ISSN (Print) : 2231-6043
ISSN (Online) : 2395-1907

Nitte Management Review, *Vol 12(1&2), DOI : 10.18311/nmr/2018/v12i1&2/24210, 20–29, January-December 2018*

The Research-teaching Nexus in an Autonomous Institution: A Case Study of Post Graduate Students' Awareness, Experiences and Perceptions of Research

P. Srinivasa Pai[1*], Niranjan N. Chiplunkar[2], Shashikantha Karinka[2] and B. R. Shrinivasa Rao[2]

[1]Department of Mechanical Engineering, NMAM Institute of Technology, Nitte, Karkala – 574110, Karnataka, India; srinivasapai@nitte.edu.in
[2]NMAM Institute of Technology, Nitte, Karkala – 574110, Karnataka, India

Abstract

Research in higher education is an integral aspect of the teaching-learning process, particularly Post Graduate (PG). One of the important indexes, which are used to evaluate the progress of any nation, is its progress in Research and Development (R and D). The vast improvements in Science and Technology and its impact on human life are mainly due to sustained research and innovation. Technical education is not exception to this. Hitherto IITs, NITs, IISc and other government R and D organizations were active in research, but now it has percolated to all the technical institutions. One reason attributed to this is an increase in number of PhDs required and produced per year in the country. In this context, to meet the ever-increasing demand for PhDs in the country, there is a need to inculcate a sense of 'research culture' among the students, particularly PG. This paper is an attempt to understand the influence of faculty research on the students' learning outcomes and how it motivates them to take up research in their future career. The study has been carried out at the authors' institution, which is an autonomous institution. A standard questionnaire survey has been carried out among all the PG students of the institution and the results of the findings are presented, with some suggestions for strengthening the research-teaching nexus.

Keywords: Awareness, Experience, Perceptions, Post Graduate Students, Research-teaching Nexus

1. Introduction

Higher education has seen a significant change, where the focus in not only on teaching, but also on research. Barrie[1] defines graduate attributes as being 'the skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge. Such attributes are what makes higher education distinct from other levels of learning[2].

Research is an integral component of university education, which helps in generating and disseminating knowledge to students through the teaching-learning process. The need for research in universities is increasing, not only for generating new knowledge and increasing the R and D outputs like technical papers, patents etc., but is also playing a major role in hiring, tenure and promotion of faculty. Gone are those days, where

teachers had a fixed role of only teaching, with no much emphasis on research. Today research and teaching go hand in hand and are considered to complement each other and there is a nexus, which is productive. Though teaching and research are considered supporting each other, according to Rugarcia[3] and Felder[4], research and teaching have different goals and require different skills and personal attributes. The primary goal of research is to advance knowledge, whereas that of teaching is to develop and enhance abilities. Researchers are valued for what they discover and the problems they solve, whereas teachers enable their students to discover and solve. Excellent researchers must be observant, objective, skilled at drawing inferences and tolerant of ambiguity, whereas excellent teachers, must be skilled communicators, familiar with the conditions that promote learning and expert at establishing them and should be approachable and empathetic. Having both traits is essential, desirable and possible, but not necessary to be successful in one domain or other[5].

The connection between teaching and research in higher education is based on the concept of Scholarship proposed by Boyer in 1990, who argued that there are four separate, but overlapping areas of Scholarship namely: Discovery, Integration, Application and Teaching, each of which is integral to academic work. Teaching is a dynamic process which links teachers' understanding and students' learning. Teaching in engineering not only involves transmitting knowledge, but also transforming and extending it. According to Boyer, teaching begins with what the teacher knows and must involve acquisition of knowledge, which is acquired through research, synthesis, practice and through teaching[6]. Several studies have been carried out to understand the teaching-research nexus, from teachers' perspective, students' perspective, exploring the relationships, the benefits to teachers, students, departments, institutions/ universities.

According to Burton R. Clark[7], the concept of research-teaching nexus originated in Germany, wherein Humboldt enunciated a new doctrine that university neither exists primarily for students, nor even for faculty. In formulating the principle of unity of research and teaching, he suggested that in Institutions of higher education, "the teacher does not exist for the sake of the student, for both teacher and student have their justification in the common pursuit of knowledge". Professors seek to train students by involving them in research and students become investigators as they seek answers to research problems that professors specify or they themselves initiate. Thus, professors and students become research-linked colleagues, as they join hands in a common search for the truth in the form of new knowledge. This became everlasting and had a significant influence on the universities[7].

In the Indian context, this issue has been debated in different forums, though there has not been any formal studies exploring this nexus. The presence of this nexus has been understood in leading technical institutions of the country like IITs, NITs, IISc, central, state and private universities. Research contributes in terms of both tangible and intangible outputs which include research publications in conferences and journals, technical reports, manuals, models, prototypes, commercialization based on the feasibility, patents etc. This has influenced the curriculum being taught in these institutions; bringing in lot of changes to accommodate the latest developments. Thus, this cyclic process of teaching affecting research and vice versa has been understood and realized. There have been no formal studies being carried out in the various categories of institutions to understand this teaching-research nexus. This study is an attempt in that direction, where a customized questionnaire survey was administered to 100 students of M.Tech in various specializations of the authors' institution, which is autonomous. About 66% of the students responded and the data regarding students' awareness, perception and experience has been analyzed to draw some meaningful conclusions. Also, based on the findings some suggestions have been made to strengthen this nexus to further improve the intellectual outputs from the institution and to improve the teaching-learning process through better knowledge generation and dissemination.

2. Literature Perspective

The subject of teaching-research nexus is being widely debated and researched internationally among academics and policy-makers and there have been many efforts. This review briefly presents some important reviews and their findings.

According to Halliwell J.[8], there is a body of literature dealing with multiple dimensions of the interconnections between teaching and research. She reviewed literature regarding the nexus. The survey was related to four countries – UK, Australia, New Zealand and US. The focus was on four interrelated questions – what is the evidence of interconnection/synergy? Is there value in a connection between teaching and research in a university context? What are the characteristics of a positive interconnection? and under what conditions are the positive benefits of an interconnection realized?[8] Jusoh and Abidin[10] presented a study of students' awareness, experiences and perceptions on teaching-research nexus in three universities in Malaysia. Based on the findings, the students perceived clear benefits to teaching and learning from the research activity undertaken at their university, their experiences on research aspects and academics' involvement in research. They also perceived some disadvantages regarding availability of staff and their not teaching the course content properly[9,10]. Ozay[11] presented a case study of undergraduate students' awareness, experiences and perceptions of research in a major metropolitan university in Australia. The findings of the study indicated that students were acquiring some form of research experience in their learning. The students found clear benefits in being taught by research-engaged staff members. More than 50% of the students agreed that they learn best when they are actively engaged in research processes[11]. Hajdarpasic et al.,[12] presented a report of key findings of a study about undergraduate awareness, experience and perception of research undertaken at Macquarie University in 2011. The study involved face-to-face survey to gather both qualitative and quantitative data. Some major findings made were – students were generally aware of research and experienced research in a range of ways, staff involvement in research was beneficial to students, students valued actively engaging in research, but undergraduate awareness and experience of research was limited in some aspects, more than 50% students felt they did not develop any research skills and involvement of staff in research activity had some negative impacts[12]. Lee et al.,[15] surveyed 151 students of different years of study, disciplines and from different locations using an established framework and survey instrument to explore students' perceptions of research in undergraduate programs. The study identified high levels of student awareness of research, experience of research and both positive and negative impacts of staff research on learning. There were statistically significant differences in student perceptions. However, students felt engagement in research was seen as a valuable and effective way to learn, with students' appreciating the teaching-research nexus[13]. Healey, M. et al.,[14] presented a case study of students' awareness, experiences and perceptions of research in a newly established university in UK. The findings were based on questionnaire and small group interviews. Many of the students perceived clear benefits to their learning from staff research, which included being taught by enthusiastic staff, enhanced staff credibility and reflected glory of being taught by well known researchers. There were also disadvantages perceived which include availability of staff and their learning being affected. Students perceived benefits, when they were actively involved in undertaking research projects and some thought that it might help their future employment[14]. This review supports the need for this nexus and presents both the advantages and disadvantages of having this nexus.

The findings of the study carried out in this work are encouraging with student involvement in different activities at different levels. Most of the students were aware about the various aspects of research happening in the institution. The study establishes the teaching-research nexus with regard to PG programs in the institution. They felt that their learning improved and they were motivated to pursue research as a career in the future. A need for evolving a 'research-based' curriculum was suggested to strengthen the nexus in[15].

3. Methods, Analysis and Discussions

To understand the awareness, experience and perceptions of post graduate students about research in the institution, a questionnaire survey[11] was administered to 100 PG students across seven specializations in five departments of the institution, by the PG Coordinator (third author). 66 responses were received, which is a reasonably good response rate. Also, there could be possibility of some students filling the questionnaire haphazardly, without really making an effort to understand the same. This may add to some error in the interpretation of the final results.

The survey contains questions under two sections. Section 1 collects personal information, which includes discipline of engineering, sex and age of the student. Section 2 collects information about the student's experience of research and consultancy. Section 2 collects data under 7 subsections, which are as follows –

2.1 – Awareness of the student about various aspects related to research in the institution.

2.2 – Experience gained by the student about issues related to research.

2.3 – Awareness about percentage of faculty in the subject area(s) they are being taught are engaged in research.

2.4 – Awareness about types of research work, the faculty teaching them are involved and if yes, in what way the students are involved.

2.5 – In what way the research activities in the department have helped the student's learning.

2.6 – Awareness about research activities in the student's discipline, research/consultancy reputation of the faculty, influence of research on learning, presence of a conducive environment for doing research etc.

2.7 – Students' experience regarding research in the department.

Students were asked to put a tick mark in front of the various options. For 2.7, they were asked to give rating on a scale of 1 to 5, with 1 means strongly disagree, 2 means disagree, 3 means neutral, 4 means agree and 5 means strongly agree.

Figure 1 shows the breakup of students under different M.Tech specializations (details are as follows – CCT – Construction Technology, ESE – Energy Systems Engineering, MMD – Machine Design, MECS – Micro Electronics and Control Systems, DEC – Digital Electronics, VLSI – VLSI and Embedded Systems, CSE – Computer Science and Engineering and CNE – Computer Networking).

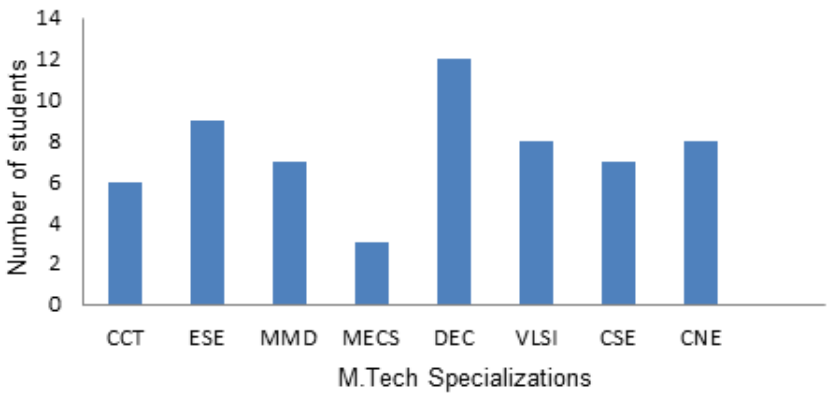

Figure 1. Number of students surveyed under different M. Tech. specializations.

Further, out of the total 66 responses, 47 were male students and the remaining were female students.

Considering Section 2, which tries to analyze the active and passive research experience of the students, in terms of their awareness, experiences and perceptions about research and consultancy are as follows:

3.1 Awareness about Different Things happening in the Institution about Research and Consultancy

The various options that students could tick are as follows: 1. Seminars/conferences/workshops happening in different research areas, 2. Notice boards advertising research opportunities, 3. PG courses offered/opportunities for students for projects/research in the Institution and outside, 4. Existence of research facilities in the department, 5. Departments having national/international reputation with regard to research and consultancy and 6. Research outputs produced in terms of publications, journal articles, books, reports, patents etc., filed by different faculty members (happenings). The results are as shown in Figure 2.

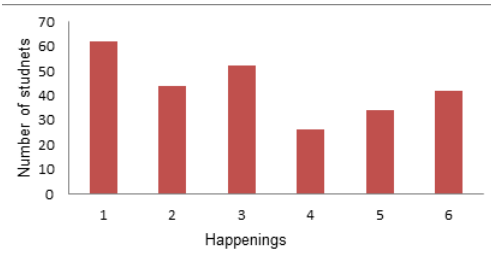

Figure 2. Students' awareness about research and consultancy in the institution.

This being a passive experience, more than 90% of the students were aware of seminars, conferences and workshops happening in different areas of research, more than 80% of the students were aware about the PG courses offered, apart from their program of study, opportunities available for projects and research both within and outside the institution. An important observation that can be made is only about 39% of the students were aware about the existence of research facilities in their department. There is a need to orient the students about the status of research in their respective departments, so that they are aware about the facilities, laboratories, faculty, their publications, achievements etc. This can be done by the respective Heads of the department during the departmental orientation program, which may be done during the first week of their admission into the institution.

3.2 Experience Related to Research/ Consultancy in the Institution

The students were asked to tick the various experiences they have had during their study in the Institution, related to research and consultancy. Table 1 gives the corresponding results.

About 85% of the students had attended seminar, conference or workshop organized by the department. Around 68% of the students had heard their faculty discuss his/her research/ consultancy work in the department and 69% had heard some expert doing the same. Only 33% of the students were part of the research/ consultancy carried out by the faculty. 36.4% of the students had attained experience regarding development of research/consultancy techniques. Fewer students have obtained experience by working as a research assistant (24.2%). Only 18% of the students contributed to the research/ consultancy output of the department. There is a need to increase the student experience in the department research/consultancy activities and projects. Students need to be oriented and motivated towards increased involvement in research activities of the department.

Table 1. Experience related to research/consultancy in the Institution

	Statement	Response
i.	Hearing a faculty discuss his/her research/consultancy work.	68.2%
ii.	Hearing an expert/guest faculty discussing their research/consultancy work.	69.7%
iii.	Reading a research/consultancy paper or report written by a faculty member.	57.6%
iv.	Attending any seminar/conference/workshop organized by the department.	84.8%
v.	Being a part of research/consultancy project conducted by a faculty member.	33.3%
vi.	Development of research/consultancy techniques (like interviewing, Lab. analysis, performance skills, design skills, statistical analysis, field work, literature review etc.)	36.4%
vii.	Undertaking an independent project as a part of the research/consultancy work of a faculty member.	43.9%
viii.	Helping the department by working as a Research assistant.	24.2%
ix.	Writing a technical paper to a journal/conference proceedings based on research work.	34.8%
x.	Contributing to research/consultancy output in the form of a patent or any other form of output.	18.2%

3.3 Percentage of Faculty in the Student's Subject Area(s) of Interest being engaged in Research

The students were asked to specify percentage of the total faculty being engaged in research in their subject area(s) of interest. The results are as follows:

10 said none, 19 said between 1–20%, 7 said between 21–40%, 13 said between 41–60%, 11 said between 61–80% and 6 said between 81–100%. The results indicate about the awareness of the students regarding the faculty teaching them being involved in research.

3.4 Awareness about the Types of Research and Consultancy Work the Faculty are engaged in

Figure 3 shows the results about the awareness of the type of research and consultancy carried out by their faculty in the department. More than 90% of the students were aware that their faculty is pursuing a research degree leading to either a Masters or PhD degree. 72% of the students were aware that their faculty writes research papers for journals, conference and seminars. 67% of the students were aware that their faculty is supervising students for their masters or PhD. The other types of work like undertaking non-funded personal research, undertaking funded research and/or consultancy, writing text books, working towards filing/obtaining patents and supervising research assistants was less than 30%. This establishes that there is a general awareness among the students regarding the type of research and consultancy happening in their departments, which is the minimum requirement for a PG student to be aware about. This is essential for them to know the status of research activities in their department and also the involvement of their faculty.

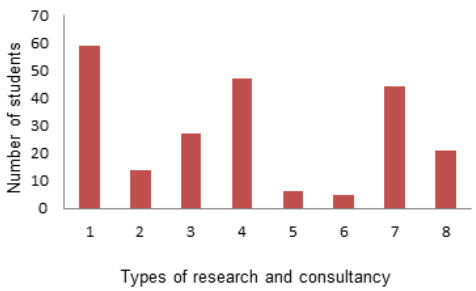

Figure 3. Awareness about type of research and consultancy carried out by the faculty.

(Types of research and consultancy – i. Undertaking a research degree (Masters/PhD), ii. Undertaking non-funded personal research, iii. Undertaking funded research and/or consultancy, iv. Writing research papers for journals/conferences or seminars), v. Writing text books, vi. Working towards filing/obtaining patents, vii. Supervising research students and viii. Supervising research assistants.)

3.5 The Experience regarding the Involvement of Faculty who Teach the Students in Research have had a Positive Impact on their Learning

From Table 2 it is clear that, except for the last statement, the responses of the students have been generally favorable regarding their experience of the involvement of their faculty in research, though statements ii and vi show slightly lower response values. Out of the total students surveyed, 87.9% of the students felt that faculty involvement in research had increased their own understanding of the subject. 66.7% of the students felt it increased their awareness about the methodology involved in conducting proper research work. 50% of the students were motivated to pursue a career in research and 57.6% of the students felt the faculty stimulated their interest and enthusiasm for the subject. Another interesting finding was that around 60% of the students were motivated to pursue their PhD in the same area in which their faculty were working, which is an encouraging trend.

Table 2. Experience of involvement of faculty in research on learning

	Statement	Response
i.	Increased my understanding of the subject.	87.9%
ii.	Contributed to the development of my research/consultancy-related skills.	39.4%
iii.	Increased my awareness about the methodology involved in conducting proper research work.	66.7%
iv.	Stimulated my interest and enthusiasm for the subject.	57.6%
v.	Motivated me to pursue my PG/PhD research in the same area.	59.1%
vi.	Increased my awareness about the problems and issues faced while doing consultancy work.	43.9%
vii.	Motivated me to consider pursuing my career in research.	50%
viii.	Motivated me to consider pursuing a career with a particular kind of consultancy with an organization or body.	25.7%

3.6 The Experience regarding the Involvement of Faculty who Teach the Students in Research have had a Negative Impact on their Learning

The number of students who felt that there was a negative impact was only about 50% of the number which took the survey. The major reason cited for this was lack of availability of the faculty to see the students, followed by lack of interest of the faculty in teaching and helping the students and lack of time available to explain things to the students in a way they can understand.

3.7 Students' Experience regarding Research in the Department

Figure 4 shows the responses of students regarding their experiences regarding research in the department. There were seven statements which are as follows:

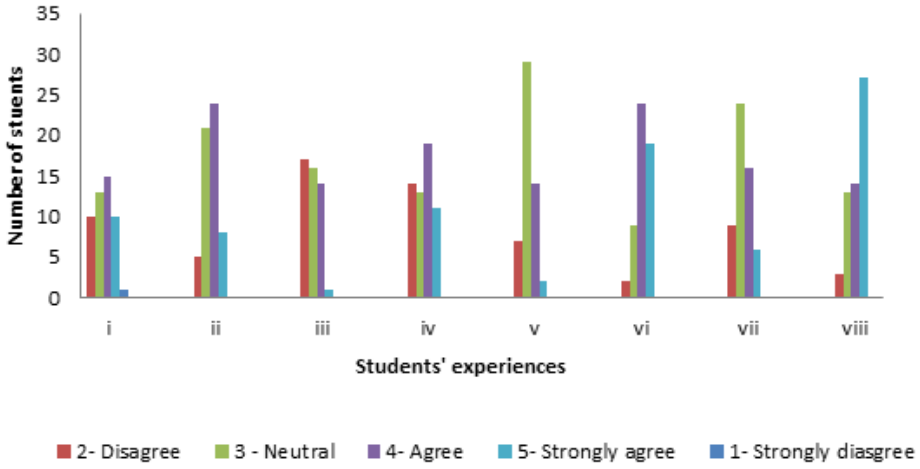

Figure 4. Students' experiences about Faculty research.

i. My lecturer's research/consultancy interests.
ii. Faculty reputation regarding research/consultancy in my subject area(s), when I applied for study here.
iii. Not aware about the benefits of the involvement of faculty in my subject area(s) in research/consultancy to me as a student.
iv. Faculty involved in research/consultancy is more enthusiastic about their subject.
v. Faculty not involved with research/consultancy spends more time helping students.
vi. Learning has happened when I undertake my own research/consultancy project.
vii. Less importance given to the subject(s), I study due to research/consultancy.
viii. The most effective teaching happens when the lecturer involves us in different aspects of research/consultancy process.

The findings are difficult to analyze. Statements ii, v, vi, vii and viii are found to be accepted by students, though in different degree. More students are aware about the faculty reputation in research/consultancy in the department and the subjects they teach. More students agree statement iv, which highlights the positive aspect of faculty involved in research/consultancy are enthusiastic about the subjects they teach. Students felt that real learning happens when they themselves undertake their own research/consultancy projects in the department (statement vi). Also, it was observed by students that faculty who are not involved in research/consultancy do not spend more time helping students (statement v). The most interesting and meaningful observation is with regard to statement viii, where maximum number of students strongly agreed that most effective teaching happens, when the lecturer involves them in different aspects of the research/consultancy process namely problem solving exercise, writing a technical paper based on the research/consultancy project or giving a presentation based on their research.

The results presented here are based on simple quantitative evaluation of questionnaire data. Statistical analysis of data can also be carried out to further understand the meaning of different options and the statements under each option and their relationships with other options. Hypotheses can be built to further understand the perceptions, awareness and experiences of students regarding faculty research. This can be dealt with separately may be in another article.

4. Conclusions

This paper is an attempt to understand the students' perceptions, awareness and experiences of students regarding faculty research. The study has been focused on post graduate students, as they are more mature and aware about research happening in their respective departments. The response of 66 students from 8 PG programs offered by six departments was analyzed. The findings cannot be generalized. Nevertheless, the findings from the study based on a standard questionnaire give a clear picture about the perceptions, awareness and experiences of the students regarding research. The number of students was almost the same from all programs, except for DEC, which is offered by the electronics department, where the students responded were more. Some observations made are as follows:

- Most of the students are aware about the various aspects of research happening in the department/institution, which is very important to orient and involve them in research. Though this is a passive experience, by proper orientation, their awareness can be further improved to promote active involvement in the research activities of the department.
- Students have gained some experience regarding research, but it is mainly restricted to attending seminar/conference/workshop organized by the department, hearing a faculty discussing about his/her research/consultancy and hearing an expert discussing about his/her research/consultancy. The experience regarding other aspects like reading a paper written by a faculty or being a part of research/consultancy project conducted by a faculty member is less. This needs to be strengthened at the department level, by involving more students in departmental research activities.
- Students were aware that the faculties who teach them in different subjects are engaged in research/consultancy in those subject areas.
- More than 90% of the students were aware that their faculty are engaged in research leading to PG or PhD degree. They were aware that their faculty write research papers to conferences and journals and supervise students for their Masters or PhD degree. The students are aware of the faculty research/consultancy projects, which helps them to decide about their involvement in the same.
- The students felt that the involvement of faculty in research/consultancy has helped their learning and in better understanding of the subjects they study. It has motivated more than 60% of them to pursue their PhD in the area of specialization of their faculty, which helps in sustaining research and consultancy in those areas, contributing to the knowledge domain.
- Except for about 50% of the students, the rest did not think that the research/consultancy projects of their faculty have a negative impact on their learning. In fact students identified benefits like the faculty involved in research/consultancy were enthused and motivated in teaching related subjects and they had up-to-date knowledge in that area.
- Student had varying experiences regarding the research happening in their department. But the most interesting observation is that maximum number of students think that the most effective teaching happens, when the faculty involves students in different aspects of research/consultancy process.

This study establishes the teaching-research nexus, with regard to PG courses taught in the authors' institution. There is a need to take necessary measures to strengthen this nexus and evolve mechanisms to involve PG students in a better way into research. This helps in improving the research outputs from the departments and establishes its credentials in the institution. This kind of studies can be carried out in different types of institutions like central government, state government, institutions of national importance, deemed universities, private universities etc., to develop policies for strengthening the nexus. This can also help in reorienting the PG curriculum and make it more research-oriented. This study also establishes

the need for PG students to involve themselves in active learning through enquiry, rather than the routine rote learning and help in developing research-intensive institutions.

5. References

1. Barrie SC. A research-based approach to generic graduate attributes policy. Higher Education Research & Development. 2004; 23:261–75.
2. Jenkins A, Healey M. Developing the student as a researcher through the curriculum. Improving student learning through the curriculum. Oxford: Oxford Centre for Staff and Learning Development, Oxford Brookes University. 2009. Recuperado de http://www. canterbury. ac. uk/Support/learning-teaching-enhancement-unit/Documents/RIT/30-RIT-DevelopingStudents. pdf.
3. Rugarcia A. The link between teaching and research: Myth or possibility? Engineering Education. 1991;81:20-22.
4. Felder RM. The Myth of the Superhuman Professor. J. Engr. Education, 1994; 82(2): 105-10.
5. Prince MJ, Felder RM, Brent R. Does faculty research improve undergraduate teaching? An analysis of existing and potential synergies. Journal of Engineering Education. 2007; 96(4):283–94. https://doi.org/10.1002/j.2168-9830.2007.tb00939.x.
6. Clark R, Andrews J. Building bridges for future sustainability? Breaching the research-teaching nexus in engineering education. Paper presented at EE 2010; Birmingham. 2010.
7. Clark B. The modern integration of research activities with teaching and learning. J of Higher Education. 1997; 68(3):241–55. https://doi.org/10.1080/00221546.1997.11778982.
8. Halliwell J. The nexus of teaching and research: Evidence and insights from the literature. Higher Education Quality Council of Ontario; Toronto. 2008.
9. Jusoh R, Abidin ZZ. The teaching-research nexus: A study on the impact of research on teaching and learning. Proc of International Conference on Innovation in Teaching and Management of Higher Education (ICITM '09); 2009. p. 1–15.
10. Jusoh R, Abidin ZZ. The teaching-research nexus: A study on the students' awareness, experiences and perceptions of research. Procedia-social and Behavioral Sciences. 2012; 38:141–8. https://doi.org/10.1016/j.sbspro.2012.03.334.
11. Ozay SB. Undergraduate students' awareness, experiences and perceptions of research in Humanities. Journal of Educational and Instructional Studies in the World. 2013; 3(1):112–20.
12. Hajdarpasic A, Brew A, Popenici S. Report on undergraduate awareness, experiences and perceptions of research at Macquarie University. Macquarie University; 2011.
13. Lee R, Myatt P, Joughin G. Undergraduate students' experiences of research: Findings from a cross-disciplinary analysis of students' perceptions. 35th HERDSA Annual International Conference (Vol. 35;129–38). Higher Education Research and Development Society of Australasia; 2012.
14. Healey M, Jordan F, Pell B, Short C. The research-teaching nexus: A case study of students' awareness, experiences and perceptions of research. Innovations in Education and Teaching International. 2010; 47(2):235–46. https://doi.org/10.1080/14703291003718968.
15. Pai PS, Rao BS, Chiplunkar NN, Bhat KS. Undergraduate students' research: A case study of their experiences and perceptions in an autonomous institution. Journal of Engineering Education Transformations. 2015. p.34–9. https://doi.org/10.16920/ijerit/2015/v0i0/59422