Inspiring student and teacher through research-led teaching; a pilot study

Vol Eight - Issue 3

Authors

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Abstract

This is a pilot study demonstrating the beneficial relationship of the teaching-research nexus through integration of the teacher’s disciplinary research on human papillomavirus and cervical cancer into the second year undergraduate medical curriculum. Students were required to research the literature on specified themes of the topic through Student Project Cases (SPCs) designed as part of the curriculum to involve them in inquiry-based, active learning. Students worked in small groups to respond to specified topic objectives through the production of both written reports and oral presentations. Questionnaires and focus group interviews examined students’ understanding of research, their knowledge of this particular SPC topic and the impact of research on their attitude to learning. Our findings indicated that students had variable understanding of research and knowledge of the topic prior to engaging in the SPC activity. Student feedback also showed an overall positive effect research had on their attitudes to learning and their engagement with the topic. Student feedback was inspiring to the teacher providing new research directions. These findings suggest the value of exploring and introducing learning designs that have their basis within the teaching-research nexus and more importantly that students play an important role as partners of the nexus.

Introduction
Teaching and research are core activities of a university. There is much discussion and debate in the literature on the relationship between teaching and research, which range from being incompatible to being mutually beneficial (Visser-Wijnveen et al., 2011; Brew, 2010; Healey et al., 2010). Studies on research productivity (number of publications, grant outcomes) and teaching effectiveness (student evaluations and peer assessments) have attempted to illustrate and quantify a relationship between the performance of academics as researchers and their effectiveness as teachers (Brew and Boud, 1995a; Jenkins and Zetter, 2003). A meta-analysis by Hattie and Marsh (1996) confirmed that teaching and research have a zero correlation while other researchers suggest that the connection cannot be quantified nor demonstrated readily (Brew and Boud, 1995b; Jenkins and Zetter, 2003; Grant and Wakelin, 2009; Visser-Wijnveen et al., 2009). However, many analysts agree on the educational potential of making a link between teaching and research even though there is no evidence that separating teaching and research impacts on teaching (Mclean and Barker, 2007).

Several argue that both research and teaching have a qualitative relationship with one influencing the other (Neumann, 1992; Smey, 1998; Visser-Wijnveen, 2009). The literature shows there is a strong rationale that research forms the discipline knowledge base of teaching and that research enhances teaching by introducing current topics and methodologies (Brew and Boud, 1995a; Baldwin, 2005). In a survey of 1592 academics, 95% of doctorate qualified academics believed that their teaching benefitted from their own research activities (Smey, 1998). This was supported by Brew (2010) after interviewing academic staff from an Australian university and highlighted the importance of research in their teaching.

Introducing students to the current research of their teachers was found to be motivational, leading students to perceive their courses to be up to date and intellectually stimulating (Neumann, 1994; Jenkins, 2004; Healey, 2005; Healey and Jenkins, 2009; Visser-Wijnveen et al., 2009), and students who were intrinsically motivated in their study were found to value a research culture (Breen and Lindsay, 1999). Other studies corroborated these findings and stated that students reported personal and intellectual development and academics viewed the students’ gains as professional socialisation into the sciences and being members, even peripherally of that community of practice (Breen and Lindsay, 1999; Hunter et al., 2006; Robertson and Blackler, 2006; Visser-Wijnveen et al., 2011). Seymour and colleagues (2004) interviewed a sample of 76 Science students taught by staff who had incorporated research into their teaching and reported positive outcomes such as increased confidence to do research; increased interest in their discipline; raised awareness of the research culture; improved and developed specific skills such as critical thinking; and a feeling of becoming part of the ‘scientific community’.

There are some examples in the literature on student experiences of learning from their teacher’s disciplinary research and its impact on their learning. In a recent study Jiang and Roberts (2011) compared the impact of using the lecturer’s own disciplinary research as the basis for a case study assignment with that of an assignment where the students had to review the academic literature to identify theoretical gaps as the basis for future research. Their findings indicated that students’ understanding of research was most informed when using the lecturer’s disciplinary research as the basis for their assignment. These students valued their teacher using his research in the course because of ‘his enthusiasm and his expertise and mentoring in doing research’ (Jiang and Roberts, 2011). Guerin and Ranasinghe (2010) showed that exposure to their teacher’s disciplinary research had an impact on the career choices made by the student. Their study examined the motivation of 39 PhD students to undertake postgraduate studies and showed that exposure to their lecturer’s research as undergraduate students strongly influenced their decision to enrol in postgraduate degrees.
If teaching and research have a positive relationship, then teaching should also enhance research (Smeby, 1998). Preparation of learning materials can expand the knowledge base of the academic and help clarify and place in context their research findings. Student feedback and questions can clarify and provide new research directions while sharing research findings with an appreciative audience has the potential to provide motivation for furthering one’s research (Marsh and Hattie, 2002; Jenkins, 2004). We hypothesise that designing learning resources that are based on research (both teacher’s and research in general) have a positive effect on both student attitude to learning and on academic research. The objective of the study described in this paper is to demonstrate the symbiotic relationship between students learning to engage with research and teacher’s disciplinary research.

The current study is conceptually aligned with the framework described by Healey (2005), which shows the links between teaching and research despite the conflicting assertions (described earlier) regarding links between teaching and research. Healey (2005) explains the relationship between teaching and research diagrammatically along two axes with student learning moving from being observers of research (teacher focused) to active participants undertaking inquiry oriented learning (student focused). The framework also shows teachers making a progressive shift from an emphasis on teaching research content to research processes and problems. Healey (2005) argues that students are most likely to gain deep learning and understanding when learning activities are increasingly student focused with an emphasis on research processes and problems. The study reported here falls into this category.

The study context

This study was conducted in a medical faculty of a research intensive multi campus Australian university. This university’s undergraduate medical program offered at both the local Australian campus and at an overseas campus is only available to applicants who have completed Year 12 studies (or equivalent) within the previous two years and have not undertaken other studies at tertiary level during that time. The course is an interdisciplinary program integrating biomedical sciences and clinical skills. The program incorporates four themes: (1) Personal and Professional Development, (2) Society, Population, Health and Illness, (3) Scientific Basis of Clinical Practice and (4) Clinical Skills. In the first two years of the course, basic medical and behavioural sciences are introduced within interdisciplinary units with a focus on clinical issues through clinical case studies. In the first two years of the course, at both campuses, all students complete the same academic program with no elective options. The Student Project Cases (SPCs) offered in the second year of the undergraduate medical curriculum, are designed to integrate these four program themes including enabling students to work effectively in teams, research the current literature on a clinically relevant topic and communicate findings by oral and written presentations (Macaulay and Nagley, 2008). Specifically, the SPCs aim to facilitate self-directed interdisciplinary learning, where students research and present a medical disease. Students work in small groups of 3-4 which are self-selected and are randomly allocated one of four topics. The SPCs are designed to engage students in enquiry-based learning and in scholarly knowledge-building communities through team work that draws on peer-to-peer learning, critical analysis, discussion, communication, negotiation, writing and presentation skills. Each group is assessed on the written document demonstrating their in depth research on the topic and an oral class presentation (Macaulay and Nagley, 2008).

One of the four SPC topics offered, entitled ‘Human papillomavirus and cervical cancer’, was based on the laboratory research of the main author of this paper who was at the time involved in researching into human papillomavirus (HPV) genotypes in patients diagnosed with cervical
dysplasia (Samarawickrema et al., 2011). This topic was selected because of its relevance to this particular student age group. A school based cervical cancer prevention vaccination programme had been introduced in Australia in 2007 and participants from the Australian campus in this study may have participated in this vaccination program. Also of relevance is cervical cancer, ranked the seventh leading cause of death by cancer among Australian women between ages of 15 to 44 (Ferlay et al., 2008).

As in the model described by Brew (2003) the SPCs enable student groups to engage in the social practice of research and knowledge building and work in a research community mirroring work of professionals in practice. Each group plans, develops and presents one of these medical cases or disease scenarios in a self-directed manner and are guided by a facilitator through a series of four scaffolded meetings as shown in Figure 1. Figure 1 also describes the SPC process, including the key activities and the main deliverables, leading to the final student presentations. This structure enabled the provision of ongoing feedback, mentoring, monitoring, problem solving if necessary leading to assessment.

Upon completion of the process described in Figure 1, students were invited to participate in this study.

**Figure 1: The SPC process**

![SPC Process Diagram]

**Method**

At the end of a timetabled lecture an academic staff member who played no academic role in this course briefed the students about the study, its objectives and the mixed methods approach to the study – the questionnaire and the focus group interview and invited volunteers to participate. It was important that the administration of the questionnaire and the focus group interviews were conducted after the formal assessment was completed so that students could participate with the assurance that their responses had no impact on their assessment. Students of the two cohorts (Australian and overseas campuses) completed the assessment for the SPCs at least one week prior to the commencement of the study.
Three hundred and fifteen (315) students were enrolled in the Australian campus while 100 students were enrolled in the overseas campus. One quarter of students from each cohort prepared the SPC on HPV and cervical cancer. Fifty nine students from the Australian campus (approximately 74% participation rate) and 21 students from the overseas campus (approximately 84% participation rate) who prepared the SPC on HPV and cervical cancer completed the questionnaire, bringing the total number of participants to 80. On completion of the questionnaire volunteers were invited to participate in a focus group interview to explore their attitudes as well as seek greater detail on survey foci. Participants were provided with the interview questions prior to the focus group to encourage more reflected responses. The two small focus groups were one hour in duration and were audio recorded. In order to maintain consistency the staff member who facilitated the discussion at the Australian campus (four participants) also facilitated the session with students from the overseas campus (three participants) via videoconferencing.

Questionnaire data were analysed using Excel and the interview data were de-identified, transcribed and analysed under three themes: (1) student understanding of and exposure to research; (2) student knowledge and understanding of the SPC topic HPV and cervical cancer; and (3) impact of research on student attitude to learning.

Results

Demographic data (Table 1) showed that majority of participants were female (63% from the Australian campus and 81% from the overseas campus) and aged between 20-22 years (58% from the Australian campus and 81% from the overseas campus). Students were mainly local. The Australian campus had 27% international students while the overseas campus had 29% international students.

Table 1:

Demographics of the two student cohorts participating in the study (total number of participants=80)

<table>
<thead>
<tr>
<th>Australian Campus</th>
<th>Overseas Campus</th>
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<tbody>
<tr>
<td>• <strong>Gender:</strong></td>
<td>• <strong>Gender:</strong></td>
</tr>
<tr>
<td>Female=63%</td>
<td>Female=81%</td>
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<tr>
<td>Male=37%</td>
<td>Male=19%</td>
</tr>
<tr>
<td>• <strong>Age range:</strong></td>
<td>• <strong>Age range:</strong></td>
</tr>
<tr>
<td>17-19 yrs: 42%</td>
<td>17-19 yrs: 19%</td>
</tr>
<tr>
<td>20-22 yrs: 58%</td>
<td>20-22 yrs: 81%</td>
</tr>
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</table>
Student understanding of research

The students were asked ‘what their understanding of research is’ and were provided options ('investigation of a subject by careful consideration and critical analysis' or 'investigation of a subject' or 'inquiry into a topic' or 'none of the above') from which they had to select one response that best reflected their understanding of research. Majority of students (78% from the Australian campus and 100% from the overseas campus) identified research to be 'an investigation of a subject by careful consideration and critical analysis'. The data indicates that the majority of students believed they were only occasionally exposed to reading the literature in peer reviewed journals (76% from the Australian campus and 90% from the overseas campus), had limited discussions about research with their peers and teachers (general and their own).

However, students' appreciation of their exposure to research is inconsistent between the two campuses. Overall, 19% of the overseas campus students in sharp contrast to the 3% Australian campus students claimed their teachers frequently presented their own research in the form of a project, an assignment, a lecture or a tutorial. 20% of the Australian campus students claimed their teachers never presented their research findings while 64% said occasionally. Of the overseas campus students, 19% said their teachers never presented their research while 52% answered occasionally. Also the students stated their teachers discussed elements of their research more often in the overseas campus (33%) than in the Australian campus (15%).

The focus group responses showed that students perceived 'research' as discovery ('Advancing the current knowledge base whether it is proving or disproving a topic which is already known or discovering new things' – Australian campus, participant A); investigation and data creation ('Research is all about investigating or doing studies and developing new primary data and collaborating lots of old primary data into a good secondary data' – Australian campus, participant B); and improving the human condition ('Research is to find out more about disease and its cure, to look at existing evidence whether it is clinical or laboratory based and fill in the blanks of a particular topic' – overseas campus, participant E).

Student knowledge and understanding of the SPC topic- HPV and cervical cancer

The students had varying knowledge of the topic, HPV and cervical cancer before starting the project. Only 29% of students from the overseas campus had a basic understanding of the topic as compared with the 56% of students from the Australian campus. As many as 63% of the Australian students (compared with 24% of students from the overseas campus) were aware of the role of HPV in the etiology of cervical cancer while 63% from the Australian campus were aware of strategies for the prevention of HPV infection as compared with 48% from the overseas campus. Most students from both campuses (58% from the Australian campus and 67% from the overseas campus) appreciated that this topic was relevant to their age group and the majority of both cohorts (54% from the Australian campus and 52% from the overseas campus) had a desire to research and learn more about specific sub-topics on HPV and cervical cancer.
Focus group participants supported this data commenting that the SPC deepened and broadened their knowledge base on this topic which they also realised to be relevant to them and their colleagues at this stage of their lives. Two participants from the Australian campus stated that:

‘The SPC on HPV and cervical cancer was particularly relevant, right at the moment Gardisil vaccination has come out. So I thought that was really interesting extrapolation of information’ (Australian campus, participant C) and.

‘I have always been more interested in things that I know will either affect me soon or affect the people I know soon a lot of my friends are getting HPV vaccinations. I find it a bit interesting and occasionally I could get this knowledge to my friends. So I am much interested in knowing which are relevant to either my age group or the people I know’(Australian campus, participant B).

Students valued the topic as it was current. The up-to-date findings made it an important and significant experience for them. ‘I was happy I got HPV and cervical cancer as my topic. Nobody had any more knowledge about the topic except that this is the virus that caused cervical cancer. So this topic was taken seriously as it was so current’ (overseas campus, participant F) and ‘For knowledge sake it is good to have current topics in our courses’ (overseas campus, participant G).

Researching into the topic has also helped participants to become more discriminatory consumers of information. ‘It’s also interesting that when you do see things in media like in the “60 Minutes” (Television program) or something like that like a programme on HPV vaccine and how it has been causing all sorts of horrible side effects and that kind of thing. And when you have done this sort of research you actually put yourself in the scene and you know the hard facts and it’s interesting to see how media twists these kinds of things. They all sort of give only one side of the story’ (Australian campus, participant A).

Impact of staff research on student learning

Students found the inclusion of staff research into their curriculum helped to broaden their knowledge base, develop their capacity to learn independently and improve their skills in enquiry. ‘I think it does have a role in you know being shown to us that people are doing research because you know learning how to do research is a very important skill to develop........’(Australian campus, participant D). Confirming this idea, another stated that; ‘It helps to work on a topic such as this because you read a lot about the topic and gather a lot of information. Also doing it on your own or as a syndicate group makes it more fun.... you learn more’(Overseas campus, participant E)

Feedback from students indicated that they were stimulated by the relevance of the information from an expert in the area and were enthused by the connections research made to the clinical context;

‘.......it was very interesting to look at the SPC presentation itself which was actually quite up to date, practical applications of research. Last year for example one of our lecturers was also involved in research here at the Alfred Hospital and she gave us a lecture on the action potentials and all that sort of thing. So she had that vast research base and I found that interesting’ (Australian campus, participant B); ‘It stimulates my interest because you can see it being used in the clinical context or in a research lab based context or whatever’ (Australian campus, participant A), ‘One of the lecturers discussed her research on maternal hypertension. It was so current that everyone was just fascinated’ (overseas campus, participant G) and ‘Because the topic was very current and relevant I wanted to learn more about it’ (overseas campus, participant F).
The importance of research and its relevance to improving human health was also inspirational to some; '......... if I can see that by doing this research it is relevant to people and will help them, then that's what's going to make me research' (Australian campus, participant B).

Students found it beneficial that the SPC was on their teacher's own research. The teacher's knowledge base incited confidence and a sense of being part of the research process and being close to 'the expert' was stimulating; 'I was glad that I got to do this topic rather than another topic because it was really based on my tutor's work and I knew I could discuss any aspect of this topic with her. To me it was exciting that my assignment was based on an aspect of her work' (Australian campus, participant A). 'It made it sort of more real and definitely made it current and realising that it is all current and that there is actually someone working on it within the university and that it was our supervisor made it exciting' (Australian campus, participant C). 'It was good to know that we can always go back to [the teacher] to check things as well because she did know about the topic specifically, so I think that was a good thing' (Australian campus, participant B) and 'It is an advantage if the staff member is researching in that area then they are going to know so much about that area and have a large knowledge base and if you ask them a question then they are able to give you a lot of information. It's great when they have got that immense knowledge it gives you more confidence in their knowledge base, personally I found it stimulating too.' (Australian campus, participant D).

Discussion and conclusion

Our data clearly demonstrated that the inclusion of research (in general and that of current staff) had a positive impact on student engagement with the topic and their attitude towards learning. Largely, the positive response of the students correlates with previous literature (Neumann, 1994; Jenkins, 2004; Healey 2005; Visser-Wijnveen et al. 2009) indicating that incorporating current staff research into the curriculum and designing captivating activities that engage students in the research process is an inspiring and exciting learning approach which demonstrates explicit linkages between curriculum approaches and current research.

There was broad agreement amongst both respondent groups about 'what research is' and its overall value although there was considerable variation in the way students experienced research, notably between the two campuses. These different student experiences at the two campuses may be due to different staff, their varying backgrounds and the limitation of the survey instrument itself and therefore merits further investigation.

The difference was more pronounced between the two cohorts of students with regard to their understanding of the SPC topic itself. This could be attributed to the publicity and the awareness campaign Australian students were exposed to prior to the introduction of the school based cervical cancer prevention vaccination programme in 2007 in Australia. Nevertheless, both student cohorts responded similarly by appreciating the relevance of the research and desiring greater exposure to some of its subtopics. Specifically students identified the topic of human papillomavirus and cervical cancer as being personally relevant to themselves and their age group. As a result of their research on the topic, students began to identify direct implications to their lives, draw connections with the workforce and into the clinical context, thus suggesting that they were beginning to develop a view of 'life after university'. In addition, the SPC process developed students' capacity for; enquiry and research, effective and perceptive communication. These are attributes and learning achievements graduates should have acquired upon completion of their university degree.
The positive relationship between research and teaching in this study is demonstrated by personal and professional gains for the students and the teacher. For the students these gains include the ability to research the literature, critically evaluate the collated information and communicate their findings formally in writing and through an oral presentation to their peers. This process of enquiry-based learning provided the opportunity for students to build on and integrate their existing knowledge on the topic of HPV and cervical cancer thus deepening their learning. In the process, the students became the experts, the providers of knowledge and confidently claimed ownership especially during class presentations. In this study student learning was stimulated because the activity was student centred, based on a topic of relevance to their lives (their specific age group) and inspired by the teacher’s disciplinary research (as explained previously). Overall, the students engaged in the process of intellectual development in thinking and behaving as researchers and being peripheral participants of that community of practice as suggested in Brew’s (2003) model.

For the teacher, appreciative feedback on the topic from students was motivational while the student responses and comments reinforced and consolidated the beneficial relationship between teaching and research (Marsh and Hattie, 2002; Jenkins, 2004; Garde-Hansen and Calvert, 2008). It has provided new research directions leading to furthering her disciplinary research to initiate a study on ‘Knowledge of HPV infections and cervical cancer and attitudes towards screening and prevention’ amongst medical undergraduates at these two campuses of the University. The varying exposures to research reported by the students of the current study has inspired the teacher’s research in the learning and teaching area, to investigate further students’ experience and understanding of research (staff research and research in general) and its impact on their learning within the University’s MBBS program incorporating students from the Australian (metropolitan and rural) and overseas campuses. Such data will provide insight into our approach in presenting research to our students; for example are we making the links between teaching and research explicit, can we make our teaching more effective as a result, can we make our students partners in this relationship? In fact this study has now been expanded to include several other courses (outside the MBBS program) within the university. This relationship is diagrammatically expressed in Figure 2 which illustrates the direct impact student feedback obtained from the current study had on the teacher’s research and therefore the positive and symbiotic relationship of the teaching-research nexus.

Figure 2: The teacher’s connections between her research and teaching

http://bejlt.brookes.ac.uk/paper/inspiring-student-and-teacher-through-research-led-teaching-a-pilot-study/
There are some limitations to the study. Both student cohorts were relatively homogeneous in terms of previous exposure to research as the course selection criteria ensures that all students are at a maximum two years post completion of secondary school and have not undertaken prior tertiary studies, as such information on previous research experience was not sought in the questionnaire survey. The small size of the focus groups could be perceived as another study limitation since the ideal number of focus group participants is recommended to be between 4 and 12 (Rice and Ezzy, 1999). However, there was good rapport among the group members that enabled in-depth discussion of ideas and each member was able to actively contribute to the discussion. Not being able to link the positive impact of the staff research with student learning and their performance in the assessment tasks is also a drawback of this study as is the fact that we could not evaluate the students who were allocated a topic other than HPV and cervical cancer. However, it should also be noted that this is a pilot study concerned with second year medical undergraduate attitudes.

At the crux of the teaching and research nexus presented in this study is the fact that the focus has shifted from the teacher’s current research to facilitating an inquiry based learning experience for students that is founded on the cross fertilisation of research from teaching. This approach further highlights the potential role played by the students as partners in the teaching and research relationship.

Learning experiences, such as the one described in this paper that ultimately inspire students to learn through exposure to research, by making research visible to them and providing opportunities to experience learning through research, add value to tertiary curricula. Facilitating students to work in teams widens their connections and sets the foundation to develop partnerships. These learning designs that make students active participants in knowledge acquisition require teachers to systematically design and build curricula, including assessment approaches, and supporting resources. This study points to the need to reflect on the topic itself; considerations of what topics are purposeful, how a topic could be justified and how the selected topic supports building students’ skills. Teachers in turn would benefit through professional development, especially exposure to exemplar learning designs and models of teaching and learning from the various disciplines in order to create rewarding learning experiences that build on the symbiosis between research and teaching. Structures surrounding the universities such as policy and technology to support group work may need to be reviewed to include these learning approaches.

Student awareness of research is a critical factor in the integration of research and teaching, and claims that teaching is research inspired are not credible unless students have a positive understanding of research. This study shows that students can potentially play a key role in consolidating the teaching-research nexus and undergraduate students need no longer think of research as remote, esoteric work their teachers engage in, with little connection to them. As this pilot study shows, the teaching-research nexus can be developed within the curriculum and provide a rewarding student experience as well as reinvigorate the teacher’s research pursuits.

References


http://bejft.brookes.ac.uk/paper/inspiring-student-and-teacher-through-research-led-teaching-a-pilot-study/
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http://bejlt.brookes.ac.uk/about,double-blind-review/

How to cite this paper.

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