Met a Researcher? Research Paradigms among those new to Research

Tony Clear
School of Information Technology
Auckland University of Technology
Private Bag 92006, Auckland 1020, New Zealand
Tony.Clear@aut.ac.nz

Alison Young
UNITEC Institute of Technology

ABSTRACT

This paper reports some insights into the understandings about research of computing educators and novice researchers in the NACCQ sector. These insights arise from a self-assessment of their approaches to teaching and research, undertaken at NACCQ sponsored "Getting Started in Research Workshops".

The self-assessment was intended to assist workshop participants to become aware of and reflect upon their predominant teaching and research paradigms. It also served as a means of actively modelling use of the critical method in research. Three paradigms – Functional, Transactional and Critical were used in the assessment process, and attendees were asked to indicate which paradigm best applied to their practice and beliefs in their teaching and research respectively.

This paper will discuss the settings, the instrument used, review the findings from data gathered to date, and indicate future directions for this research.

Keywords
Computing Education, Computing research, research paradigms

1. INTRODUCTION

Degree accreditation requirements have bought a new set of expectations to the NACCQ sector by requiring that a degree programme be "taught mainly by people engaged in research" - section 254 of the Educational Amendment Act 1990 - (TAG Group 1996). But whereas "experience and skill in research have been taken for granted for academic staff in the university sector…this has not generally been the case for New Zealand Polytechnics where the emphasis has been on professional practice and expertise. The majority of academic staff have come into the sector from careers in the private sector with limited, if any, research experience" (Sylvester, 1997). Since 1998, NACCQ has conducted six "Getting Started in Research" workshops for educators in the NACCQ sector, as one initiative to address this deficiency. The authors have jointly facilitated five of the six small group workshops, and believe that they have been a successful mechanism for generating increased awareness and enthusiasm for research among educators in this rapidly changing sector. For instance, over a span of less than eight years, 17 of the 24 NACCQ sector members have now become involved in the provision of computing degrees. The research reported here analyses the beliefs about research and teaching of attendees at the last three workshops and two further sessions specifically inquiring into researchers beliefs.

2. SETTINGS

The first "Getting Started in Research" workshop was conducted as a two-day residential workshop in late January 1998 at the Central Institute of Technology facilitated by Dr. Linda Selby and the authors of this paper. Two further workshops were conducted that year for computing educators, one at Christchurch and one in Auckland. A follow-up NACCQ workshop for graduates, covering the writing process was also held at Auckland prior to the annual conference. Due to the ease of access, and low accommodation cost for participants from around the country a further Central Institute of Technology workshop was held in late January 1999.

The style of the workshops has been relatively informal with a combination of lecture mode delivery, class discussion, group and individual work. Tailoring the workshop to accommodate evolving needs has been a key consideration and in 2000 the workshop was recast into a one-day format, which removed the residential requirement. Two workshops were held in 2000, the first at Wellington in June as a pre-conference workshop for computing educators attending the conference, and the second later that year at Taranaki Polytechnic as a joint NACCQ/APNZ workshop, including not only computing educators but a number of attendees from other disciplines. The success of this workshop saw a follow up workshop at Taranaki Polytechnic held in late January 2001 for educators drawn from several different disciplines at the Polytechnic.

It is from these last three workshops that the data reported here has been gathered, as a set of anonymous and voluntary contributions from participants. Subsequent to the workshops themselves we have conducted two further sessions, collecting information relating specifically to the paradigmatic beliefs of researchers in the sector. The data from these two sessions are also reported in this paper.

3. THE RESEARCH PROCESS AND INSTRUMENT

The research reported here occurs within the context of a loosely framed action research (AR) programme undertaken by the NACCQ Professional Development Working Group (now Academic Quality and Support Working Group). The programme is concerned with improving the research capability of educators in the sector, in order to provide for their professional development, to contribute to the knowledgebase within the IT industry and wider society in New Zealand, and to underpin the quality and reputation of the sector's degree programmes.

Carr & Kemmis (1983) distinguish three distinct kinds of action research: technical, practical and emancipatory. Technical action research could be regarded as form of consultancy or active field study led by an expert researcher to achieve externally imposed goals. Practical AR aims to improve the practices of individuals or groups of practitioners, and to contribute both to practitioners understandings of their practice and of the situations in which practice occurs. The facilitator in practical AR encourages "practical deliberation, while systematically transferring ownership of the method of self-reflection to participants." (ibid.)

"Emancipatory AR by contrast shifts responsibility for practice and the action research process to the participant group. In this case the group takes joint responsibility for action and reflection". This form of AR "incorporates a social perspective…provokes a critical response to organisational constraints…and aims at a transformation of the organisation and practice of education." (Carr & Kemmis, 1983)

A key mechanism in an action research model within an educational context is the concept of reflective practice Argyris & Schon (1974), (Schon, 1987) in which professional work involves an ongoing process involving self monitoring, continual improvement and action cycles (plan, act, observe, reflect). It has been phrased thus: "the term 'reflective practitioner' was embraced because it admits a variety of strengths and an openness in terms of beliefs about teaching methodologies. The teacher, as reflective practitioner, is committed to evaluating and re-evaluating performance both individually and collegially in order to sustain the never-ending drive to performance improvement. The more we learn the more there is to learn. And the more we improve the more we recognise how much more we can improve."(Hinchcliff, 1997)

3.1   Towards Self Confident Practice Communities

This paper results from a reflective cycle within the NACCQ sector's programme of research capability development. A summary of the research programme is expressed below in terms of the McKay & Marshall (1999) "elements of an action research intervention". While the research method may be somewhat "retrofitted" upon a practice improvement initiative, it does accurately frame the research process being undertaken, and acknowledges the evolutionary nature of the action research process.

Element	Description
F (Framework)	Reflective Practitioner Model (Argyris & Schon, 1974, Schon, 1987) Emancipatory Action Research (Carr &Kemmis, 1983)
M$_R$ (Research Method)	Practical Action Research, (Loosely framed), combining some elements of Emancipatory Action Research?
M$_{PS}$ (Problem solving method)	Practical Action Research, educative workshops, reflective critique
A - (problem situation of interest to the researcher)	• What should be the nature of research in the NACCQ sector, and how can it be enhanced? • What is the nature of researchers in the NACCQ sector and how can they become more effective? • What is the nature of the research culture in the NACCQ sector and how can it be enhanced?
P - a problem situation in which we are intervening	• Developing and maintaining NACCQ sector degree level teaching quality • Developing NACCQ sector educator capabilities in research • Developing NACCQ sector research culture and community

Table 1: elements of an action research intervention – NACCQ sector research capability development

In an emancipatory AR model this work might be part of developing a self-sustaining, enlightened, and assertive community of researchers within the NACCQ sector, promoting a new set of stories and insights in a distinct and

vibrant model of New Zealand research. But, at this stage this research should be classified under the "practical" rather than the "emancipatory" AR category.

3.2 The Paradigm Assessment Research Instrument

One component of the workshop programme included a wide ranging presentation on the nature of researchers' beliefs, covering the assumptions underlying each of three main research paradigms - objectivist, interpretivist and critical - and the nature of research conducted within the tenets of each paradigm (Orlikowski & Baroudi, 1991).

Participants at each of the three workshops were then asked to assess themselves against each paradigm in the areas firstly of curriculum development and secondly of research. The instrument used was based upon a self-assessment instrument originally developed by Melrose (1993), addressing three areas including curriculum development. The instrument has been adapted for the workshops to specifically address research, while retaining the original criteria for curriculum development. It was felt that the area of curriculum development would be a good starting point, familiar to participants and from the reflections upon their practice in this area they would then be able to apply the instrument more readily to the newer area of research. The details completed by each participant are given in the instrument shown in Appendix A:

The subsequent feedback session from each participant to the group offered an opportunity to explore the nature of their teaching practice and views about research. The limitations of the objectivist paradigm and the reliance upon purely quantitative data could be discussed, in the face of this rich body of interpretive information from each participant. The relative strengths of data collection methods - video-taping or transcribing feedback sessions, as opposed to simply tabulating and statistically analysing the raw results could be explored, as could the related ethical issues if participants were identifiable.

The nature of the critical paradigm with its emphasis upon reflection could be drawn out, as each participant became more self aware of their personal teaching and research styles and the extent to which these paradigmatic styles were imposed by external conditions or by personal comfort or preference, or through the predominant research style preferred within their discipline.

4. FINDINGS

Data from each of the three workshops and the two subsequent sessions is tabulated below – refer Appendix A for definitions of the terms Functional (F,f), Transactional (T,t) and Critical (C,c). As a general finding, most participants at each of the three workshops assessed themselves as relatively novice researchers.

4.1 Analysis

The data was originally provided as nominal data in a text coded upper case or lower case letter. This was recoded to ease the analysis process of elucidating significant patterns.

However the interpretive nature of the instrument as a means of personal evaluation and critical reflection means that some caution must be exercised in subjecting it to the type of analysis normal in positivist quantitative research. For instance the tests for rigour differ in each paradigm, so that the implications for such measures as "construct and content validity", or "instrument reliability" need careful assessment (cf. Boudreau, Gefen et. al. 2001, and Klein & Myers, 1999). The authors are still refining the instrument and developing suitable approaches to analysing the data gathered to date.

Nonetheless some patterns did emerge which appeared consistent with the nature of the groups, the observations of the authors, and the individual comments from the presenters as they explained their rationales for selecting one or a combination of paradigms that reflected their teaching and research practice. The value of the instrument as a technique for reflecting upon ones own practice was borne out by an attendee at the third workshop who had also attended the previous one. She noted that her perspective had changed in the intervening two-month period and upon reflection her answers now differed from those she had originally given. Likewise an attendee at the fifth session, had conducted the exercise previously and now felt she had a much clearer grasp of the distinctions and was able to reflect upon the progression of her own practice as a researcher.

4.1.1 Group differences

4.1.1.1 Attendees at the first workshop at which we conducted this evaluation were computing educators from several different institutions across New Zealand. Analysis of their curriculum development and research paradigms is given below.

NACCQ Getting started in Research workshop 30 June 2000 Wellington Conference

Paradigm Self Evaluation - with codes numerically translated (UC = 1, LC = .5)

Group No.	Curriculum development	F	f	T	t	C	c	Research F	f	T	t	C	c
1	Paradigm	F	f	T	t	C	c	F	f	T	t	C	c
1	Raw Totals (n)	5	2	2	3	1	6	3	3	5	2	1	2
1	Adjusted Totals (n)	5	1	2	1.5	1	3	3	1.5	5	1	1	1
1	Respondent %	71.43	14.29	28.57	21.43	14.29	42.86	42.86	21.43	71.43	14.29	14.29	14.29
1	Rank	1	5	3	4	5	2	2	3	1	4	4	4

Group No.		Funct	Trans	Crit	Fun	Tran	Crit
1	Paradigm	6	3.5	4	4.5	6	2
1	%	85.71	50.00	57.14	64.29	85.71	28.57
1	Rank	1	3	2	2	1	3

Overall total n= 7

Table 2: Group 1

This first (computing) group appeared to favour predominantly Functional curriculum development paradigms, but were predominantly Transactional in their research.

General observations:

We had a poorer response in the first workshop (7 out of 20 respondents) than in the later sessions. As contributions were anonymous, this was probably due to lack of explicit instructions to attendees rather than a lack of desire to participate.
Responses with a mix of paradigms explained their choices based upon personal context – for instance researchers engaged in commercial consulting activity tended to adopt a functional paradigm to meet client requirements. Educators involved in teaching computing products may have had a personal preference for the transactional style, but adjusted that to small functional and critical when teaching specific product skills. Others adopted a pragmatic mix to suit circumstances.

4.1.1.2 Attendees at the subsequent workshop were a combination of computing educators and educators in other disciplines (business, welding, design) from Taranaki Polytechnic. Analysis of their paradigms is given below.

NACCQ Getting started in Research workshop 24 Nov 2000 Taranaki Polytechnic

Paradigm Self Evaluation - with codes numerically translated (UC = 1, LC = .5)

Group No.	Curriculum development	F	f	T	t	C	c	Research F	f	T	t	C	c
2	Paradigm	F	f	T	t	C	c	F	f	T	t	C	c
2	Raw Totals (n)	1	7	7	1	0	6	3	4	3	5	3	1
2	Adjusted Totals (n)	1	3.5	7	0.5	0	3	3	2	3	2.5	3	0.5
2	Respondent %	11.11	38.89	77.78	5.56	0.00	33.33	33.33	22.22	33.33	27.78	33.33	5.56
2	Rank	4	2	1	5	6	3	1	5	1	4	1	6

Group No.		Funct	Trans	Crit	Fun	Tran	Crit
2	Paradigm	4.5	7.5	3	5	5.5	3.5
2	%	50.00	83.33	33.33	55.56	61.11	38.89
2	Rank	2	1	3	2	1	3

Overall total n= 9

Table 3: Group 2

This second (mixed) group were predominantly Transactional in both curriculum development and research paradigms, but their research also emphasised the functional paradigm.

General observations:

Paradigm choices in curriculum development were often constrained by nationally prescribed curricula, and specific skills and outcomes to be achieved, leading to a strong functional component for certain disciplines, offset by educators desires for teaching informed by other paradigms.
Research paradigms were often constrained by the nature of the discipline or knowledge only of certain methodologies.

4.1.1.3 Attendees at the third workshop were a combination of educators mostly in non-computing disciplines (nursing, mental health, early childhood education, business, beauty care) from Taranaki Polytechnic. Analysis of their paradigms is given below.

NACCQ Getting started in Research workshop 30 Jan 2001 Taranaki Polytechnic

Paradigm Self Evaluation - with codes numerically translated (UC = 1, LC = .5)

Group No.	Curriculum development						Research					
3	Paradigm	F	f	T	t	C	c	F	f	T	t	C	c
3	Raw Totals (n)	6	6	7	7	7	7	1	9	12	2	7	7
3	Adjusted Totals (n)	6	3.5	7	3.5	7	3.5	1	4.5	12	1	7	3.5
3	Respondent %	42.86	25.00	50.00	25.00	50.00	25.00	7.14	32.14	85.71	7.14	50.00	25.00
3	Rank	3	4	1	4	1	4	5	3	1	5	2	4

		Funct	Trans	Crit	Fun	Tran	Crit
3	Paradigm	9.5	10.5	10.5	5.5	13	10.5
3	%	67.86	75.00	75.00	39.29	92.86	75.00
3	Rank	3	1	1	3	1	2

Overall total n= 14

Table 4: Group 3

The third (non computing) group were equally transactional and critical in their curriculum development, and highly transactional in their research combined with a strong critical element.

General observations:

The distinction between different objectives in the curriculum became apparent with this group. For a discipline such as nursing it is vital that students competently master certain skills (e.g. administering injections), but student centred teaching and critical social awareness and lifelong learning required of the profession are also important aspects of the pedagogy. This resulted in many multi paradigm responses.
In research paradigms likewise the early childhood education and nursing disciplines with their strong social science emphases, and critical social awareness tended to result in many combinations of a transactional/critical research paradigm.

4.1.1.4 Attendees at the fourth data gathering session (run independently of a workshop) were a combination of educators partly from computing and the remainder mostly in Business disciplines at Eastern Institute of Technology. Analysis of their paradigms is given below.

NACCQ Research Paradigm Evaluation 6 May 2001 Eastern Institute of Technology

Paradigm Self Evaluation - with codes numerically translated (UC = 1, LC = .5)

Group No.	Curriculum development							Research					
4	Paradigm	F	f	T	t	C	c	F	f	T	t	C	c
4	Raw Totals (n)	11	5	5	5	1	12	8	3	2	10	5	7
4	Adjusted Totals (n)	11	2.5	5	2.5	1	6	8	1.5	2	5	5	3.5
4	Respondent %	68.75	15.63	31.25	15.63	6.25	37.50	50.00	9.38	12.50	31.25	31.25	21.88
4	Rank	1	4	3	4	6	2	1	6	5	2	2	4

Group No.	Paradigm	F		T		C		F		T		C	
4	Paradigm	13.5		7.5		7		9.5		7		8.5	
4	%	84.38		46.88		43.75		59.38		43.75		53.13	
4	Rank	1		2		3		1		3		2	

Overall total n= 16

Table 5: Group 4

The Fourth (mixed) group were highly functional in their curriculum development, with transactional and critical elements present to a lesser degree; while in their research they were more evenly spread across paradigms, mainly functional but with the critical paradigm featuring at a similar level.

General observations:

Attendees noted the particular impact of teaching level upon their curriculum development paradigm. This may be an area for inclusion in a later version of the research instrument.
The nature of the critical model appeared well internalised by the attendees, who were excited by the idea that they were "joint owners" of this research into practice in the sector.

4.1.1.5 Attendees at the fifth data gathering session (run independently of a workshop) were educators teaching in computing disciplines from UNITEC Institute of Technology. Analysis of their paradigms is given below.

NACCQ Research Paradigm Evaluation 9 May 2001 UNITEC Institute of Technology

Paradigm Self Evaluation - with codes numerically translated (UC = 1, LC = .5)

Group No.	Curriculum development							Research					
5	Paradigm	F	f	T	t	C	c	F	f	T	t	C	c
5	Raw Totals (n)	8	3	7	5	3	7	6	4	4	5	2	3
5	Adjusted Totals (n)	8	1.5	7	2.5	3	3.5	6	2	4	2.5	2	1.5
5	Respondent %	61.54	11.54	53.85	19.23	23.08	26.92	46.15	15.38	30.77	19.23	15.38	11.54
5	Rank	1	6	2	5	4	3	1	4	2	3	4	6

Group No.	Paradigm	F		T		C		F		T		C	
5	Paradigm	9.5		9.5		6.5		8		6.5		3.5	
5	%	73.08		73.08		50.00		61.54		50.00		26.92	
5	Rank	1		1		3		1		2		3	

Overall total n= 13

Table 6: Group 5

The fifth (computing) group were equally functional and transactional in their curriculum development, and while predominantly functional in their research, were also transactional to a slightly lesser degree.

General observations:

Attendees again noted the particular impact of teaching level upon their curriculum development paradigm. Some attendees drew a distinction between teaching in the IT & Computing area, and their research, which is often (especially for novice researchers) focused upon the teaching of the discipline.

5. FUTURE DIRECTIONS

There are a number of unanswered questions that arise from these initial studies. The degree of change in the NACCQ sector over the last decade has been enormous, yet there is a "lack of research on tertiary education itself" (TEAC, 2001) and the nature and impact of the new research communities developing in the NACCQ sector as a result of deregulation and degree provision within the sector. This study gives some insights into the nature of NACCQ sector computing educators, suggests some differences and a number of areas for follow up studies. The authors are in the process of further developing and refining these research instruments and gathering similar data from other research communities here and overseas in an attempt to draw some more solid conclusions about differences, and perceptions about research and teaching both across disciplines and as researchers develop in expertise and confidence. Moving to a model of a jointly owned and directed research programme within the NACCQ sector is a desired progression for this research.

6. REFERENCES

Argyris, C. and Schon, D. (1974) "Theory In Practice: Increasing Professional Effectiveness". Jossey Bass, San Francisco

Boudreau, M. Gefen, D. Straub, D. (2001) "Validation in Information Systems Research: A State-of-the-Art Assessment". MIS Quarterly, 25 (1): 1-16

Carr W., Kemmis S., (1983), *Becoming Critical: Knowing Through Action Research*, Deakin University Press, Victoria

Hinchcliff, J. (1997), "Values Integrating Education", Mirilea Press, Pukekohe

Klein, H.K. and Myers, M.D. (1999), "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems". MIS Quarterly,23(1): 67-93.

McKay, J. Marshall P. (1999), "2x6 = 12, or Does It Equal Action Research?" Australasian Conference on Information Systems, Wellington: Accessed March 27, 2000. <http://www.vuw.ac.nz/acis99/j-m.html>

Melrose, M.J. (1993), "Development And Evaluation Of The Certificate In Educational Leadership. An Investigation Of The Context And The Perceptions About A Programme For Polytechnic Staff At The Centre For Professional Development Auckland Institute Of Technology", PhD. Thesis, University of Auckland, Auckland, New Zealand.

Orlikowski, W. Baroudi, J. (1991), "Studying Information Technology in Organizations: Research Approaches and Assumptions". Information Systems Research 2(1): 1-28

Schon, D. (1987), "Educating the Reflective Practitioner". Jossey Bass, San Francisco

Sylvester, G. (1997), "Developing Research in New Zealand Polytechnics: A Sector in Change". Australian and New Zealand Journal of Vocational Education Research, 5(1): 109 - 130

TAG Group. (1996), "Tertiary Action Group Final Report". NZQA Wellington

TEAC (2001), "Shaping A Shared Vision – Initial Report Of The Tertiary Education Advisory Committee". Accessed March 28, 2001. <http://www.teac.govt.nz/reports.htm>

Instructions:

1. Read the descriptions of the three different models in part 1 of Melrose's Appendix. Consider your own beliefs and practices. Construct your own individual code for curriculum development and write it in the table below. You may use between 1 and 3 letters for your code. Each letter may be capital or lower case.

Use: F or f for Functional
        T or t for Transactional
        C or c for Critical

Note:

There are no correct answers. People have constructed many different codes, e.g. T or fTc belong to people with a similar outlook but the second person switches from one model to another at times (depending on context) while still preferring a transactional approach.

2. Move on to construct your code(s) for part 2 (research) and add them to the table.

Area of Practice	Code	Comment
1. Your curriculum development	☐	
2. Your research	☐	

Table 7: Curriculum Development and Research Codes

Participants were referred to Melrose's Appendix 4.1 (1993), for instructions in how to use the self-assessment tool. Her clues for identifying the code are given below for curriculum development, followed by the clues developed for research.

Clues to identifying the code

Part 1: for curriculum development

- **Functional:** Is set in the present. Fits what the industry or society needs now for that person to take up that job. Reproductive. Technical. Task and skills-based for a specific occupation. Content of subject area is very important. Has objectives that are often set by an external body or an industry group with some input from teachers. Sometimes referred to as practical. Methodology often involves set lectures and teacher-directed demonstrations, workshops or laboratories.
- **Transactional:** Based on the needs of the individual students or group who happen to be doing that course. Often transferable skills are involved. Process – rather than product - or content orientated. Negotiated objectives and criteria (for individual and/or group) evolve. Methodology often involves facilitation of group discussion. People centred. Student centred. Experiential learning is valued. Democratic.
- **Critical:** Based on predictions of future needs, visions of a better, fairer world. Education for the future is a focus. Learning to learn is important. Developing critical thinkers is a goal. Methodology often involves teacher asking critical questions, shaking previously held beliefs, querying current systems, acting as change agent, emancipatory. Objectives are often broad.

Part 2: for research

- **Functional:** the researcher operates as an objective expert observer, seeking to discover new knowledge by developing and testing hypotheses. Participants in the research are passive or directed subjects. The goal of the research is to discover new knowledge, theories or rules, which have universal applicability. **Typical methods:** *quantitative*, hypothetico-deductive, surveys, experiments, statistical analyses (e.g. regression analysis, factor analysis, simultaneous equation modelling).
- **Transactional:** the researcher operates as an expert interpreter, but acknowledges that research subjects have their own perspectives which may be interfered with by the researcher's presence. The goal of the research is to generate insights from the lived experience of the research subjects. **Typical methods:** *qualitative*, case studies, phenomenology, unstructured interviews, ethnography, narrative enquiry, grounded theory.
- **Critical:** the researcher operates as an agent of enlightenment or active change. The goal of the research is to uncover oppressive forces and restrictive conditions, which may not be apparent to the research subjects. These conditions may be illuminated and shared with the subjects, or the researcher and subjects may jointly negotiate goals and work as co-researchers to change the status quo. **Typical methods:** *evaluative*, critical ethnography, critical action research or participatory research, dialectical hermeneutics, critical theoretic.