UNIVERSITY OF MALTA

PERCEPTION OF CREATIVITY BY AN EDUCATOR AND A SCIENTIST

IOT5027 Creativity and Innovation in Education, Science and Technology

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1. INTRODUCTION

1.1. Definition of creativity

Creativity as a phenomenon is not easy to define, mainly due to its multi-dimensional nature. Yet, the arena of definitions on creativity is extensive. It is widely agreed that creativity is something novel that adds value, or it is combining existing elements in a new way. According to Seltzer and Bentley (1999) creativity is the application of knowledge and skills in new ways to achieve a valued goal. Edward de Bono (1992) sees creativity as bringing into being something that was not there before. Feldman (1999) insists that 'creative accomplishment' is a developmental shift, a significant re-organisation of knowledge and understanding, which can lead to change in products, ideas, beliefs and technologies. The list of definitions on creativity is overwhelming and it is not possible to cover it all in this assignment.

1.2. The main approaches to the study of creativity

The field of creativity started attracting more interest amongst researchers in the 1950s when Guilford challenged psychologists in his APA Presidential Address to focus more on creativity as somewhat neglected topic. However, only in the 1990s one has witnessed a significant increase of interest and research in creativity (Sternberg and Lubart, 1999). Creativity as an area of study has been divided into different concepts discussed by Sternberg and Lubart (1999). Creativity as mystical phenomenon can be attributed to earlier times and does not have much credibility and validity in the scientific discourse. Also the pragmatic approaches that focus on practical methods of enhancing creativity skills, mainly advocated by Edward de Bono, lack basis in serious psychological theory according to Sternberg and Lubart (1999). Psychodynamic approaches are seen as the first major 21st century theoretical approach to the study of creativity. However, due to its nature, mainly based on case-study method, this approach has not obtained the central position in the creativity research (Sternberg and Lubart, 1999).

More significant concepts in the creativity research deal with psychometric, cognitive, social-personality and confluence approaches. The best known method representing the psychometric approach is the Torrance Tests of Creative Thinking, scoring for fluency, flexibility, originality and elaboration. The cognitive and social-personality approaches have offered valuable insight into creativity, cognitive concept focusing on processing creative thought and social-personality approach mainly concentrating on self-actualisation and creativity (Maslow), motivation for creativity (Amabile) and social environment to creativity (Simonton). However, confluence approach argues that several factors have to converge for creativity to occur (Sternberg and

Lubart, 1999). For instance, Amabile (1983) highlights that creativity is the confluence of intrinsic motivation, domain-specific knowledge and creativity relevant skills, whereas Csikszentmihalyi (1996) sees creativity as the interaction between the individual, domain and field. Another very influential theory amongst confluence approaches is the Investment Theory of Creativity developed by Sternberg and Lubart (1991) according to which creative individuals buy their ideas low, but sell high. More importantly, this theory lies on six interrelated resources required for creativity – intellectual abilities, knowledge, styles of thinking, personality, motivation and environment – showing that creative performance depends on the concurrency of several factors.

1.3. Creativity in education, science and technology

The way, creativity is perceived, researched and discussed amongst academic circles, decision-makers, as well as in the wider public, has a major impact on the education system and therefore also on the progress of science and technology. Recently, creativity has become a widely used term in the economy as a driving force for innovation, but moreover it has been emphasised in several policies as a key factor for the change in the educational system (Craft, 2003). Decisions made today in the education system will have an enormous influence on the future.

1.4. Research method

The given research focuses on perceptions on creativity from an educator's and a scientist's perspective. The method used for this research was semi-structured interviewing in order to gain in-depth insight into these two indicated persons' point of views. Both respondents received the prepared questions prior to the meeting and therefore had the opportunity to think about the topic in advance. The interview with the educator took place face to face and lasted around 30 minutes. The interview with the scientist was conducted via Skype due to his location in Washington D.C. and lasted around 45 minutes.

2. CREATIVITY FROM THE PERSPECTIVE OF AN EDUCATOR

2.1. Educator's background and area of expertise

The Educator under research is a male lecturer (age 33) of International Business at the Institute of Business and Commerce at MCAST. He holds a Bachelor's degree in Economics and Public Policy and a Master's degree in Diplomatic Studies, both from University of Malta. He is also a warranted teacher by Post Graduate Certificate in Education. At MCAST he lectures students who range from certificate level to vocational level.

2.2. Perception on the concept of creativity

Feldman (1999) has indicated several dimensions of creativity, including education and preparation, characteristics of the domain and field, social/cultural contextual aspects, etc., that also may have an impact on how one perceives creativity. Similarly to many creativity researchers, the Educator indicated that for him there is no single definition for creativity as it is much vaster concept. According to him, "*creativity is something out of the ordinary*". As he emphasised „*you take something ordinary and you make it extraordinary, creativity is that something extra, it is infinity and beyond*". He also argued that it is art and science combined, because there are different techniques that one can learn as one goes along.

In the psychology and creativity research, there is an ongoing debate on nature vs nurture approach – is creativity and inborn trait or a skill that can be learned? The viewpoint on this issue determines whether we make an effort to develop and enhance our creativity skills or we just take it for granted. In the Educator's opinion, if humans were not naturally creative, we would still be living in the caves. He compared creativity with singing, „*everyone has ears for music and everyone can actually sing, however, professionals have to train and practice every day*." Consequently, summarising his perception, he agrees with Craft's (2002) statement that creativity is within the capabilities of every individual, yet, it has to be developed further.

2.3. Creativity in the classroom

Sternberg and O'Hara (1999) discuss in their paper five different approaches to the relationship between intelligence and creativity: creativity as a subset of intelligence, intelligence as a subset of creativity, creativity and intelligence as overlapping sets, creativity and intelligence as coincident sets and no relationship as such. This relationship is an important phenomenon to investigate, particularly in education system. They way an educator perceives intelligent and

creative students, may have a significant impact on his/her approach to students and teaching methods.

When asking the Educator to describe the relationship between intelligence and creativity from his point of view, he pointed out that the example of an intelligent and creative student would also answer this question. In his opinion, an intelligent student would tackle the presentation differently from a creative student. According to him, an intelligent student would play safe: he would do much research, take many notes, and ask questions to know exactly what he needs to do. When delivering the presentation, he would provide very detailed slides full of information. A creative student, in contrast, would dedicate more time to the actual presentation itself such as the colour codes and audio-visual devices used. He would be more concerned with making the presentation the best learning experience possible by delivering the message in the simplest way, rather than just giving many details. The Educator indicated that he personally enjoys more the presentation given by a creative student. Consequently, he sees intelligence as doing everything required, whereas creativity involves playing around with several options and combining them in an interesting way.

In the Educator's opinion, creativity is very important to be nurtured in the classroom. As part of his teaching methods, he is using simulations, role plays, interviews, presentations, etc. According to him 'one plus one equals three', meaning that by combining different creative methods for learning, one takes much more out of it. In addition, he likes to involve students by asking them to deliver a lesson themselves.

According to the Educator, the opportunities for developing creativity at MCAST are much wider than, for instance, at junior college or university as the approach is much more practical and hands-on. For instance, Art and Design students go out from the classroom to different creative environments to work there, mechanical engineering students are involved with Lufthansa Technique where they develop their own projects, etc. The emphasis is always put on the practical side and how things work in reality. However, despite the practical approach there are still old-fashioned teachers who use the same notes and teaching methods as 20 years ago and who therefore are not remarkable advocates for creativity and not much appreciated by the students.

As for the difference between a creative and innovative educator, the Educator pointed out that "*innovative educators are those who put creativity into practice, creativity is a channel that can help innovate, to come up with new ideas*". With that, the Educator has well demonstrated his understanding of creativity and innovation and the difference between them.

2.4. Teaching creatively, teaching for creativity

Jeffrey and Craft (2004) discuss in their article two concepts 'teaching creatively' and 'teaching for creativity' and a relationship between them. They conclude that the relationship is an integral and that teaching creatively often leads to teaching for creativity. In the Educator's opinion 'teaching for creativity' puts more emphasis on the end result, creating creativity in one particular person, whereas 'teaching creatively' is about the means and methods of teaching. However, he does not believe that 'teaching for creativity' necessarily has to involve the element of 'teaching creatively'. In this sense, he has not grasped these two concepts in the way Jeffrey and Craft have discussed them.

2.5. Constraints to creativity

American Creativity Association has published „10 Barriers To Creativity" on its website. What can clearly be constraints to the development of creativity in the education institution are lacking support structure for transforming the ideas through implementation, neglecting different initiatives and lack of acknowledgement. These are also indicated in the document mentioned above (Rohe, NA).

According to the Educator, the biggest detrimental factors to creativity are lack of resources and bureaucracy. At MCAST a teacher has to get an official permission for everything, such as for inviting a guest to give a presentation. There are several forms that have to be filled in by the school officials as well as by the guest himself which does not encourage guests to come and teachers to take up this time demanding task. The educator added that „*you move a step forward, but they take you three steps backwards*".

Another limiting factor for creativity in the Educator's opinion is the lacking collaboration between the board of MCAST and the teachers. Until just recently, teachers and students were even not involved in the decision-making process of the school. He said that "*most of the time, we are the soldiers, they are the generals*". Creativity is neither encouraged by the assessment methods. The exams were introduced recently as the board did not believe in continuous assessment and was in an opinion that a course without an exam would not be up to standards.

2.6. The current education system

Craft (2003) discusses several limitations to creativity in education, including in curriculum organisation and in centrally-controlled pedagogy. At MCAST the teachers have the opportunity

to develop their own syllabus in the frames of curriculum and despite other constraints discussed above, they can encourage creativity in their school.

However, the Educator admitted that apart from MCAST, the education system neither develops students' creativity nor prepares them for real life. He pointed out from his own experience how university, for instance, lacks of practical methods. Another example he mentioned was about his friends who obtained a degree in Management based on American approach which, however, was not applicable in Maltese context.

3. CREATIVITY FROM THE PERSPECTIVE OF A SCIENTIST

3.1. Field of expertise

Dr. Bruno Sanchez-Andrade Nuńo is a space (rocket) scientist at the US Naval Research Laboratory Space Science Division and he is a contractor from the George Mason University (Washington D.C.). He obtained his PhD in astrophysics from University of Göttingen (Germany) in 2008. He is currently 29 years old.

His area of research deals with the Sun and Space Weather (Earth-Sun relation). The main responsibilities within his research include working with the data from space satellites, rockets and calibration of cameras on-board scientific rockets, developing computer codes for assimilating the incoming data and also building hardware for data collection. In addition, he is focusing on writing articles as according to him the number of references to one's papers is the most significant factor in determining how successful a scientist is.

His area of research is only based on innovation – discovering new phenomena and developing new hardware for Space research.

3.2. Perception on the concept of creativity

Whereas the Educator saw creativity as something very challenging to define and gave several answers how to describe creativity, the Scientist was more straightforward in explaining the concept from his point of view. According to him, creativity lies on new ideas from already known information. It is about picking up these noises that play around in one's head and developing them into new ideas.

The issue about creativity as an inborn factor or a learned skill was perceived in a similar way by the Scientist as by the Educator. According to the Scientist, creativity is like a muscle – one could have a predisposition to be more or less muscular. However, one has to exercise creativity, because otherwise it would fade away. He agreed that the environment also influences much of a human's creative abilities.

There are several authors such as Csikszentmihalyi (1996), Ivcevic and Mayer (2006), Dacey and Lennon (1998) who have discussed the personality traits of a creative individual (Conrad, 2007). Although their research approach to the traits of creative individuals and emphasis is a bit different from one another, they all agree that creative individuals are very curious and open to

new experiences. In the Scientist' opinion, a creative person has much to do with curiosity. "*You have to be open to all your inputs and let the ideas play in your mind*." A creative scientist from his point of view holds most of the variables and comes up with a new idea from all the inputs and constraints. Consequently, a normal scientist just follows orders. However, he also added that if one is creative then the idea created is not the end of the path but it has to be converted into a real thing.

Feist (1996) discusses the influence of personality on artistic and scientific creativity and in his article he clearly demonstrates that personality has an impact on creative achievement in art and science. According to the scientist, his personality has played a major role in his scientific career. "*I am doing what I am doing because of the way I am*." He explained that in physics and mathematics one has to be passionate about what one is doing otherwise one even would not graduate from university. "*Curiosity, openness to other cultures, ideas, experiences – everything you get into your mind, is tested against what you know*."

3.3. Subjectivity/objectivity in science

The subjectivity/objectivity topic in science has gained much attention and debates amongst different scientific disciplines. The Scientist agreed that science should beyond doubt be objective but usually it is not the case. According to him, every academic has his/her opinions, ideas, preferences, which are clearly reflected in one's work. He also pointed out, that the government plays a major role in influencing science and areas that are given the importance to.

He has an opinion that if one cannot follow all steps of scientific method, it is not the science how it is understood. He agreed that in social sciences there are data, theories, hypothesis and results. Social sciences can explain social phenomena, however, according to him they are never able to predict what will happen as next. In contrast to social sciences, nature sciences can always make predictions and if not, then there is an issue.

3.4. Creativity in science

Mostly, science is not associated with creativity as it comprises very certain step-by-step procedures and rules. However, it is admitted that many great discoveries would have not happened, if there would not have been any creativity involved (Adams and Pierce, 2007).

For the Scientist, creativity in science is keeping in mind all the knowledge and then trying to find explanations to different phenomena. Usually, the creativity part is significant in the beginning of

the research process when investigating new phenomena. However, the new idea has to be viable and consistent with all the laws. In his opinion, it is accepted to break some rules, yet, breaking all the rules would just be foolish.

The Scientist believes that it is important to be creative in science and that all scientific projects need creativity at some point. In his opinion, one must play around with the data and try to understand it, yet, if one cannot interpret it, then it is even more interesting because that is where creativity comes in. However, he emphasised that one has to be critical: "*If you have to follow the rules, then follow the rules but always think about what you are doing*." Furthermore, old knowledge has to be transformed into new knowledge with the help of creativity. Scientists coming up with new methods or solutions can be considered creative, in his opinion. However, he stressed that a new idea has to be testable according to the scientific method, because if it is not then it not a scientific idea.

There are several step-by-step idea generation methods that can be successfully applied in the scientific process, such as SCAMPER, TRIZ, Creative Problem Solving, Provocation and Movement, etc.. However, when asking about the use of the idea generation tools, he pointed out that mostly he is just following the path of previous scientists, reading papers, attending conferences and trying to develop his understanding of an issue from these inputs.

Perl (2008) discusses different factors influencing creativity and innovation in engineering and science. He emphasises that the ability to visualise and use imagination is a crucial factor for creativity in these areas. The Scientist uses much visualisation and imagination in his creative processes. *"I love to have a white board... You need to draw it before it will fade away.*" This confirms Perl's notion on the role of imagination and visualisation in the creative scientific process.

Adams and Pierce (2007) argue that although creativity plays a crucial role in scientific discoveries, it is often absent in the science classroom. With the reference to the TED Talk by Sir Ken Robinson (2006) the scientist admitted that people are educated out of creativity. Furthermore, students, in his opinion, do not think but just learn and that kills creativity. He added that out of the box thinking is not encouraged in the science classroom because they are often crowded and the material has to be delivered in a limited time frame, not allowing much time for thinking. According to his point of view, a successful education system stands on two pillars: thinking and inspiration. Students have to be inspired and in order to attract interest science should communicate its achievements more with the public.

3.5. Environment for creativity

Environment is deemed to be amongst the most influential aspects influencing creativity. Hughson and Hughson (2004) discuss concepts like ‘Creative Surroundings’ and ‘Being in the Right Place’ as important factors for enhancing an individual’s creativity. For the Scientist, interaction with other colleagues plays a crucial role in succeeding as a scientist. According to him, science is becoming more and more complicated where different expertise and contribution is required. Consequently, it is not possible to be alone in this process.

When asking about the working environment, the Scientist indicated that in his case it is both conducive and detrimental to creativity. US Naval Research Laboratory Space Science Division is the best place in the world where to research the Space and the Sun as most of the experts on Space are working there. This environment genuinely encourages collaboration.

However, this environment also has some detrimental elements. According to the Scientist, the atmosphere at the office is too closed and antisocial to encourage creativity. He reflected that a typical scientist is antisocial and does not have any social skills. Consequently, environment that is extremely anti-social is not good for creativity.

4. CONCLUSION

The topics covered during the interview with the Educator discussed the concept of creativity, its implementation in the classroom, the concepts of 'Teaching creatively, teaching for creativity', constraints to creativity and the current educational system and its limitations.

The interview with the Scientist focused on the concept of creativity from a scientific point of view, subjectivity/objectivity in science, creativity in science as well as the importance of the environment for creativity.

Evidently, creativity required in science differs in its nature from that required in the classroom. Whereas creativity at school means using different interactive teaching methods, involving students and allowing them to play around with various ideas, creativity in science has to be built upon certain rules and consecutive steps that cannot be ignored. However, in both cases creativity leads the participants involved to something novel.

Both the Educator and Scientist expressed their concerns about the education system, which traditionally does not encourage creative thinking or enhancement of practical skills. They believe that creativity needs to be present not only in the schooling stage but also at work and this is only possible if the environment supports creativity.

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APPENDIX A: INTERVIEW QUESTIONS

Questions for the Educator:

1. What does creativity mean to you? How would you define it in your own words?
2. Do you think that creativity is an inborn ability or is it something that can be learned?
3. Is there a difference in your opinion between intelligence and creativity?
4. How would you describe an intelligent student and a creative student?
5. Is creativity important to be nurtured in a classroom?
6. Do you think that the concepts 'Teaching Creatively' and 'Teaching For Creativity are different? Can you please explain it further?
7. Are there any methods you are using during the lesson that are not based on from-teacher-to-students approach (teacher only speaking and students following the lesson)?
8. What can a teacher do within the frames of curricula to stimulate creativity? Do you do anything to create a creative atmosphere?
9. To what extent students' creativity can be encouraged in the classroom?
10. How do you make a link between the theoretical material and the real life?
11. Is the concept of 'creativity' emphasised by the school? If yes, in what way?
12. What are the barriers in your opinion to creativity in the classroom?
13. Do you think that in the society, where more and more skills, competencies and capabilities are valued, the current educational system is actually meeting the society's needs?
14. Is there a difference for you between creative educator and innovative educator? How would you describe it?

Questions for the Scientist:

1. Please describe your main responsibilities at work and a typical working day?
2. What does creativity mean to you?
3. Do you think creativity is an inherited trait or something that can be learned?
4. Who is a creative person? Who is a creative scientist? Characteristics.
5. How would you describe the role of creativity in science?
6. What do you think is creativity important in science?
7. How does creativity differ in different scientific disciplines?
8. How much is out of the box thinking encouraged nowadays in the science classrooms?
9. What kind of role has your personality played in pursuing your scientific career and in your new discoveries? What has driven/motivated you to move forward in science?
10. How do you think new ideas emerge in science?

11. How important it is for you to play around with different ideas when working out something? Or are you rather a rule-follower or a creative thinker?
12. Are there any specific methods you are using for generating ideas in your research process?
13. Can you please describe your scientific creative process? If you have a creative idea, how do you usually proceed with it? How much there is visualisation, imagination involved?
14. How much do you appreciate interaction with other people in your field of research?
15. Do you find your working environment is conducive or detrimental to creativity? Why?
16. Subjectivity/objectivity in science?