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Growing Scholarly Teachers and Educational Researchers: A Curriculum for a Research Pathway in Preservice Teacher Education

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This paper advocates the development of high-level research capability in some students in their undergraduate Bachelor of Education course. The rationale for this viewpoint is presented in relation to three questions: “What is educational research?” “Why should universities develop high-level research capability in some preservice teacher education graduates?” and “What type of curriculum can support the development of high-level research capability in some preservice teacher education graduates?” The first two questions are addressed broadly. The latter question is addressed with reference to an existing Research Pathway within a Bachelor of Education course. The paper concludes with the identification of a priority issue for subsequent iterations of the Pathway and a reflection on the shift in my role as a teacher in this Pathway from ‘teacher researcher’ to ‘scholarly teacher’.

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Increasingly, contemporary preservice teacher education courses are promoting a research-oriented and reflective approach to teaching. Subsequent to graduation, some of these students will build on this foundational research capability through higher degree studies or self-education. However, there are also individual and societal advantages to some preservice students graduating from their preservice training with relatively high-level research capabilities. This paper explores issues in the development of graduate research capability in preservice teacher education through a discussion of three questions. The first question — “What is educational research?” — discusses the nature of educational research, professional orientations towards teaching and research, and the distinct roles of teacher researchers, scholarly teachers, and educational researchers. The second question — “Why should universities develop high-level research capability in some preservice teacher education graduates?” — addresses the advantages of training that provides opportunities for some students to develop high-level research capability. The final question — “What type of curriculum can support the development of high-level research capability in some preservice teacher education students?” — describes a Research Pathway curriculum for preservice students within a Bachelor of Education [BEd] course. This paper concludes with the identification of a priority issue that needs to be addressed in the Pathway and a reflection on my changed role as a teacher within this Pathway.

What is educational research?

Educational research is defined as a systematic inquiry within the broad range of educational contexts in which “teachers are at the heart of the educational process [because] classrooms are the ideal laboratory for testing educational theory [and] the teacher is a potential participant observer in classrooms and schools” (Stenhouse, 1981, p. 109). Educational research has three distinguishing features according to Shavelston and Towne (2002). Firstly, there are *multiple disciplinary perspectives* on education with input into the educational process from a range of professionals including economists, developmental psychologists, organizational sociologists, cultural anthropologists, and political scientists. Secondly, there are *ethical considerations* that relate to the protection of human participants particularly children. Finally, there are multiple *relationships* with those engaged in professional practice including teachers, administrators, curriculum developers, and university staff. Whether this inquiry process is public or private has implications for the contribution of the research to community knowledge (Stenhouse, 1981):

A full definition of research might include the qualification that it be made public. Private research for our purpose does not count as research. Partly, this is because unpublished research does not profit by criticism. Partly, it is because we see research as a community effort and unpublished research is of little use to others. What seems most important to me is that research becomes part of a community of critical discourse ... Publication has two functions. It opens work up to criticism and consequently to refinement; and it also disseminates the fruits of research and hence makes possible the cumulation of knowledge. (p. 111)

Underlying Stenhouse's definition of research is the issue of intentionality, that is, how an individual or group intended for their research to influence practice. Private research in education focuses on the enhancement of teachers' professional knowledge, professional attributes and professional practice (e.g., Australian Association of Mathematics Teachers, 2002). In contrast, public research attempts to influence practice by building on the existing professional knowledge base. In education, public research is guided by the principles of inquiry (Shavelston & Towne, 2002) (see Table 1).

Table 1

Principles of Inquiry

Pose significant questions that can be investigated empirically.
Link research to relevant theory.
Use methods that permit direct investigation of the question.
Provide a coherent and explicit chain of reasoning.
Replicate and generalize across studies.
Disclose research to encourage professional scrutiny and critique.

(Shavelston & Towne, 2002, p. 52)

In view of the perspectives on professionalism in teaching and research, there are three distinct roles that teachers might assume in relation to teaching and research, namely teacher researcher, scholarly teacher, and educational researcher. These roles are not fixed and teachers can move between them according to their professional intent and their capability.

A *teacher researcher* is primarily oriented towards professionalism in their teaching. Teacher research is situated in the teachers' local professional environment, such as their own classroom or school, and is underpinned by self-monitoring strategies (Stenhouse, 1981). The employment of these strategies demonstrates teachers' professionalism as 'reflective practioners' (Brookfield, 1995; Schön, 1983). Additionally, it provides the foundation for teachers to become 'practitioner researchers', who are motivated to engage in an inquiry of their professional problems, and formulate, evaluate and refine the solutions to these problems (Stenhouse, 1981). Thus, embedded in the term 'teacher researcher' is the connotation of a professional who is reflective and who accepts the responsibility, has the capability, and is sufficiently motivated to identify and address problems in his or her own practice. However, teacher research is often conducted in relative isolation from the literature with teachers neither capitalising on the available literature for information about their professional problems nor contributing their research findings to the literature (Stenhouse, 1981). The importance of the role of teacher researchers is acknowledged but is not discussed further.

An *educational researcher* is primarily oriented towards professionalism in research. Teachers who are engaged in an educational inquiry unrelated to their own teaching practice might undertake this role, for example, by studying other teachers' professional practice (e.g., Peers, Diezmann, & Watters, 2003). Notably, however, many educational researchers are not teachers (Shavelston & Towne, 2002).

A *scholarly teacher* is oriented towards professionalism in teaching and research. There is considerable variation in the literature on the terms ‘scholarly teaching’ and its relationship to the ‘scholarship of teaching’ (e.g., Boyer, 1990; Richlin, 2001). However, the view adopted here is that a scholarly teacher engages fully in the process of scholarship. The teacher investigates the relevant literature, is reflective about his or her teaching; and contributes to professional thinking through publication. The inclusion of this latter step is sometimes omitted from definitions of scholarly teaching because it is argued that dissemination is the responsibility of a scholar rather than a teacher (e.g., Richlin, 2001). However, the communicative process of writing is of substantial value for a teacher because it can clarify his or her own thinking (McKeachie, 1999), and subsequently has the potential to improve practice. Thus, the roles of scholarly teachers and educational researchers demand a high level of research capability.

Why should universities develop high-level research capability in some teacher education graduates?

The rationale for the development of high-level research capability in some preservice students is based on six reasons. Firstly, students who are interested in and knowledgeable about research have broader career options in that they can pursue careers in either teaching or research or positions that draw on both types of capabilities, such as academia. Secondly, research-oriented units are a form of curriculum differentiation that provides challenge for capable students and enables them to pursue topics of interest (VanTassel-Baska, 2003). These students have the potential to become future educational leaders and researchers. Thirdly, graduates with research capability can make a substantial contribution to an educational organisation and the profession through their conduct of scholarly or educational research, as a collaborator with teachers or academics, as a mentor or ‘critical friend’ to teachers, and by providing a conduit between the professional and research communities, which should provide other teachers with a raised awareness of the literature base. Fourthly, an undergraduate research program has the potential to impact on the quality and quantity of higher degree students. Such a program is discussed shortly. Additionally, an undergraduate research program can provide a sound basis for graduate studies (Martin, McLachlan, & Karmel, 2001). Furthermore, given that Australian students have a tendency to remain at the same university for subsequent study (Kiley & Austin, 2000), universities should also be able to increase their numbers of quality higher degree students by ‘growing’ them from undergraduates. Fifthly, the Research Pathway provides opportunities for staff to capitalise on access to quality students to foster their own research agenda. Much research is conducted in universities by research students at undergraduate level. Finally, an undergraduate research program should enhance the quality of part-time university staff. Teachers are employed by universities for their ‘real world’ expertise and credibility, and to address academic staffing shortfalls. However, it would be fallacious to assume that even expert teachers in pre-school or school contexts will become high quality teachers in higher education without adopting a reflective and research-oriented approach to this new context.

Notwithstanding these advantages, there are substantial indications that specialist research training at the undergraduate level should be restricted to students with an interest in research and the capability to perform highly. High attrition and slow completion in higher degree courses indicates that some postgraduates find research studies challenging. Additionally, some academics find research difficult, as evident from staff who are yet to complete doctoral qualification or are inactive researchers (i.e., publication, grant success, higher degree student supervision). Thus, undergraduate students should be carefully selected for any research program to ensure that they have an optimal chance for a successful outcome in that program.

What type of curriculum can support the development of high-level research capability in some preservice teacher education students?

This question is addressed in two steps. Firstly, a brief overview of the Research Pathway is presented. Secondly, key aspects of the Pathway curriculum are described.

An Overview of the Research Pathway

The Research Pathway comprises one eighth of the four-year (eight semester) BEd course requirements (48 of 384 credit points) and consists of an introductory research unit (12 credit points) and a dissertation unit (36 credit points). The Pathway is undertaken in the final three semesters of the BEd course. In Semester 6, the content is typical of an introductory research unit but importantly focuses on supporting the students to identify an appropriate research problem, which can be a challenging process (Hoover & Feldhusen, 1994). This unit is taught by a colleague and myself in a class situation. During this semester, students are also introduced to a range of potential supervisors. In Semester 7, students undertake a short advanced information retrieval course and a short academic writing course to assist them in the preparation of their dissertation literature review. During Semesters 7 and 8, students predominantly work with supervisors on their selected dissertation topics. However, I also monitor students' progress in these semesters through class meetings, individual meetings, and contact with their supervisors.

Students are eligible for the Research Pathway if they have a grade point average of 5.5 (credit to distinction standard) on a 7 point scale at the end of their second year of undergraduate studies and they have four elective choices (48 credit points) available within their course. There is particular pressure on students to complete a high quality dissertation because this unit is weighted at three times the value of other units in the BEd course, and the Faculty awards Honours in course completion based on the overall course grade point average. Additionally, students need to achieve highly in this Pathway to be successful in obtaining direct entry into a doctoral course and to be competitive for higher degree scholarships.

The Research Pathway Curriculum

The Research Pathway is designed to achieve three broad goals, which are:

1. To assist students to develop a research-oriented and reflective approach to teaching,
2. To broaden career opportunities by developing research skills, and
3. To provide successful students with direct entry, in the future, to a PhD program at Queensland University of Technology [QUT] and improve their competitive standing in applications for merit-based PhD scholarships.

Consistent with the goal orientation of the Pathway, a performance or systems-based approach underpins the curriculum design (Toohey, 1999). A complete description of the Pathway curriculum is beyond the scope of this paper. However, an insight into the Pathway curriculum is provided through the description of key aspects of the curriculum in relation to Toohey's six-category framework for describing curriculum approaches.

1. The view of knowledge

Knowledge in the Research Pathway is influenced by three viewpoints. Firstly, knowledge is performance-oriented, and hence, students need opportunities to develop and demonstrate their increasing levels of competence (Toohey, 1999). Because performance is a demonstration of real understanding (Biggs, 1999), it is an optimal educational outcome (Harris, Guthrie, Hobart, & Lundberg, 1995). Secondly, adequate knowledge of the discipline needs to be developed (Ratcliff, 1997). Thus, within a research discipline, students need to demonstrate their knowledge of the key principles of inquiry (see Table 1). Finally, knowledge is considered to be epistemologically pluralistic to accommodate the various content disciplines that students might choose to explore (Rickmeyer, 1990), how knowledge is constructed in various paradigms (Rickmeyer, 1990), and to foster an appreciation of cultural diversity within a globalised world (Kelly, 2000).

These viewpoints of knowledge are embedded in the Pathway curriculum, for example, in the ‘*Meet the Researchers’ sessions*, which are convened during the latter stages of the introductory research methods unit. During these sessions, potential supervisors talk to the class about their research and students are encouraged to engage in dialogue with the researchers and identify which staff they feel share their interests and would best support them to produce a high quality dissertation. To uncover hidden assumptions about the culture (Brookfield, 1995, and to foster dialogue, researchers are specifically asked to talk about problematic issues of research and students are cued to ask about any relevant ethical issues. Within each session, researchers are purposefully timetabled to highlight the diversity in cultural, discipline, and research perspectives.

2. The process of learning, the roles of teachers and students

Learning is conceptualised as a multi-faceted enculturation process (Joseph, Bravmann, Windschitl, Mikel, & Green, 2000). Thus, the primary role of the teacher is to familiarise students with the culture. This process involves the teacher planning a series of hierarchically sequenced authentic tasks for the students (Toohey, 1999). Although there is limited flexibility in the type of learning tasks due to the performance orientation (Toohey, 1999), topic choice can be built into these tasks. Because learning should be demonstrated by an expansion in an individual’s “repertoire of skills and ways behaving” (Toohey, 1999, p. 52), capable students need cognitively challenging tasks. However, these students are also susceptible to underachievement due to perfectionist tendencies (Rimm, 2003).

An example of the process of learning, and the roles of teachers and students in the Pathway is illustrated in the set of activities related to *the critique of scholarly writing*. Critical thinking skills are central to reflective teaching (Brookfield, 1995) and to scholarly research (Shavelston & Towne, 2002). Researchers are expected to “link of research to relevant theory” and “disclose research to encourage professional scrutiny and critique” (Shavelston & Towne, 2002, p. 52). Thus, as part of the enculturation process, students need to learn how to critique scholarly writing. In the introductory research unit, staff periodically critique key aspects of research in papers that have been assigned for class reading and model the critique of a scholarly article. Students are encouraged students to contribute their own critiques on set readings. They also investigate the review process for publication through an examination of guidelines in a variety of scholarly journals. The assessment also focuses on scholarly critique. One assignment requires students to undertake a critical analysis of two research articles on the same topic but from different paradigms. Another assignment involves students critiquing a limited number of scholarly articles in the literature review of a research proposal. The dissertation requires students to critique a wider number of articles and use this critique to justify their research topic. Students have acknowledged their learning about scholarly critique and the interrelationship between reviewing and writing.

I will understand and be more critical of research articles. I am hoping it will help me with my academic writing.

Various teaching resources and strategies were utilised to extend my learning and critical thinking skills.

The revisiting of the critique of scholarly writing in various guises and at increasing levels of complexity should enable students to develop a deep understanding of the cultural practice of scholarly critique in a manner analogous to the deep learning approaches employed by Confucian heritage learners (Biggs, 1997).

3. The learning goals and how they are expressed

The learning goals are oriented towards building capability for the production of a quality dissertation. Hence, the goals are hierarchically organised to focus on the growth in capability for skilled performance (Toohey, 1999). For example, the unit objectives in the two Pathway units

indicate the expectation of an increasing level of competency over time (Toohey, 1999) (see Table 2).

Table 2

Development of Objectives Across the Units

Introductory Research Unit	Dissertation Unit
Objective (iv): Demonstrate knowledge and understanding of the <u>various cycles and stages</u> used in different types of educational research.	Objective (ii): Demonstrate an <u>appropriate application</u> of research design and associated methods.

4. How content is chosen and organized

A discipline can provide a conceptual framework for the selection of content (Ratcliff, 1997). Hence, the content in the Pathway is based on authentic research activities, such as the critique of scholarly writing described earlier. The content is selected according to the requirements for skilled performance rather than students' or staff's interests (Toohey, 1999) and is hierarchically organised across three semesters to foster capability and confidence. In the first semester, students engage in four modules in the introductory research unit that respectively focus on the basics of educational research, qualitative perspectives on research, quantitative perspectives on research, and the design and evaluation of research. During the final two semesters, students engage with the specialised content for their dissertation topic and their selected research approach.

Within the introductory research unit, a transdisciplinary problem-based learning model has proved an effective way of organising the content to promote an integrated understanding of key concepts and support students to think beyond disciplinary boundaries (Savin-Baden, 2000). For example, students were introduced to the various components of a research project through a problem scenario in which they investigated how a teacher implemented a constructivist-oriented approach to teaching. Students built on their prior knowledge by conducting a brief literature review of constructivism and discussing their ideas. They then coded excerpts of teacher interview and classroom video data for emergent themes, analysed lesson plans and assessment artifacts, and presented brief written and oral research reports. The exploration of this scenario in one 4 hour session was made possible through the assemblage of a set of multi-media resources comprising a website of relevant literature and classroom artifacts, and videos of classroom lessons and teacher interviews. Students were able to verify their interpretations of the data through consultation of a CDROM that was purposefully designed to link theory and practice in constructivist approaches. This problem scenario represented a form of curriculum compacting, which is a recommended teaching strategy for capable students that acknowledges their prior knowledge and capitalises on their learning capacity (Reis & Purcell 1993). Students' written and oral reports on this scenario indicated that the task had cued desirable thinking (Sale, 2001). Additionally, students' feedback endorsed the problem-based approach.

The most useful learning experience was the mini research project where we fast tracked the research process. (emphasis added)

5. What purpose does assessment serve and how is it organized

Consistent with a systems approach, the assessment across the Pathway is explicitly oriented towards achieving a high level of performance on their dissertation. The three summative assessment items in the introductory research unit contribute to the development of the knowledge components required in a dissertation. The *portfolio* consists of four sets of research activities related to each of four modules. These activities are submitted at the conclusion of each module to encourage students to engage with the various components of research throughout the semester. Portfolios can play a critical role in identifying the development of students' capabilities within a

unit (Cochrane, Mahoney, Bone, & Johnson, 1999) and regular assessment provides feedback to students about their performance and enables prompt interventions (Toohey, 1999). A *scholarly critique* assignment focuses on the review of two articles from different paradigms as described earlier. This critique provides students with an opportunity to demonstrate their understanding of multiple perspectives (McLaughlin, 2000). A *research proposal* includes a literature review and requires students to integrate their knowledge to undertake this authentic research task.

Formative assessment precedes summative assessments of the scholarly critique and the research proposal. For example, prior to the submission of their research proposal students prepare a two-page summary of their proposal and orally present their proposals. Staff and peers provide students with oral and written feedback based on the assessment criteria. This mini conference format emulates a community of inquiry in which the development of each research problem is led by an individual but the community are jointly responsible for helping the individual develop their thinking about this topic. Learning within a community is culturally responsive and contrasts with the traditional individualistic view of learning (McLaughlin, 2000). Students' comments indicated that they valued the learning process and were empowered through peer feedback (Meldrum, 2002).

Refreshing to work with positive students who were keen and interested in learning about your area, and able to give constructive feedback.

The final summative assessment task in the Pathway is the *dissertation*, which focuses on the integration and synthesis of existing knowledge and the production of new knowledge (McLaughlin, 2000) and acts as a certification of a particular standard of performance (Toohey, 1999). To assist students to achieve a high standard dissertation, the marking criteria are explained in relation to an exemplar. This approach should enhance students' understanding of the assessment criteria (Dunn, Parry, & Morgan, 2002).

6. What kinds of resources and infrastructure are needed?

The material resourcing of the introductory unit requires the identification of resources that will appeal to a wide range of students across early childhood, primary and secondary BEd courses. The incorporation of a problem-based scenarios into the curriculum required the assemblage of a set of multi-media resources focused on constructivist approaches.

Consistent with the systems approach, specialist personnel and facilities are employed to achieve a high level of performance (Toohey, 1999). Staff in the introductory unit have expertise in the breadth of research approaches and experience in meeting the educational needs of capable students. In the dissertation unit, various staff have specialist expertise in information retrieval, academic writing, and the dissertation topic. While students are undertaking their dissertation, they also have access to specialist library and computing facilities in the University Researcher Centre, which is normally only accessible to higher degree students.

Curriculum Assessment and Evaluation

The Pathway curriculum arguably provides a quality learning environment through its adherence to the five principles of assessment and learner engagement identified by Meyers and Nulty (2002) that promote deep learning (see Table 3). Examples of each of these principles have been addressed in the preceding description of the Pathway curriculum. Additionally, students have been overwhelmingly positive about the Pathway curriculum.

Learning curve tremendous!!

Great! Interest, motivation, productive discussion/critique, support, empathy and BRAINS [working with capable students]!"

Table 3

Principles of Curriculum Design for Deep Learning

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1. The rationale for the curriculum has been stated in real world terms.
 2. The learning environment is challenging and interesting.
 3. The assessment tasks promote a deep approach to learning.
 4. The assessment tasks are interlinked and cumulative.
 5. There is an articulation of how all elements of the course will produce the desired learning outcomes.
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(summarised from Meyers & Nulty, 2002, pp. 7-11)

The Research Pathway was designed to achieve specific purposes. Hence, the evaluation of the curriculum relates to the degree to which the Pathway has achieved these purposes. This traditional approach to curriculum evaluation (Brady, 1995) is consistent with the performance-oriented approach that underpins the Pathway curriculum (Toohey, 1999), and the demand for evidence-based practice in an era of accountability (Slavin, 2002). Thus, the evaluation accommodates the political context (Print, 1993). It is too early to fully evaluate the Pathway because only one cohort of students has graduated to date with the second cohort currently completing their dissertations. However, there are indications that the Pathway is achieving its goals.

The first goal of the Pathway is to assist students to develop a research-oriented and reflective approach to teaching. Written and oral feedback from students and student work indicates that this goal is being achieved.

[Knowledge from the Research Pathway will enable me] To use research methods to collect data and analyze my own teaching.

Amazing to experience the teaching methods that we are encouraged to use ourselves.
[emphasis in original]

Additionally, those Pathway students who were employed as research assistants have had additional opportunities to enhance their understanding of research, through the learning opportunities that occur in authentic work contexts (Kirkpatrick & Garrick, 1998).

The second goal of the Pathway is to broaden career opportunities by developing research skills. Students have reported that they now considered research as a complementary or alternative path to teaching.

I feel I may take this path [further study] as my career as a teacher continues.

[I now plan] To deepen my knowledge in my area, become more employable and to eventually return to Uni to lecture and improve teacher education.

The final goal of the Pathway is to provide successful students with direct entry, in the future, to a PhD program at QUT and improve their competitive standing in applications for merit-based PhD scholarships. The Pathway appears to have raised students' awareness of higher degree study and enhanced their competitiveness for scholarships.

[I intend] to pursue research and return to QUT in 2004 to undertake a PhD.

I have been able to secure a three-year PhD scholarship.

Conclusion

There is considerable benefit to the individual and to society in some preservice BEd students developing high-level research capability, for example through a program such as the Research Pathway described. However, despite indications that the Pathway is fulfilling its goals, a priority issue to be addressed in subsequent iterations of the pathway is the small cohort size. Small

numbers are economically unsustainable and prevent the achievement of the goals of the Pathway on a reasonable scale. Currently, eligible students receive letters of invitation to enrol and information sessions are held to provide further information. However, these strategies have only been moderately successful in building student numbers. Prior to the next intake of the Pathway, the recruitment campaign will be expanded. Because ‘word of mouth’ endorsement of a program by other students is an effective way to influence students’ program selections (e.g., Kiley & Austin, 2000), final year Pathway students will be invited to talk about their experiences to second year students in core lectures. Although an increase in numbers may add to the timetabling difficulties of scheduling classes to suit core units and practicum across BEd courses, online learning offers potential as a flexible delivery option (McLaughlin, 2000).

During the first and second iterations of the Pathway, I assumed the role of ‘teacher researcher’ through the process of reflection and self-monitoring. My perceptions of the effectiveness of this curriculum were informed through students’ work and feedback from students and colleagues. The outcomes of this process resulted in the identification of key issues of concern, that have been addressed (e.g., the amount of content in the introductory research unit) and a priority issue that needs to be addressed (i.e., cohort size). By reconstructing and theorising the curriculum (e.g., Aspland & Brooker, 1998), my role has changed from ‘teacher researcher’ to ‘scholarly teacher’. The shift from ‘private research’ to ‘public research’ of the Pathway is high stakes due to the potential for external critique. However, this shift opens up three avenues for scholarly thinking, which were previously unavailable in my role as a teacher researcher. Firstly, the preparation of this paper has enabled me to identify a potentially viable way of addressing the issue of small cohort size through student endorsement (e.g., Kiley & Austin, 2000). Secondly, some of the literature sourced for this paper also has relevance for Pathway students. For example, students could use Toohey’s (1999) curriculum frameworks in analysing their own practice (i.e. scholarly teachers) or the practices of others (i.e., educational researchers). Finally, the peer review of this paper provides a further forum for scholarly thinking about the Pathway, and, upon publication, will contribute to the knowledge base about research training in preservice BEd programs.

Research serves to make building stones out of stumbling blocks. Arthur D. Little.

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References

- Aspland, T. & Brooker, R. (1998) A pathway for postgraduate teaching, in: B. Atweh, S. Kemmis & P. Weeks (Eds.) *Action research in practice: Partnership for social justice in education*. (London, Routledge), 280–301.
- Australian Association of Mathematics Teachers. (2002) *Standards for excellence in teaching mathematics in Australian schools teaching*. Retrieved December 14 2003 from Australian Association of Mathematics Teachers Web site <http://www.aamt.edu.au/standards/>
- Biggs, J. (1997, July) Teaching across and within cultures: the issue of international students, in: R. Murray-Harvey & H. C. Silins (Eds.) *Learning and teaching in higher education: Advancing international perspectives, Proceedings of the Higher Education Research and Development Society of Australia Conference, Adelaide (pp. 1-22)* [Special Edition]
- Biggs, J. B. (1999) *Teaching for quality learning at university: What the student does* (Buckingham, Open University Press).
- Boyer, E. (1990) *Scholarship reconsidered: Priorities for the professoriate* (Princeton, NJ, Carnegie Foundation for the Advancement of Teaching, University of Princeton).
- Brady, L. (1995) *Curriculum development* (Sydney, Prentice Hall).

- Brookfield, S. D. (1995) *Becoming a critically reflective teacher* (San Francisco, Jossey-Bass).
- Cochrane, K., Mahoney, M. J., Bone, Z., & Johnson, S. (1999, July) Capabilities, constructivism and portfolios: Working towards a fresh approach to curriculum design in management education: in *Cornerstones: What do we value in higher education?* Proceedings from the Higher Education Research & development Society of Australasia Conference, Melbourne. Retrieved June 26, 2002, from <http://www.herdsa.org.au/vic/cornerstones/pdf/Cochrane.pdf>
- Dunn, L., Parry, S. & Morgan, C. (2002, August) Seeking quality in criterion referenced assessment, paper presented at the *Learning Communities and Assessment Cultures conference*, Northumbria. Retrieved November 5, 2002, from the FullText database: Education-line.
- Harris, R. Guthrie, H., Hobart, B. & Lundberg, D. (1995) *Competency-based education and training: between a rock and a whirlpool* (South Melbourne, Macmillan Education Australia).
- Hoover, S. M., & Feldhusen, J. F., (1994). Scientific problem solving and problem finding: A theoretical model, in: M. A. Runco (Ed.) *Problem finding, Problem solving, and creativity*, (Norwood, NJ: Ablex Publishing), 201-219.
- Joseph, P. B., Bravmann, S. L., Windschitl, M. A. Mikel, E. R., & Green, N. S. (2000) *Cultures of curriculum* (Mahwah, N.J, Lawrence Erlbaum).
- Kelly, P. (2000) Internationalising the curriculum: For profit or planet?, in: S. Inyatullah & J. Gidley (Eds) *The university in transformation: Global perspectives on the futures of the university* (Westport, Conn, Bergin & Garvey), 161-172.
- Kiley, M. & Austin, A. (2000). Australian postgraduate students' perceptions, preferences and mobility, *Higher Education Research and Development*, 19(1), 75-88.
- Kirkpatrick, D. & Garrick, J. (1998, July). Critical issues in workplace-based learning, paper presented at the *Transformation in Higher Education HERDSA Conference*, Auckland. Retrieved June 26, 2002 from <http://ww2.auckland.nz/cpd/HERDSA/HTMC/CurrDEv/kirpat2.htm>
- Martin, Y. M., McLachlan, M. & Karmel, T. (2001). *Postgraduate completion rates*. Retrieved December 14, 2003, from <http://www.dest.gov.au/highered/occpaper/01d/01d.pdf>
- McLaughlin, C. (2000). Inclusivity and alignment: principles of pedagogy, task and assessment design for effective cross-cultural on-line learning, *Distance Education*, 22(1), 7-29.
- Mckeachie, W. J. (1999) *Mckeachie's teaching tips: Strategies, research, and theory for college and university teachers* (10th edn) (Boston, Houghton Mifflin).
- Meldrum, R. (2002, August) Developing competent e-learners: The role of assessment (pp. 1-13), paper presented at the *Learning Communities and Assessment Cultures Conference*. Retrieved November 5, 2002, from the FullText database: Education-line.
- Meyers, N. N. M. & Nulty, D. (2002) Assessment and student engagement: Some principles, paper presented at the *Learning Communities and Assessment Cultures Conference*. Retrieved November 5, 2002, from the FullText database: Education-line.
- Peers, S. E. P., Diezmann, C. M. & Watters, J. J. (2003) Supports and concerns for teacher professional growth during the implementation of a science curriculum innovation, *Research in Science Education*, 33, 89-110.
- Print, M. (1993) *Curriculum development and design* (St Leonards, N.S.W., Allen & Unwin).
- Ratcliff, J.L. (1997) What is a curriculum and what should it be?, in: J. G. Gaff, J. L. Ratcliff & Associates (Eds.) *Handbook of the undergraduate curriculum: a comprehensive guide to purposes, structures, practices, and change* (San Francisco, Jossey-Bass), 5-29.
- Reis, S. M. & Purcell, J. H. (1993) An analysis of content elimination and strategies used by elementary classroom teachers and the curriculum compacting process, *Journal for the Education of the Gifted*, 16, 147-170.
- Richlin, L. (2001) Scholarly teaching and the scholarship of teaching, in: C. Kreber, (Ed.) *Scholarship revisited: perspectives on the scholarship of teaching and learning, new directions for teaching and learning*, no. 86 (San Francisco, Jossey-Bass).

- Rickmeyer, W. J. (1990) Paradigms and progress: Integrating knowledge and education for the twenty-first century, in: M. E. Clark, & S. A. Wawrytko (Eds.) *Rethinking the curriculum: Toward an integrated, interdisciplinary college education* (New York, Greenwood Press).
- Rimm, S. (2003) Underachievement: A national epidemic, in: N. Colangelo & G. K. Davis (Eds.) *Handbook of gifted education* (3rd edn) (Needham Heights, MA, Allyn & Bacon), 424-443.
- Sale, D. (2001) Designing a thinking curriculum in the classroom, *Curriculum and Teaching*, 16(1), 45-57.
- Savin-Baden, M. (2000) *Problem-based learning in higher education: Untold stories* (Buckingham: Society for Research into Higher Education: Open University).
- Schön, D. (1983) *The reflective practitioner: How professionals think in action*, (New York, Basic Books).
- Shavelson, R. J. & Towne, L. (Eds.) (2002) *Scientific research in Education* (Washington D.C: National Research Council).
- Slavin, R. E. (2002) Evidenced-based education policies: Transforming education practice and research, *Educational Researcher*, 31(7), 15-21.
- Stenhouse, L. (1981). What counts as research, *British Journal of Educational Studies*, 29(2), 103-114.
- Toohey, S. (1999) *Designing courses for higher education*.(Buckingham, Society for Research into Higher Education/Open University).
- VanTassel-Baska, J. (2003). What matters in curriculum for gifted learners: Reflections on theory, research and practice, in: N. Colangelo & G. Davis (Eds.) *Handbook of gifted education* (3rd edn) (Boston, MA, Allyn & Bacon), 174-183.