Research Teaching Nexus: Case Study for Undergraduate Learning

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ABSTRACT

Purpose *– This paper investigates the learners' view on the connection between research and teaching, and develops a rationale for introducing the research teaching nexus awareness to the student learning process.*

Methodology *– This research uses case studies, sample groups, and interview tools to investigate the nexus reflection on student learning.*

Findings *– Findings indicate a moderate awareness of research-teaching nexus among the undergraduates. Results indicate that that undergraduate-level education can improve students' sustainable learning.*

Conclusions *– This study indicates that students had limited awareness of their instructors' research activities. Learners think that most research is carried out by other people than their instructors. Students report to have enhanced their knowledge about research activities.*

Research limitations *– The study indicates limited engagement of learners in research is not startle because the sample group participants were only starting their second year at the university.*

Practical implications *– This study brings up future research questions, to investigate more learners, from different curriculum programs to enhance the development of learners' views in relation to their learning practices. Although, students indicated to have little experience with research, they reported to have learned most when conducting research themselves.*

Originality/value *– This study uses an empirically-based quantitative method to improve the level to which undergraduate curriculum could be improved by research-based learning to change perceptions and behavior of class participants.*

Keywords, *Research-based teaching*, *research*, *teaching*, *nexus.*

INTRODUCTION

In academic institutions, there has been an increasing divide between the perceived importance of teaching versus research. Rowland (1996) stated that no issue is more basic in contemporary higher education than the negative views of academia due to the perception that academia creates superficial knowledge. In his view, the dispute can be outlined with regard to two theories: the compatibility theory and the incompatibility theory. In the incompatibility theory, research and teaching oppose each other and time dedicated to one suggests minimal time to the other. The compatibility theory assumes that both teaching and research have a positive effect on the other.

Many, if not most, academics regarding the connection between research and teaching to be positive (Jenkins et. al. and Jenkins and Zetter, 2003) support the compatibility theory. However, there is little empirical evidence on the link between the quality of teaching and quality of research. In a metacognitive study, Marsh and Hattie (2003) analyzed 58 studies and considered several descriptive models on the relationship between teaching and research. They found no link between the assessment of teaching and the outcome of research at the departmental and individual levels. Their conclusion was that the general perception that teaching and research are inseparably linked is a "myth". Terenzini et.al. (1994) expressed the view that the perception of a good researcher makes a good instructor is one of the several myths about higher education. In a large scale study (Marsh and Hattie, 2003) testing the relationship between research and teaching, they found no link and they could not identify possible solutions. Similar results were obtained by Euwals and Ward (2005).

While the presence of the perceived positive link has not been found, the conviction that the link exists remains (Ashwin, 2003). This resulted in either studies (Lindsay et. al., 2002, Robertson and Blackler, 2006) which searched for factors which would establish a clear link between research and teaching, or in articles or books that suggest approaches to improve the link. Brew and Boud (1995) stated that one of the problems is that there are no clear definitions for "research" and 'teaching'' because both concepts are difficult to define, let alone measure. They claim that it would be more effective to focus on student learning than on teaching assessment.

Those who advocate an efficient nexus between research and teaching focus upon the anticipated advantages that research can bring to teaching, in terms of benefits to student learning. The students' views of the nexus are not well understood and their experiences regarding the link between the two may add to the understanding of these concepts and the relationship between them (Elton, 2005). Recent research (Healey et. al., (2003) and Jenkins et. al., (2003) indicates that learners know that research is conducted at academic institutions although they are not fully aware of its implications. These studies find that learners find both positive and negative consequences of their instructors' involvement in research.

Barnett (2003) interviewed instructors and undergraduates to determine the effect of research-active instructors' use of updated instructional material in class to motivate student learning. Potential negative effects were unbalanced course programs, minimal time for exploring pedagogical methods and less time for undergraduates. The findings by Jenkins (2004) and Robertson and Bond (2005) indicate a similar result. They created focus groups with undergraduates who stated that the educational institution is seen to be more desirable when famed researchers are teaching. Unfortunately, undergraduates did not view themselves as stakeholders in the research process of their instructors.

There are suggestions that the relationship between research and teaching is moderated by various factors. Newman (1994) and Breen and Lindsay (1999) indicated that the relationship is based on motivation of the undergraduates, subject, type and goals of the course, and the possibility to interact with the instructor. While most studies focus on senior undergraduates, little is known about the perceptions of junior undergraduates. The George Washington University, a research-driven university, recognizes the relevance of a close relation between teaching and research in its educational concept (Pocklington and Tupper, 2002). Their study found a linking of research to teaching, with all undergraduates participating in research as often and as early in the program as possible.

This study seeks to develop an understanding of undergraduates' views of the relationship between research and teaching and its effectiveness on their learning. This research study is a first small-scale endeavor to assess undergraduates' views of the research-teaching nexus in a department of mathematics. There are two research questions: i) What are undergraduates' views of the research activities of their instructors and ii) How do undergraduates appreciate the connection between research and teaching?

To determine undergraduates' views of the research activities of their instructors, whether these activities enhance the quality of teaching in class, and whether there is an awareness of the connection between research and teaching, a questionnaire derived from that developed by Healey et. al, (2003) was used. The questionnaire evaluates undergraduates' awareness of the research of their instructors, assesses the undergraduate experience in the research-teaching nexus, and the student assessment of their research-active instructors.

The questionnaire includes 51 closed-ended questions consisting of three types: 16 questions were evaluated by using *Likert* type scale from 1 (strongly disagree) to 5 (strongly agree), 33 questions were analyzed by using yes or no responses, and 2 questions used a particular answer scale. Of the 51 questions, there were 3 open-ended questions and 4 identification questions.

There were two groups of academic instructors: professors and teaching assistants. Professors were academic instructors who held a Doctoral degree and who connect research with teaching. Teaching assistants, who prepare for a Doctoral degree, conduct basic research and teach mainly laboratory sessions. This research

sample size included 27 first year undergraduates. The response rate was 86%. The results were to be considered explorative and indicative.

FINDINGS

Undergraduates' views of research active instructors

Some undergraduates know that research is conducted at University (see Table 1 below), but not all are aware of research conferences, webinars and seminars (mean: 3.37) and the presence of centers for research (mean: 3.33). Many knew that some fields of research are internationally and nationally recognized (mean: 3.41) and that posters and reports about research were presented and prepared (mean 2.78) as well as scientific papers and chapters of books and whole books were written (mean: 3.22). It is interesting that no students strongly disagreed with any of the statements, and those that agreed (agree or strongly agree) with the statements greatly outnumbered those who disagreed to some degree (disagree or strongly disagree).

Table 1: Undergraduates' awareness of research activities in the University (n=27)

Undergraduates' awareness that at the University are:		*Strongly Agree (4)*	*Agree (3)*	*Neutral (2)*	*Disagree (1)*	*Strongly Disagree (0)*	*Mean Value*
1	Research conferences, webinars, and seminars.	14	10	2	1	0	3.37
2	Centers for research	16	6	3	2	0	3.33
3	Fields of research that are internationally and nationally recognized	13	12	2	0	0	3.41
4	Presented posters and reports about research	8	7	9	4	0	2.78
5	Research published in scientific journals and written chapters of books or whole books.	13	10	3	1	0	3.22

It is interesting that only 4% of respondents believe that at least 80% of their instructors were research-active (see Table 2). Most respondents (82%) felt that between 40-80% of their instructors were research-active. The respondents underrated the number of research active instructors. Most undergraduates believe these research active instructors are similar to other university instructors (33%) or stated that they do not know (7%).

Table 2: **Distribution of undergraduates' views of the percentage of their instructors involved in research** (n= 27)

Percentage of instructors involved in ongoing research		81-100 [%]	61-80 [%]	41-60 [%]	21-40 [%]	1-20 [%]	None [%]
1	Number of undergraduates' views	1	7	10	5	2	2
2	Percentage of undergraduates'	4%	26%	37%	19%	7%	7%

Undergraduates appear to be not well informed about the different research activities of their instructors (see Table 3). Three out of four undergraduates know that their teaching assistants are working on a D.Sc. degree. Less than half the undergraduates know that their instructors are involved in industry-sponsored research. They are less informed about academic instructors guiding their teaching assistants than about professors mentoring master degree graduates in their scientific research (respectively 30% and 44. Only 22% of the respondents are aware their instructors work on research projects.

Table 3: Undergraduates' awareness of particular research involvement by their instructors.

Awareness of undergraduates that their instructors are:		Percentage [%] of undergraduates' positive replies (n=27)
1	Mentoring D.Sc. graduates	74
2	Involved in non-sponsored research	7
3	Involved in industry sponsored research	41
4	Publishing research work	22
5	Supervising master degree graduates in their scientific research	44
6	Supervising teaching assistants in their scientific research	30

First year undergraduates stated (see Table 4) that they had limited knowledge of research done at undergraduate level. Approximately half the respondents (52%) were made aware of their instructors' research when these instructors shared their research results during classes. Relatively few students read scientific papers written by their instructors (22%) or engage in instructors' research as participants in sample groups in studies (26%). Undergraduates report having had no experience with research activities or engaging in research seminars, producing a research project as part of a course, or writing research scientific papers. There were no undergraduates to state that they had experience as research assistants, prepared a thesis or wrote a research paper. Although practical laboratories supported part of the curriculum, two of the undergraduates (7%) reported to have had developed research skills.

Table 4: Undergraduates' understanding of the research-teaching nexus.

	Undergraduates' understanding of research-teaching nexus	Percentage [%] of undergraduates' positive replies (n=27)
1	Instructors share research results with students	52
2	Students read scientific papers written by their instructors	22
3	Students engagement in instructors' research work	26
4	Students who worked as research assistants	7

Most undergraduates did not have prior knowledge of their instructors' involvement in research activities and that there were not aware of the research activities at the university level. The results in Table 5 shows that undergraduates' experience with research development at university level is weak. While some students read papers (22% or had research presented in class by their professors (52%), few attended or participated in seminars, participated in conferences, or had developed basic research skills.

Table 5: Undergraduates' experiences with research development at university level.

What was your undergraduate experience in research? Percentage of students who answered positively		Percentage [%] of undergraduates positive replies (n=27)
1	Instructors shared research experience and results with students during class	52
2	Students read scientific papers written by their own instructors	22
3	Students participated in a departmental seminars where guest researchers present their scientific papers seminars	11
4	Students attended research seminars outside their classrooms	4
5	Students participated at a conference or research day, organized by the University	4
6	Students developed research skills and techniques (e.g. analyzing data, statistical techniques) because some instructors used research-based component in their class	0
7	Students prepared research project as requirement of completion of their course	7
8	Some students were active as a research assistants to their instructor's research activity	4
9	Students developed research skills in preparing scientific papers for Conferences	4
10	Students cooperated with graduate students in developing of a research project	4

Participants in the sample group expressed varies opinions about the connection between research and teaching (Table 6). The participants feel it is important for their instructors to be engaged in research (mean: 3.44), and indicated they perceive an effectiveness in connecting research and teaching (mean: 3.22). They were relatively unaware of their instructors' research interests (mean: 2.30), and at the time of their enrollment, students were not aware of the research reputation of their future instructors (mean: 2.51).

It is important for instructors to introduce research components in their classes to help students develop research skills. Undergraduates feel that teaching in traditional classes is most efficient when instructors use research results in class and ask undergraduates to conduct research activities (mean: 3.11). The perception to connect research and teaching is viewed as important (mean: 3.03), though less than active engagement. Students' motivation to engage actively in their instructors' research is somewhat weak (mean: 2.88). Undergraduates have no strong opinion for the time they need to dedicate to develop research skills in their academic programs (mean: 2.40).

Table 6: **Undergraduates' perceptions about connecting research and teaching** (n=27)

	Students are aware of the following:	*Strongly Agree (4)*	*Agree (3)*	*Neutral (2)*	*Disagree (1)*	*Strongly Disagree (0)*	*Mean Value*
1	Instructors research interests	4	10	7	2	4	2.3
2	Research reputation of future instructors, at the time of students enrollment at the academic program	4	10	9	4	0	2.51
3	Instructors' engagement in research activities	14	11	2	0	0	3.44
4	Learning by doing research	12	10	4	1	0	3.22
5	Lack of time for research	3	7	15	2	0	2.40
6	Effectiveness of connecting research and teaching	8	13	5	1	0	3.03
7	Instructors' effective teaching by introducing research components in class and asking students to do research	7	15	5	0	0	3.11
8	Effective learning by developing research skills by engaging in instructors' research activities	6	12	9	0	0	2.88

Although undergraduates support their instructors' engagement in research, respondents only indicate weak recognition of advantages of research in teaching (Table 7). Few undergraduates indicate either being motivated to learning about their discipline (11%) or knowing more about particular research in the discipline (11%), because of instructor's involvement in research. Nineteen percent of undergraduates plan to conduct research in the discipline in the future. At the same time undergraduates do not indicate that they have understanding of the research process, or development of their research skills. The students are not keen to pursue an advanced degree in their subject area.

Table 7: **Undergraduates' views on advantages of research involvement of instructors**

The advantages to students by their instructors involvement in research:		Percentage [%] of undergraduates positive replies (n=27)
1	Undergraduates understand the subject discipline better	7
2	Undergraduates can develop research skills better	4
3	Undergraduates are more motivated to engage in their instructors research	11
4	Undergraduates are motivated in obtaining additional degree in the particular discipline.	4
5	Undergraduates are informed of the issues in their discipline	11
	Undergraduates are motivated to do research	22

Undergraduates do not appear to experience any negative issues from instructors' involvement in research (see Table 8). Undergraduates indicate that some instructors and teaching assistants are not capable of explicitly explaining the instructional material (11%). However, undergraduates are not expressing dissatisfaction with regard to their instructors' teaching.

Table 8: **Undergraduates' negative experience of instructors involved in research**

Undergraduates' negative experience of instructors involved in research:		Percentage [%] of undergraduates positive replies (n=27)
1	Instructors are not available to help me in my learning process	0
2	Instructors cannot explain explicitly the instructional material	11
3	Instructors have minimal interest in my research activity	0
4	Instructors are interested in teaching	4

DISCUSSION

The results obtained by the authors of this research are supported by these found by Healey et. al., (2003). These results show that undergraduates had limited awareness of their instructors' involvement in research, which aligns with previous conducted research by Zamorski, (2002). In this research, first year students show little or no knowledge of the advantages and disadvantages of research-teaching nexus in contrast to the research conducted by Coete et. al., 2001, Gibbs, 2000, Healey, 2003, and Newmann, 1994. The authors of this research used focus groups and interviews where students were not explicit in their views as they were responding by writing the questionnaire, as Healey's et. al., (2003) suggested. Neumann (1994) and Healey et al., (2003) suggested to investigate more advanced undergraduates, while this research focused on first year undergraduates that showed some limitations to the undergraduates that were viewed as negative outcomes of research.

The undergraduates' limitation in conducting research was not a surprise because the learning of subjects only started in their second year at the university. The results indicate that most students knew of the scientific articles and books were available at the University bookstore but not that not all their instructors were active in scientific research (Table 2). And one undergraduate appears to be aware that the instructors were actively involved in writing scientific papers. This could be an argument for the students to view that most research articles were written by other people and not their instructors. This may help the undergraduates to believe that there are other types of instructors who are only involved in research and these who teach do little to none research. Another finding was that undergraduates recognized to have had minimal research experience at the university and also that they learnt most when conducting research themselves. The results indicate that the undergraduates' motivation to involve in research is little to none. This research study could be further enhanced by investigating more undergraduates, from different fields of specializations. A follow up study would be needed to find out more about the development of undergraduates' views on connecting research, teaching, and their learning experiences.

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