

*Nexus Between Research and Teaching: Fostering Students' Expectations of
Research-Informed Teaching Approaches*

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Abstract

Integration of research and teaching in higher education can provide valuable ways of enhancing the student learning experience, but establishing such integrative links can be complex and problematic given different practices and levels of understanding. This study contributes to the pedagogical literature in drawing on findings from students' survey exploring perceptions of research-informed teaching, to examine how links between research and teaching can be suitably strengthened. The study employed a descriptive research design limited to the undergraduate students taking thesis/capstone courses in the tertiary levels as respondents of the study. The survey was undertaken within the remit of a broader institutional educational enhancement project of McLinden & Edwards, 2011. The findings noted that the students' responses from different disciplines: engineering, science, education, business related and computer on the nexus between research and teaching is remarkable in fostering student expectations of research-informed teaching approaches. Students' expectations on research-led, research-oriented, research-based and research-tutored are enablers in linking research and teaching. It is recommended that experimental studies should be conducted using the four different research-informed teaching approaches in the classroom namely: research-led, research-oriented, research-based and research-tutored.

Keywords: Research-Led, Research-Informed Teaching, Research-Oriented Teaching, Research-Tutored, Research-Based

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Introduction

Integration of research and teaching in higher education can provide valuable ways of enhancing the student learning experience, but establishing such integrative links can be complex and problematic given different practices and levels of understanding, (Cleaver et al. (2014). For many higher education institutions, the idea of a "symbiotic relationship between research and teaching constituting the very core of higher education" (Robertson 2007) has served as a crucial pillar. These two core strands of activity are frequently referred to as a "research-teaching" nexus.

Undergraduate education is thought to be fundamentally reliant on teaching strategies that are 'research-informed'. By combining the activities of "research" and "teaching and learning" within an institution, for instance, a recent publication by the Russell Group (Russell Group, 2014) notes that the experience of learning within a research-intensive environment can help students "take their thinking to a new level and develop skills they need for a wide range of careers." However, it is noted that this "experience" is not something that just happens and that "academics and universities must take proactive steps to bring them together."

Activities related to teaching and research at the departmental level are frequently organized in different committees, for instance. Incorporating undergraduate students into the departmental research community and engaging them in research and inquiry may therefore be hampered by structural and perceptual hurdles (see, for instance, Coate, Barnett, & Williams, 2001; Durning & Jenkins, 2005). As a result, Jenkins (2004) remarked that there might not be a straightforward functional relationship between "quality" in research and "quality" in teaching at the departmental level. As staff research may be too far ahead of the undergraduate curriculum, for instance in several sciences, it has also been noted that it may be challenging to draw clear connections between staff research and learning.

The purpose of this study is to determine the nexus between research and teaching towards fostering student expectations of research-informed teaching approaches such as research-led, research-oriented, research-tutored and research-based learning. Moreover, to determine the basis to keep the curriculum up to date and active and to engage with developments in the field and link to developments in the teaching of the faculty. It also purposely establish that courses are designed in ways that support the development of learning outcomes appropriate to the knowledge economy, including appropriate pedagogy – that is, students experiencing research and developing research skills. Further, embedding research –informed teaching in institutional structures, gives light in understanding the integration of research and teaching; cultivating student expectations and supporting transition and achieving pedagogic resonance through systematic embedding of research within a student curriculum. Hence, the study is propose.

Research Methodology

The study employed a descriptive research design limited to the 100 undergraduate students taking thesis/capstone subjects in the tertiary level in Bahrain. All quantitative data were gathered through Google forms. For the statistical treatment of data, frequency counts, means, and standard deviations were used to describe the data. Parametric test such as t-test was used to test the following: (a) difference between teaching approaches and enablers and barriers to linking research and teaching; and (b) difference between the perceived barriers to

linking research and the impact or research-informed teaching approaches. A 0.05 level of significance was used to determine the significance of the results.

Results and Discussions

The data presented include research-informed teaching understood and practiced, enablers and barriers to linking research and teaching, impact of research-informed teaching approaches on the student learning experiences, difference between teaching approaches and enablers and barriers to linking research and teaching.

Research-Informed Teaching Understood and Practiced

The integration of research and teaching in higher education can provide valuable ways of enhancing the student learning experience, establishing such integrative links can be complex and problematic given different practices and levels of understanding.

Research-Led Teaching

Research-led teaching is a teaching approach is all about where students are taught research findings in their field of study. It is a significant skill that students may possess to be future competitive professionals in their chosen field. As stated by Kelly (2020), to wit:

I believe research-led teaching can offer perfect conditions for learning. Some of the best research in the world goes on here, so there's an opportunity for us to have the best teaching in the world.

Table 1 presents the means and standard deviations on the research-led teaching of learning about the research of others.

Table 1 Means and Standard Deviations on the Research-led teaching of Learning about the Research of others

<i>Indicators</i>	<i>n</i>	<i>Learning about the Research of others</i>		<i>Description</i>
		<i>M</i>	<i>SD</i>	
Students learn about research findings through a curriculum content which consists largely of staff or current disciplinary research interests.	100	3.92	0.64	Agree
It can provide examples and ways of illustrating ideas, concepts and theories.	100	4.46	0.52	Agree
Some or a lot of the teaching may rely on information transmission, for example through traditional lectures or set reading.	100	4.08	0.76	Agree
There may be a focus on memorizing the key facts that have emerged from research in the discipline.	100	4.08	0.49	Agree
Also known as research-led teaching.	100	4.23	0.60	Agree

Note: A five-point likert scale, responses on this table - maximum score is 5 and the minimum score is 3.

The students agreed that research-led teaching of learning about the research of others provide examples and ways of illustrating ideas, concepts and theories with a mean of 4.46

and a standard deviation of 0.52. In addition the students concurred that, *provide examples and ways of illustrating ideas, concepts and theories and there may be a focus on memorizing the key facts that have emerged from research in the discipline* considered as research-led teaching of learning about the research of others. Further, the students agreed that research-led teaching of learning about the research of others *learn about research findings through a curriculum content which consists largely of staff or current disciplinary research interests* with a mean of 3.92 and a standard deviation of 0.64. As reflected in the result, this is in contrast to the Jenkins (2004) reports that students tend to vary in their attitudes to staff research depending on their academic orientation to their studies, noting that disciplinary variations tend to occur in teaching-research relations which are shaped by how disciplinary communities conceive the nature of knowledge, research and teaching, the forms of pedagogy and curricula in different disciplines, and for some disciplines. On the other hand, the students agreed that research-led teaching of learning about the research of others *also known as research-led teaching* with a mean of 4.23 and a standard deviation of 0.60. This finding also validates the findings of Healey (2005), research-led teaching is a teaching approach is all about where students are taught research findings in their field of study.

Research-Oriented Teaching

Research-oriented teaching, this teaching approach is all about where students learn research processes and methodologies. Table 2 presents the means and standard deviations on the research-oriented teaching of learning about the research processes. The students strongly agreed that research-oriented teaching of learning about the research processes is significant in the teaching-learning, as stated in the indicator *the curriculum emphasises as much the processes by which knowledge is produced as knowledge that has been achieved, for example learning about, and critiquing, different research methods* with a mean of 4.54 and a standard deviation of 0.66. Moreover the students agreed that, *students learn about how to undertake their own research within their discipline and try to engender a research ethos through their teaching, for example by encouraging students to begin to think like researchers, and not simply accept others' research findings as given* with a mean of 4.38 and a standard deviation of 0.65.

Table 2: Means and Standard Deviations on the Research-oriented teaching of Learning about the Research Processes

<i>Indicators</i>	<i>n</i>	<i>Learning about the Research Processes</i>		<i>Description</i>
		<i>M</i>	<i>SD</i>	
The curriculum emphasises as much the processes by which knowledge is produced as knowledge that has been achieved, for example learning about, and critiquing, different research methods.	100	4.54	0.66	Strongly agree
Students learn about how to undertake their own research within their discipline and try to engender a research ethos through their teaching, for example by encouraging students to begin to think like researchers, and not simply accept others' research findings as given.	100	4.38	0.65	Agree
Also known as research-oriented teaching.	100	4.46	0.52	Agree

Note: A five-point likert scale, responses on this table - maximum score is 5 and the minimum score is 3.

The students confirmed that all the indicators mentioned in the table considered as research-oriented teaching of learning about the research processes. The students' responses coincided with Manu (2016), to wit:

The knowledge of methodology provides good training especially to the new research worker and enables him to do better research. It helps him to develop disciplined thinking or a 'bent of mind' to observe the field objectively.

Nevertheless, this finding could be attributed to the fact that research-oriented teaching is all about where students learn research processes and methodologies Healey (2005).

Research-Based Teaching

Research-based teaching approach is all about where students learn as researchers and develop research skills on actual projects led by academic staff. Table 3 presents the means and standard deviations on the research-based teaching or enquiry – based learning of learning as researchers

Table 3: Means and Standard Deviations on the Research-based teaching or enquiry – based learning of Learning as Researchers

<i>Indicators</i>	<i>n</i>	<i>Learning about the Research of others</i>		<i>Description</i>
		<i>M</i>	<i>SD</i>	
The curriculum is largely designed around enquiry-based activities.	100	4.00	0.58	Agree
Enquiry-based learning can be described as learning that arises through a structured process of enquiry within a supportive environment, designed to promote collaborative and active engagement with problems and issues; examples include case studies, problem-solving activities, field trips and simulations.	100	4.08	0.86	Agree
The differentiation between teacher and student roles is minimized: both are participants in the enquiry process, with the teacher acting as the more experienced 'partner'.	100	4.38	0.65	Agree
Also known as research-based teaching or enquiry-based learning.	100	4.00	0.58	Agree

Note: A five-point likert scale, responses on this table - maximum score is 5 and the minimum score is 3.

As reflected in the table above, in the research-based teaching or enquiry – based learning of learning as researchers, the students agreed that *the differentiation between teacher and student roles is minimised: both are participants in the enquiry process, with the teacher acting as the more experienced 'partner'* with a mean of 4.38 and a standard deviation of 0.65. This result also validates the findings of Healey (2005) which states that, research-based teaching means actively engaging students in research and inquiry.

Further, the students acknowledged the importance of research-based teaching, as the students rated the indicator *enquiry-based learning can be described as learning that arises through a structured process of enquiry within a supportive environment, designed to promote collaborative and active engagement with problems and issues; examples include case studies, problem-solving activities, field trips and simulations* with a mean of 4.08 and a standard deviation of 0.86. The claimed of the students coincided with the result of the study of Granjeiro, E.M. (2019) which cited that the students were able to express their difficulties during this process, as well as to give their views about the contribution of research-based teaching. The use of research-based teaching can increase the commitment and collaboration of the student during the teaching-learning process.

Research-Tutored Teaching

Research-tutored teaching approach is all about where students learn through critique and wide-ranging discussion between themselves and staff who can draw upon a deep understanding of thinking and knowledge in their field. Table 4 presents the means and standard deviations on the research-tutored teaching of critiquing others' research.

Table 4: Means and Standard Deviations on the Research-tutored teaching of critiquing others' Research

<i>Indicators</i>	<i>n</i>	<i>Learning about the Research of others</i>		<i>Description</i>
		<i>M</i>	<i>SD</i>	
Focuses on the critical appraisal of research and moving research forward. This includes critical literature reviews and critical discussions about research papers.	100	4.46	0.66	Agree
Students typically participate in small group discussions with or without a teacher to consider research findings.	100	4.23	0.60	Agree
Also known as research-tutored teaching.	100	4.08	0.76	Agree

Note: A five-point likert scale, responses on this table - maximum score is 5 and the minimum score is 3.

The result of the study posed valuable insight into the research-tutored teaching. Students confirmed that critiquing others' research also known as research-tutored teaching. Moreover, students' rate on *focuses on the critical appraisal of research and moving research forward*. This includes critical literature reviews and a critical discussion about research papers is high with a mean of 4.46 and a standard deviation of 0.66. Further, *the students typically participate in small group discussions with or without a teacher to consider research findings* is a great consideration in the research-tutored teaching with a mean of 4.23 and a standard deviation of 0.60. The claimed of the students coincided with the findings of Nicholson (2017) research-tutored" would be better described as "student-focused"; the emphasis is on students learning by doing.

Perceived Enablers and Barriers to Linking Research and Teaching

On the context of perceived enablers and barriers to linking research and teaching, as stated by (Nelson, Leffler & Hansen, 2009), to wit:

They need to be communicated in brief summaries showing: how findings fit into the wider context, with suggestions for action; using straightforward language without jargon, light on both referencing and statistics; having examples, illustrations, anecdotes and analogies that teachers can relate to their own experiences, and providing practical decision-making guidance.

Table 5 presents the means and standard deviations on the perceived enablers and barriers to linking research and teaching.

Table 5: Means and Standard Deviations on the Perceived Enablers and Barriers to Linking Research and Teaching

<i>Indicators</i>	<i>n</i>	<i>Perceived enablers to linking research and teaching</i>		<i>Description</i>
		<i>M</i>	<i>SD</i>	
Research attitudes of the learner.	100	4.38	0.87	Agree
Personal time management	100	3.62	1.19	Agree
Capability of teacher to link research and teaching	100	4.08	0.86	Agree
<i>Perceived barriers to linking research and teaching</i>				
Lack of support	100	4.31	0.63	Agree
Lack of training/experience	100	4.31	0.63	Agree
Lack of resources	100	4.23	0.73	Agree

Note: A five-point likert scale, responses on this table - maximum score is 5 and the minimum score is 2.

Table 5 indicates that, the students perceived *research attitudes of the learner* as enabler to linking research and teaching with a mean of 4.38 and a standard deviation of 0.87. Followed by *capability of teacher to link research and teaching* with a mean of 4.08 and a standard deviation of 0.86, the students agreed that appropriate knowledge of teacher is significant in linking research and teaching. Furthermore, the students confirmed that *personal time management* with a mean of 3.62 and a standard deviation of 1.19 is an enabler to linking research and teaching; the students agreed that appropriate time management will attain the goal of linking research and teaching. Further, the students perceived *lack of support* and *lack of training/experience* are barriers to linking research and teaching with a mean of 4.31 and a standard deviation of 0.63. Moreover, *lack of resources* is also acknowledged by the students as a barrier in linking research and teaching.

Research-Informed Teaching Approaches on the Student Learning Experiences

Research-informed Teaching may involve: • students learning about others' research; • students learning to do research; • students learning about their discipline in research or inquiry mode; and/or • research that informs staff about their teaching. Well designed, these activities assist students to understand the role of research in learning and how knowledge is constructed and produced within their discipline. This creates a bridge between teaching and research for teacher and student. An effective Research-informed Teaching approach means that all students studying for the degree award will develop the skills of critical inquiry, such as critical appraisal, reflection and analysis, problem-solving, and the ability to apply evidence-based solutions. Table 6 presents the means and standard deviations on the impact of research-informed teaching approaches on the student learning experiences.

Table 6: Means and Standard Deviations on the Impact of Research-informed Teaching Approaches on the Student Learning Experiences

<i>Indicators</i>	<i>n</i>	<i>Impact of Research-informed Teaching....</i>		<i>Description</i>
		<i>M</i>	<i>SD</i>	
Providing first-hand, relevant and practical knowledge.	100	4.46	0.66	Agree
Stimulating students' trust in the lecturer and interest in the course.	100	4.23	0.60	Agree
Modeling expert thinking.	100	4.31	0.63	Agree
A new way of learning that is active and challenging.	100	4.38	0.51	Agree
Learning to learn through research skills.	100	4.15	0.38	Agree
In-depth and up-to-date knowledge.	100	4.46	0.78	Agree

Note: A five-point likert scale, responses on this table - maximum score is 5 and the minimum score is 3.

As gleaned from the table, the students confirmed that *providing first-hand, relevant and practical knowledge* and *in-depth and up-to-date knowledge* as a research-informed teaching approaches have great impact on the student learning experiences with a mean of 4.46 and a standard deviation of 0.66. Moreover, modeling expert thinking and a new way of learning that is active and challenging are platforms on research-informed teaching that have challenging impact on student learning experiences. These findings accept the framework of Matheson (2010) teaching can be research-informed in the sense that it draws consciously on systematic inquiry into the teaching and learning process itself.

Difference Between Teaching Approaches and Enablers and Barriers to Linking Research and Teaching

Table 7 presents the independent sample t-test comparing the teaching approaches and enablers and barriers to linking research and teaching.

Table 7: Independent Sample t-test Comparing the teaching Approaches and Enablers and Barriers to Linking Research and Teaching

<i>Variables</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Research-led teaching	100	4.15	0.11	-0.09	0.93 _{ns}
Enablers & Barriers	100	4.11	0.24		
Research-oriented teaching	100	4.38	0.26	1.79	0.58 _{ns}
Enablers & Barriers	100	4.11	0.24		
Research-based teaching	100	4.12	0.13	-0.24	0.41 _{ns}
Enablers & Barriers	100	4.11	0.24		
Research-tutored teaching	100	4.26	0.08	0.73	0.24 _{ns}
Enablers & Barriers	100	4.11	0.24		

****p<0.05, significant.***

As reflected in the table there was no significant difference in the scores for research-led teaching (M=4.15, SD=0.11) and perceived enablers and barriers to linking research and teaching (M=4.11, SD=0.24) with; -0.09=t-value; 0.93 = p-value. There was no significant difference in the scores for research-oriented teaching (M=4.38, SD=0.26) and perceived enablers and barriers to linking research and teaching (M=4.11, SD=0.24) with; 1.79=t-value;

0.58 = p-value. There was no significant difference in the scores for research-based teaching (M=4.12, SD=0.13) and perceived enablers and barriers to linking research and teaching (M=4.11, SD=0.24) with; -0.24=t-value; 0.41 = p-value. There was no significant difference in the scores for research-led teaching (M=4.26, SD=0.13) and perceived enablers and barriers to linking research and teaching (M=4.11, SD=0.24) with; 0.73=t-value; 0.24 = p-value. Delving deeper into the result, the students' responses from different disciplines: engineering, science, education, business related and computer science on the nexus between research and teaching is remarkable in fostering student expectations of research-informed teaching approaches. Students' expectations on research-led, research-oriented, research-based and research-tutored are enablers in linking research and teaching.

Difference Between Barriers to Linking Research and Teaching and the Impact of Research-Informed Teaching Approaches

Table 8 presents the independent sample t-test comparing the enablers and barriers to linking research and teaching and the impact of research-informed teaching approaches.

Table 8: Independent Sample t-test Comparing the Enablers and Barriers to Linking Research and Teaching and the Impact of research-informed teaching Approaches

<i>Variables</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>T</i>	<i>p</i>
Enablers and Barriers to Linking Research and Teaching	100	4.11	0.24	-1.42	0.09 _{ns}
Impact of research-informed teaching Approaches	100	4.31	0.15		

**p<0.05, significant.*

As gleaned from the table there was no significant difference in the scores for perceived enablers and barriers to linking research and teaching (M=4.11, SD=0.24) and impact of research-informed teaching approaches (M=4.31, SD=0.15) with; t-value=-1.42 and p-value = 0.09. The result establishes the fact that, the students' responses from different disciplines: engineering, science, education, business related and computer science confirmed that enablers and barriers to linking research and teaching and the impact of research-informed teaching approaches are factors on the nexus between research and teaching.

Conclusion

In particular, it offered insights into the ways in which research-informed teaching relationships were interpreted and embedded within disciplines, the enablers and barriers/difficulties to linking research and teaching and the perceived impact on the student learning experience. The findings noted that the students' responses from different disciplines: engineering, science, education, business related and computer on the nexus between research and teaching is remarkable in fostering student expectations of research-informed teaching approaches. Students' expectations on research-led, research-oriented, research-based and research-tutored are enablers in linking research and teaching.

In this study, it is recommended that the type of approaches that could support more active student engagement in the curriculum is important and call for the sharing of more curriculum examples from within the disciplines. Experimental studies should be conducted using the four different research-informed teaching approaches in the classroom namely: research-led, research-oriented, research-based and research-tutored.

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