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Teaching creativity to first year students to solve relevant problems – a success story

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Abstract:

The subject Information Systems Analysis and Design forms part of a first year's BCom degree at a large urban university in the administrative capital of South Africa. This paper describes the way creativity teaching is included in this course, namely as traditional lecturing supplemented with the use of other media and class exercises in a blended learning fashion. The students had to apply creativity techniques to suggest responses to the current leadership problem in South Africa in an assignment they had to complete. A survey performed after the assignment showed that although students thought the classroom environment was where they learned most about creativity, the assignment they enjoyed best was making their own video. This paper contributes to the IS field by presenting a success story of teaching creativity skills and can be used as an example that other similar courses can benefit from, when applying its principles.

Key words: Blended learning, Creativity, First year course, Teaching, Problem solving

I. Introduction

The subject Information Systems Analysis and Design forms part of a first year's BCom degree at a large urban university in the administrative capital of South Africa. This degree is hosted by the university's School of Information technology (SIT) and while it forms part of the core subjects of the BCom Informatics degree, it is also a support subject for numerous other degrees such as BCom Financial management, BCom Internal Auditing and other. Hence, less than 10% of the 600 – 800 students have it as a subject of primary interest. The main focus of the first part of the course is problem solving, including not only well formulated problems but also messy problems. Problem solving is considered a fundamental skill to be acquired by the Information Systems graduate [Topi, Valacich and Wright, 2010:380]. Complex and messy problems need creative solutions and therefore creativity is also included in the IS2010 curriculum. In the course under discussion, creativity techniques were taught to a group of 781 first year students in 2012. Traditional lecturing was supplemented with the use of other media and class exercises in a blended learning fashion. To bring creativity techniques to life outside the classroom, a group assignment was given to the students. They had to apply creativity techniques to suggest responses to the current leadership problem in South Africa. Groups were requested to make their own videos to present the work. The structure of this paper is as follows, 1) The importance of creativity in education; 2) the teaching of creativity in IS education; 3) research approach and findings; 4) discussion and conclusion.

II. The teaching of creativity

Various definitions for creativity exist [Couger, Higgins and McIntyre, 1993; Dinicaa, Dinescua and Miron, 2010; Tsai, 2012; Barlow, 2001; Seidel, Muller-Wienbergen and Becker, 2010]. One such definition is "Creativity is the ability to see a challenge or problem in a new light and thus to find solutions that have not been obvious before" [Dinicaa et al., 2010:3732]. Couger et al. [1993:376] listed various other definitions including a quote from Ciardi [1956] saying "Creativity is the imaginatively gifted combination of known elements into something new". By integrating the above

definitions for creativity, creativity is seen as an ability to see a problem in a different way and being able to use known elements to either create something new or to find solutions to existing problems.

In an ever changing world where the only certain thing in life is change [Tsai, 2012] the creative way one handles change is almost becoming a survival skill. The assumption is, similar to Couger et al. [1993], that creativity exist within us all and can be enhanced by structured creativity development. One way of achieving this is to include creativity into the curricula of educational programmes [Couger et al., 1993]. Tsai believes that “unlocking the power of imagination to transform creative thoughts into creative actions becomes significant in the educational agenda” [Tsai, 2012:84]. Adams [2006] considers the important components of creativity to be motivation, expertise and creative thinking skills. According to Adams, problem-based learning presents an ideal learning environment where all three components come together in the creation of a solution.

Several disciplines include creativity teaching as part of their offering. Creativity teaching is often applied in computer science education. For example, Heines, Greher and Kuhn [2009] use ideas from music to increase creativity in programming. Sweeney [2003] and Romeike [2008] propose the explicit inclusion of creativity techniques in the teaching of programming. Horton [2006] developed a method to teach creativity to students from engineering, management, computer science and social sciences. He reduced the large number of creativity techniques into a small number of fundamental principles in order to develop a systematic methodology for generating ideas. The inclusion of creativity into IS education is discussed in the next section.

III. Creativity in IS education

It is clear that researchers consider creativity to be fundamental to most activities of Information Systems professionals. These activities range from requirements engineering [Nguyen and Shanks, 2009] to the design of the artifact [Lee, Baskerville and Pries-Heje, 2012]. Couger, Higgings and McIntyre [1993] also mention the need for IS professionals to be able to creatively solve problems in this competitive environment, to be innovative and solve problems in new ways.

Topi et al [2010] therefore include creativity as a fundamental skill for IS graduates. However, research on the explicit inclusion of creativity techniques in the IS curricula is scarce. Rather, it is seen as a result of problem-based learning [Law, 2007]. An exception is Zhao and Zhao [2010] who follow an explicit approach and develop a teaching method based on the mental processes from the cognitive, emotional and creative domains. Each of these domains are developed and stimulated by exercises. Students are taught different thinking styles (e.g. associative thinking, reversal thinking etc.) to stimulate their creative abilities in the broader context of problem solving (e.g. the design and development of a web page).

This paper describes an approach to explicitly include creativity thinking skills into the IS offering. The three components as presented by Adams are addressed as follows:

1) Expertise: This refers to the student's knowledge of the problem area. Since most of the students are not IS students, an unstructured or messy problem that is relevant to all, was chosen. The problem deals with leadership in South Africa. It was assumed that most students will have some knowledge of the political environment in SA.

2) Creative thinking skills: In preparation for the assignment, students were provided with different creativity techniques and had to do class exercises applying these.

3) Motivation: This refers to the intrinsic and extrinsic motivation of the student to solve the problem. The extrinsic motivation was provided by making this activity an assessment opportunity which counted towards the semester mark. Intrinsic motivation cannot be controlled. However, the majority of the students are technology-wise and can be described as “always on/never off” [Ashraf, 2009:343]. It was assumed that by integrating technology into the learning environment, students might have some fun and be more willing to be creative. This was done by having students create a short video to demonstrate the way in which they used the creativity techniques to solve the problem.

The next section discusses the teaching approach that was followed in more detail.

IV. The teaching approach

Research was conducted at a large urban university in the administrative capital of South Africa. The university enrolls around 45 000 contact students in a wide range of subjects and is considered a research institution. Within the School of Technology, the Informatics Department offers a wide range of courses including the Introduction to System Analysis and Design. Here the students are introduced to the systems approach as well as creative problem solving. One of the study units covered in the course is creative problem solving within which these students are introduced to various creativity techniques. These include the six thinking hats, brainstorming, mental provocation, random input, idea association, Do-IT, Method 635, the concept fan and others. Due to the fact that a simple lecture in a classroom may not be effective in teaching creativity [Tsai, 2012], various teaching methods were applied throughout the semester of the above mentioned course. Methods such as group assignments, video presentations, and visual teaching aids during class contact sessions to ensure that the students were given the opportunity to act on these creative ideas were applied.

After creativity was introduced and various methods applied, the students had to complete a group assignment. They were given a quote from an ANC Youth League PEC Member of the Free State about social challenges in South Africa and an encouragement to “turn the tide around” and become better leaders. The students had to use various creativity techniques of which some were introduced in class and others were for self-study, and write a report on how the leadership problem can be addressed and solved. After the report, the students had to make a 5 minute video to illustrate at least three of the techniques used to solve the problems. All the assignments had to be done in groups between 4 and 5 and in the end; there were 154 groups who completed the assignment. The reason why this assignment had to be done in groups was two-fold, firstly due to the large number of students registered in this course and secondly, Barlow [2001] realizes that someone else’s “AHA” moment might trigger an even bigger “AHA” moment in a team member once he hears or sees this and thus you will be able to ensure a much bigger impact on creative thinking than on an individual basis. *“It is also crucial to notice that as team members learn and shift... the team members change in ways that make old ideas newly acceptable”* [Barlow, 2001:3]. Groups should also not be too large in numbers, thus a maximum of 5 students per group, and it should be a collaboration group where everybody’s opinion is taken into consideration [Seidel et al., 2010]. It should be noted that the students had to form these groups themselves and were not assigned to other group members. The assignment counted 10% of students’ semester mark, and therefore most students took the assignment seriously.

It is also important to note that no actual technology training on video equipment or editing was provided, this was due to Rikye et al.’s [2009] notion that these students pick an electronic device, and start experimenting right away because they have *“adopted a mind-set of rapid-fire trial and error learning. They’re not afraid of making mistakes because they learn more quickly that way. They use devices experientially, and have no problems getting help online. ..”* [Rikhye et al., 2009:8]. This links back to the definition of creativity, which is the ability to see a problem in a different way and being able to use known elements to either create something new or to find solutions to these existing problems.

Giving the students a technology-based assignment was a means to acknowledge their identity as the net generation, who are techno-savvy and digitally-literate. It was also a way of adding a fun element which may have added to intrinsic motivation.

As mentioned earlier there were 781 registered first year students enrolled in this course of which 741 students had exam entrance (note however that exam entrance for first years in the first semester is only 30%). At the end of the course, the students were asked to complete an online survey of their experience of the subject, 462 respondents completed the survey resulting in a response rate of 51%. Both quantitative and qualitative data analyses were done.

V. Findings

In total, there were 42 questions which formed part of the survey, of which most of the questions were closed. However, there were questions where the students were allowed to express their actual feelings and thoughts on the course and the notion of creativity (all the questions can be viewed in

Annexure A). Not all of the questions are relevant to this study and thus some are used in other research papers.

Students were asked if they feel that their creativity were developed and explored due to the fact that there was little structure to the problem. Ninety-one percent (91%) of the students said yes, which link to the notion that self-exploration can enhance creative problem solving.

The students were then asked which part of the assignment they enjoyed the most. The reason for asking this was to identify if the assignment was relevant, and if one enjoys the work, chances are that you will be motivated and give it your best effort.

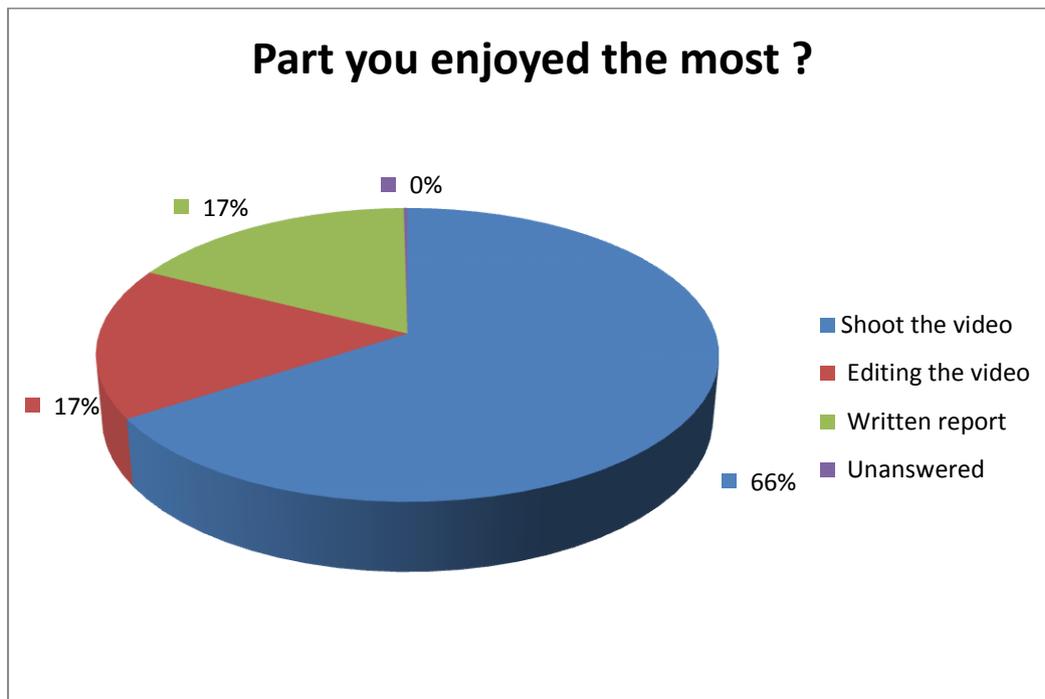


Figure 1. Which part did you enjoyed most?

Figure 1 clearly show that the majority of the students enjoyed filming their video. This however did spark the researchers' curiosity as to the actual devices used for filming of the videos as not everybody has access to a High-definition video camera. However, as the specific device being used was an open question, the data is not that clear although it was identified that 195 of the students said they used their smartphones to record the video. Even though all the data is not useable, what is clear is that by using the smart phones; most of the students did have access to video camera functionality. (A survey recently conducted at the University indicated that more than 90% of first year students had smart phones.)

Although the students had to select three different techniques to apply in their assignments, it is interesting to see which techniques they felt most comfortable with. The students were asked which creative problem solving techniques they used in this assignment. 66% of the groups used the six thinking hats, which was a techniques taught during our lectures. 46% decided to use the Do-IT technique, which was a self-study technique. They were then asked which technique they felt was the most useful; the highest ranked technique was the six thinking hats with 40% of them indicated it as the most useful. The second technique which they found useful was brainstorming. Even though the students indicated these techniques as the most useful, the researchers needed to know if they could solve problems easily with these techniques. Figure 2 clearly shows that 87% of the students did feel they could easily address the given problem by using these techniques.

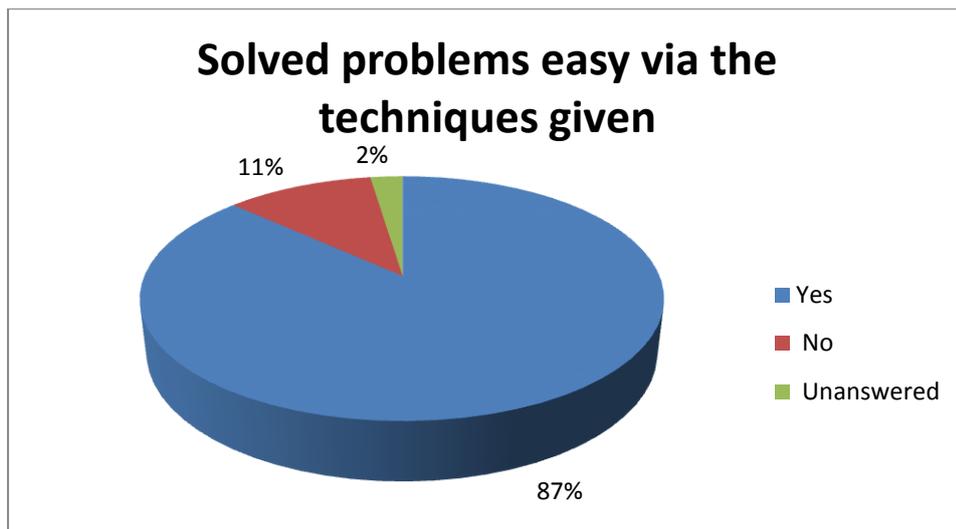


Figure 2. Easily solve problems

As the aim, of not only the assignment but also this course, was to ensure that students become more creative problem solvers, various interventions took place from the lecturer’s side during contact sessions, to engage with the students and to stimulate their creativity as mentioned earlier. Not only were students asked if the techniques help them solve the problem but also if it helped them to understand the problem better, 83% of the students said they understood the problem at hand better by using the techniques.

Students were asked to indicate where they felt they learned the most on creative problem-solving techniques. Figure 3 clearly indicates that it was the combination of class contact sessions and the assignment, which places an emphasis on having to follow a blended learning approach. It is also important to note that during class contact sessions, every session had a group assignment at the end of the session or there was an interactive debate facilitated by the lecturers.

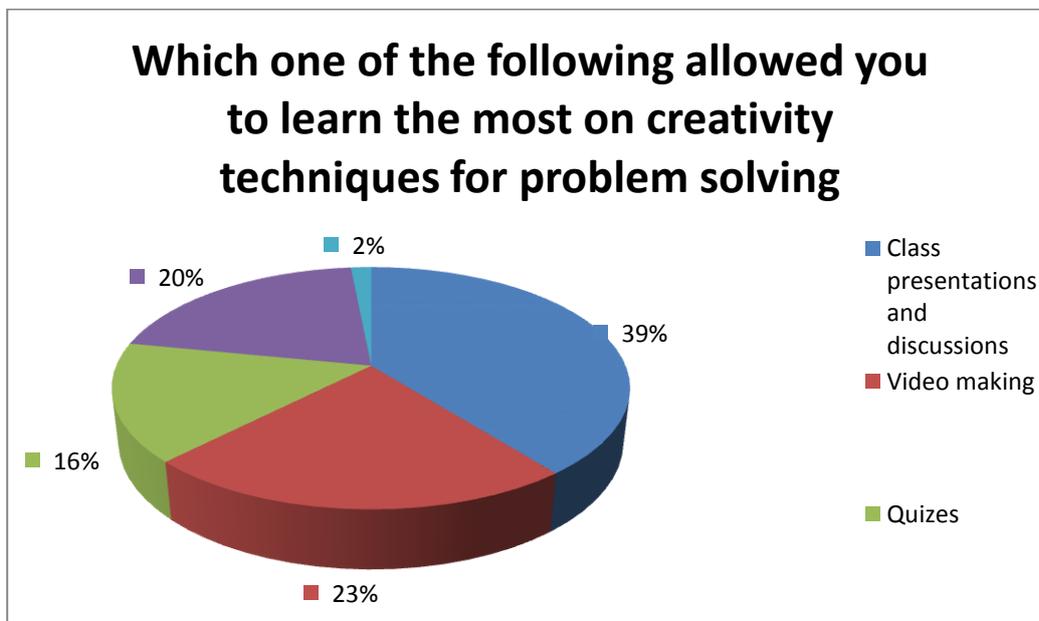


Figure 3. How did you learn the most?

VI. Discussion

At the end of the survey, students were asked to list any additional comments which they might have on the assignment. Roughly half of the students chose to comment. A word count through the comments indicates the following:

Table 1: Word frequency in additional comments response

Word / phrase	Frequency
"fun"	71
"group"	45
"enjoy"	44
"learn"	35
"problem solving"	21
"creative"	14
"boring"	4
"hate"	2

As can be seen, the words "fun", "enjoy" and "learn" occurred frequently, compared to very few occurrences of words such as "boring" and "hate". Since 45 students commented on working in groups, we investigated whether they referred to group work in a positive or negative light. It was found that 27 students made positive comments about the group work, such as: *"I enjoyed the task, and enjoyed working with my group mates, able to make new helpful friends, and was able to see each other's capabilities"*. The other 18 students mentioned challenges related to the group exercise, without necessarily being negative, such as: *"Working in a group is somewhat challenging"*. A handful of the 18 comments were negative, for example: *"I personally hate group work, reason being that I do not have even a friend. As a result I find it difficult to find a group. Even after I have found one, I find it difficult to be around them. I would prefer individual assignments in future."*

Some of the other comments were:

"Was an enjoyable experience"; "If making video was the only part for the assignment it would have been very enjoyable and thus more time to complete and polish video appearance for a quality presentation."; "It was fun to actually putting the problem solving techniques we learnt in a practice"; "really opened my eyes to new ways of thinking and solving problems"; "the class was mind awakening learnt to think creatively and solve problem creatively; "It was so much Exciting and it helped me to make new friends and understand the Techniques we were taught in Class very well"; "The assignment helped our group to fully understand how to use these problem solving techniques"; "It was the best project we did because of the idea of video recording. It helped us understand the topic by having fun with it."; "I thought that the exercise was actually quite fun and was a nice break from just reading theory than applying it in the form of a test."; "It enabled all students to experience an unorthodox manner of learning which increases participation and enjoyment of the exercise. Very productive and helpful."

Overall, it seems as if the students had a good learning experience and that their creative problem solving techniques were addressed. While there were a small number of negative comments, such as: *"It would have helped to have clearer guidelines about what the video should in fact contain"; and ; "the assignment was too long for group work"*, none of the students said they would prefer to rather not do a similar assignment again or that they felt it was a waste of their time, which is also a positive indication.

And perhaps, they learned some life lessons: *“It is important to have fun and love doing what is very rewarding you academically and socially. This module is an outstanding subject to learn about life.”*

It does seem that overall, by allowing the students to approach the assignment without giving too strict guidelines, forced them to understand the problem at hand better and it also allowed for a spark in the approach they use to solve problems. Even though they might not use the techniques as is in the future, they did seem to learn that one has to follow a certain approach and certain guidelines to solve a problem but one does not have to be restricted by one's own mind. Thinking out of the box, even though it seems silly at some point, is the only way to become a good problem solver and thus a great systems analyst.

VII. Conclusion

While creativity skills are included as a foundational skill in the IS2010 curriculum, there is very little published on the explicit teaching of creativity techniques in IS. The lack of evidence of creativity teaching is alarming, since the environment for which we design and build information systems is ever increasing in complexity, and increasingly in need of new ways to address problems.

This paper describes the way creativity teaching is included in a first year course in Systems Analysis and Design at a large urban university in South Africa. In the classroom, traditional lecturing is supplemented with the use of other media and class exercises in a blended learning fashion. To bring creativity techniques to life outside the classroom, a group assignment was given to the students. They had to apply creativity techniques to suggest responses to the current leadership problem in South Africa. The exercise further encouraged creativity by requesting groups to make their own videos to present the work. The use of technology as part of the assignment served another purpose, namely to engage students of the techno-savvy and digitally-literate generation and to provide an element of fun.

A survey performed after the assignment showed that although students thought the classroom environment was where they learned most about creativity, the assignment they enjoyed best was making their own video. They chose to apply the techniques that was covered more extensively in class, and found the techniques helpful in problem solving. Responses to an open-ended question to provide additional comments on the exercise, was overwhelmingly positive, with a clear message that overall, students enjoyed the exercise, learned a lot and found it meaningful. The positive feedback from the students is also encouraging in the light that most of them are taking the module as a service course and are as such not motivated to take the course content seriously.

This paper contributes to the IS field by presenting a success story of teaching creativity skills to first year students in Systems Analysis and Design, as part of an Informatics/ Information Systems degree. Since such case studies are scarce, it can be used as an example that other similar courses can benefit from, when applying its principles.

VIII. Further research

Creativity skills have been included in the same first year course for a number of years, but the feedback from the students was only gathered and formally assessed in 2012. Areas for further research include experimenting with different creativity teaching methods and practical assignments, and repeating the survey to compare results.

The authors are keen to find evidence of other similar environments where creativity skills are taught, and learn from or collaborate with other researchers in this respect.

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Annexure A

Questions from the survey

1. What are you studying ?
2. Understood what was expected
3. Enjoyed working in a group ?
4. Assignment allowed for multi-tasking (thus doing both written report and making same time) ?
5. Understood my group members, based on different brain profiles ?
6. Assignment allowed creativity as no clear boundaries was given?
7. Part you enjoyed the most ?
8. New concept ?
9. Confusing / Challenging
10. Difficult at first
11. What type of camera was used to shoot your group video?
12. What software did you use to edit your video ?
13. It was easy to write a script for the video
14. User friendly
15. Editing was easy
16. Difficult to upload sound to video
17. Was the music you added to your video legally downloaded? (Don't worry we won't tell)
18. I enjoyed playing myself in the video
19. Prefer being present when the video was marked
20. Reaction to video assignment overall (Positive / Negative)
21. Fun / Enjoyable / Exciting
22. Good Learning experience / Educational
23. Interesting?
24. Endless creativity / Think out of Box
25. Good group collaboration
26. Like to do a similar assignment in the future due to instant gratification and instant rewards
27. Positive learning experience
28. Liked Editing
29. Liked writing the script
30. Problem solving techniques understood
31. Problem solving techniques we used
32. Problem solving technique we found most useful in addressing problem (choose one)
33. Solved problems easy via the techniques given
34. Applying problem solving techniques helped me to understand the problem better
35. Enjoyed the instant results that could be visually experienced during editing
36. Getting stuck helped us to become better problem solvers
37. Which one of the following allowed you to learn the most on creativity techniques for problem solving
38. I believe the solutions we developed are relevant for addressing the leadership problem in South Africa
39. Helpful ?
40. Approachable?
41. Who/what did you first approach for help?
42. Additional comments (type in any additional comments that you have on the exercise)