

Using (TRPN) Technique in Architecture Theory Curricula as Framework for Alternative Brainstorming in Design Studio

Alshaimaa Hussein Mohammed

Architecture department –Faculty of engineering
MTI (Modern University for Engineering and Technology)
Cairo , Egypt

Abstract— Architectural design thinking and teaching architecture theory courses has long been separated ,which causes a gap between theory and practice , during this study, we used a new teaching approach, based on the integration between two different methods of teaching techniques (TRPN) methodology in teaching architecture theory courses and Brainstorming technique in design studio. Hoping to reduce the gap between architecture theory course and undergraduate design projects, trying to enhance undergraduate architecture student thinking. Thus, this research tries to investigate and test this approaches for undergraduate students (N = 32-40) at MTI university- design department of 2 rd- (second term) -3 rd (term first) architecture student for two semesters at MTI university, by the jury (external), collection via questionnaires . The research aimed to develop creativity thinking in two consequences programs theory and design more than two terms, these studies combining several aspects, and used some techniques including learning; participate in lectures, readings, and documentaries followed by operating groups to produce final mapping and visual representations and group projects.

Keywords— *The Teaching-Research-Practice Nexus, Brain storming, design creativity*

I. INTRODUCTION

Architecture creativity has discussed in many researchers as the primary catalyst for stimulating students thinking and decisions, thus Improvement of students' creativity thinking has always been a complicated process, it has not been an organized process in sciences and art [6] ; it's a skill that should be fostered altogether disciplines and across all intellectual and social areas [1] .

Many studies concerned about integrated Architectural design and Architectural theoretical studies, schools of architecture still construct a division between theoretical and applied teaching in the basic curricular [6] [31], through stages of teaching, and practical training ,due to different philosophies on curriculum, teaching methods, architectural design teaching and architectural history teaching methods [17]. From this theoretical knowledge is essential to change Students' perspective, Studying the historical and architect previous works, for making better understanding of design methods and philosophies, which helps to enhance their design abilities, and creativity [17] [9].

Architecture theory teaching objectives and plan under the new pedagogy combining history, culture, ecology, technology, special lectures on Comparisons between Eastern

and Western Architecture Cultures [23] (TRPN) was a frame work in several engineering studies Li, W. (2018). A Research on Undergraduate Architecture, Krause: Nexus A guide for academics and policy-makers in higher education, (TRPN) as a framework for the implementation of Theory courses in Architecture department, according to different philosophies and techniques on curriculum, teaching methods (TRPN) [10] [13].

Brainstorming (BS) in design which techniques for fostering group creativity to achieve unusual solutions to practical problems [8]. Brainstorming is still the most widely adopted technique for groups to explore new approaches to a problem or a project. It's frequently applied, expecting an increase in both productivity and creativity [5]. This process needs several stages and requires suitable conditions such as ,relation of the teacher and student ,suitable atmosphere within the working environment, creative tasks(sketching, conceptual prototyping), student research activities reports and paper presentations[29].The creative brainstorming techniques is wider than student creative thinking it is Responding to one, specific problem or question and the way the student could express his suggestions or ideas quickly and spontaneously, during this research used Nominal brainstorming (NBS) technique which suitable for design courses, and individual design project .This research is an investigating to discover a new approach method which used two different technique in the theatrical subject (TRPN),and Brainstorming technique in deign course the research could be a trying to connect between theoretical approach and also the application in design courses for improving the creative thinking and focus on the student attitudes, and activities in respect to the nexus, also a synergies between research-teaching and teaching-research, and additionally, synergies in respect to connections to design issue. It is essentially for improving student design creativity in architecture design.

I-LITERAL REVIEW

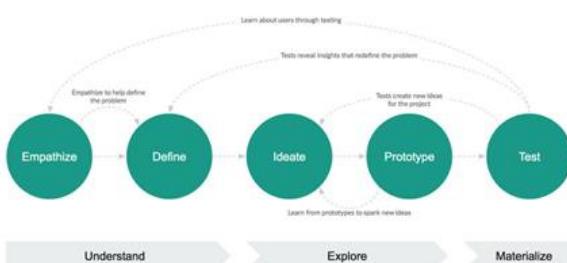
I-1BRAINSTORMING

IN debited It is not new to use BS in design studio it has several faces and techniques it was in the beginning of In the Bauhaus teaching ,which concern with The relationship between the student-lecture and teachers , education through stages covering all the necessary practical and scientific education for apprenticeship, the teacher was more passive, and a guide to the student in the design [11] . in some

researches grouping in brainstorming is less productive than individual brainstorming [6]. In an interactive group, each member can unconsciously snoop the efforts and productivity of others, which in turn results in social comparison that might give rise to social matching or more precisely, "social loafing" [3]. Social loafing appears when individuals show a tendency to conform to peers, i.e., they give less effort in a coaction group because responsibility is dispersed to generate as many ideas as possible as until these ideas take shape, they begin to inspire a new and even better ideas [6].

Empathize : Conduct research in order to develop knowledge about what your users do say think, and feel, that idea generation is only a part of the creative process and not a goal in itself Fig(1) [23],

- **Define**: Analyze the information about your users to define the core problem in a human-centered manner.
- **Ideate**: Generate ideas and look for alternative ways to view the problem, generate ideas by free association [18].
- **Prototype**: Build tactile representations of your idea to understand which features work and which do not.
- **Test**: Go back to your users with your prototype and get feedback Design Thinking is not as linear as it sounds. Each stage can take you back and forth as you learn about your users and test prototypes.



FIG(1) BRAINSTORMING STEPS AND DESIGN THINKING[24]

1.2 BRAINSTORMING NBS TECHNIQUE IN DESIGN

TBS is the first form of idea generation where group members actively participate in active Conversation and interaction by sharing their ideas at the same time. It helps in imagination produce large quantity of ideas, ruling out criticism, freewheeling, and combining ideas. NBS technique where group members can generate ideas individually without communicating with other members of the same group [14]. Possible reason for this preference can be attributed to the NBS's role as a mediator in meeting the demands of the additive task through producing the largest number of ideas. EBS has been introduced as a means for group members to facilitate idea generation simultaneously. It involves the use of online resources and tools such as e-mail, browser-based systems, chat, and discussion forums to support the discussion process [4]. In some situations, when using certain BS techniques, individuals/teams may tend to generate a large quantity of ideas [14] [2] they discuss the best technique in education according to the specialist NBS in

design creativity connector for altering the generation of ideas and originality among students. The use of these tools was to advance the NBS environment through exposing individuals to relevant clues. We believe that this method may enable the students to generate, evaluate and select the most relevant ideas and to form teams for project execution [15]. NBS revealed its potential application for ensuring a sufficient use of resources among members, thus making better quality decisions. Both TBS and NBS techniques are believed to create feasible sharing rules that can stimulate students 'positive behavior to creatively solve complex problems.

2- TEACHING RESEARCH NEXUS

"Teaching Research Nexus" (TRN) has become well-known describing a relationship between the two academic activities, which is need to be equally integrated into the academic education [18]. It helps students' academic capabilities and improving their lifelong learning ability; development of students' capacity for independent learning [16]. The aim is to equip students on the basis of integrated thinking with skills and the determination for decision-making in order to be able to make practical decisions that are generally acceptable in practice [29].

There are several frameworks and models describing the nexus from different perspectives. In order to study the links between research and teaching, there was a theoretical framework for developing different types of teaching activities, but also on other more comprehensive aspects of the nexus. According to Healey [14] there are different ways of including research in teaching activities, a model based on the work by Griffiths [18]. In these models students can be regarded as either participants or audience. The two axes in the model lead to four different types of teaching activities: research-tutored, research-based, research-led and research-oriented [12].

According to Neumann (1992) framework there are three types of links between research and teaching [5] :

- The tangible connection this type of nexus, relates to the researchers' knowledge, based on student own research but also on knowledge obtained in their field of research, which they include in their teaching.
- The intangible connection this type of nexus and relates to several aspects as the approaches and attitudes one has towards knowledge including having a critical view and being positive towards learning. means that the student have to review and reflect upon student own [21].
- The global connection the third type, the global nexus, entails a perspective on all the research conducted at a department and all the teaching offered, thus this third type describes how the educational programmers and curricula are influenced by the research at departmental level [21].

According to Krause et al. (2008) Nexus helps students' academic capabilities and improving their lifelong learning ability [15]; (Fig2) development of students' capacity to conduct research and development of students' capacity for independent learning [5]



(Fig2)Methodological correlation within the components of the TRPN,(Petra &, Lukas & Michelle 2018)

2.1 TRPN IMPLEMENTATION IN THEORY COURSES

Theory is essential to transition beyond our current methods of practice to question or critically examine what we already experience or what exists in the world which is available for reproduction[6]

Theory offers students a different way in which to 'see' a problem in order to move beyond direct experiences of the world, theory needs to be incorporated into building design, new methods of design, architectural theory is part of several sciences history, design ideology, sociology, and part aesthetic judgment. Therefore, Theories in architecture often emerge from less formalized, more individualistic paradigms. Many architectural theories are the writings of individual architects., not necessarily rooted in objective Empirical [29] Architectural theory is vast and diverse, and encompasses at least three main areas:

- Theories of architectural technology: principles of structure, ventilation, drainage, lighting, etc.
- Theories of architectural history: social phenomena and patterns, linguistic analyses, Analyses of physical artifacts, etc.
- Theories of architectural design: organizational strategies, design methods, spatial Concepts, aesthetic judgments

Teaching TRPN exemplification through presentations (lectures, assignment, workshops at the university), fostering the trans disciplinary communication, publications [22].

3-CASE STUDY

3.1 FIRST CASE STUDY TRPN APPLICATION IN THEORY COURSES

The study was divided to two sectors first the application of TURN methodology on theoretical courses (Modern Architecture ,Theory IV) tack in consideration the aims and outcome of the courses and the time table according to the university each course was 12 week for two hours weekly, It is been studied on model outcomes for two consecutive academic years 2018/2019 and 2019/2020 first term MTI University , the practical implementation in Modern Architecture & Theory of Architecture IV courses teaching includes the following activities Observe (video, PPT), read (article), and reflect (Important questions, assessment) Modern Architecture clomusly course for student who finished design 2 course , Theory of Architecture IV for the student who finished design three and theory III courses both courses are discussion the main principles of architecture thinking methodology and the development of main principles of theory.

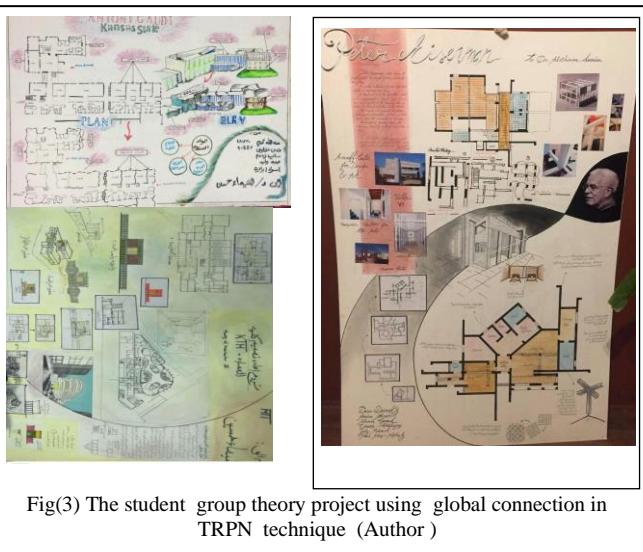
First sector of the study ,The study brought together between two frame works of Nuex the intangible& the global connection in theory architecture courses:

- The intangible connection (Individual) has towards main knowledge throw (lectures – general discussion – personal sketch(weekly) to analysis the main thinking of the architecture school or trend) this assignment aimed to deep understanding for the main concept of the course . It is the philosophy of the practice that defines the rationale by which they produce particular solutions to definitive problems. Rationalism, Empiricism, structuralism, post-modernism, de-constructivism structuralism and phenomenology are some directions from philosophy influencing architecture.
- The global connection a perspective on the student application and extent of benefit of the theoretical study on his own thinking ,opinion in architecture generally and the ability to criticism on architecture project that show throw a project of redesign a building for an architect as a case study for a team working for group (5-6) , this project aimed to help the student to connect the theoretical approach with design in plans ,elevation and mass, helping the student to imagine how this architect was thinking and what was his priority in design and why ,also see the important of other project.

Design Brain storming

Empathize	Preparation	Define the design challenge	choose a design challenge project it focuses on people needs and Location & design principles, design main program depend on the theoretical study and TRUN steps	Design III Cultural Museum Design IV complex building (Residential & commercial)
Define	Design Research	IMMERSE	understand the challenges through studying same examples According to theoretical courses	Gain new ideas, and to test our intuition.
		OBSERVE & INQUIRE	Conduct observations & site visiting	What architect say about it and what people need -learn by talking to people -learn by observation - drawing bubble diagram
Ideate	First sketches	Framing the concept it's hard for student to know where to start.	-look back and analysis through our research themes. Each theme may prompt several brainstorm questions. -Ask yourself why you're suggesting this concept and zoning -generate as many ideas as possible. The time for analytical thinking will come	Identifying important themes from our design is foundational work that points to opportunities for design.
		Defer judgment Encourage wild idea Build on the ideas of others Stay focused on topic One conversation at a time Be visual Go for Quantity	no bad ideas at this point! It's the wild ideas that often provide the best insights Think 'and' rather than 'but' You get better quality output if everyone is disciplined That way all ideas can be heard and built upon Try to engage the left and right sides of the brain Set an outrageous goal and subdivide it	The goal of ideation is to generate as many ideas as possible. The first step is framing
Prototype	Implementation	Introduce the final plan Introduce the sections Introduce the elevations	-Representations of final plans idea& function to understand which features work and which do not. -Bring a cross-functional for all project together to solve a problem	Measuring the project outcome idea circulation ,function ,mass relation ,design features (Internal jury)
		Final project External Jury		

Table (2) Using brain storming technique in design courses



Fig(3) The student group theory project using global connection in TRPN technique (Author)

3.2 Second case study TRPN technique and Brainstorming in design studio

The second sector apply the TRPN technique in theory to improve the design brainstorming. This is important to connect the design studios and theoretical courses. Within the studio can be relatable to architectural practice, students learn to 'think architecturally' [2], students should spend their time learning how to bring things together, synthesizes it is a required central skill [2]. From this approach the research has designed a methodology in using brain storming in design courses Design II , Design III Table [1].

Design Brain storming				
Empathize	Preparation	Define the design challenge	choose a design challenge project it focuses on people needs and Location & design principles, design main program depend on the theoretical study and TRUN steps	Design III Cultural Museum Design IV complex building (Residential & commercial)
Define	Design Research	IMMERSE	understand the challenges through studying same examples According to theoretical courses	Gain new ideas, and to test our intuition.
Ideate	First sketches	OBSERVE & INQUIRE	Conduct observations & site visiting	What architect say about it and what people need -learn by talking to people -learn by observation -drawing bubble diagram
Ideate	Design divergent thinking	Framing the concept it's hard for student to know where to start.	-look back and analysis through our research themes. Each theme may prompt several brainstorm questions. -Ask yourself why you're suggesting this concept and zoning -generate as many ideas as possible. The time for analytical thinking will come	Identifying important themes from our design is foundational work that points to opportunities for design.
Prototype	Implementation	Defer judgment Encourage wild idea Build on the ideas of others Stay focused on topic One conversation at a time Be visual Go for Quantity	no bad ideas at this point! It's the wild ideas that often provide many insights Think 'and' rather than 'but' You get better quality output if everyone is disciplined That way all ideas can be heard and built upon Try to engage the left and right sides of the brain Set an outrageous goal and succeed	The goal of ideation is to generate as many ideas as possible. The first step is framing
Test		Introduce the final plan Introduce the sections Introduce the elevations	-Representations of final plans idea& function to understand which features work and which do not. -Bring a cross-functional for all project together to solve a problem	Measuring the project outcome idea circulation, function, mass relation ,design features (Internal jury)
Final project External Jury				

Table (2) Using brain storming technique in design courses



Fig (4) samples from The student projects and the impact of theory course on their different thinking and inspiration

4-FINAL QUESTIONNAIRE

After completing the two courses of theory and two design courses , students were asked to fill in a questionnaire were non-anonymous, their answers were used to analyses other questions, The initial questionnaire was divided into two sections; first about the method of courses teaching technique .. The second section consisted of open-ended questions about how they perceive Collaborative work. The answers of initial questionnaires were meant to help in evaluating the theoretical course teaching method and it relation to improving design creativity Two data gathering and assessment tools were designed and applied in order to achieve the research goal as follows:

- (a) Two Design courses product
- (b) Theory research project.
- (c) Student Questionnaire.

Students were asked about their experience in both experiments, therefore the findings of the questionnaire about the two approaches which investigate the following:

- The relation between the teaching technique in theory courses and the impact on the student creativity improvement.
- The student opining on the number of theory courses
- from student on their opinion, ideas and TRPN implementation development, critical reflection on the own status .

THE INITAIAL RESULAT

The initial questionnaire was answered by 100% - 42 student participants in the Architecture theory courses and Architecture design in the beginning they were asked about the number of theory courses was enough 50% was agreed it was enough ,33% say it may be enough

that mean they think they need more courses which discuss the same concept ,7% think it's not enough to improve their thinking in design, This percentage lead us to see that the students have good impact in learning theory according this (TRPN) and need more courses . fig (5).

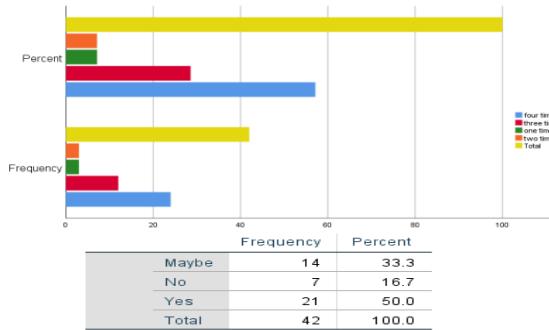


fig (5) student opinion on number of theory courses

- On the survey question did the technique in teaching design and theory impact in your thinking 64.5% was agreed and fielded that teaching technique has a good role in improve their thinking ,19% not sure ,16.7% don't feel any different in this technique in developing their thinking , This percentage lead us to see that the students need a new teaching technique Fig (6).

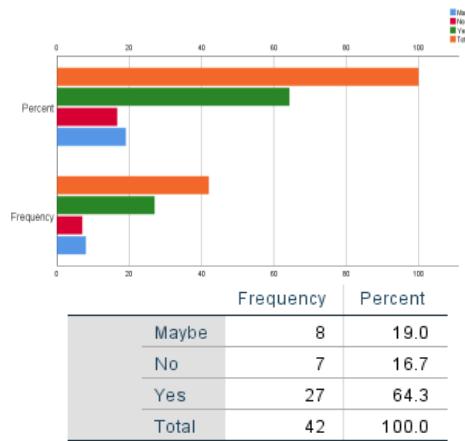


fig (6) Did the technique in teaching design and theory impact in your thinking

- On the survey question the best technique in teaching theory course the comparison between the architect design thinking and similar projects 26.2% ,Studying the relation between time period and the architecture trend for the architect and architecture thinking 19%, Studying architect thinking and his design ideas in the project 42.9%, Models and Mass design 11.9%,This percentage lead us to see that theory architecture was more effective on improve their thinking, the student interest on the question how the architect could think and his main inspiration Fig(7).

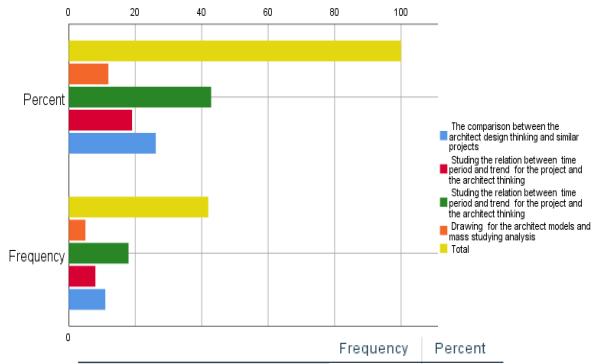


fig (7) student opinion on best technique in teaching theory course

- On the survey question the best theory technique which helped you in design thinking, Research depend on lectures 9.5% ,Site visiting for similar project14.3%,Reading related books 2.4%,Reading and analyzing architect projects 31.0%, Lectures 21.4%,Modeling and Mass simulation 2.4%, Team work Project 16.7% ,Individual project for every student 2.4% . This question leads us to discuss the student field that analyzing similar projects has more impact in developing their thinking , the lectures has good impact on their improvement 21.4% Fig(8).

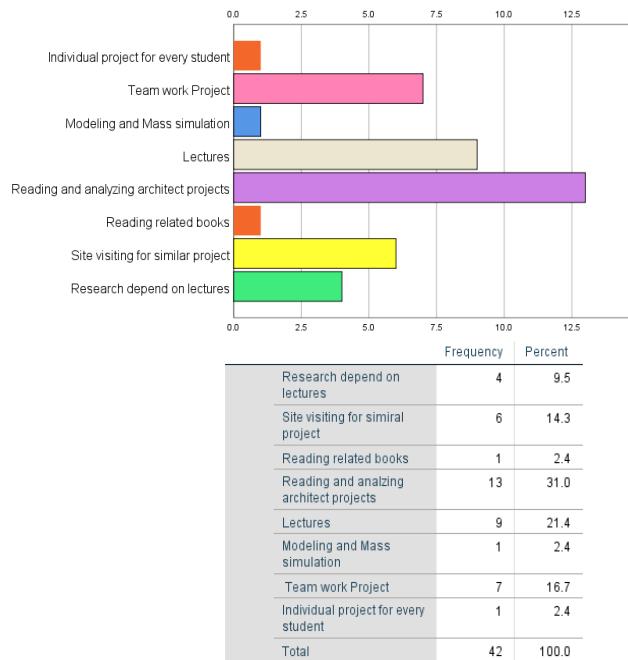


fig (8) student opinion on the best theory technique which helped you in design thinking

5-CONCLUSION

In architectural education, the theory of knowledge does not inspire creativity to the student at a certain time, and it is not possible to clarify creativity clearly. If the student depends on the knowledge he or she receives through regular approaches (lectures, researches) then the inspirational activity of the student is expected longer than using other approaches to encourage the student's imagination, the results of the planning of theoretical courses based on scientific approaches without a distance between the actual output the content of the Curriculum.

However we shouldn't neglect any personal flair or imagination. It is difficult to expect an individual improvement from each student, but it is observed that knowledge given at the right time in design courses is the result of the quality ratio of the planning results and good theatrical understanding. Additionally, giving the student knowledge on time as a seminar and team activities, referring the student to study and developing the habit of clarifying his own thought and personality of design, having integration between theoretical and practical courses and using theoretical and practical knowledge in the application of design would encourage a considerable amount of innovation for the student.

In this case study it was found that by use of Teaching Research Nexus (TRN) as a framework for teaching theory courses with respect to curriculum content and courses aims at improving the teaching technique and organizing the course according to identified rubrics and methodology, has a positive outcome according the student's opinion and the level of design project not only taking into consideration design principles or taking into account the concepts of design or circulation inside the projects, or the student's ability to integrate the Theoretical subject into his design projects, the student could have a different perspectives on how to proceed in design projects.

ACKNOWLEDGMENTS

I would like to thank the External and Internal jury for Design III ,Design II Modern University of Engineering and Technology, for their positive opinion on the student projects

REFERENCES

[1] The Design Thinking Process for Innovation A TOOLKIT FOR LEADING CREATIVE CONVERSATIONS ABOUT PARK AND PROGRAM RELEVANCE ,<https://www.npca.org/resources/2746->.

[2] [21] Neumann, R. (1994) The Teaching-research Nexus: applying a framework to university students' learning experiences. European Journal of Education 29 (3), 323–338. Newman, J. (1976) The idea of a university. Oxford: Clarendon Press.

[3] Alhan Faris Ibrahim, The Impact of the Creative Thinking and the Brainstorming on the Students (The students of Interior Design in Cihan University as a case study), A Special Issue for Cihan University-Erbil Second International Conference on Linguistics and Arts (CIC-LITART'18), June 27-28, 2018 DOI: 10.24086/cuesj.si.2018.n1a13

[4] Baruah, J., & Paulus, P. B.. The role of time and category relatedness in electronic brainstorming. Small Group Research2016, 47(3), 333–342.

[5] Christina Christ ,Brainstorming steps and design thinking<https://blog.internetcreations.com/2019/08/using-design-thinking-for-more-productive-brainstorming/#.XvP-SW0zAM8>

[6] Doaa K. Hassan, Potentiating the innovation capacity of brainstorming Education ,Implementing Sustainability in the Curriculum of Universities,World Sustainability Series,2018 https://doi.org/10.1007/978-3-319-70281-0_8

[7] a. Education, 54(6), 867–884.

[7] Elizabeth Donovan, Sustainable Architecture Theory in Education: How Architecture Students Engage and Process Knowledge of Sustainable Architecture , Implementing Sustainability in the Curriculum of Universities,p31-48, © Springer International Publishing AG 2018

[8] Farmer, H. S. (1988). Predicting who our future scientists and mathematicians will be. Behavioral and Brain Sciences, 11, 190-191

[9] Feist, G. J. (1997). Quantity, impact, and depth of research as influences on scientific eminence: Is quantity most important? Creativity Research Journal, 10, 325–335.

[10] Gogus, Aytac and Ertek, Gurdal, Statistical Scoring Algorithm for Learning and Study Skills (2012). Procedia - Social and Behavioral Sciences, Volume 55, 5 October 2012, Pages 882-886, <https://ssrn.com/abstract=3151804>.

[11] Griffiths, R. (2004). Knowledge production and the research-teaching nexus: The case of the built environment disciplines. Studies in Higher Education, 29(6), 709–726

[12] Griffiths, R. (2004). Knowledge production and the research-teaching nexus: The case of Hacer MUTLU DANACI,2015, Creativity and knowledge in architectural education, Social and Behavioral Sciences 174 (2015) 1309 – 1312, (<http://creativecommons.org/licenses/by-nd/4.0/>).

[13] Haarmann Henk J. 2013 Does divergent thinking training improve language proficiency and performance? Literature review reveals benefits and suggests testable approaches. University of Maryland Center for Advanced Study of Language; 2013.

[14] Healey, M. (2005). Linking research and teaching exploring disciplinary spaces and the role of inquiry based learning. In R. Barnett (Ed.), Reshaping the university: new relationships between research, scholarship and teaching (pp. 67-78).

[15] Henningsen, D. D., & Henningsen, M. L. M. (2013). Generating ideas about the uses of brainstorming: Reconsidering the losses and gains of brainstorming groups.

[16] Hosam Al-Samarraie& Shuhaila Hj Hurmuzan, A Review of Brainstorming Techniques in Higher Education, Thinking Skills and Creativity 27 (2018) 78–<https://doi.org/10.4236/ce.2018.912135>

[17] Krause, K.-L., Green, A., Arkoudis, S., James, R., Jennings, C. and McCulloch, R. (2008) The Teaching-research Nexus: A guide for academics and policy-makers in higher education, Available from: <http://trnexus.edu.au/index.php> [accessed 8 November 2011]

[18] Li, W. (2018). A Research on Undergraduate Architecture Teaching Approach Based on Integration of Architectural Design and Architectural History Teaching. Creative Education, 9,1843–1853.

[19] Magnell ,M, Söderlind J, and Geschwind L., TEACHING-RESEARCH NEXUS IN ENGINEERING EDUCATION, Proceedings of the 12th International CDIO Conference, Turku University of Applied Sciences,Turku, Finland, June 12-16, 2016

[20] Marie Magnell, Lars Geschwind & Anette Kolmos, Faculty perspectives on the inclusion of work-related learning in engineering curricula,European Journal of Engineering Education ,Volume 42, 2017 – Issue6 ,<https://doi.org/10.1080/03043797.2016.1250067>

[21] Miller, L. E. (2009). Evidence-based instruction: a classroom experiment comparing nominal and brainstorming groups. Organization Management Journal, 6(4),229–238.

[22] Mohammad, M. F., & Hussein, A. A. (2013). Enhancing students' motivation to write essays through brainstorming: A comparative study. International Journal of

[23] Neumann, R. (1992). Perceptions of the teaching-research nexus: A framework for analysis. Higher orientation of academic research. Journal of Philosophy of Education, 40(1), 31–50p. 403-420.

[24] Petra Schneider, Lukas Folkens and Michelle Busch , The Teaching-Research-Practice Nexus as Framework for the Implementation of Sustainability in Curricula in Higher Education , Implementing Sustainability in the Curriculum of Universities Approaches, Methods and Projects, publication 2018, <https://doi.org/10.1007/978-3-319-70281-0>

[25] Reinig, B.A. and R.O. Briggs 2008 , On the relationship between idea-quantity and relative to nominal groups. Southern Communication Journal, 78(1), 42–55.

[26] Robertson, J. (2007). Beyond the 'research/teaching nexus': Exploring the complexity of academic experience. Studies in Higher Education, 32(5), 541–556

- [27] Simons, M. (2006). 'Education through research' at European universities: Notes on theorisation of academic research. *Journal of Philosophy of Education*, 40(1), 31–50
- [28] Taylor, J. (2007). The teaching: research nexus: A model for institutional management. *Higher testing approaches in architecture education medium*, *Int J Technol Des Educ* (2019) 29:583–602
- [29] Wang, Zh. N., Wu, X. J., et al. A Research on Undergraduate Architecture Teaching Approach Based on Integration of Architectural Design and Architectural History Teaching, *Creative Education* , Vol.9 No.12, September 2018
- [30] William Locke, Reconnecting the Research–Policy–Practice Nexus in Higher Education: 'Evidence-Based Policy' in Practice in National and International Contexts, *Higher Education Policy* · June 2009, t: <https://www.researchgate.net/publication/31939014>
- [31] Xu, Zh., & Gu, D. Zh. (2013). An Innovative Study on Architectural History Teaching Model for Excellent Engineers. *Journal of Southeast University (Philosophy and Social Science Edition)* , S2 , 149-152.