added to, and benefited from, this discourse. As stated above, many of the school sector TLRI projects either explicitly or implicitly involved teachers inquiring into their teaching. This is congruent with the goal of the TLRI to "build the capability of teachers to improve their teaching practice by learning from the findings of research" (Teaching and Learning Research Initiative, n.d.b). This suggests that even if teachers are not involved as researchers, they would learn from research participation.

The involvement of teachers in the work of inquiry is a clear theme through the project reports. In some, school leaders and teachers took leading roles as teacher researchers, often guided by university research partners in the process of systematic inquiry and improvement cycles. In other projects, the teachers and students assisted university researchers with data collection and analysis and then used the findings to make changes within their school contexts. There is evidence, too, that involvement in the TLRI-funded projects resulted in classroom practitioners and school leaders completing research degrees at masters and doctoral level.

4.1.4.2 Tools for teachers to use, to learn about and/or change their teaching

Three projects produced tools to assist teachers to learn more about their practice so that they might modify it. These projects were diverse in nature. One provided a set of guidelines for schools and teachers to use to improve the integration of transient students (9243). Another produced a matrix to assist beginning teachers plot the important ideas in science units and understand the pedagogical implications of these as a guide to planning their units of teaching (9289). A third tool is an observation guide for teachers to use with their peers that can assist them to have evidence-based conversations about their literacy practices (9221).

Such tools could be useful for practitioner inquiry and professional learning. New Zealand teachers have enthusiastically embraced "teaching as inquiry" in the New Zealand curriculum and tools such as those developed and trialled in these projects could well support such inquiry. What is not clear from this review, however, is how tools such as these can be promoted and shared more widely with practitioners and professional development providers. While published academic papers were found for two of these tools (9289, 9221), it is not clear how widespread their use is in practice, nor how useful they could be for teachers outside these projects.

4.1.4.3 Professional diversity

One project focused on Pasifika teachers in secondary education. While this study could, perhaps, be considered outside the TLRI brief, it contributed insights into how Pasifika teachers might be assisted into the profession and into what it might mean to operate at a high level as a Pasifika teacher in relation to the

sometimes conflicting expectations of schools and other teachers. Suffice to say that by following Pasifika research principles, its findings raise significant issues about the need to accommodate diversity in the teaching force in New Zealand.

4.1.5 Summary

In summary, the school sector TLRI projects are well aligned with national and international concerns in teaching and learning. This was particularly the case in the curriculum areas of literacy and mathematics, with respect to the generation and use of learning progressions, and understanding and using assessment. There was less coherence and connection across the studies regarding learner outcomes. Given the current concern regarding inequities in educational outcomes for specific groups of learners, many of the projects have not explicitly discussed how these might be addressed. Six projects investigated ICT effects on teaching and learning. These were small projects which raised issues for further exploration, including how well teachers are prepared and supported to use ICT in productive ways.

While most of the projects were well aligned with international thematic concerns, those led and mentored by university-based researchers were better connected to the international literature and were more likely to have published in peer-reviewed journals or at conferences. The review also found that the useful knowledge produced through these projects is often shared at the local level (that is, the schools participating in the project), and published on the TLRI website, some in books, and within peer-reviewed academic journals. It was hard to find traces of this work in policy or within Ministry of Education or similar publications. Thematic concerns of national and international that were less (or not) evident in these studies included (but were not limited to) ways in which institutional contexts and school leadership could be better harnessed in the service of more equitable educational outcomes, processes that support learners' social and emotional needs, and the involvement of parents and communities as partners in improving educational outcomes.

Theme	Subtheme	Frequency
Teaching and learning across curriculum areas	Teacher knowledge and pedagogy	43
	Learning progressions	14
	Assessment conceptions and practices	14
	Learner outcomes	12
Teaching particular groups of learners	English as an additional language	1
	Māori	9
	Pasifika	4
	Low decile	6
	Diverse classrooms/transient students	5
ICT for learning		6
Practitioner research and professional learning	Teaching (and learning) as inquiry	41
	Tools for teachers to learn about and/or change their practice	3
	Professional diversity	1

Table 1: Thematic concerns summary

4.2 Building cumulative knowledge

The third research question for this review asked, "To what extent is there a cumulative approach (in contrast with an accumulation of unconnected findings)?" This section addresses this question and also takes account of two of the five "ideas" that generated this review, namely: "What evidence is there that the researchers are looking at the specifications of a fund such as the TLRI and using this to move the field forward and/or what evidence is there that the focus is on using the fund to move personal intellectual projects forward and /or some combination?" And "How has (or could) the programme shape/give affordance to individual and collective trajectories?" Reading across the corpus of this work revealed that although the studies ranged widely in size, content, methodologies and findings, there is evidence of a cumulative approach in some aspects of the school sector studies, and potential for further work to build on these beginnings. In some cases, the TLRI studies are part of substantial bodies of work in well-established areas. However, the nature of the TLRI principles which support and encourage innovative and exploratory work also promote studies in new areas of interest sometimes carried out by less experienced researchers and through teacher inquiry. Therefore, in reviewing the evidence for cumulative knowledge building, the potential for new knowledge building was also kept in mind.

4.2.1 Connected projects

In these first eight years of the fund, several established research groups won funding for and completed more than one project in a connected programme of research. The most obvious example of this is the group of studies to investigate and build reading competence in low decile schools in South Auckland by McNaughton and colleagues (9206, 9220, 9258, 9292). These studies are part of the work of the Woolf Fisher Research Centre at the University of Auckland and contribute important support to the centre's aim of advancing the development of education and schooling success for diverse communities, with a particular focus on Māori and Pasifika communities. Connected with these reading studies, two further literacy projects (9221, 9239) investigated supporting teachers to improve their literacy teaching.

Another set of two connected projects led by Sandretto (9231, 9237) investigated the teaching and learning of critical literacy. This work led to the publication of a book (Sandretto & Klenner, 2011) about embedding critical literacy into classroom practices. Associated with this programme of research, Locke et al. from Waikato University have also investigated effective classroom practices in teaching literature and address elements of critical literacies within their report (9248).

Projects investigating science learning and teaching, all from the University of Waikato, form another connected set of studies (9215, 9268, 9271, 9289), as do two related to environmental education and sustainability (9224, 9245).

Three projects investigate teaching and learning in the arts, two from Waikato (9218, 9281) and one based at Victoria University (9273). Although different in their focus, these studies all wrestled with the issue of a lack of primary teacher expertise in the arts. Potential exists for further studies based on these emergent findings.

There are connections between some of the studies in mathematics. Groups of researchers have established programmes with projects funded through the TLRI at the University of Auckland (9211, 9202, 9256, 9225, 9274); Massey University (9201, 9251,9269); and through a collaboration between the universities of Otago and Auckland (9230, 9252).

In a more general way, there are also other links across projects. For example, as noted earlier, at least 10 of the completed school sector projects had a focus on literacy and, thus, provide a basis for potential cumulative knowledge building about teaching and learning. Two projects funded through different universities have investigated statistics teaching and learning in secondary contexts, and a set of projects investigating ICT use, and teachers' knowledge and students' learning through ICT, were conducted in different contexts by teams from several institutions. Across the projects reviewed there are also some with a focus on a particular group of learners such as those learning in multilingual contexts (9248, 9211), Māori contexts (9208, 9268), Pasifika contexts (9270, 9269) and through te reo Māori (9230, 9252, 9283).

Some projects were strongly connected with the research programme of researchers leading, and working in, the projects. For example, Peterson et al.'s (9222) work is strongly connected with the work of Brown (for example, 2004; Brown & Hirschfield, 2007) in student conceptions of assessment, cited regularly, and informs work in other TLRI projects in literacy (Parr et al., 2007) and in the tertiary sector (Hill et al., 2010).

One project did not appear to be linked by curriculum area, teaching and learning area, or by focus on particular groups of learners with other TLRI projects (9229). Several less connected studies focused on understanding teaching and learning within particular schools or community contexts (9226, 9227, 9243, 9253, 9241). These less-connected studies tended to be one-year projects.

4.2.2   Building research capability: Research approach, methods and analysis

Another way in which the school sector projects can build cumulative knowledge is through the use and development of research approaches and methods suited for building knowledge about teaching and learning

in practice contexts. Figure 16 sets out the research approaches named by funding year. Thirty-six named a research approach but 13 of the projects were less than explicit about the research approach and methods used.

Almost every report included some mention of the research methods used, most including a mixture of data collection strategies. Eight projects included a quantitative aspect that stated using questionnaires, surveys, or the use of achievement data, and analysis methods or results that indicated the use of this data for statistical analyses. Investigators at one university carried out six of these projects, with one project at each of two other universities. A further 11 projects mentioned using questionnaires or surveys but did not explain the nature of these, or did not include statistical procedures for analysis, or provide statistical analyses in their results. Thus, the vast majority of studies in the school sector appear to have, to date, employed more qualitative methods (see Figure 16).

Research approaches by funding year
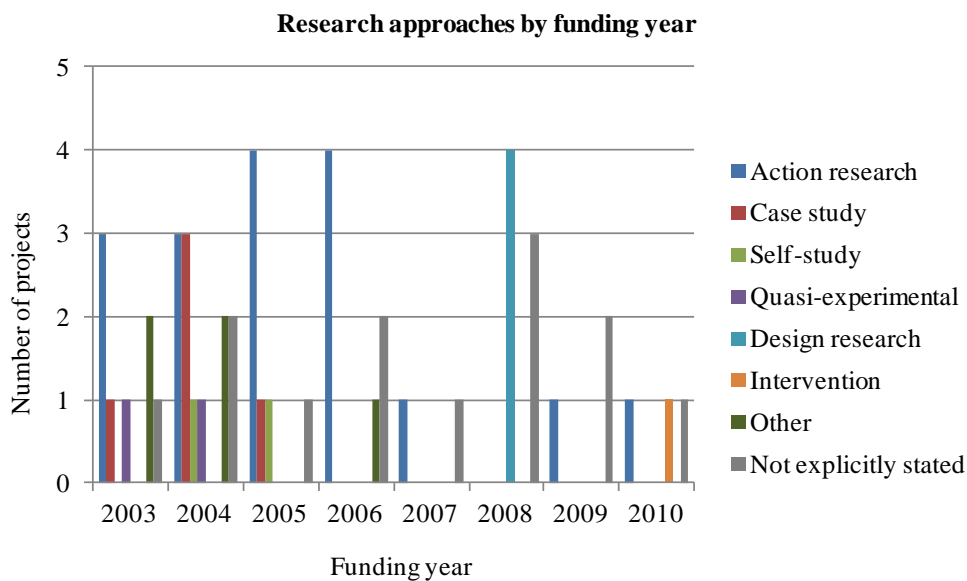
Figure 16: Research approaches by funding year

Across all the projects there was far less information about the analysis of the data and its interpretation (see Figure 15). Twenty-two either did not explain this aspect or described the analysis as "joint".

Using video and video analysis to build cumulative knowledge was a common intention across the corpus of the studies. This held potential for cumulative learning across the school sector projects. However, only two projects mentioned video analysis and of these only one project (9237) gave details about this process. As noted in section 3, it would be useful to understand whether and how the other projects using video managed

and integrated analysis and interpretation of these data. This could make a useful contribution to cumulative knowledge building. It was difficult to build a detailed picture of how the research approaches, methods and analysis processes could have assisted research capability building although it is reasonable to assume this has taken place.

4.2.3 *Researchers communicating their findings and building research capacity*

To find out how findings from the projects had been published and disseminated, we conducted a search for publications by each of the named researchers since the funding dates of the projects and examined the titles. This was time consuming and difficult because not all of this information is available from the TLRI website. Furthermore, it was not always possible to decide to what extent publications had arisen from the TLRI projects, from other aligned work, or a combination of these. Therefore the analysis presented in Table 2 is indicative of publications from the TLRI-funded school sector projects rather than accurate. Due to the number of projects and the difficulties we had identifying publications from these projects, no citation search was carried out for this analysis.

Books (including masters and doctoral theses)	Refereed journal articles	Chapters in books	Presentations, workshops	TLRI reports[1]
18	174	47	211	76

[1] Projects funded before 2008 provided a full report and a summary but later reports were only asked to provide a short report suitable for dissemination to a practitioner audience. The total number of these reports and summaries is provided here.

Table 2: Project publications

This approximate analysis indicates that the work from the school sector projects is being disseminated through academic channels and through workshops and presentations to both academic and professional audiences. Over 500 outputs from the 49 projects indicates an average of about 10 per project. However, as might be expected, the distribution was uneven. Some had produced as many as 30 outputs, while for others only the TLRI reports could be located.

As noted above, many of the school sector projects aligned with national strategic goals in education and these align with international trends. Our analysis confirmed that well-established and experienced researchers, and those associated with programmes of research, have published their work more often and presented their work more extensively than teachers who were also researchers in these projects. Thus we found evidence that in pursuing their personal research agendas, researchers had also moved knowledge and understanding about their respective fields forward.

There was evidence in these projects of research capacity building. For example, this was demonstrated where a series of projects had been implemented. Where several projects in a series conducted by the same wider research group had been funded, earlier projects in the series were led by a more experienced principal investigator while later projects were led by a new principal investigator with the support of the more experienced one (for example, see projects related to McNaughton where Lai led a later project; Anthony where Hunter led a later projects; and Cowie, where a later project was led by Otrel-Cass). There were also other instances where researchers within these studies went on to win and lead TLRI projects in the tertiary sector (for example, Haigh from 9222).

Teacher researchers had written the reports, or parts of the reports, of some projects (9204, 9226, 9239, 9255) and many of the reports stated that particular teachers were intensely involved in all stages of the research planning and implementation, indicating that research capability would have been built. Further evidence of capacity building within the school sector projects is the completion of research degrees by the research assistants, teachers and school support facilitators participating in these projects. A search was conducted to try and ascertain how frequently this occurred but it was difficult to know when the completion of such a degree was (or wasn't) connected with a TLRI project. However, it was clear that in at least five instances this was the case. Furthermore, electronic searches demonstrated that some project personnel are currently enrolled in masters and doctoral degrees.

4.2.4 Summary

There is evidence that TLRI projects are building cumulative knowledge within the school sector. Several research groups completed more than one project as part of a connected programme of research (for example in literacy, science and the arts), and there are connections between different studies in several areas including mathematics, the arts, in the use of ICT, learning in te reo Māori, and in culturally responsive teaching. There is also evidence that the TLRI has encouraged and supported research capability development. Practitioner and action research approaches that enhance teaching have been stimulated, although there would appear to be scope for the results of these projects to be disseminated more widely. The lack of detail in many reports about research approach, design, data collection and analysis suggests that either research report specifications/writing or research capability (or both) require further refinement, support and development. These studies demonstrate that university researchers are using the fund productively to build cumulative knowledge and research capability. These projects also appear to have encouraged and supported teachers to become more capable and involved in undertaking research, teaching as inquiry and in completing research degrees at the graduate and postgraduate level.

5. Summary and conclusions

The research question for this review asked, "What and how has the TLRI contributed to cumulative knowledge about teaching and learning in the school sector?" and asked us to consider five ideas. As summarised in the introduction, these were that the reviewers look for evidence that TLRI projects are identifying and addressing thematic concerns in the school-based field nationally and internationally; investigate the extent to which the school sector projects are using TLRI specifications to move the field forward in contrast with pursuing personal intellectual projects; and consider how the TLRI programme and findings have (or could) afford richer individual and collective trajectories. These ideas are now addressed to summarise the findings reported and discussed above, and to raise points for discussion at the symposium to be held in Wellington on November 16, 2012.

5.1   TLRI school sector projects build cumulative knowledge

There is evidence that the school sector studies are building cumulative knowledge about teaching and learning in several curriculum areas. There was a clear emphasis in these projects on building knowledge in two curriculum areas, literacy and mathematics. There was some focus upon building knowledge about learning regarding science, and the arts. However, across all the projects, the main focus for investigation was on teacher content and pedagogical content knowledge. The projects gave more or less even attention to primary and secondary schooling.

Several of the school sector projects placed emphasis on deepening understanding about how we can address current inequities in educational outcomes and on creating the teaching and learning processes that will support success for all learners in the twenty-first century. These include (but are not restricted to) quasi-experimental studies that show how it is possible to raise reading comprehension in primary schools where children are achieving well below national averages, a mixed methods study that provided information about the challenges for children who have English as an additional language learning mathematics, and several rich qualitative studies of culturally responsive pedagogy and its effects for learners of science, mathematics and Māori students learning in bilingual contexts. However, many of the school sector projects did not explicitly address this central concern of the TLRI, even when they stated that their participants were from groups most at risk of low achievement. There is still a need for more school sector projects that provide deep insight into the issues that result in inequities in educational outcomes and ways to address these.

The school sector projects have also built research capacity and capability within the education sector. Within the universities, especially those where a number of projects have been funded, teams of researchers with expertise in aspects of teaching and learning have grown in strength from TLRI funding. As reported in the findings, progression is evidenced in leadership, as well as in the completion of research degrees.

Connected with the theme of developing a pro-active profession through practitioner inquiry, a specific aim of the TLRI fund has been to develop research capability in teaching and learning through partnerships where the collective knowledge of researchers and practitioners is applied to problems in practice. Partnerships are a strong feature of the school sector studies and there is potential to learn more about working across research practice boundaries in the schooling sector from a closer investigation of these aspects in the project reports and publications. A substantial number of schools and teachers have led, and been research partners in, systematic inquiry through these projects. In a number of instances, schools have been the instigators of projects. NZCER and university researchers have supported these schools and, as described earlier, this process has assisted the bedding in of "teaching as inquiry". Thus the school sector projects are serving to increase the capacity of schools and teachers to take an inquiry stance in their work. In addition to promoting teaching as inquiry, the evidence from this review is that teachers and school support facilitators have gained research degrees and some have moved into academic careers at least in part due to involvement in these projects.

5.2   TLRI school sector projects identify and address national and international thematic concerns

The school sector projects to date have addressed themes of national and international interest. Four broad themes were identified from reading across the projects. Connections to national and international thematic concerns were then identified within each of these. Within the first theme, teaching and learning across the curriculum, connections were made with international and national trends in the literature regarding the influence of teacher knowledge and pedagogy on learning, a focus on the construction and use of learning progressions, how teachers' conceptions and use of assessment influence teachers' practices and student learning, and on the contested nature of learning outcomes. As indicated in the findings, many of the TLRI researchers are well connected with leading researchers in their fields internationally and have contributed to building knowledge in their respective areas through these projects. All of these themes were salient within the TLRP studies (Pollard, 2010) and the assessment concerns are closely related to those in the TLRP commentary on assessment in schools (Mansell et al., 2009).

Consistent with international and national thematic concerns, most focus in the school sector projects was on the literacy and mathematics curriculum areas. For example, this review identified that more than half the school sector projects had a focus on mathematics and literacy, areas central to current strategic developments such as national standards in literacy and mathematics in the primary sector and literacy across the curriculum. As noted in the findings, given the current attention to these areas by the Ministry of Education, this is hardly surprising when the TLRI calls for proposals about matters of strategic importance for education. Several studies had a focus on science, the arts and cross-curriculum aspects but there were no

projects in health, physical education or social sciences in those completed by March 2012. Internationally there are programmes of research across the curriculum spectrum and it therefore might be a future intention that TLRI projects address these gaps.

Teaching particular groups of learners was identified as a second theme related to international and national trends. Just under half of the projects identified their work as focused on addressing learning and teaching for one or several particular groups of learners. These groups were described as Māori, Pasifika, bilingual, multilingual, low decile, diverse, and transient. Associated with research nationally and internationally, several studies investigated the nature and use of culturally responsive teaching/pedagogy. These studies included mainstream schools and kura at both primary and secondary levels.

Aside from the findings about the importance of responsiveness and relationships, it was challenging to identify other themes across the studies that had a focus on a particular group of learners, due in part to their situation specific nature. There was a trend to report that teacher research and teacher involvement in research can be an effective strategy through which to enhance teaching and learning for Māori students, Pasifika students, and students from diverse backgrounds, as well as those from low decile schools.

The third theme, the use of ICT to enhance both teaching and learning, was addressed within the school sector studies. The use of these tools is a focus both nationally and internationally at this time and the New Zealand government is giving priority to connecting schools to high speed broadband. The findings of those projects that investigated ICT use in schools raise important issues about how well schools are prepared, and teachers are supported, to use technology for the range of purposes that fall within a teacher's professional responsibilities.

The fourth theme was a focus on the use of practitioner inquiry. Internationally, taking an inquiry stance to one's teaching is viewed as a productive approach to professional learning (Beckett & Struthers, 2011; Cochran-Smith & Lytle, 2009; Timperley et al., 2007, for example). Within New Zealand, such an approach is seen as strategic, as evidenced by the inclusion of teaching as inquiry in the New Zealand curriculum. Through these school sector TLRI projects, teachers and school leaders have been encouraged to continue to see teaching as more than a job and schools as more than places of work. Practitioner researchers are committed to better teaching and learning, often through collaborative effort. Being involved in practitioner research is more than problem solving; as Ponte (2005) writes, it is part of creating a thinking, educated profession. Furthermore, building the involvement of teachers can "counteract the tendency towards an externally controlled and regulated teaching profession" (Sachs, 2002, p. 292). This is likely to continue to be an important contribution from the TLRI programme of projects.

In line with the aims of the TLRI and international trends, the TLRI projects have also built cumulative knowledge about research methodology, especially that which is well suited to a close working relationship between academics and teachers. This partnership was addressed using a range of research approaches. Despite the emphasis on action research, qualitative and descriptive approaches, eight projects included larger-scale surveys and quantitative analyses. There is scope, therefore, to broaden and deepen the kinds of research being used to achieve the TLRI aims, and increase knowledge sharing about such approaches beyond those involved in the projects.

While most projects were explicit about how the information for the project had been gathered, the analysis processes used tended to be more opaque. For example, 22 of the projects either did not explain their analysis techniques or reported these simply as joint, meaning that they were carried out between the university and school partners. Eighteen projects stated that they used video recordings as a data collection strategy. This suggests that TLRI researchers believe video has the potential to assist in answering questions about teaching and learning practices. Unfortunately, very few of the reports or available publications described how the video footage was examined, and whether video analysis software was used, and if so how; nor did they describe how using this medium assisted with the investigation beyond ways for which observations and audio recordings would have sufficed. Searching more widely for this information from the researchers was beyond the scope of this review. The potential exists, however, to learn more about how and why video recordings were used in these settings, as well as about the issues that arose and how these were resolved.

Due to a lack of specific detail in some reports, and the lack of publications from some projects, it was not always possible to understand how the data collected was used to enable the researchers to answer the research questions. Although this issue is evident in some of the full reports from projects funded before 2008, the requirement for only a short, approximately four-page report from projects funded from 2008 meant that information on these aspects was restricted in these later ones. Increasing the size of the final reports and further encouraging the inclusion of details about the data collection and analysis could address these issues.

5.3 Researchers are both moving the field forward and furthering personal intellectual research programmes and agendas

We found evidence that the school sector projects are both moving research in teaching and learning forward and have furthered personal research programmes and agendas. In fact, we would argue that these are interdependent endeavours. The most obvious examples of this are studies by groups of researchers within the universities, particularly those within research centres. The TLRI has provided support to build on work already begun in curriculum areas including literacy, mathematics, science, and the arts, as well as reducing

inequities and improving educational outcomes. It has also stimulated knowledge building in new and important areas such as critical literacy. As noted, however, some projects did not appear to be closely linked by curriculum area, teaching and learning area, or by focus on particular groups of learners with projects either within or outside of the school-based projects to date. While keeping in mind the need to ensure research funded is robust and focused on the guiding principles of the TLRI, supporting personal intellectual research programmes and agendas should continue to be accommodated by the fund to ensure cumulative knowledge building and foster research capability and innovation.

The TLRI principles frame the possibilities for projects ensuring a focus on teaching and learning, building research capability and having a direct influence on practice. They encourage researchers to work in partnership with teachers and ensure clarity in research design. In terms of focus, mathematics and literacy have dominated. As noted above, there is room to increase the number of projects in other curriculum areas and given the ubiquity of ICT in society and its increasingly powerful role, there is scope for building knowledge in its use in education. It is clear that the school sector projects have informed the practice of the schools and teachers who participated in them. It is less obvious how, and if, this work has affected practice beyond those immediately involved. The challenge is to continue to support practitioner involvement in research that illuminates learning and increases understanding of the nature of responsive, effective teaching in the various contexts that are New Zealand classrooms, particularly in areas of strategic importance. In the face of growing criticism about the general quality of practitioner research (Beckett & Struthers, 2011), the TLRI projects have given importance to researching with, and not on or about, those who are centrally involved in teaching and learning—the teachers and students. In line with the TLRI principles, in most projects considerable effort has gone into forming strong partnerships with teachers, who have been instrumental in the effectiveness of the research. Perhaps more importantly, these teachers have used the knowledge gained through their involvement to investigate new ways of teaching and to learn how to use research in practice.

As well as sharing the learning from the TLRI studies through teacher networks, it is clear that the findings of the school sector projects have been disseminated through the publication of several books, numerous articles and a great many presentations. Resource packs and the reports are available on the TLRI website. It is curious, however, that given the TLRI funding is Ministry of Education-sponsored, Ministry of Education publications do not commonly incorporate TLRI findings in publications for teachers. A case in point is the July (2012) issue of *The New Zealand Curriculum Update*, a "pullout" brochure in the *New Zealand Education Gazette Tukutuku Kōrero* (Ministry of Education, 2012). This recent issue addressed topics that have been addressed in the findings of school sector TLRI projects in literacy but did not draw on any TLRI project reports. Teachers often read Ministry of Education, NZEI and PPTA publications and these would be useful ways to accelerate the dissemination and use of the TLRI school sector studies.

5.4   Possible points for discussion at the symposium

To conclude this review, we include below some discussion points for colleagues attending the symposium on November 16, 2012. Keeping in mind the limitations we noted regarding this review (section 2.4), we see the following ideas as starting points for discussion rather than propositions or recommendations.

1. Participants could consider ways to facilitate connections among the projects and project teams to ensure that findings more deeply inform further TLRI projects. For example, further work to investigate and disseminate the findings on topics such as literacy learning, using ICT in support of teaching and learning, and about diverse learners would be useful and informative. So too would work that probes more deeply and shares insights into the use of video for data collection and strategies for data analysis and representation in publications.

2. The findings in this review suggest that there is a need for further research in particular areas. Projects could explicitly address (but may not be confined to) inequities in achievement, a greater focus on student learning including the breadth of learning outcomes, and a focus on learning and teaching in a wider range of curriculum areas.

3. There is scope to consider the role the parameters of the TLRI play in constraining and enabling the research focus on teaching and learning. This is noticeable particularly in relation to the lack of studies that describe and trace learning over extended periods of time and, at the micro-level, studies that focus on the key competencies and values, and studies that foreground student perspectives.

4. Given the ubiquity of ICT and its increasingly influential role in society, there is still much scope for building knowledge in this field. The ICTs that are available in schools are continually evolving and come with new and different affordances that have the potential to transform teaching and learning in ways that support success for diverse learners. There is still, however, much to learn about how to achieve this. The symposium could explore how projects funded by the TLRI in the future could contribute more to this aim.

5. The review identified that TLRI projects are identifying and addressing national and international thematic concerns in the school sector, some at the cutting edge internationally. It would be fruitful to discuss further opportunities afforded by contexts in New Zealand that might support distinctive contributions to school sector research and practice internationally.

6. The symposium participants could generate ways to increase the detail contained in final reports of completed projects. The requirement for only a short report from projects funded from 2008 meant that information on the research design and conduct and the findings was restricted in these later reports. We are aware of arguments to keep these reports brief and to focus energy on publications and presentations. However, if the TLRI wishes to understand the kinds of ideas that stimulated this review, it would be helpful to have had more information, particularly about research design,

research processes including data collection and analysis, research team operation, findings and implications in these reports.

7. The symposium could explore ways in which the TLRI can expand the variety of research approaches used.

8. There could be discussion of ways TLRI could stimulate the submission of projects paying more explicit attention to the interaction of national and institutional policies on learning and teaching.

9. The symposium could explore ways to better connect TLRI cumulative knowledge building with national policy making and provision of information for schools and teachers through Ministry of Education-sponsored media and publications.

10. The findings from some projects have been very widely disseminated while in other projects this knowledge does not appear to have been shared beyond the TLRI report and local practice settings. TLRI contracts have been changed to encourage wider dissemination of results through requiring publication and conference presentation in each year of project funding. Discussion of ways to support and encourage further sharing, dissemination and publication of project findings would be useful.

11. Symposium participants could also discuss priorities for cumulative knowledge building in the school sector and ways to stimulate more sustained research. These priorities could include: longer-term projects (three years or more); projects that involve collaborations across universities and schools; projects that explicitly aim to develop new methodological approaches; or others that arise from consideration of this review.

Appendix A: Summary of funded and completed TLRI school sector projects (provided by the TLRI co-ordination team)

9201   *Title:* Numeracy practices and change

Funded years: 2004/06   *Duration:* 2 years   *Funded years:* 2004/06

Research team members: Associate Professor Glenda Anthony (PI), Dr. Margaret Walshaw, Bobbie Hunter, Ngaire Davies, and Karen Walker

Brief description: This project was a two-year study that looked at issues to do with equity, proficiency, and sustainable practice as a result of recent numeracy reforms in the primary school sector. It was a collaborative venture between researchers, teachers, and students in 16 schools previously involved in the Numeracy Development Project. It offered schools and classroom teachers the opportunity to undertake a serious deliberation of the effects of their work following the reforms. We formed four projects to explore teacher knowledge, mathematical practices, the perspectives of the learner, and teacher change. We looked at the personal, school-wide and community capacities needed for changing teaching and learning–including a look at how students themselves viewed mathematics learning.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/numeracy-practices-and-change

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9202   *Title:* Mathematics enhancement project: Professional development research

Funded years:2004/06   *Duration*: 2 years   *Funded years:2004/06*

Research team members: Associate Professor Bill Barton (PI), Dr Hannah Bartholomew, Barbara Kensington-Miller, Viliami Latu, Garry Nathan, and Judy Paterson, University of Auckland

Brief description: This project was situated in the teacher development component of the mathematics enhancement project during the years 2004–2005. Our preliminary research had confirmed other studies that professional development of teachers requires their active participation in investigating aspects of their practice in ways that take account of the systemic problems of their particular environment (in this case, low-decile schools). The project, therefore, set out to establish whether and how teacher research could form part of effective professional development. The project involved 27 teacher researchers and six university researchers in an ongoing research community that produced quality research on the mathematics learning of their classes. De facto, the 17 research group meetings held during the course of the project were professional development sites where best mathematics teaching practice was discussed and support given for classroom changes. In the first year, participating teachers were grouped into six predetermined research studies as research partners. In the second year, teachers could choose to be involved in their own classroom-based studies, and a further study was added to the six original ones. The teachers were inducted into critical research processes and thus gained insights into their practice as part of a professional community that included research as part of professional practice. The whole process

was researched for its effectiveness as professional development.

9204 *Title:* Great expectations: Enhancing learning and strengthening teaching in primary schools with diverse student populations through action research

Funded years: 2003/05   *Duration:* 2 years   *Funded years:* 2003/05

Research team members: Mary Hill (PI), Jan Robertson, Rachel Allan, Therese Bakker, Darryl Connelly, Maureen Grimes, Lesley Murrihy, and Mike Sutton

Brief description: It is now widely recognised that more detailed school and classroom research is needed to uncover the complexities of teaching and learning (Ministry of Education, 2002). One of the greatest challenges in this kind of research is to describe what happens when teachers, students, and communities work together, in order to understand the relationship between teaching action, expectation, and student achievement (Nuthall, 1999). Within New Zealand and elsewhere, investigations have looked into the impacts of assessment (for both formative and accountability purposes), the use of achievement evidence to inform teaching moves (Hill, 2003; Timperley & Parr, 2004), learning styles, leadership impacts, and teacher coaching (Robertson, 2005). Another factor known to be of considerable importance in teaching and learning is that of teacher expectations (Galton, Hargreaves, Comber, Wall, & Tell, 1999; Timperley & Phillips, 2003). While externally provided professional development has been shown to have an effect on teacher expectations, feelings of self-efficacy, and student achievement (for example, Timperley & Phillips, 2003), the rationale for this study was to investigate how schools themselves could draw on existing research and, through their own efforts, initiate and sustain high expectations and increased student achievement.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/great-expectations-enhancing-learning-and

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9205 *Title:* Making sense of learning at secondary school: An exploration by teachers with students

Funded years: 2003/05   *Duration*: 2 years   *Organisation:* Massey University

Research team members: Ruth G. Kane (PI), Nicola Maw and Christopher Chimwayang

Brief description: International and national research shows that the two most important factors in students' engagement and variance in achievement are the students themselves and the teacher (Hattie, 2002). Few studies, however, have sought to understand learning simultaneously from the perspectives of both parties immediately engaged in the process—the teachers and the students.

The initial challenge in this project was to make student learning processes explicit by asking secondary students how they understand and make sense of learning at school. This challenge, however, must be understood within the context of student and teacher interactions in the secondary classroom.

The second challenge of this project was to support teacher researchers as they bring together the ways in which they and their students make sense of learning and examine ways in which these are coherent or otherwise.

9206   *Title:* Enhanced teaching and learning of comprehension in Years 4–9: A research–practice
        collaboration for Mangere schools

Funded years: 2004/06   *Duration:* 2 years   *Funded years:* 2004/06

Research team members: Stuart McNaughton (PI), Shelley MacDonald, Meaola Amituanai-Toloa, Mei Kuin Lai, Sasha Farry

Brief description: A research and development programme, conducted as a collaborative partnership between researchers, schools, and the Ministry of Education, was designed to test several questions about achievement in seven decile 1 schools in South Auckland. These questions were:

- Can a research-practice collaboration develop cluster-wide and school-based professional learning communities that are able to critically analyse and problem solve issues of instructional effectiveness, thereby developing more effective instruction that has a powerful educationally significant impact on Māori and Pasifika children's comprehension at Years 4–9 in decile 1 schools?

- Can a set of effective instructional activities be identified that are able to be used by teachers to enhance the teaching of comprehension for Māori and Pasifika children in Years 4–9 in decile 1 schools?

- In addition, there was a specific question about Samoan students and achievement in Samoan bilingual classrooms:

- Can the research and development programme contribute to more effective instruction for Samoan students in Samoan bilingual classes?

9208   *Title:* Effective teaching in different cultural contexts: A comparative analysis of language,
        culture, and pedagogy

Funded years: 2004/06   *Duration:* 2 year   *Funded years:* 2004/06

Research team members: Tanya Wendt Samu (PI), Leonie Pihama, Tupeni Baba, and Trish Stoddart

Brief description: The project proposal noted the key aim of the research project as being: to analyse a range of teaching practices for Māori and Pasifika students in Auckland city schools and conduct a comparative analysis of the teaching and learning of these students in classrooms that focus on Māori and Pasifika language and culture with classrooms where instructional practices focus on mainstreaming, and there is no, or limited input, of Māori and Pasifika language and cultural instruction. (Stoddart, Pihama, & Baba, 2003, p. 2) Furthermore, the research sought to extend the current understanding of effective generic teaching practices by identifying the context-specific and general principles of effective teaching practice for Years 7 and 8 Māori and Pasifika pupils.

9211 *Title:* The relationship between English language and mathematics learning for non-native speakers

Funded years: 2004/05   *Duration:* 1 year   *Funded years:* 2004/05

Research team members: Phillipa Neville-Barton (PI), Bill Barton

Brief description: This project was undertaken to better understand the relationship between English language and mathematics learning for students for whom English is an additional language (EAL). We were interested in exploring the extent of any difficulties in learning mathematics attributable to low proficiency in English language, and also discovering particular language features that might cause problems.

Some literature that explores this issue at the elementary level exists, but there is little work at the senior secondary or tertiary levels. In New Zealand, many of the EAL students arrive in our education system in the final years of secondary school or directly into tertiary institutions.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/relationship-between-english-language-and-mathematics

9215 *Title:* The classroom InSiTE project: Understanding classroom interactions to enhance teaching and learning in science and

Technology in Years 1–8

Funded years: 2005/08   *Duration:* 3 years   *Funded years:* 2005/08

Research team members: Bronwen Cowie (PI), Judy Moreland, Alister Jones, and Kathrin Otrel-Cass

Brief description: For teachers, undertaking AfL is demanding and complex. To assess and respond to student learning, teachers need a detailed understanding of possible student learning pathways, along with the ability to develop and deploy pedagogical strategies to ascertain students' current understandings and to move their learning forward. The blending of teacher content knowledge and pedagogical knowledge to a form appropriate for their particular students is commonly referred to as pedagogical content knowledge (PCK) (Shulman, 1987). New Zealand primary teachers have indicated that they can lack confidence in their ability to teach science and technology and that they are interested in developing their practice in these areas (McGee et al., 2003). This project built on that interest. A sociocultural perspective towards learning and pedagogy underpinned the InSiTE study. Sociocultural perspectives are increasingly being used to make sense of classroom teaching and learning because they acknowledge complexity and the impact of interactions between people, ideas, tools, and settings over time (Wertsch, 1998).

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/classroom-insite-project-understanding-classroom

9218 *Title:* The art of the matter: The development and extension of ways of knowing in the arts

Funded years: 2005/07   *Duration:* 2 years   *Funded years:* 2005/07

Research team members: Deborah Fraser (PI), Clare Henderson and Graham Price

Brief description: The art of the matter project focused on learning and teaching in the arts, and investigated how children develop their ideas and related skills in each of the arts' disciplines (dance, drama, music, and visual art) in the primary school. It also scrutinised the nature of any "ritual patterns" (Efl and, 2002; Nuthall, 2001) of teaching that support or constrain arts education, and, by doing so, considered pedagogical processes that deepen children's experience and understanding in the arts. As a major outcome, the project sought to further knowledge of how generalist teachers can enhance and extend children's learning in the arts.

The project comprised a team of 10 generalist primary school teacher-researchers working alongside three university-researchers over a period of two years in eight schools, with children across the Years 0–6 age range. The project was also informed by the expertise of two consultants: Dr Viv Aitken (drama education) and Sue Cheesman (dance education).

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/art-matter-development-and-extension-ways-knowing

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9220 *Title:* Enhanced teaching and learning of comprehension in Years 5–8: Otara Schools

Funded years: 2005/07   *Duration:* 2 years   *Funded years:* 2005/07

Research team members: Stuart McNaughton (PI), Mei Kuin Lai, Meaola Amituanai-Toloa, and Sasha Farry

Brief description: The schools of South Auckland, which have high proportions of Māori and Pasifika students, have long been described by researchers as sites for low achievement, particularly in literacy (see, for example, Ramsay, Sneddon, Grenfell, & Ford, 1981). However, recent evidence suggests that the disparities between Māori and Pasifika students and other students in reading accuracy have been reduced, and that there has been a substantial reduction in the proportions of students in the lowest bands of achievement. Despite this, the evidence also suggests that at Year 4 and Year 9 the disparities in reading comprehension have continued, if not increased (Crooks & Flockton, 2005).

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/enhanced-teaching-and-learning-comprehension-years-5

9221 *Title:* Measuring classroom literacy practice

Funded years: 2005and 2007   *Duration:* 2 years   *Funded years:* 2005 and 2007

Research team members: Dr. Judy Parr (PI), Eleanor Hawe and Claire Sinnema, University of Auckland

Brief description: The two-year study outlined in this summary was conducted in partnership with three schools. The first year involved developing and trialing an instrument (observation guide) that captured critical elements of teachers' literacy practice. Part A of the full report, *Measuring Classroom Practice in Literacy* (Parr & Hawe, 2008), outlines and discusses the processes and challenges associated with this. It also addresses the challenges encountered during a prolonged period of implementation and outlines the subsequent changes made to the guide.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/measuring-classroom-literacy-practice

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9222   *Title:* Conceptions of assessment and feedback project

Funded years: 2005/07   *Duration:* 2 years   *Funded years:* 2005/07

Research team members: Elizabeth Peterson (PI), Earl Irving, University of Auckland

Brief description: This project aimed to investigate ways of identifying secondary school students' and teachers' conceptions of assessment and feedback. It outlines the modification of one inventory (students' conceptions of assessment) and the development of two new inventories (conceptions of feedback and conceptions of learning). We also outline the design of a series of classroom activities that teachers can use to identify students' conceptions of specific assessment and feedback practices. Finally this project documents the development of teachers as researchers, highlighting some of the benefits and some of the difficulties.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/conceptions-assessment-and-feedback-project

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9224   *Title:* Investigating teachers' pedagogical approaches in environmental education that promote students' action competence

Funded years: 2005/06   *Duration:* 1 year   *Funded years:* 2005/06

Research team members: Chris Eames (PI), Barry Law, Miles Barker, Hilary Iles, Jock McKenzie, Rosemarie Patterson, Pam Williams, and Faye Wilson-Hill

Brief description: In 1999 the Ministry of Education published the *Guidelines for Environmental Education in New Zealand Schools* (Ministry of Education, 1999). The guidelines are intended to assist teachers and schools to plan and provide education "in, about, and for the environment" in a way that integrates with learning objectives from the seven mandatory learning areas of the *New Zealand Curriculum Framework* (Ministry of Education, 1993). An action orientation is seen as a key feature that defines environmental education (Fien & Greenall Gough, 1996; McLean, 2003; Tilbury, 1995). The concept of action competence acknowledges this orientation (Breiting & Mogensen, 1999; Jensen & Schnack, 1997). Action competence refers to students' abilities to act with reference to environmental concerns, as active participants in environmental education. It includes the ability to identify problems, make decisions about solutions, and take action that develops the students' competence to participate in future action on environmental issues. Development of students' action competence can be seen as promoting democratic and participative education that can be valuable across all aspects of schooling. This project focused on classroom practices that encouraged the development of student action competence within a unit based in environmental education.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/investigating-teachers%E2%80%99-pedagogical-approaches

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9225   *Title:* Technology use and the teaching of mathematics in the secondary classroom

Funded years: 2005/07 *Duration:* 2 years *Funded years:* 2005/07

Research team members: Dr. Mike Thomas (PI), Jenny Bosley, Alan delos Santos, Rosheen Gray, Ye Yoon Hong, and Jared Loh

Brief description: In this study, we considered whether the National Certificate of Educational Achievement (NCEA) Levels 2 and 3 assessment standards had presented any challenges for teachers in terms of their use of technology in mathematics teaching. While the general explanatory notes to these standards include statements such as "Appropriate technology should be used, but justified working may be required" and "Appropriate technology (such as spreadsheets) should be used to aid simulation", it was not clear how this was being implemented. Hence, this research project sought to explore both the qualitative and quantitative aspects of technology use in the classroom under NCEA Levels 2 and 3 assessment standards, and their relationship to theoretical perspectives in the research literature and quality learning. It was a collaborative research study between university researchers and secondary school teachers, observing teachers in schools to analyse current teaching practice.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/technology-use-and-teaching-mathematics-secondary

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9226 *Title:* Together is better? Primary students' and teachers' experiences of collaborative learning online

Funded years: 2005/06 *Duration:* 1 year *Funded years:* 2005/06

Research team members: Pat Street (PI), Sandra Williamson-Leadley, Jackie Ott, Anita Record, Caroline Mayo, and Dorothy Haywood

Brief description: This project undertook to research the use of the Learning Activity Management System (LAMS) online learning environment to teach a collaborative unit involving three classes in two primary schools. Research support was provided to encourage the participating teachers to develop as critical professionals reflecting on their practice, using action research. In particular, the project had teachers use a "hybrid" model (mixture of online and face-to-face environments) to deliver part of their classroom teaching and learning programme and reflect on this process (Collison, Erlbaum, Haavind, & Tinkler, 2000; Draves, 2002; Ko & Rossen, 2001).

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/together-better-primary-students%E2%80%99-and-teachers%E2%80%99

9227 *Title:* Zeroing in on quality teaching: Reducing disparities by building teachers' capacities and capabilities with respect to integrative approaches to curriculum delivery

Funded years: 2005/2006 *Duration*: 1 year *Funded years:* 2005/2006

Research team members: Christina Harwood (PI), Lorraine Williamson and Graham Wilson

Brief description: This project, a collaborative venture between two primary schools and Massey University, followed a year of intensive professional development in 2004 that had two aims: to improve learning outcomes for all students in the two schools, with a particular focus on the achievement of Māori

students; and to develop communities of practice within and between the two schools to enable a proactive and sustained focus on improving learning. The involvement of teachers in the research project provided a means of checking progress, and provided forums to identify problems and ways to solve them, all central activities of the implementation of change (Hopkins, Ainscow, & West, 1994).

The staff of the two schools explored the theory and practice of curriculum integration, described by Beane (1997) as "a curriculum design that is concerned with enhancing the possibilities for personal and social integration … [organising] curriculum around significant problems and issues, collaboratively identified by educators and young people, without regard for subject boundaries" (pp. x–xi). Teachers worked from the premise that the use of integrative designs and alternative pedagogical approaches had the potential to improve student engagement in learning and reduce the incidence of behavioural issues, thus enhancing student learning outcomes. They also believed that by providing specific opportunities for students to share or display their work, parents/whānau would become more involved with their children's learning at school.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/zeroing-quality-teaching-reducing-disparities

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9228   Title: Investigating responses to diversity in a secondary environment

Funded years: 2005/06   *Duration:* 1 year   *Funded years:* 2005/06

Research team members: Lindsey Conner (PI), Janinka Greenwood, Peter Buyers

Brief description: Linwood College is an urban, lower decile school with a student population that is diverse in many ways in terms of: culture and race, academic ability, attitude to schooling, home socioeconomic status, personality and personal interests, and ability to cope with instructional English. The school became a partner in this research project because it has a commitment to embrace and celebrate aspects of diversity within its strategic vision, its policy statements, and curriculum implementation. At the same time, staff wrestle with what are often considered to be oppositional pressures of curriculum delivery, assessment requirements, and the fostering of meaningful learning for diverse learners. The school wanted to examine what it currently does in terms of responding to diversity and wanted to investigate ways to narrow the gap between policy and practice. This project represents a beginning to a much longer process.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/investigating-responses-diversity-secondary

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9229   Title: Pasifika teachers in secondary education: Issues, possibilities and strategies

Funded years: 2005/06   *Duration*: 1 year   *Funded years:* 2005/06

Research team members: Tony Brown (PI), Nesta Devine and Emilie Sila'ila'i University of Waikato

Brief description: The study outlined the characteristics that Pasifika people assign to themselves and how these are challenged within educational contexts and at interfaces with other New Zealand cultures. It examined how schools assist and resist the accommodation of new Pasifika teachers. It surveyed the

rationales for building Pasifika representation within the teaching force and how they shape the expectations and experience of new Pasifika teachers. Through examining how notions of Pasifika cultural identity for individuals are held in place between community ties, genealogical roots, and oral histories, the study asked how such identities might be seen as reaching out to possible futures within the context of mainstream secondary education within New Zealand. In the light of the analysis, the study examined how future priorities might be formulated and offers preliminary advice on how and where future initiatives might be targeted to bring more Pasifika teachers into the profession and to improve the retention of these teachers.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/pasifika-teachers-secondary-education-issues

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9230   Title: Te reo tataitai: Developing rich mathematical language in Māori immersion classrooms

Funded years: 2005/07   *Duration:* 2 years   *Funded years:* 2005/07

Research team members: Tamsin Meaney (PI), Tony Trinick, University of Auckland

Brief description: During 2005 and 2006, this Teaching and Learning Research Initiative project gathered information on the acquisition of the mathematics register by documenting and evaluating the scaffolding and modelling of student's mathematical language by the teachers in a kura kaupapa Māori. It involved a partnership between seven teachers of mathematics at Te Kura Kaupapa Māori o te Koutu and three researchers. The teachers were also participating in Te Poutama Tau and felt that this research would complement that project. Having all the teachers involved in this project meant that the results are seen as coherent and of use in discussions about the mathematics programme.

The final stage of the research investigated how this knowledge affected the teaching practice of those involved and this enabled an appropriate evaluation of the research for its practical value to be undertaken. Better understanding of how the mathematics register is acquired is likely to be of benefit not just to kura kaupapa Māori teachers and their students, but also to others considering language issues in other content areas.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/te-reo-tataitai-developing-rich-mathematical-language

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9231   Title: A collaborative self-study into the development of critical-literacy practices: A pilot study

Funded years: 2005/06   *Duration:* 1 year   *Funded years:* 2005/06

Research team members: Susan Sandretto(PI), Jane Tilson, Cambridge, England

Brief description: This pilot project consisted of collaborative self-study research into the development of critical-literacy practices within primary schools. Two teachers from each of two primary schools in the Dunedin area developed a project in partnership with two researchers from the University of Otago. The teachers, with the assistance of the researchers, collaboratively investigated the development and implementation of an enhanced critical-literacy focus within everyday guided reading practices in their classrooms. The research sought to:

- enhance the understandings and pedagogical practices of critical literacy for the participating primary school teachers;

- document the implementation of critical-literacy strategies within regular, ongoing, guided-reading lessons in the participating teachers' classrooms;

- involve focus groups of students in stimulated-recall interviews to comment on a guided-reading lesson using critical-literacy strategies;

- produce collaboratively theorised reports of the research process and findings to share with audiences of both researchers and teachers; and

- elaborate on ways in which the pilot could be expanded and enhanced in a future research study.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/collaborative-self-study-development-critical

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9235 *Title:* Developing teacher–researcher partnerships to investigate best practices: Literacy learning and teaching in content areas of the secondary school

Funded years: 2006/08   *Duration:* 2 years   *Funded years:* 2006/08

Research team members: Trevor McDonald (PI), Christina Thornley

Brief description: This project was a Teaching and Learning Research Initiative project undertaken as a partnership between Auckland Seventh Day Adventist High School, Education Associates Ltd, Roxburgh Area School, Teuila Consultancy, and Waitaki Girls' High School. During the two-year project, the partnership members in each school developed, trialed, and researched a range of literacy pedagogical approaches to determine their efficacy in improving learning and achievement for Year 9, 10, and 11 secondary school students.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/developing-teacher%E2%80%93researcher-partnerships

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9237 *Title:* A collaborative self-study into the development and integration of critical literacy practices

Funded years: 2006/08   *Duration:* 2 years   *Funded years:* 2006/08

Research team members: Susan Sandretto (PI), Scott Klenner and Andrew Straw

Brief description: During 2006–7, four Dunedin primary schools and one secondary school, involving a total of 16 teachers, took part in the project. The participating teachers became familiar with the literature on the theory and practice of critical literacy, and developed, implemented, and evaluated critical literacy strategies in their regular classroom programmes.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/collaborative-self-study-development-and-integration

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9239 *Title:* Enhancing capacity to analyse students' writing

Funded years: 2006/08   *Duration:* 2 years   *Funded years:* 2006/08

Research team members: Libby Limbrick (PI), Pauline Buchanan, Marineke Goodwin, and Helen Schwarcz

Brief description: Research has suggested that when teachers engage in "learning talk", there can be positive outcomes for student achievement (Annan, Lai, & Robinson, 2003; Ball & Cohen, cited in Robinson, 2003, p. 29). Professional discussion can enhance both teacher knowledge and student achievement. Through such discussions, teachers examine their own pedagogy in relation to student achievement, building on identified sound practice, strengthening weaknesses and overcoming gaps in knowledge (Robinson, 2003). However, Timperley (2007), in her inaugural professorial address, emphatically makes the point that talking is not enough: talk must also transform student achievement. This is similar to the action research process described by Cardno (2003) which has been influential in encouraging many teachers to adopt an inquiry model as the basis for enhancing their own practice.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/enhancing-capacity-analyse-students%E2%80%99-writing

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9240 *Title:* "Write-on!": Investigations into relationships between teacher learning and student achievement through writing

Funded years: 2006/07   *Duration:* 1 year   *Organisation:* University of Canterbury

Research team members: Ruth Boyask (PI), Kathleen Quinlivan, Mary Goulter

Brief description: Originating in a policy context where evidence-based practice is associated with best practice (cf. Ministry of Education, 2005), a proposal for a project to address student writing literacy was developed by a group of heads of departments at Kakariki College, (a decile 2 co-educational ethnically diverse suburban secondary school in one of New Zealand's main centres) concerned at the level of students' achievement in writing within their school. The teachers recognised that NCEA has increased the significance of written language to the senior secondary curriculum, making attaining national qualifications dependent upon competency in writing. This was n especially challenging prospect for their students whose attainment in literacy fell short of others in similarly low-decile schools. The teachers' response was to initiate a programme of professional development on evidence-based teaching interventions that recognised and built upon the strengths of their students. In partnership with researchers from the School of Education, University of Canterbury, the project was expanded to include critical examination of the interrelationships between research evidence, teacher learning, and student outcomes in writing.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/%E2%80%9Cwrite-on%E2%80%9D-investigations-relationships-between

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9241 *Title:* Building bilingual pedagogical content knowledge through critical action research: A pilot study 2006

Funded years: 2006/07   *Duration:* 1 year   *Funded years:* 2006/07

Research team members: Donald McLean (PI), Stephen May, University of Waikato; John McCaffery and Helen Villers, University of Auckland

Brief description: This pilot project aimed to assist the school's practitioners to develop and apply critical

research methods to identify the existing strengths in multicultural–bilingual policy and practice. It was intended to also identifies gaps and needs, and provides critical assessment and analysis in relation to current best evidence in critical multicultural and bilingual education theory.

The key research questions that emerged, and guided the wider action research process, over the course of the year, can be summarised as follows:

- What are the existing bilingual pedagogies and practices of RRS and how effective are they?

- What levels of bilingual pedagogical content knowledge (PCK) do RRS teachers demonstrate in relation to these existing bilingual pedagogies and practices at the school?

- How can critical action research (CAR) extend RRS teachers' bilingual PCK in line with best practices identified in the relevant research literature?

- How might this CAR process provide the basis for changing/modifying/improving teaching practices at the school, within the limits of a one-year pilot study?

The emergent research focus on the role and significance of teachers' bilingual PCK to the ongoing bilingual pedagogy and practice of RRS was a key feature of this pilot study. Developing further the bilingual PCK of teachers, and linking this directly to their educational practice through critical action research, also came to be seen as a key aspect of the research process over the course of the year.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/building-bilingual-pedagogical-content-knowledge

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9242   *Title:* Early algebraic thinking: Links to numeracy

Funded years: 2006/07   *Duration:* 1 year   *Funded years:* 2006/07

Research team members: Chris Linsell (PI), Jan Savell, Noel Johnston, Melissa Bell, Eric McAuslan, and John Bell

Brief description: The links between numeracy and readiness for learning algebra need to be investigated. Linsell (2005) suggested that only those students who have mastered multiplicative part–whole thinking are capable of solving equations by the formal process of inverse operations. We have available the diagnostic tool for assessing students' stage of numeracy (Ministry of Education, 2003a). To determine how the students' stages of numeracy have an effect on their learning of algebra, a diagnostic tool needs to be developed for assessing algebraic thinking in the domain of solving equations. This would allow a framework for algebraic thinking to start to be developed.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/early-algebraic-thinking-links-numeracy

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9243   *Title:* Addressing the needs of transient students: A collaborative approach to enhance teaching and learning in an area school

Funded years: 2006/07   *Duration:* 1 year   *Funded years:* 2006/07

Research team members: Jude MacArthur (PI), Nancy Higgins

Brief description: This project looked at transient students and their families in a small rural area school

(Years 1–13) in Wooldon, The difficulties faced by transient students were highlighted as being of particular concern at Wooldon School.1 For this project, a "community of practice" was established in the school by the principal and deputy principal to collaboratively and, with the researchers, reflexively explore issues relating to teaching and learning for transient students.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/addressing-needs-transient-students-collaborative

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9244   *Title:* Teachers developing as researchers: teachers investigate their use of questions in mathematics

Funded years: 2006/07   *Duration:* 1 year   *Funded years:* 2006/07

Research team members: Linda Bonne (PI), Ruth Pritchard, Shane Gault, Vanessa Hendry, Paulette Holland, Gillian Kissling, Susan Kliffen, Mark Kyne, Catherine Miller, and Jan Treeby

Brief description: Eight primary school teachers worked in partnership with two research team leaders to analyse two of their numeracy lessons in order to investigate aspects of questioning practice. The project was conducted over the 2006 school year in five primary schools in the Wellington area. The teacher researchers and research team leaders shared responsibility for determining the shape and direction of the research.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/teachers-developing-researchers-teachers-investigate

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9245   *Title:* Investigating the relationship between whole-school approaches to education for sustainability and student learning.

Funded years: 2007/09   *Duration:* 2 years   *Organisation:* University of Waikato

Research team members: Dr. Chris Eames (PI), Barry Law, University of Canterbury; Miles Barker, University of Waikato; Heidi Mardon, Enviroschools Foundation

Brief description: There is little empirical research available on what whole-school approaches and action competence look like in practice. Nor do we have reliable instruments to examine progress in these two areas. Our previous TLRI project examined action competence in a New Zealand context and led us to recommend that a research-based tool for evaluating action competence be developed (Eames et al., 2006). The current TLRI project provided an opportunity to do this alongside our parallel work on whole-school approaches.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/investigating-relationship-between-whole-school

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9248   *Title:* Teaching literature in the multicultural classroom

Funded years: 2007/09   *Duration:* 2 years   *Funded years:* 2007/09

Research team members: Terry Locke (PI), Gail Cawkwell & Emilie Sila'ila'i, with Alison Cleary, Willem de Beer, Sandy Harris, Elizabeth Lumby, David Riley, Janet Sturgess, and Julie-Ann Thumath

Brief description: This project focused on ways in which pupils engaged with literary texts in primary and

secondary classrooms which were multicultural and multilingual in their composition. The word "engage", as used here, had two facets. One was attitudinal. Did pupils enjoy responding to and composing literary texts? The other was practice-related. What specific practices did teachers engage students in to facilitate their response to literary texts and to foster acts of literary composition? This collaborative research project was made up of a team of four primary/ intermediate teachers and four secondary teachers, who worked with three university-based researchers over a period of two years in seven schools (three primary/ intermediate and four secondary).

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/teaching-literature-multicultural-classroom

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9251   Title: Mathematics classrooms: Explorations into the teaching/learning nexus

Funded years: 2007/09   *Duration:* 2 years   *Funded years:* 2007/09

Research team members: Glenda Anthony (PI), Margaret Walshaw, Dr Tim Burgess, Dr Peter Rawlins, Anne Lawrence and Dr Liping Ding.

Brief description: While research has told us much about primary school mathematics classrooms, we know less about what happens at the secondary school level. Our Teaching and Learning Research Initiative project, a video study involving three Year 9 classes, enabled us to learn more about the mathematical relationships and practices in secondary classes. To date, our analysis has focused on the communities of practices, and the various ways in which teachers organise instructional activities. What we found was that, irrespective of school decile level, years of teachers' experience, and the proficiency level of students, teachers are highly focused on doing the best possible job for their students. Teachers work hard to enhance students' confidence and their understanding of mathematics. They bring their knowledge and skill to the task to deal with the "heady" demands of teaching mathematics, as well as the organisational and management matters that are part and parcel of any busy classroom.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/mathematics-classrooms-explorations-teachinglearning

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9252   Title: Mathematics: She'll be write!

Funded years: 2007/08   *Duration:* 1 year   *Organisation:* University of Canterbury

Research team members: Tamsin Meaney (PI), Tony Trinick and Uenuku Fairhall

Brief description: The focus of this Teaching and Learning Research Initiative project was to discover effective ways to develop students' mathematical writing in te reo Māori. It was assumed that this would lead to better understanding of mathematics. The investigation was undertaken at Te Kura Kaupapa Māori o te Koutu which caters for students from Years 0–13, many of whom are second language users of te reo Māori. It involved all the teachers as well as two outside researchers considering a number of issues around the role of writing in mathematics.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/mathematics-she%E2%80%99ll-be-write

9253 *Title:* Researching understanding of learning and teaching: A case study in using practice-based research to develop a school-wide learning community

Funded years: 2007/09   *Duration:* 2 years   *Funded years:* 2007/09

Research team members: Elaine Mayo (PI), Lindsey Conner

Brief description: This research project investigates how teachers who are using a peer-coaching model to help each other gain a deeper understanding of teaching and learning can distil and share their emerging experiential knowledge, and how this influences future praxis (thinking and acting) in teaching. The school aims to build a reflective learning community where teachers collaborate deliberately to support improved outcomes for students.

The project involved four cycles of activity in which the "learning stories" from the peer-coaching model will be documented and used to promote fresh questions about individual and collective learning.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/researching-understanding-learning-and-teaching-rult

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9255 *Title:* A school for the 21st century: Researching the impact of changing teacher practice on student learning

Funded years: 2007/09   *Duration:* 2 years   *Funded years:* 2007/09

Research team members: Michael Denny (PI), Lynda Shanks and Karyn White, Alfriston College; Rosemary Hipkins, NZCER

Brief description: This TLRI-funded project, conducted at Alfriston College, is researching the impact of changing teaching practice on student learning.

Alfriston College was founded in 2004. From its inception, the school has challenged itself to put into practice various recommendations for changing established teaching practice to transform student learning for a new century. Adapting the traditional timetable structure to try and make space for deeper learning was part of this "21st-century vision" (Locke, 2006) This was done through the use of 100-minute lessons and three-day episodes where the timetable for all students is suspended for three days each term, while students work on extended projects in cross-year level groups.

The TLRI project was a two-year long collaboration between key members of the teaching staff at Alfriston College and an experienced researcher from NZCER, collectively called the professional learning group (PLG). The PLG investigated ways teachers understood and responded to innovative approaches to scheduling time for teaching and learning, and sought evidence that the innovations had a significant effect on student learning.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/school-21st-century-researching-impact-changing

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9256 *Title:* Teachers learning mathematics: Professional development research

Funded years: 2007/08   *Duration*: 1 year   *Funded years:* 2007/08

Research team members: Dr. Bill Barton (PI), Judy Paterson

Brief description: The issue of mathematical knowledge of teachers has been documented in New Zealand for 80 years. For example, the 2004 New Zealand Ministry of Education Teacher Census showed that 25 percent of secondary mathematics teachers had no university mathematics qualification—a rise from 21 percent in 1977.

This one-year study aimed to investigate the development of teachers' own mathematical knowledge for teaching. Seven secondary teachers from the Auckland region each developed some aspect of their mathematical knowledge. Two external researchers supported the teachers and facilitated reporting.

URL: http://www.tlri.org.nz/tlri-research/research-completed/post-school-sector/teachers-learning-mathematics-professional

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9258 *Title:* Sustainability of effective teaching and school practices developing a model for sustaining and extending literacy achievement

Funded years: 2008/10   *Duration:* 2 years   *Organisation:* Auckland UniServices

Research team members: Dr. Mei Kuin Lai (PI), Professor Stuart McNaughton and Professor Helen Timperley, Selena Hsiao, Sophie Kercher, Sasha Farry, Angela McNicholl, Alaisa Pritchard

Brief description: The focus of this TLRI project was on sustaining gains in reading comprehension made through TLRI funded interventions in two clusters of schools in South Auckland. The aim was to develop a model for sustaining effective teaching and school practices so that student achievement continued to improve once the interventions ended. This involved identifying and explaining the conditions that enabled schools to continue improving achievement; explaining how the conditions interrelated; and how these relationships resulted in differing patterns of achievement after the intervention.

Our research was concentrated around two questions. The first question was: Can two clusters decile 1 schools with mainly Māori and Pasifika students sustain student achievement gains one year after their participation in TLRI reading comprehension interventions? Sustainability was judged as having sustained gains at the same rate as during the interventions. An associated analysis was whether the gains in achievement were sufficient to reach parity with national expectations. The second question was: What were the practices associated with sustained improvements in achievement?

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/sustainability-effective-teaching-and-school

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9268 *Title:* Culturally responsive pedagogy and assessment in primary science classrooms: Whakamana tamariki

Funded years: 2009/11   *Duration:* 2 years   *Funded years:* 2009/11

Research team members: Dr. Bronwen Cowie (PI), Dr Kathrin Otrel-Cass, Ted Glynn, and Helena Kara, University of Waikato

Brief description: In this project, four teachers addressed their diverse students' need for a range of different opportunities to develop more sophisticated expertise in science. They achieved this by drawing

on the principles and practices of culturally responsive pedagogy and assessment for learning. Interviews and classroom observations indicated that students, and their families, took greater ownership and responsibility for science learning when teachers incorporated and built on the funds of knowledge and lived experience that all students bring from their homes and communities.

*URL:*http://www.tlri.org.nz/tlri-research/research-completed/school-sector/culturally-responsive-pedagogy-and-assessment-primary

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9269   Title: Learning to "friendly argue" in a community of mathematical inquiry

Funded years: 2009/11   *Duration:* 2 years   *Funded years:* 2009/11

Research team members: Dr. Roberta Hunter (PI), Dr Glenda Anthony (Palmerston North Campus)

Brief description: This project explored the sorts of culturally responsive pedagogy teachers can engage in to optimise equitable access for students to proficient forms of mathematical talk and activity. The project sought to further our knowledge of the effects on student achievement and mathematical disposition when a specific focus is placed on building a classroom culture of mathematical inquiry and argumentation. During the project we explored the following research questions:

- How do teachers adapt and use a purposely designed communication and participation framework to structure student engagement in collective reasoned discourse?

- What different pedagogical strategies and adaptations do teachers make to position diverse students to access mathematical discourse equitably?

- How are changes in students' ways of participating in their mathematical learning influencing their mathematical proficiency and identity?

- How do students view their roles and responsibilities in the collective discourse as they gain increased agency in the classroom mathematical discourse?

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/learning-friendly-argue-community-mathematical

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9270   Title: Statistics is boring … because it makes you think!

Funded years: 2009/11   *Duration:* 2 year   *Organisation:* University of Waikato

Research team members: Dr. Sashi Sharma (PI), Phil Doyle, Auckland University

Brief description: In this collaborative research study, teaching experiments were carried out in Year 9 classes of predominantly Pasifika students. There were three phases. During the planning phase the research team planned activities and envisioned how dialogue and statistical activity would unfold as a result of the classroom activities. Data were collected during the teaching phase, and then the data were analysed using a grounded theory approach. The findings have implications for the teaching of statistical literacy.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/statistics-boring-%E2%80%A6-because-it-makes-you-think

9271 *Title:* Augmenting primary teaching and learning science through ICT

Funded years: 2009/11   *Duration:* 2 years   *Funded years:* 2009/11

Research team members: Dr. Kathrin Otrel-Cass (PI), Dr Bronwen Cowie and Dr Elaine Khoo

Brief description: This study explored how information communication technologies (ICTs) in primary classrooms can enhance the teaching and learning of science. By building on teachers' and students' prior knowledge and experience with ICTs, we investigated how ICT use can structure activities to offer enhanced opportunities for active participation in science. The project generated examples of how ICTs can support subject-relevant ways of exploring and communicating science, and evaluating what has been learnt.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/augmenting-primary-teaching-and-learning-science

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9273 *Title:* Arts e-learning and the online specialist teacher: Increasing opportunities for quality student outcomes

Funded years: 2009/11   *Duration:* 2 years   *Organisation:* Victoria University of Wellington

Research team members: Jan Bolton and Dr Joanna Higgins (PIs), Jan Bolwell, Delia Baskerville, Melody Craw, Michelle Hall, Jay Smock, Sheree Drummond, and Richard Lloyd

Brief description: The project researched the potential of an arts (dance and drama) e-learning environment to provide quality arts teaching and produce successful learning outcomes for students. It involved the implementation of an innovative, web-based programme that makes possible the expertise of dance and drama specialists online in Year 6, 7, and 8 classrooms where such expertise would not normally otherwise be available.

A project team comprised researcher/specialist practitioners and classroom teachers in documenting the changing process of multiple implementations of the programme and producing insights into the potential ongoing viability of such models to make a positive difference to students' arts learning opportunities.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/arts-e-learning-and-online-specialist-teacher

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9274 *Title:* LEMMA: Learning Environments with Mathematical Modelling Activities

Funded years: 2009/11   *Duration:* 2 years   *Organisation:* Auckland UniServices

Research team members: Dr. Caroline Yoon (PI), Anne Patel, Waiheke High School; Peter Radonich, Northcote High School; Nikki Sullivan, Unitec New Zealand

Brief description: The LEMMA project—Learning Environments with Mathematics Modelling Activities—grew out of a concern that many of our mathematics students struggle to use mathematical concepts flexibly to solve problems in the real world. The LEMMA project designed learning environments that encourage students to develop sophisticated conceptual understandings and communication competencies through mathematical modelling activities. Like a lemma in mathematics,

LEMMA is not a grand theorem or solution, but merely "a stepping stone to a larger result" (Wikipedia, 2009)—the desired result being improved mathematical competencies among New Zealand secondary school students.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/lemma-learning-environments-mathematical-modelling

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9275 *Title:* Building students' inferential reasoning: Statistics curriculum Levels 5 and 6

Funded years: 2009/11   *Duration:* 2 years   *Funded years:* 2009/11

Research team members: Dr. Maxine Pfannkuch (PI), Pip Arnold, Cognition Education; Chris Wild and Matt Regan, University of Auckland

Brief description: The project was a two-year collaboration among two statisticians, two researchers, and nine teachers. There was an urgent need to understand how students can progressively develop informal statistical inferential reasoning from Levels 5 to 8 of the new curriculum. The project team designed innovative approaches to develop students' informal inferential reasoning and sought evidence that these innovations had a significant effect on improving students' statistical reasoning in this domain.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/building-students-inferential-reasoning-statistics

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9280 *Title:* School is out: Students' experiences of non-traditional learning

Funded years: 2010/11   *Duration:* 1 year   *Funded years:* 2010/11

Research team members: Dr. Keryn Pratt (PI), Dr Ken Pullar and Ann Trewern

Brief description: The experience of New Zealand school students is increasingly changing. In addition to their traditional schools students are participating in virtual classrooms and other forms of learning, such as classes through the Correspondence School and vocational programmes. This study aims to extend previous research by looking at the experience of students in one regional cluster of schools who are taking classes in multiple formats, from multiple providers, described here as "blended learning".

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/school-out-students-experiences-non-traditional

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9281 *Title:* Connecting curriculum, connecting learning: Negotiation and the arts

Funded years: 2010/12   *Duration:* 2 years   *Organisation:* University of Waikato

Research team members: Assoc. Professor. Deborah Fraser (PI), Dr Viv Aitken, Graham Price and Barbara Whyte

Brief description: The project is working with three schools initially, extending to further schools as the study progresses. The focus is upon negotiated and integrated curriculum that includes the arts. It builds upon a previous TLRI on the arts but does not solely focus on the arts per se. For example, the drama pedagogy Mantle of the Expert is an approach being studied which includes student-teacher negotiation and cross-curricula learning. In terms of data collection we will:

- observe teachers focusing on teacher talk, teacher-child interaction patterns and teacher-child

negotiations using a systematic observation chart and running records.

- observe children's interaction with each other, with their teacher, and with their activities during lessons
- collect work samples (including literacy)
- undertake semi-structured interviews with teachers and wider school community members
- undertake learning conversations with children individually and in small groups (some of these will be undertaken using drama strategies such as teacher-in-role as a projective device)
- track engagement with an engagement tool
- observe children's groups sorting and categorising pictures and statements

The range of data collection methods outlined above will be necessary for investigating the research questions and for tracking children's learning. There will be whole class and group observations that focus on interaction. There will also be a close focus on five children per class in some depth. Such tracking will have the added benefit of contributing to the teachers' assessment records as well.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/connecting-curriculum-connecting-learning-negotiation

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9282 *Title:* School achievement: Why summer matters

Funded years: 2010/12 *Duration:* 2 years *Funded years:* 2010/12

Research team members: Stuart McNaughton (PI), Dr Rebecca Jesson, Tone Kolose and Sophie Kercher

Brief description: The "summer learning effect" is where students' school literacy achievement plateaus or declines over summer. This limits students' levels of achievement over time which can create a barrier to decile 1 schools' effectiveness. It is a well known effect both within New Zealand and worldwide, but there is limited research evidence on how to overcome it. Our aim was to identify factors that may help overcome the summer learning effect in reading in decile 1 schools in New Zealand.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/school-achievement-why-summer-matters

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9283 *Title:* Understanding the pedagogy of school-based marae: A culturally responsive learning context in secondary schools

Funded years: 2010/12 *Duration*: 2 years *Funded years:* 2010/12

Research team members: Dr. Jenny Lee (PI), Lisa Smith, Dr Leonie Pihama

Brief description: This research project will investigate the role of school-based marae as a culturally responsive pedagogy in mainstream secondary schools. It will involve the participation of students, teachers, whānau and community representatives of three urban school marae with the Auckland region. This study will examine the pedagogy of school marae and the way it impacts on the educational achievement of Māori learners and their whānau. We will be interviewing key people about the establishment of each of the school marae. We will also conduct focus group interviews with students, teachers, whānau and the principal about the role the marae in teaching and learning for Māori students

and their whānau. Māori students, staff and whānau at each school will also complete a questionnaire to provide further information about the importance of marae.

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/understanding-pedagogy-school-based-marae-culturally

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9286   *Title:* Developing a place-based approach to outdoor education in Aotearoa/New Zealand

Funded years: 2010/12   *Duration:* 2 years   *Funded years:* 2010/12

Research team members: Dr. Mike Brown (PI), Crispian Hills, University of Waikato

Brief description: Outdoor education is often thought of as occurring in remote locations requiring specialist staff and equipment. Such an approach is resource intensive and potentially expensive. This project sought to develop 'localised' outdoor experiences that empowered teachers and students to better understand places of significance in their community. By being responsive to the geographical and cultural features in the local area both students and teachers were able to incorporate prior knowledge and experiences and connect these to life "outside school".

URL: http://www.tlri.org.nz/tlri-research/research-completed/school-sector/developing-place-based-approach-outdoor-education

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9289   *Title:* CoRe: A way to build pedagogical content knowledge for beginning teachers

Funded years: 2011/12   *Duration:* 1 year   *Funded years:* 2011/12

Research team members: Chris Eames (PI), John Williams, Anne Hume, John Lockley, Bill Henderson, Kim Pickering, University of Waikato

Brief description: Research has shown that one of the factors which enable effective teachers is their rich pedagogical content knowledge (PCK). Beginning teachers need support to develop this PCK and CoRes (content representations) have been proposed as a model for doing this. The study reported here brought together science and technology experts in content and pedagogy, early career secondary teachers, and researchers to design a CoRe to assist development of teacher pedagogical content knowledge. The study then researched the early career teachers' use of the CoRe in their planning and delivery of a unit in their classrooms to examine the impact of the CoRe on teaching and learning, and on the development of the teachers' PCK.

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