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Collaborative Learning: a means to Creative Thinking in Design

Siu-kay Pun

Abstract**—**Employers are increasingly looking for graduates who can think creatively and collaborate effectively to come up with innovative solutions to complex problems. This paper presents a study on applying a pedagogical approach based on collaborative learning to a course for students from different majors. The objective of the course is to develop in students creative thinking skills in solving design problems. The results show the effectiveness of this approach in making team-learning fun for the students who are from different majors. The team projects completed were highly creative and effective and also showed the influence of their own disciplines in the solutions they came up with.

Keywords**—** Collaborative learning, creative thinking, visual art, multidisciplinary group.

I. Introduction

IN this age of a globalized and highly competitive world, it is essential for countries to move towards more knowledge-based economies to remain relevant and competitive in the 21st century. As such, a strong emphasis on quality education to develop human capital becomes utmost important. In this respect, institutions of higher learning play a most significant role and must innovate and develop curriculum that meet with the changing needs to remain relevant. "We must not be mere knowledge providers, but also knowledge creators, generating new ideas that revolutionize the way we live, work and play" [1]. In other words, apart from acquiring today's multidisciplinary knowledge and skills, future generation will need to have good communication and team working skills, possess creative and innovative minds to respond flexibly to complex problems, manage information and break new grounds [2],[3].

More student-centered pedagogy and learning approaches are needed, with broader-based curriculum and holistic modes of assessment [4]-[6]. This paper studies the effectiveness of a pedagogy employed in a general elective course to encourage student-centered collaborative learning to nurture creative thinking in solving design problems. It examines the effect of the pedagogical approach taken on student learning in small work groups, and multidisciplinary group dynamics through questionnaires and interviews. It concludes with the findings and implications for future studies.

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II. Why Collaborative Learning

As far back as the early 20th century, American philosopher, psychologist and educational reformer John Dewey advocated using education as a social process and "the child should be stimulated and controlled in his work through the life of the community" [7]. In Dewey's view, learners do not learn in isolation; the individual learns by being part of the community and the world as a whole [8]. Like Dewey, Vygotsky recognized that our thoughts and ideas are constructed through communication with others [9]. Dewey and Vygotsky thus planted the seed for group work and collaborative learning as an effective student-centered way of learning.

Studies on collaborative learning have found that "Isolated students do not learn as much or as well as students who are embedded in a network of informal social relations" [10]. Those studies which focused on the intellectual and cognitive aspects of peer interaction within schools have all concluded that collaborative learning helps individuals acknowledge and integrate many perspectives on a problem and that this process of coordination and collaboration produces superior intellectual results [11]-[14]. Advocates of collaborative learning in the visual art, such as Sally Hagaman, also believe that a community of inquiry approach "would not diminish the importance of individual achievement, but rather it would provide a broader view of how such individual achievement might be realized" [15]. Yet, in the learning of visual art, most learners are often left to work alone through personal experience in the discovery process.

In the visual arts, Houser acknowledged "the process of creating, analyzing, and evaluating in collaboration with others stimulates development of higher psychological functions in the construction of related meaning" [16]. This is in line with Vygotsky who wrote that "a central feature of the psychological study of instruction is the potential the child has to raise himself to a higher intellectual level of development through collaboration" [17]. Given such acknowledgement, a call for the development of new approaches to, and utilization of, collaborative learning to nurture creative thinking in visual design is well founded. Vygotsky held that when one establishes the right kind of environment, that is, one of structured teacher guidance and collaboration with peers,

students are able to produce something together, which they could not have produced alone, such as a significant inquiry into issues of aesthetics [18]. Teachers should therefore, not only facilitate knowledge delivery, they should also encourage participation of creative exploration and guide the process of artistic inquiry. Teachers should encourage students to have fun and play in collaborative learning especially when they brainstorm for creative ideas. Alex Osborn, founder of BBDO and creativity theorist, suggested a spirit of playfulness in brainstorming. He believed that the truly original solution was more likely to be developed from a wild and zany idea than from a routine comment. His technique of brainstorming had been used at BBDO and very often also in many other creative agencies [19]. As Michael McClure put it "The pleasure of play leads students to adjust their attitudes, making them more willing to engage with the course on other levels as well. 'Work' suddenly feels good... and collaborative methods are uniquely adaptable for the purposes of play" [20]. The important thing is the spirit of the group. Sandra Moriarty, author of Creative Advertising, cautioned "There needs to be a spirit of mutual encouragement... a spirit of intensity to move beyond the partying mentality...It's like making a game out of hitting a target" [21]. When teachers structure a conducive environment for group work, Johnson and Johnson noted that collaborative learning "promote(s) greater cognitive and emotional perspective-taking ability"; students learn to see the perspective of others, take on more positive attitudes toward peers, and develop higher self-esteem [22].

It is with the objective of testing the effectiveness of community learning that the pedagogical approach of student-centered collaborative learning in small group work was applied to an elective course. One of the learning objectives of this course is to enhance creative thinking in design. The learners are students in engineering and other disciplines who have very little or no prior background in the visual art.

III. Curriculum Makeover At NTU

Undergraduate education at Nanyang Technological University (NTU), which has the world's largest engineering student enrolment, will undergo a major makeover to produce a new generation of graduates to meet the demands of the innovation-based economy in 2015 and beyond. All incoming freshmen from academic year 2011 will undergo a curriculum which will offer them more breadth, choice and flexibility. Students will be able to choose a greater number of elective courses beyond their specialization and from a larger selection of inter-disciplinary courses. Engineering students, for example, will spend 30 to 45 per cent of curriculum time on electives, up from the present 25 per cent.

Total course requirements will also be reduced by up to 14 per cent. This change is to give students more time for group-based learning, self-reflection and more space for creative thinking and innovation.

The changes were based on recommendations of a high-level committee convened by the University geared towards nurturing in NTU graduates an upright character, smart leadership, social conscience, expert scholarship and an enquiring and creative mind. Speaking on the significance of these changes, Professor Bertil Andersson, NTU President said, "The working world of the future will require T-shaped professionals with in-depth knowledge of one discipline and a broad knowledge base in adjacent areas. The new NTU undergraduate experience will give our current and future students the critical X-factors and competitive edge in the global talent marketplace" [23].

This paper examines the effects of the introduction of collaborative learning in small group work in one of the courses conducted at NTU's School of Art, Design and Media. This course on "Creative Design in Communication and Marketing" is open to all undergraduates at NTU as a general elective complementing their majors and minors. One of the main objectives of this course is to nurture creative thinking through designing for brand identity. Conducted weekly with 3-hour lecture-cum-tutorial classes over 13 weeks, this course has been offered every semester since 2004. The maximum class size was 40 but this had been increased to 50 since January 2008 semester because of its popularity. Surveys conducted indicate that almost all of the students enrolled in this course had no background in the visual art. This is not unexpected as visual art education has not been, until recent years, considered to be important in Singapore's primary and secondary education system.

IV. Pedagogical Approach

In the pedagogical approach taken, the teacher in this course played multiple roles - as facilitator, guide, coach, tutor and advisor. The approach to knowledge delivery adopted "one of guiding the learner, focusing on knowledge construction rather than knowledge transmission" [24], [25]. Lessons were planned and designed with the intent of making learning a meaningful and enjoyable experience and promoting a life-long interest in design and the visual art.

As facilitator, the teacher "orchestrates the context, provides resources and poses questions to stimulate students to think up their own answers" [26]. The teaching strategies were tailored to student responses. Students were encouraged to analyze, interpret, and predict information. While each student was invited to be a contributor and active participant in the learning process, knowledge was constructed by the students with the teacher acting only as a guide. Both the teacher and the students joined together in the learning process to form a community of learners [27]-[29].

After each topic had been discussed and covered in class, students formed themselves into small groups to work on an exercise which involves brainstorming and applying the concepts learned. Each group then presented its solutions to the whole class for peer comments and discussions.

In the final stage of the course, students formed themselves into groups of five each to work on a final project which was to create a new brand identity for a product, a company or an

event that promotes eco-friendliness. Students made their own choice of eco-friendly issue they wished to promote.

These projects provided collaborative learning opportunities for students to conceptualize and experiment with original and novel ideas, and to brainstorm in a group to challenge preconceived patterns and to further explore new ideas. The aim was to facilitate formation of a new, one-of-a-kind identity as a creative solution to a design problem. The goal of this process was to nurture creative thinking by providing opportunities for cognitive growth, to learn through sensory interactions, to explore and experiment in a group, to challenge one another's mind and to learn from one another's talent.

Each group had to submit a report on how they conceptualized their idea, the creative strategy and approach involved, and presented this to the whole class. The aim for all these approaches was to nurture creative thinking on relevant issues like global warming and depletion of natural resources that are urgent and have tremendous effect on mankind [30].

Before students formed themselves for group work, the teacher prepared them for effective collaborative learning by giving guidance on proper behavior and individual responsibility to reduce interpersonal conflict. They were also encouraged to have fun and to create an environment conducive for creative thinking and learning. They were reminded that assessment would be based not only on how well the group came together to brainstorm for creative ideas but also on the creative process as well as the final product. Each individual contribution would be assessed in addition to the performance of the whole group.

Prior to their final group presentations, each group met up with the teacher two or more times to share their progress and challenges faced. Students shared with their teacher their design problem definition and problem solving approaches. They were encouraged to talk spontaneously about their ideas, concepts and design drafts.

Through dialogue, the teacher was able to get to know the students well, to find out what they were thinking and whether they were on the right track. The teacher was also in a good position to facilitate further development of the design process when the solution was not original. Where necessary, students were pushed to re-think their initial idea and encouraged to brainstorm again to find new solutions. Interactions like these were intended to help students to self examine, to explore, and to build more meaningful understandings based on their own experience [27]. The teacher was also able to assess their project based on the design process, on whether students had put in their best efforts to improve themselves and not just on the final outcome.

V. Data Collection

Students enrolled over the last five semesters were surveyed to determine their learning experience. These groups were selected based on the following criteria:

- Homogeneity: CS groups comprising all communication studies students.
- Homogeneity plus related disciplines: ENG groups comprising engineering and science students, and BUS groups comprising business and accountancy students.
- Mixed groups comprising students from different disciplines and groups with local students and those from other countries.

Table 1 below shows the questions in the questionnaire.

TABLE 1. QUESTIONNAIRE FOR GROUP PROJECT

Please fill in all blanks, put NA if not applicable and highlight the chosen one in **bold.**

1. Name of respondent:
2. School/year:
3. If graduated, present profession:
4. Time spent as a group (exclude individual's time spent) for the GD02 group project:
   - Brainstorming for creative ideas and planning for creative strategy & approach _____ sessions, roughly total no. of hours ___.
   - Evaluating or improving on our ideas _____ sessions, roughly total no. of hours _____.
   - Executing the design as a group _____ sessions, roughly total no. of hours _____.
5. We used brainstorming techniques like words association, or divergent thinking, or associative thinking, or analogical thinking, or lateral thinking, or visual thinking.
   If none of these, please specify_____.
6. We got a lot, or moderate amount or few creative ideas when we brainstormed.
7. When we planned, we followed closely, or loosely to the creative strategy and approach learnt in class; or initiated our own creative strategy and approach; or both; or none.
8. Time spent as an individual: Conceptualization _____(roughly hours in total)
   Execution of design ____ (roughly hours in total or NA)
   Others like report writing, PPT slides preparation etc. _____ (roughly hours in total)
9. When executing the design idea, I consistently, or sometimes, or seldom reminded myself the use of:
   a) Design elements and principles (eg. Line, shape, type, texture, color, value, balance, contrast, unity, movement, depth, Gestalt Theory, Visual Hierarchy, positive & negative space)
   b) Design that suits its message
   c) Design that suits its target audience
   d) Others (please indicate):
10. When we worked in our group:
    a) Everyone did everything together
    b) Each took different role. I took the role of leadership; managing schedule; notes/minutes taking; copy writing; report writing; editing; design execution; PPT slides preparation; others
    c) Both a) and b)
11. When we worked:
    all or some or a few or none - shared ideas; or communicated with each other
    all or some or a few or none - helped each other; or volunteered to do extra things for the group
12. Working in a group, I have benefited from:
    a) Learning each other's talent
    b) Enhancing one's creative thinking
    c) Realizing one's hidden talent
    d) Learning Photoshop skills etc
    e) Having fun & enjoyment in a group
    f) Making new friends
    g) Learning how to balance differences in opinion
    h) Accommodating other's working style
    i) Others, please specify_____
    j) none of the above
13. Overall, the group project has enabled me:
    a) to inculcate interest in the visual art

b) to have a sense of self-satisfaction & accomplishment
c) to practice creative thinking skills which can be applied to my major discipline
d) others, please specify_____
e) none of the above
14. Overall challenges I faced:
a) Many differences in opinion among group members
b) Conflicts about how to do the work in my group
b) How to involve non-participating member
c) Monitoring the team progress according to schedule
d) Scheduling meetings
e) others, please specify _____
15. Any other comments, if any, on working in your group or as individual_____
16. Do you have any plan or interest to further any study in visual art or visual communication?

As shown in Table 1, in Question 4, students indicated time and number of sessions spent in brainstorming; evaluating or improving their ideas; and executing the design as a group. This was to measure the intensity of their brainstorming effort, their dedication to improve themselves and working as a group in designing. Question 5, 7 and 9, measured the extent students applied what they learned in their projects like brainstorming techniques, creative strategy and approach; and design elements and principles. In Question 6, the effectiveness of their brainstorming was measured. Question 8 measured the individual effort in conceptualization, execution of design and other duties. Question 10 and 11 measured the cohesiveness and spirit of the group. Question 12 and 13 measured the benefits the student experienced from working in a group. Question 14 measured the challenges faced. Question 16 sought to determine whether this course had inculcated in the correspondent interests in the visual art as evidenced by taking up further studies in this area.

At the end of each semester, all students enrolled in this course were also tasked to write about their personal experience in working in groups. Observations in group dynamics and group progress were also recorded by the teacher during group consultations.

VI. Findings And Analysis

A. Applying what they learned

Table 2 shows the percentage of various groups who applied what they learned in class during their brainstorming, planning and implementation of their projects. Nearly all made good use of the creative thinking skills they learned. While they followed closely the creative strategy and approaches learnt in class, they also employed their own independent strategy. This shows their ability to apply their logic, common sense and knowledge from their own disciplines when they planned. CS groups (88%) consistently lead ENG/BUS/Mixed groups (70%) in implementing design elements and principles learnt and indicated 100% awareness that the design should suit the intended message and its target audience. The other groups show 68% to 75% awareness in this matter.

TABLE 2. APPLYING WHAT THEY LEARNED (IN %)

Activity	CS	ENG	BUS	Mix
Brainstorming techniques:				
apply at least one creative thinking skill	90	100	100	95
apply more than one creative thinking skills	70	70	70	72
Planning:				
follow closely creative strategy learned	50	50	100	77
use their own strategy	50	50	40	77
implement design elements & principles	88	70	68	70
create design that suits its message & its target	100	68	68	75

B. Participation in learning

Table 3 shows the participation of the members of the different groups in learning.

TABLE 3. PARTICIPATION IN LEARNING

Activity	CS	ENG	BUS	Mix
As a group: -Brain-storming, evaluation & execution	Thorough	Some groups more thorough Moderate to a lot	Thorough to very thorough	Thorough
- Ideas generated	A lot		A lot	A lot
As individual: Members take different roles	2 or more members did major design; others took different roles	2 or more members did major design; others took minor design & roles;	3 or more members did major design. All did design & other roles.	2 or more members did major design; others took minor design & roles;
	2 groups have leaders	Leader not apparent		1 group has leader

The BUS groups were most thorough in their brainstorming, evaluation and execution as a group and they generated a lot of ideas in their brainstorming. This was followed by the CS and mixed groups. For the ENG groups, not all members brainstormed together. Some of their members were more thorough in brainstorming than others and the ideas generated were moderate to a lot.

Some of the CS/Mixed groups had leaders/managers to manage schedule and track team progress. It is not apparent that any of the ENG/BUS groups had leaders/managers. All groups employed at least two members to execute the major design works while the other members either took some minor design works and/or took on other roles. In comparison, the BUS groups led others in being most active in collaborative learning, followed by CS and Mixed groups and finally ENG groups.

C. Benefit – creative side

Table 4 shows the percentage of the students who benefited from collaborative learning activities. The majority of the members in all the groups found that they could learn from one another's talents and working in a group enhanced their creative thinking. Some of their comments are as follows:
ENG: *"Group work allows ideas to be born from trash talk, as opposed to being by yourself in soliloquy"*.
Mixed: *"Brainstorming was great...we came up with crazy ideas and everyone contributed...design part was vigorous..."*;

"A fruitful module especially in nurturing creative thinking..."; "Easier to learn in teams"; "Recommend this very useful module...trains me to see and think differently, express myself and share my creativity and ideas..."; "From the eyes of a design student, I love the fresh ideas suggested by the non-design students. Inspired me a lot☺".

Some of them even realized their hidden talents through group work with BUS students leading the others. More than half had acquired skills applying software such as Photoshop.

TABLE 4. BENEFIT – CREATIVE SIDE (IN %)

Activity	CS	ENG	BUS	Mix
-Learn from each other's talent	92	94	78	78
-Enhance one's creative thinking	92	79	87	93
-Realize one's hidden talent	33	17	65	38
-Learn Photoshop etc skills	62	44	62	-
-Inculcate interest in visual art	60	95	100	57
-Creative thinking skills can be applied to one's major discipline	83	70	77	48
-Self-satisfaction & accomplishment	67	83	90	60

A strong indicator of enhanced interest was found in all ENG/BUS groups with more than 95% highlighted what they learned and how they learned in groups have created a lot of interests in the visual art in them. For the CS/Mixed groups, this figure is around 60%. This could be due to a larger number in the latter groups being already in the related arts and communication studies. Being in related studies, a large majority (83%) in the CS groups also indicated that the creative thinking skills they learned can be applied to their major discipline while a lower percentage of the ENG/BUS (70+%) and the Mixed (48%) groups thought so.

Typical comments are:

CS: *"thinking out of the box"; "learnt creative stuffs"; "awesome, extremely refreshing experience"; "help me in my major"; "creative thinking can be applied to future career".*

Mixed: *"learnt many useful skills that would help me in my career ...focuses on strategic & design elements that can make me think"; "Enjoyed class presentations... interactive & fun"; "Thought-invoking and pragmatic".*

The majority of the ENG/BUS groups expressed self-satisfaction and accomplishment in their work while more than 60% of the CS/Mixed groups indicated the same. Some of their comments are:

Mixed: *"Extremely fulfilling, stimulating experience"; "change my perspective on marketing"; "Definitely a memorable experience...after seeing all the groups' works...clearly a display of creativity and originality. As much as I enjoyed the end products, I also very much enjoyed the process...Really loved brainstorming...saying it was enriching is simply an understatement ☺".*

CS: *"Very proud of our work."; "Work with people with different opinions... Benefited me greatly".*

Mixed: *"We have dedicated and motivated members who strive for excellence and push our potentials to the maximum."; "All 5 of us are not quite familiar with designing. We put in a lot of effort and improved our designs again, again and again. Looking at our final product, working all night just worth it."*

D. Human relations

The percentages of the different groups which benefited from various human relations activities are shown in Table 5. As can be seen from the table, while all the members in the BUS groups and a substantial 85-92% of the ENG/Mixed groups shared ideas and communicated with one another, only 62% of CS groups did so.

TABLE 5. HUMAN RELATIONS (IN %)

Activity	CS	ENG	BUS	Mix
- Share & communicate with each other	62	85	100	92
- Do things together, help one another & volunteer to do extra for the group	92	74	75	85
-Having fun & enjoy working in a group	80	60	90	85
-Make new friends	75	91	90	70
-Learn how to balance differences in opinion	75	75	62	63
-Accommodate other's working style	92	83	87	70

There is indication that when students from different disciplines work together, they can also create greater synergy among themselves. They can share their different knowledge and interests with one another. 74% to 92% of members in all the groups did things together, helping one another and volunteering to do extra work for their group. This is only possible when they have established rapport and synergy and enjoy working together.

A large majority of the BUS/CS/Mixed groups had fun and enjoyed working in a group while 60% of ENG groups indicated this. This may be because engineers need to learn to be more relaxed and to have fun while they work.

Student comments include:

CS: *"Did not feel like a project that...simply for academic purposes, but something we all enjoy..."*

Mixed: *"Enjoyed our class presentations, interactive & fun."; "I was able to be more creative than in other courses."*

90% of the ENG/BUS groups indicated that they made new friends with a lower figure (70+ %) for the CS/Mixed groups. This is likely due to members of a group having a better chance of meeting new friends when they are from different disciplines. Those who come from the same discipline may already have known one another. Some of their comments are:

CS: *"Great time... nervous at the start... they constantly invited me to join in group discussion"; "I learnt all the brainstorming of crazy ideas that I would not have tried. We overcame difficulties along the way & learnt design strategies together..."; "Experienced synergy... made great friendship...Complemented each other skills...going extra miles to perfect and edit project to meet our very own strict standards"; "I met 4 persons whom I've never known before, and we formed a team. I learnt many things from them!"*

The majority of members in all the groups also further developed their human relations skills and learned how to balance differences in opinions and to accommodate other's working style. Their feedback includes:

CS: *"Built tolerance & understanding over the taxing few weeks"; "We worked well together, each contributing in their special, subtle way."*

Mixed:*"Learn how to do a proper project management";*
"... taught me how to work with people with different strength...organize workflow suitable for everyone... complement each other and bring out the best of us as a team…"

Other benefits cited by exchange students:
Mixed: *"Group dynamic very different... Proactive from the start & strive for perfection... quite like the real world"; "Working with people with different personalities and from different countries...was very good experience"; "When I go home, I'll push myself to achieve more-like how people work here."*

E. Challenges

Table 6 gives the proportion of groups, in percentages, which found working in groups a challenging proposition. More than half of the ENG/Mixed groups, compared to a lower 37% of CS groups, found many differences in opinions among the group. The corresponding figure for the BUS groups is only 22%.

Their feedback includes the following comments:
CS: "Hard to coordinate, especially design execution. Different styles hard to resolve. Requires compromise and accommodation"; "Difficulty in reaching agreement because of relatively large group."

All groups seem to be able to resolve conflicts among themselves as only a small proportion of students, 15% to 25%, indicated conflicts about how work should be done in the group. There also appears to be few problems on how to involve non-participating members. Less than half of the ENG/Mixed groups had problem in monitoring team progress and keeping scheduling while 67% to 75% of the BUS/CS groups had this problem. The ENG groups could have let things run naturally as they did not have any manager in their group.

TABLE 6. CHALLENGES (IN %)

Activity	CS	ENG	BUS	Mix
- Many differences in opinion	37	60	22	50
-Conflicts about how to do the work in my group	16	19	25	15
-How to involve non-participating member	8	10	13	7
-Monitor the team progress according to schedule	75	43	67	47
-Scheduling meetings	88	35	55	17

88% of the CS groups, followed by 55% of the BUS groups, cited scheduling meetings as a challenge while only 35% of the ENG groups and 17% of the Mixed groups had this problem. This could be due to the stress placed on more planning by the CS groups.

Other challenges include a steep learning curve on technical skills like Photoshop, limitation on design skills to execute all the good ideas and lack of time due to heavy workload from other courses taken at the same time. Some student comments are:
ENG: *"Because of the limit on design skill, some good ideas cannot be executed"; "very interesting to try this new, fresh design project... run out of time...unable to execute some ideas…"*
Mixed: *"Steep learning curve"; "Time consuming."*
CS: *"Work load was murder but it was fun & I leant a lot"; "Quite stressful at times but learnt a lot."*

F. Further studies

66% of the CS groups indicated a firm "yes" to take up further studies in visual communication while slightly more than half of the BUS/mixed groups and a third of the ENG groups indicated this. This could be because visual communication is closely related to CS core disciplines. While a very high proportion in the ENG groups indicated they had strong interests in visual communication, they wanted to fulfil their core subject requirements first.

VII. CREATIVE OUTCOMES

The attached appendices 1 to 3 illustrate examples of group work by ENG, BUS and CS respectively. They show the differences in creative approaches taken by the students from different disciplines in solving their design problems. As mentioned earlier, students formed themselves into groups of five each to work on a final project which was to create a new brand identity for a product, a company or an event that promotes eco-friendliness. Students made their own choice of eco-friendly issue they wished to promote.

As illustrated in Appendix 1, the ENG group chose to work on a campaign to encourage potted planting in homes in an effort to create a 'green' environment as most people in Singapore live in high rise flats. The primary target audience was the children and the secondary targets were their parents. An 'earthworm' character was created to attract the targeted children and to draw their parents' awareness of how planting can improve the environment and reduce the greenhouse effect on the earth. More importantly, the campaign portrayed potted planting as a fun-filled family activity. The five posters shown in Appendix 1 were created to kick off this campaign. Each shows a 'little friend' holding a potted plant with the headline "A little help from a little friend" with the logo cum tagline "Will you make the connection?" to reach out to the audience.

An earthworm was used to replace the letter 'n' and the question mark in the logo cum tagline. It is seen, in Appendix 1, crawling out from the potted plant helping it to grow. In the last poster, the earthworm can be seen helping to change a devastated earth to one that is 'greener'. The earthworm character and images of potted plants can be seen repeatedly in all the collaterals, emphasizing how plants can improve our environment as well as the benefits brought by earthworms to the plants. A pamphlet, in the shape of a potted plant with a cute earthworm sticking its head out, was also designed to draw attention. The information inside were written in a simple and light-hearted manner to explain how earthworms and plants work together. As can be seen, the content and graphic illustrations used have certain similarity to illustrations found in Science books. This demonstrates the influence of Engineering and Science in the design solutions of the Engineering group work. To further promote the

campaign, a flyer and a postcard were sent to residents to promote awareness and encourage potted planting. Flyers with the campaign logo were slipped under the doors of residents. When picked up, they were meant to pop open to become pots with the intention of giving a surprise to the residents and motivating them to potted planting. With their background in Computer-Aided-Design, these Engineering students had applied what they learned in their core discipline to their design solutions. The postcard design had strips of curly paper that resembled earthworms crawling out. The designs of the signage placed in the playground took the form of a cute earthworm as a slide and a potted plant as a see-saw. The logo and other information about the campaign were also placed in the playground.

This ENG group had successfully created a campaign to draw awareness and attention to potted planting as a fun-filled family activity. Their designs showed the influence of the Engineering and Science background these students had.

Appendix 2 contains the designs of a BUS group who created a brand identity for a range of solid toiletries that were handmade with eco-friendly organic ingredients. “Sploosh” was the brand name chosen to help save the environment. The target group was young adults who were willing to spend on body-care and beauty products and, at the same time, concerned with environment and health issues.

The logo was designed to incorporate the brand name “Sploosh” in blue, the color associated with water which also represents nature and life. “Sploosh” in display font with a splash of water below to capture attention, was intended to represent the sound of solid soap falling into water. A rubber duckie mascot used throughout all the collaterals was also incorporated on the letter “p” in the logo. The tagline “solid, organic, fun” aptly summarized the spirit of the brand.

This group spent much effort coming up with the brand name and the creative designs of the logo and store exterior and interior. This demonstrated their understanding of the importance of brand exposure. This understanding could be enhanced by their training and background in Business.

As illustrated in Appendix 2, two big posters are displayed on the shop front with each bearing the shape of a liquid soap bottle and a headline calling out to viewers to “Take a closer look”. On closer examination, the soap bottle is made up of chemical formulae and the body copy spells out the harmful effects of liquid soap on the body and on the environment. It calls out to the viewers to “make a choice today” to use the chemical-free soap and “to experience the change yourself”. The shop interior supports the brand by reinforcing a very clean image using light blue bathroom tiles on the floor, light yellow rubber duckie pattern wallpaper, bathtub for display of products and bathtub shaped window. A brochure in the shape of a bathtub with pullout cards in the shapes of rubber duckie and soap provides information for the reasons to use organic soap. The pull-out pages in a chain allow information to be given out one at a time. The reader is invited to interact to find out more and the meaningful shapes used serve as brand recall. The copies were well written and aligned with the promotional objectives. A huge size logo sitting in a water fountain on a main street with rubber duckies swimming in the water serves as outdoor advertising. The intention is to attract the attention of the passers-by who might pick up the rubber duckies and find the product logo printed at the bottom.

The marketing strategies to maximize product awareness and recall employed by this group of students reflect the Business influence of their background. Packaging of this product is in the shape of a bathtub. Waterproof business card and stationery using blue water wavy patterns also reinforce the nature of the product. This BUS group had meaningfully executed the design elements in all the collaterals which enabled a unified appeal to project the spirit of the brand ‘Sploosh’ very well.

The CS group, illustrated in Appendix 3, chose to promote an environmental campaign through the launch of a CD album. This group aimed to tug at the heartstrings of the targeted youth by exposing them to the different plights of the earth through the use of celebrities, songs and lyrics. Seven popular singers, each performing different genre of music from seven different continents were featured, each in one of the seven posters and lyrics cards in the CD box.

“Listen” was chosen as the brand name. It denotes thoughtful attention, close appreciation and absorption in an intensive manner. The logo takes on a signature design. The flanking brackets around ‘Listen’ typify amplified sound waves, reinforcing their concept of using music to spread the message. They also look like headphones. The cursive handwritten font for ‘Listen’ resembles strewn wires and accentuates the dynamic and free-spirited qualities of the music. The logo featured prominently in all the collaterals doubles as a “call-to-action” by imploring the viewer to start listening by getting the CD.

The seven celebrities also personalize their poster with handwritten lyrics from the songs that they sing. The choice of using lyrics cards, each representing an artiste and his/her songs, over a long song booklet lends a personal touch to the album and allows consumers to “spread the message” around by giving them to their friends.

Finally, the entire ‘Listen’ experience culminates in a ‘bonus’ lyrics card with a shiny reflective mirror-like surface. The message on this card calls on the listeners to follow in the footsteps of the celebrities and do their part to save the Earth. The brand identity designs were also incorporated into iPhone/iPod cases as they are important music related paraphernalia that helped promote the entire ‘Listen’ CD experience.

A huge 3-D model of the logo was placed in the main street as an outdoor marketing tool. Speakers disguised as brackets on both sides of the logo allowed passersby to listen to sample tracks of the CD. Scaled down versions of the posters in the form of postcards were also available on site. Audio jacks wrapped with the logo were made available on audio walls along selected underground malls and tunnels for the listeners

to plug in. Badges with the logo were distributed to serve as brand recalls.

This whole creation of audio experience for the environmental campaign reflected the knowledge and background of these students in Communication studies. The different media employed had enriched the sensory experience of the target. The strategy to "spread the message" was carefully and consciously built into the campaign. A strategy that was familiar to students in Communication had also turned the campaign into a very effective one.

VIII. Conclusion

Based on the findings in this study, it is clear that when students were assigned to work in small groups in a "community of learners", the majority consistently applied what they learned and participated actively in the various roles they played. Nearly all of them shared ideas and communicated with one another. Most of them also did things together and helped one another for the benefit of the whole group. A majority of them learned from one another's talent and their creative thinking skills and interests in the visual art were enhanced. The majority also expressed self-satisfaction and accomplishment in their group work, made new friends, had fun and enjoyed working in groups, although for the engineering groups, only 60% indicated fun and enjoyment.

As regards to the creative outcomes, there was indication that the knowledge and background of the various groups had strong influence on the creative strategies and design elements they employed. This is, after all, to be expected.

All groups seemed to be able to acquire the competitive skills needed to meet the challenges of the 21st century. The onus, thus, is for educators to pay more attention to nurture creative thinking and collaborative skills in the students so that they can work effectively and respectfully with others to come up with creative approaches to solving complex problems.

The works presented here illustrate the benefits of assigning students to collaborate in group work and to form a community of learners. It also points to the benefit of non-design students doing design works. In future, when these non-design graduates work with professional designers, they will be able to communicate better with each other having understood the visual language. They will also be able to enrich the design strategy with their core background knowledge. More follow up research on how these non-design graduates work with others in solving design problems in the work place will shed more light on the effectiveness of student-centric collaborative learning.

Appendix

Please see appendix 1 to 3 after the reference page.

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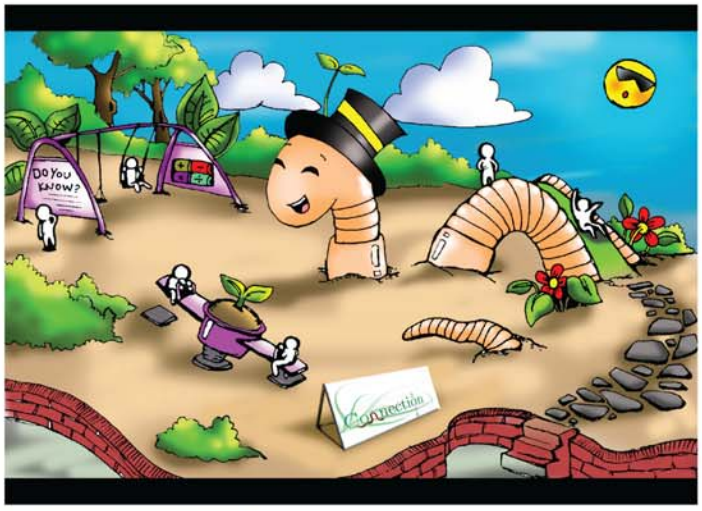
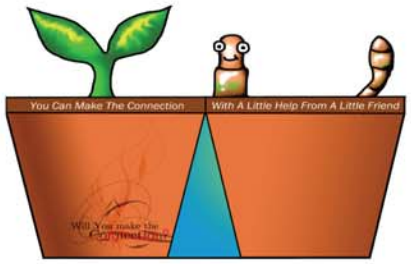
Appendix 1

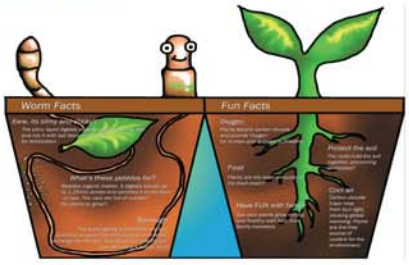
A campaign to promote potted planting at home to improve the environment and reduce the green-house effect on earth designed by engineering students Cedric Tan, Tan Chun Seng, Lai Chee Cieh and Pang Chong Wei. Earthworm character is used in all the collaterals to attract the attention of the targeted children who may also rope in their parents to start a fun-filled activity for the family. Five posters are seen on the left and a pamphlet in the shape of a potted plant below. At the bottom is the flyer which pops out to be a pot after passing the door.

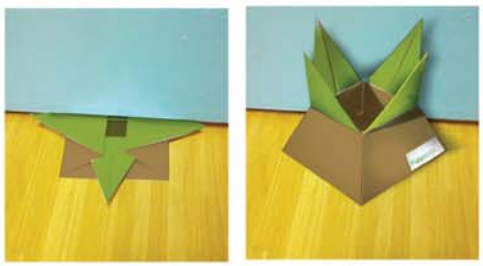


Signage designs in the playground shown above taken the form of a cute erathworm as slide and a potted plant as see-saw. Postcard on the left has paper strips that act as earthworms.



Pamphlet front & back on the left & inside of the pamphlet below





Flyer

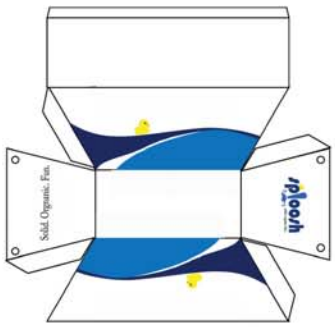
Appendix 2

Brand identity design of a range of handmade solid toiletries using eco-friendly organic ingredients created by Business students Desmond Tan, Tan Yu Chuan, Michel Tan, Chloe Chua and Gabriel Ong.

Logo for the brand "Sploosh" above, shop exterior & interior on the left and outdoor advertising with logo and rubber duckies in the water fountain below.

Two posters above; brochure with rubber duckie & soap shaped cards on the right and packaging design below.

Stationery and business cards below



Appendix 3

Brand identity design of a CD album "Listen" for an environmental campaign created by Marcus Yong, Alex Shieh, Andrew Ong, Grace Au-Yong and Jasmine Tan. Seven posters on the left each features a popular artiste with his/her handwritten lyrics as headline. The logo "Listen" at the bottom of each poster calls out to the viewers to start listening. The bonus reflective lyrics card and CD box are shown below. Bottom right are the CD lyrics cards, each featuring an artiste with his/her song lyrics behind.

Below is the 3D model of the logo placed in the main street. Far left bottom shows the location of the speakers on the left and right of the logo. Right bottom show a CD badge & iPhone/iPod case.