What approach can we develop to improve creativity in design?

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Abstract: Visual inspiration is a relatively well-understood and effective approach to sharing and developing creativity. This research project is concerned with how designers can draw inspiration from nature and how nature can affect and help develop creativity and make conceptual design decisions. In particular, the premise of this research project developed from experience and understanding of teaching undergraduate interior design students. The researcher wanted to explore new and innovative approaches to develop and share creativity. The research methods used involved an independent measures design consisting of thirty, year one, undergraduate interior design students. This group of students was presented with a lecture on the specific topic of inspiration transmitted through the study of nature. Subsequently, all students who attended the lecture were then asked to complete a questionnaire regarding their understanding of the importance of this area of study and whether learning more about this topic would help their own creativity and design decisions. The findings revealed that the majority of students found that this lecture fascinated them; helped to broaden their thinking and impacted their creative design and processes. The students also stated their desire to see this topic included on the undergraduate specification as a core module of teaching. Practical recommendations from this research include the need to establish and impart a core teaching module that focuses on inspiration transmitted through nature; as the findings revealed that students were interested in this topic as an aid to the development of their designs. Furthermore, it is clear that the study of nature can be a source of inspiration for the whole generation and perhaps it should even be introduced into the curriculum at an earlier age possibly during elementary school. A meditation and awareness of nature can be a source of perpetual creative inspiration, which can benefit society as a whole. It is hoped that this approach could be widely applied in classroom practice and stimulate improvements in pedagogical practices.
[Abeer A Alawad**. What approach can we develop to improve creativity in design?** *Life Sci J* 2014;11(6):140-146]. (ISSN:1097-8135). http://www.lifesciencesite.com. 20

Key words: Biomimicry, Interior Design, Visual Inspiration, Creativity.

1.Introduction :

The natural world is innovative, synchronised and organised. Nature has been a source of inspiration for human beings throughout the history of the world. Since early days, humans have absorbed and discovered things from the natural world and used nature's organization/structures as a source of inspiration (Vahedi, 2009). Nature can teach mankind about various systems, materials, structures and designs. The emergence of biomimicry has recognized: 'innovation and inspiration from nature' and the need to look 'to nature as a teacher' (Benyus, 1997). Indeed, more designers and architects have realized and harnessed the power of nature to inspire. Korecki maintains that nature is continually developing and evolving. According to Korecki the natural world is flexible and dynamic (p54): "Whether one attributes the creation of the natural world to design or phenomena, it is undeniable that it is the ultimate picture of systemic beauty and is the standard of which everything else if measured." Moreover, through this method nature may provide more sustainable; ecologically sound and efficient solutions to design problems possibly even integrating designs to harmonize with nature.

Furthermore, Bernsen, 2004, explored the simplicity of nature and this element is one of the defining factors of design in the natural world. Everything has a purpose (Bernsen, 2004). The purpose of this study is to research the importance of inspiration in teaching as a tool to develop creativity and design. Mother Nature's forms and patterns may inspire and motivate students of interior design with their own creations and conceptual designs. Could this approach be applied further in university practice and enable changes to the curriculum?

Literature review

As stated in the introduction, research has increasingly focused on the area of biomimicry. A variety of disciplines and sectors of society have utilised biomimicry as a tool to aid design. Biomimicry means "copying nature" and this term 'Biomimicry' was first coined in 1985. However, this concept of finding inspiration from nature is not new. For example, Leonardo Da Vinci's own sketchbooks were evidence for his designs that were found in the natural world. He advocated the study of nature, as he believed

that in nature's inventions nothing is lacking and everything has a purpose. Today, the scientific community are referring to nature and drawing inspiration from it. Many studies and research has been conducted in this area. Biomimicry enables designers to find inspiration through looking at nature and products naturally prevalent in the world.

Benyus (1997) has highlighted particular principles in her work *Biomimicry:Innovation Inspired by Nature* and these are beliefs that govern natural design and processes such as: Nature as Model; Nature as Measure and Nature as Mentor. These principles illustrate that the subject of biomimicry is a science, which considers the models found within nature and garners inspiration from them. In addition, Biomimicry uses a standard (Nature as Measure) to evaluate the effectiveness of our concepts and designs. Nature has taught us that designs that work remain in use: they last. Finally, Nature is seen as a teacher, a mentor that enables us to view and appreciate nature (Benyus, 1997). Furthermore, Benyus provides a number of biomimicry design examples that she and Dayna Baumesiter of the Biomimcry Guild have included on a database for designers (Biomimicry, 2013). One of these principles is that form fits function. For example, nature optimizes instead of maximises. Therefore, designers should optimise form to best fit the function. The designers of the Speedo Fatskin swimsuit took their inspiration from nature as their design mimics a shark's skin, which enables it to reduce water drag hence making the swimmer quicker.

Another researcher examining natural principles and designs is Kurk. This researcher states that nature is a teacher: 'Nature's solutions are not only optimal in design, they are always based upon life-sustaining principles". (Kurk & McNamara, 2006, p2). Jirapong and Krawczyk, 2002, also deem nature as a teacher that has a wealth of knowledge for humans to learn from. For example, the creative use of material and the natural forms visible in our world (Jirapong and Krawczyk, 2002). The growing field of biomimetics indicates the validity of this area of research. Bio-inspiration involves looking for inspiration from the natural world that could potentially offer answers to technological, industrial or bio-medical problems. The basic premise is that nature is the best designer and should be copied. In nature animals, plants and microbes have been solving problems for years without human intervention. Designers are now using nature as a model and mentor. Biomimicry has proved influential to functional applications. For example, furniture and lighting design natural factors/elements such as leaves (Enea Studio and spider webs (Junio Design) and bird's nests have proved influential to the aesthetic characteristics of seating designs and lighting fixtures. In addition, the interdisciplinary field of bionic, the science that links biology and technology merges with architects and designers: "Bionic fits our focus on methods in integrated design including interdisciplinary team work" (Stokholm, 2006, p7-13).

Arciszewski and Kicinger proposed three different levels of inspiration, which are: visual inspiration; conceptual inspiration and computational inspiration. (Arciszewski and Kicinger, 2005). All three of these types of inspiration are essential when designing and creating a concept. Visual inspiration is most widely used and this involves a picture of a particular living organism, which is then used to create similarly looking designs/systems. Biomimetic design can be applied to any type of design and for any purpose. Some designers get their ideas from creation, some from the structural solutions afforded in nature and some using materials found in nature. What is clear is that visual inspiration provides the highest level of inspiration more than conceptual or computational. Godfaurd *et al.'s*., research (2005) considered the role biomimetics plays in providing designs that are useful and sustainable. This will enable building engineers and architects to appreciate the real value and application of nature in creating and producing sustainable and efficient buildings. Architects can judge the response of building materials to their environment by analyzing the animal world. Godfaurd et al., provide the example of termites as an innovative animal architect which enables them to survive in whichever environment they reside. For example, some termites build chimneys, others have rain roofs on their dwellings. These tiny creatures appear to be able to modify the heat gain and loss though their dwellings due to the outside temperature.

Stokholm believed that Bionics, which is an interdisciplinary field mediating between technology and biology, is 'no universal tool for solving problems, but may in the best way be an excellent assisting tool' (Stokholm, 2006). Looking to nature as a teacher of design is a fascinating and ecologically valid option. Within the area of applied Bionics there are numerous examples of how designers have borrowed inspiration from nature. For example, the lotus-effect, this natural phenomenon has been applied in dirt-repelling and self-cleansing surfaces (Colombo, 2007). This effect refers to the self-cleaning and high water repellence shown by the lotus flower leaf. Moreover, this natural effect has been developed by designers to improve sensors on traffic control units and coatings, paints and roof tiles. These and other surfaces can stay dry and clean themselves in the same way as this lotus leaf. Therefore, this shows nature as a teacher and mentor to designers.

Vahedi concluded that nature has the most optimized organization in terms of form, function, structure, and material within the context (Vahedi,

2009). Nature provides a solution for interior designers and architects to hone their design works and optimize their ideas (Vahedi, 2009). Therefore, this research seeks to discover whether this knowledge of nature as inspiration should be imparted to trainee interior designers/architects. If informed early in their careers and learning journeys this may significantly affect and influence their future conceptual designs and creative ideas.

Lovegove is a designer who garners inspiration from the simplicity and beauty of nature. His visionary designs consider the link between technology, materials and organic form. Lovegove's work is believed to be "at the very apex of stimulating a profound change in the physicality of our three dimensional world'. He advocates 'organic essentialism' which means he will only use what is absolutely necessary and he has taken this stance from observing nature and its logic. Although Lovegove states that it is not about copying nature instead he is concerned with the application of nature (Lovegove , 2013).

This study aims to explore the viability and achievability of using biomimicry to transmit basic design ideas to undergraduate students. The purpose of thus study was to investigate whether originality and innovation can be taught to interior design students via a series of lectures on biomimicry.

2. Material and Methods

The research methods used involved an independent measures design consisting of thirty, year one, undergraduate interior design students. This group of students was presented with a lecture on the specific topic of inspiration transmitted through the study of nature. Subsequently, all students who attended the lecture were then asked to complete a questionnaire regarding their understanding of the importance of this area of study and whether learning more about this topic would help their own creativity and design decisions.

The methodology of this study involved using self-report techniques, in particular a questionnaire. The following questions were used in the questionnaire:

1- Did you hear about inspiration from nature before today's lecture?

2- Did you get this subject inspiration in a different module or just this module?

3- One lecture is enough to fully comprehend this technique for obtaining inspiration?

4- I would like to have more lectures to fully understand the technique of inspiration from nature.

5- This inspiration subject/topic relevant to me as a student of interior design?

6- This inspiration topic is very important in this stage of university: year one.

7- Inspiration helps me to gain a deeper understanding of nature.

8- Inspiration helped me to meditate on the environment.

9- The evaluation of my design becomes higher after I know inspiration.

10- I like my design after I know the topic.

Questions one and two were closed questions requiring a yes or no answer from the student. Whereas, in relation to questions three to ten the students were provided with a Likert scale and the students had to rank the statement or question according to pre-determined category choices. The choices were: strongly agree; agree; neither agrees or disagrees; disagree; strongly disagree. Students were required to rank a number of statements and questions focused on their earlier lecture on inspiration. Question 3 and 4 were focused on whether the students felt they would like to know more about this topic. Questions 5 and 6 were looking to identify if this topic was relevant to them at this stage of their career. The meditation and understanding of nature were the focus for questions 7 and 8. The final two questions (9 and 10) required an overall evaluation of their own design ideas after the initial lecture.

3. Results

The table below demonstrates the students' response to questions 1 and 2 of the questionnaire. Questions 1 and 2 were closed questions requiring a simple yes or no response from each student. Whereas, questions 3 through 10 required the students to rank each statement/question using a pre-determined Likert scale.

In a similar way, figure 1 depicts the students' response to the closed questions (1 and 2). Figure 2 shows the students' response to questions 3-10. The final figure shows the students' response to agreement or disagreement in questions 3-10.

Table 1: Students' response to Questions 1 and 2 of the questionnaire.

Questions	Yes		No	
	N	(%)	N	(%)
Q1: Did you hear about inspiration from nature before today's lecture?	21	70	9	30
Q2: Did you get this subject inspiration in a different module or just this module?	6	20	24	80

Table 2: Students' response to Questions 3 to 10 of the questionnaire.

Questions	Strongly agree		Agree		Neither Agree or disagree		Disagree		Strongly disagree	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Q3: One lecture is enough to fully comprehend this technique for obtaining inspiration?	3	10	8	27	4	13	14	47	1	3
Q4: I would like to have more lectures to understand technique of inspiration from nature.	16	53	6	20	4	13	4	13	0	0
Q5: This inspiration subject/topic relevant to me as a student of interior design?	24	80	5	17	0	0	1	3	0	0
Q6: This inspiration topic is very important in this stage of university: year one.	11	37	15	50	3	10	1	3	0	0
Q7: Inspiration helps me to gain a deeper understanding of nature.	19	63	10	33	0	0	1	3	0	0
Q8: Inspiration helped me to meditate on the environment.	19	63	10	33	0	0	1	3	0	0
Q9: The evaluation of my design becomes higher after I know inspiration.	6	20	9	30	7	23	8	27	0	0
Q10: I like my design after I know the topic.	11	37	13	43	5	17	1	3	0	0

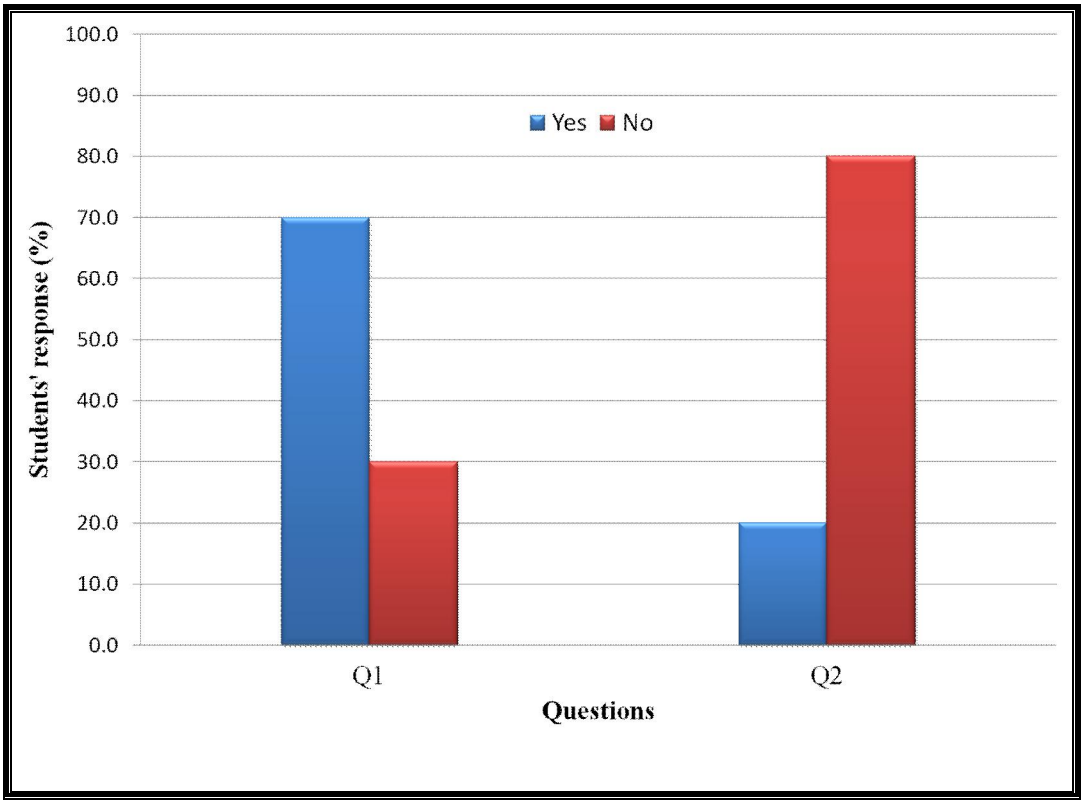

Figure 1: Bar chart showing students' response to Questions 1 and 2.

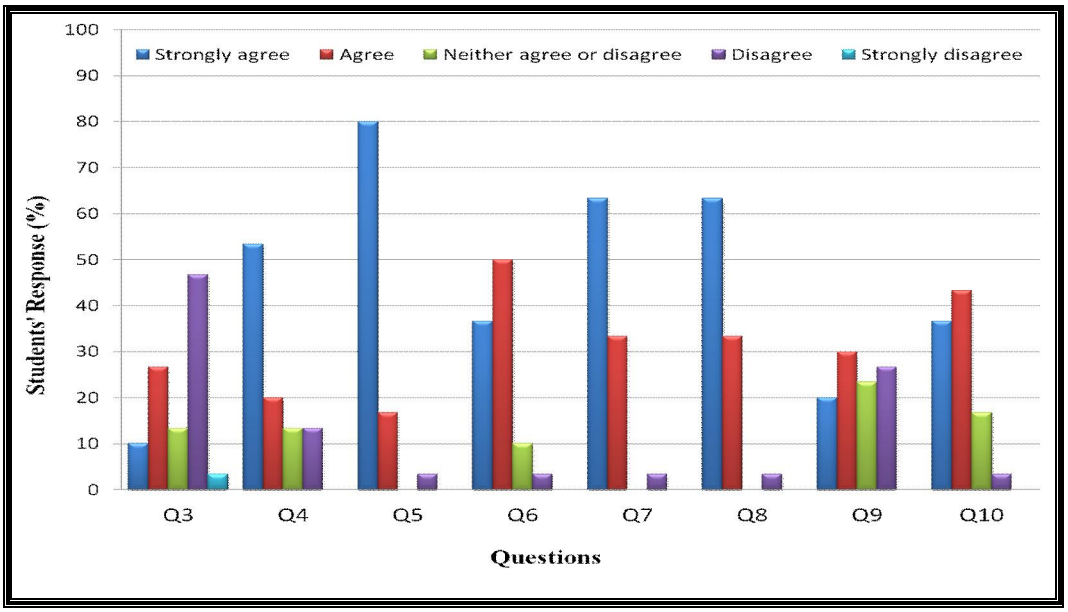

Figure 2: Bar chart showing students' response to Questions 3 to 10.

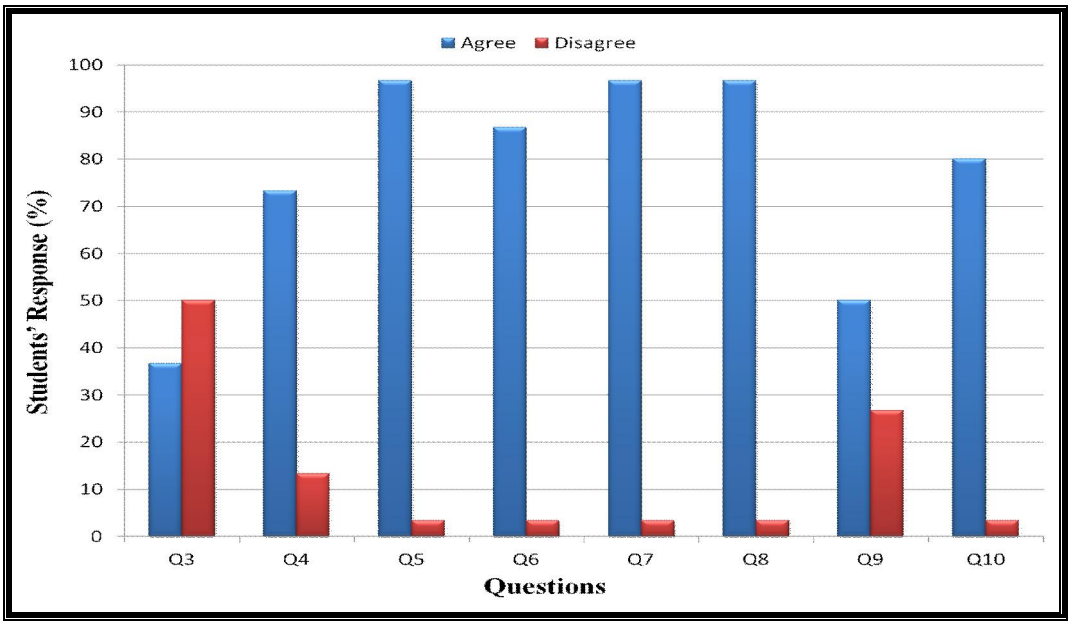

Figure 3: Bar chart showing students' response to agreement or disagreement in Questions 3 to 10.

4. Discussion

The questionnaire results revealed that inspiration from nature is a relevant, useful and also popular area that needs to be taught in more detail in undergraduate study. Questions 1 and 2 revealed that 70% of students had heard of this topic before but not through university teaching. 80% of students acknowledged that this topic hadn't been transmitted in a different module or course at the university. In relation to questions three and four the majority of students agreed that they needed more lectures to fully understand the information and apply the research to their own conceptual designs.

In response to the question five and six: Is this inspiration subject/topic relevant to me as a student of interior design and the topic is very important in this stage of university: year one? The majority strongly agreed with this statement as 80% of students strongly

agreed that this topic was relevant to them and 87% of students either strongly agreed or agreed that the topic is very important to them at this stage of university: year one. This is an important finding, which reflects the need for this topic to be taught to year one interior design students. The majority of students also agreed with these two statements: Inspiration helped them to gain a deeper understanding of nature (96% either agree or strongly agree). In addition, 96% also either agreed or strongly agreed with the statement that inspiration helped them to meditate on the natural environment. This stimulated them to search further on this topic because in the lecture they just received a general introduction. In question nine and ten students recognised that evaluation of their design becomes higher after they know the topic of inspiration. In addition, self-confidence seemed to flourish as 80% either agreed or strongly agreed that they liked their designs more about being informed of this topic. Overall, the students answered each question on the questionnaire in a positive and encouraging way.

This research, especially the results of question 9 and 10, concurs with Stokholm's premise that the use of nature to stimulate design ideas and act as an 'assisting tool' to conceptual designs is a valid and ecologically viable option. Bionics is 'no universal tool for solving problems, but may in the best way be an excellent assisting tool' (Stokholm, 2007). Furthermore, these results also are supported by the research of Vahedi who indicated that nature provides a solution for interior designers and architects to hone their design works and optimize their ideas (Vahedi, 2009). Questionnaires revealed a high level of increment in the creativity of students and their innovation ability. The findings revealed that the majority of students found that this initial lecture fascinated them and as it helped to broaden their thinking and impacted their creative design and processes. The students also stated their desire to see this topic included on the undergraduate specification as a core module of teaching.

This study supports Lovegove's stance on design and the application of nature. Lovegove has stated that contemporary design is often lacking and uninspired. Perhaps the answer would be embracing and teaching biomimicry to budding interior designs and artists. Lovegove would advocate implementing nature into design and gaining a deep understanding of the forms nature has demonstrated. After all, this natural design has been in the world longer than humans.

Practical recommendations from this research include the need to consider this topic as a main component of the design education system. This research compliments Godfaurd *et al.'s* research (2005) that the natural world has valuable lessons that can be applied to architecture or design as a whole. The natural world can be viewed as a type of archive from which we can extract ideas and one that can also inspire creativity.

Design students indicated the need to establish and impart a core teaching module that focuses on inspiration transmitted through nature; as the findings revealed that students were interested in this topic as an aid to the development of their designs. Lecturers should advocate looking at nature in new ways and ultimately this can inspire and motivate their students. The Biomimicry Institute acknowledges that biomimicry is expanding as a topic resulting in academic establishments throughout the world incorporating this subject in their institutions. For example, Harvard University boasts the Aizenberg lab, which considers the basic principles of biomineralization. Additionally, Imperial College London has an institute of biomedical engineering.

The research also revealed that one lecture is clearly not enough to impart to interior design students the full details regarding inspiration stemming from nature and the application of natural principles. In addition, this subject is not currently on the undergraduate interior design syllabus instead the student tended to focus on more theoretical modules such as the history of art. Furthermore, it is clear that the study of nature can be a source of inspiration for the whole generation and perhaps it should even be introduced into the curriculum at an earlier age possibly during elementary school. A meditation and awareness of nature can be a source of perpetual creative inspiration, which can benefit society as a whole.

Conclusion

It is clear that learning from nature is inspirational and offers potentially unlimited design opportunities. The researcher wanted to explore new and innovative approaches to develop and share creativity and the analysis demonstrated that students are keen to know more about biomimicry and how it can assist their chosen career as an interior designer. The application of biomimicry and its transmission through undergraduate lectures enables students to meditate on the power of nature. Students will not only be learning about design but they will also be informed concerning nature and natural world as a means of design inspiration.

This study has intended to reveal new approaches to teaching interior design students by focusing on drawing and applying inspiration from nature. Nature may provide constructive material that can be a source of creative inspiration. The application could be used to inspire future designers and students material innovation. The researcher proposes the use of

compulsory modules of teaching based on biomimicry and inspiration from nature.

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3/23/2014