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Encouraging Creativity with Scientific Inquiry

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ABSTRACT

Creativity facilitates scientists in their investigations of new problems or with a new orientation. However, K-12 science education typically does not acknowledge this aspect of creativity. Science/Technology/Society provides an avenue for creativity when addressing inquiry. The use of Cothron et al.'s [1] four question strategy allows for a planning approach for inquiry.

Keywords: Science, Inquiry, K-12

The majority of the use of creativity today is in the arts and humanities. Kind and Kind [2] consider creativity has greater identity with art rather than science. However, numerous famous scientists such as Charles Darwin, Charles Lyle, Galileo, Isaac Newton, Watson and Crick, Albert Einstein, and many others are recognized for their creativity associated with ways of scientific discovery. According to Root-Berstein and Root-Bernstein [3], it was originally assumed that artists and scientists had approached things in different ways, concluding that scientists use similar processes as artists in their creative endeavors because both types of individuals have broad interests, similar psychological profiles, similar creative habits, and art can influence scientific discovery and vice versa. The influence of Snow's "The Two Cultures" [4] fosters this assumption. Others consider the arts to be evaluated by intrinsic aesthetic criteria while science is evaluated by the contributions to systems of truth (*i.e.* scientific laws, scientific theories, etc.) [5]. Creative thinking is the production of novel or aesthetic ideas or products which would include both art and science [6]; however, it is considered that science has an indirect connection with creativity [7].

1. What is Creativity?

Just as there are different views of careers associated with creativity, there are multiple definitions. Gardner [8] defined creativity where products developed are viewed as novel within the discipline/specialty and are ultimately accepted within the community. Gardner's definition separates experts and creativity with creative individuals being superior. Gardner considers creativity in physics different from creativity in the non-sciences. A creative

individual takes risks, is not afraid of failing, seeks the unknown, or questions the status quo. Gardner also concurs with Czikszenmihalyi [9] that creativity comes from the interaction of special talented individuals, discipline and others in the field who will make judgments about the quality and originality. Creativity also involves the discipline of being ready and willing to accept the creative contribution [10]. For example, Gregory Mendel's work on the genetics of peas in 1863 was not acknowledged until the 1900's. This creative link was originally missed for close to 40 years. Mendel had sent his paper to Darwin but it was never opened until his papers were recently put on the web.

Plucker *et al.* [11] identified three aspects in defining creativity:

- 1) Frequently involved more than one individual,
- 2) Happens when applied in a supportive environment, and
- 3) Results in new and useful identifiable product for society

Plucker [12] summarized 100 years of research on creativity. Throughout this paper, creativity involves novel products/approaches formulated by teams that result in a possible solution to part of a problem or benefit to society. Students have novel approaches to problems they encounter in K-12 and frequently demonstrate aspects of creativity that is appropriate for their level—their personal inquiry.

What makes science unique and where does creativity fit? Just like many careers, future scientists follow a formal and structured apprenticeship—doctorate where research occurs under close supervision by an expert mentor, post-doctoral study where an individual hones their skills and insight. Their minds are challenged to extend

knowledge as new experts. Their interaction with peers at conferences and professional reading facilitates their creative approach. This occurs in a laboratory or field site with controlled variables where data are collected to resolve a testable question. Other times the sequence is to collect and analyze data, hypothesis and conclusion/ next question because the discipline is unable to control variables.

The greatest scientists think of new questions that have not been previously considered [13]. Scientists utilize both deductive reasoning (implications formed from general assumptions) and inductive reasoning (general principles from individual phenomena). Gardner [13] acknowledges that science is a social invention and is dependent upon society accepting the consequences (e.g. current debate over global warming).

The goal of science is the mastery of one of the disciplines conceptual schemes [14]. As new scientists refine their skills, previous research reports provide clues of possible new approach and things to avoid. Science is built upon previous results. Koestler's book on creativity and science [15] noted the process of combining previously unrelated knowledge which results in new relationships. Scientists also use visualization to help form a solution (e.g. Watson's description of DNA spiral), analogy and logic to help resolve their question by bringing realization to their idea—either acceptance or rejection. John-Steiner [14] summarized:

“... scientist's training allows him or her to test the value of an insight...for its general concepts. And in the process of testings, other, more complex analogies or disturbing patterns emerge... At times the struggle with an idea is incredibly lengthy”.

However, this image of science is not accurately portrayed in K-12 science classrooms of the United States. Investigations are short duration, typically verify what has been studied, cookbook orientation, and purpose is not understood by students [16]. According to Csasztonhalyi, Rothende, and Whalen [5], K-12 science has a focus on discipline work where lessons are sequenced with logical steps. Scientists and secondary science teachers agree it is important to include critical thinking skills and lessons should inspire students' creativity [17].

2. Creativity and STS

So how can we get K-12 students involved in the creative approach in science? Hodson and Reid [18] consider creativity to be integral to science and the scientific process. Creativity is one of the five components of the Science/Technology/Society (STS) movement [19]. Yager and Roy [20] conclude that STS facilitates students' creativity by encouraging K-12 students to ask more questions in their development of science concepts, encourages the development of unique questions of personal interest, investigates causes and effects of their

personal observations, and generate more high quality questions associated with their personal lives. The key focus of STS instructional model is the selection of a long term problem where students take an action to attempt to resolve part of the problem. The problem is motivational to the students and tends to be a local problem. Creativity occurs as students investigate various aspects of the problem. Science/technology/society is an international movement.

Students' views of science are shaped by their school experiences; therefore, it is imperative to engage K-12 students to promote more positive attitudes toward science and improve their creativity skills [20]. STS is not a prescriptive approach of science teaching, but involves problem driven activities which begins with a problem or situation that is appropriate and relevant to the students [21]. Csasztonhalyi [5], and Penick [22] consider question-posing and problem-finding are at the heart of originality; thereby, strongly associated with creativity. Creative approaches are not by chance [22]. To promote creativity, Penick recommends thought provoking questions where students can explore, take risks, experiment and speculate in a safe environment. Lee and Erdogan [23] studied 591 Korean students of STS trained science teachers and found they had a significantly higher creativity score over a control group. The creativity test focused upon three areas—questioning, reasoning, and predicting consequences. Lee and Erdogan described an STS learning environment where students are active participants in dealing with real-world problems. In addition, STS students had a more positive attitude toward science.

3. Inquiry

In the United States, the focus of K-12 science education of the 1990's was shaped by the publication of two policy documents—*Science for All Americans* [24] and *National Science Education Standards, NSES* [16]. Both of these documents stressed the importance of inquiry. However, inquiry today is approached differently than from previous generations [25]. *NSES* identified three aspects of inquiry—abilities, understanding and teaching. The first domain—abilities of inquiry require K-12 teachers of science to provide multiple investigations for students that are not verification or “cookbook” laboratory experiences. The second domain is understandings about inquiry so students will develop meaning about science and how scientists work. The final domain is teaching where various strategies (e.g. wait time, assessing prior knowledge, effective questioning strategies, long term investigations, etc.) would facilitate students' understanding of science [25].

The National Research Council [26] clarified inquiry by identifying five attributes for learners:

- 1) Engages in scientifically oriented questions,
- 2) Gives priority to evidence in responding to ques-

tions,

- 3) Formulates explanation from evidence,
- 4) Connects explanations to scientific knowledge, and
- 5) Communicates and justifies explanations.

These five attributes are on a continuum from teacher directed on one end to student directed on the other end. Therefore, a K-12 teacher of science can rate their teaching approach, curriculum, and assessment for level of inquiry. **Table 1** from National Research Council [26], illustrates variations that a teacher of science can utilize in their use of inquiry. The degree of teacher-student centeredness can vary for each attribute.

Several researchers have developed categories of inquiry based upon the responsibilities of the student and teacher. Earlier, Swaab's [27] classified inquiry into four levels for source of question, data collection methods and interpretation of results. For level O, the teacher provides students with the testable question to be investigated, methods for collecting data, and guides them toward the expected conclusion. This would represent a "cookbook" type investigation. A Level 3 would involve students framing the question, devising the procedures to gather the data, and formulating conclusions based upon the data. Coburn [28] considers this to be an open inquiry similar to what a student would do for a science fair project. Coburn considers Schwab's Level 1 and 2 to be guided inquiry. Settlage [29] has argued that it is illogical

for K-12 science to have an open inquiry focus. Johnston [30] has recently challenged this view. The science education community has not resolved the emphasis of inquiry because of confusion about what is inquiry [25]. It must be noted that the *NSES* [16] did *not* recommend that all science concepts be taught by inquiry. For a different investigation, teachers of science could have different emphasis.

The use of all three domains of inquiry will facilitate students' creativity. What are some inquiry strategies teachers of science can utilize to facilitate creativity? First, students need to have opportunities to design scientific oriented investigations through their testable question. Second, students would work in small groups as they design their procedures to address the question. Third, students will share their findings with peers. Some students will create a formal presentation, poster, and/or technology report. Kind and Kind [2] considers inquiry as described mimics scientists use of creativity.

The use of the four question strategy [1] allows students from elementary through graduate school to implement a format that can be used to address their personal testable question. These four questions are:

- 1) Available materials?
- 2) Different forms of materials?
- 3) What will be modified in attempting to answer the question?

Table 1. Essential features of classroom inquiry and their variations

Essential Feature		Variations		
Learner engages in scientifically oriented questions	Learner poses a question	Learner selects among questions, poses new questions	Learner sharpens or clarifies question provided by teacher, materials, or other source	Learner engages in question provided by teacher, materials, or other source
Learner gives priority to evidence in responding to questions	Learner determines what constitutes evidence and collects it	Learner directed to collect certain data	Learner given data and asked to analyze	Learner given data and told how to analyze
Learner formulates explanations from evidence	Learner formulates explanations after summarizing evidence	Learner guided in process of formulating explanations from evidence	Learner given possible ways to use evidence to formulate explanation	Learner provided with evidence
Learner connects explanations to scientific knowledge	Learner independently examines other resources and forms links to explanations	Learner directed toward areas and sources of scientific knowledge	Learner given possible connections	
Learner communicates and justifies explanations	Learner forms reasonable and logical argument to communicate explanations	Learner coached in development of communication	Learner provided broad guidelines to sharpen communication	Learner given steps and procedures for communication
More-----Amount of Learner Self-Direction-----Less Less-----Amount of Direction from Teacher or Material-----More				

4) How will its impact be measured?

This approach allows students a consistent approach for planning their investigation including identifying and controlling variables. Different groups of students could use different creative ways to answer the same question. The four question strategy provides a model for teachers of science to assist their students in developing their confidence to utilize scientific inquiry. The strategy begins with a testable question which can be posed by the teacher. When the class investigates the question, different groups can approach the question by testing different independent variables. As groups of students devise their procedures, they will also be deciding what data is to be collected and reported to answer the testable question. **Table 2** is the result of a four question strategy that examines how the number of ice cubes influences water temperature. After formulating their responses, the students can generalize their experimental design of the question, independent and dependent variables, data table, hypothesis, conclusion based upon constant conditions that provided control (**Table 3**). This development is an example of students utilizing creativity to resolve a testable question.

4. Summary

Creativity has a place in K-12 science education in the United States. The use of the four question strategy allows students to be creative in their designing a way to solve a testable question and helps science teachers' address their frustrations about inquiry [17]. This guided inquiry experience will help students to become more comfortable in approaching science. It is also motivational because students can devise their approach, decide the type of data to be collected, and formulate a conclusion to the question. The STS movement includes creativity and can incorporate the four question plan to a local problem.

Future research could compare STS classrooms where the four question strategy has been consistently used with non-use classrooms. A qualitative case study could also investigate how groups decide which independent variable was selected to answer the problem. A series of semi-structural interviews of teachers and analysis of videos of each group could provide insight about use of the four question strategy. Students would rate their perceived level of creativity in STS unit. Science teachers

Table 2. Completed four question strategy

National Research Council. (2000). *Inquiry and the National Science Education Standards*. Washington, D.C.: National Academy Press. (p. 29).

Testable question: How does the number of ice cubes affect temperature of water?

1. Materials available:

Number of ice cubes, thermometer, shape of ice cube, amount of water, initial water temperature, type of water, stir, container, graduated cylinder

2. Different forms of materials:

<u>Number ice cubes</u>	<u>Thermometer</u>	<u>Shape of ice cube</u>
0	°C	Rectangle
1	°F	Circle
2		Crushed
3		Half moon
4		Square
		Cylinder
<u>Amount of water</u>	<u>Initial temperature water</u>	<u>Time</u>
50 ml	10°	1 minute
100 ml	15°	2 minutes
150 ml	20°	3 minutes
200 ml	25°	
<u>Type of water</u>	<u>Stir</u>	<u>Container</u>
tap	yes	glass
distilled	no	plastic
bottled		metal
		styrofoam
		<u>Graduated cylinder</u>
		10 ml
		25 ml
		50 ml
		100 ml

3. What is to be modified?

Number of ice cubes

4. How will its impact be measured?

°C

Table 3. Experimental design for testing how the number of ice cubes affects water temperature

Title: The Effect of the Number of Ice Cubes on the Temperature of Water																			
Hypothesis: If more rectangular ice cubes are used, then it will lower water temperature faster.																			
Independent Variable: Number of ice cubes																			
0 ice cubes			Average	1 ice cube			Average	2 ice cubes			Average	3 ice cubes			Average	4 ice cubes			Average
Temperature °C				Temperature °C				Temperature °C				Temperature °C				Temperature °C			
1	2	3		1	2	3		1	2	3		1	2	3		1	2	3	
Dependent Variable: Ice water temperature in °C																			
Constants:		100 ml Tap Water					Room Temperature Water					2 Minutes			Away from air vent and sunshine				
Shape ice cubes		Plastic Tumbler					0°C					No Stir							

would note the level of creativity of individual students. Correlations could be computed between teacher's rating with individual students. Science teachers would self-categorize their teaching on each of the five aspects of inquiry [19].

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Initial Findings on the Pursuit of Excellence in Teacher Training

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ABSTRACT

This article reports the initial findings of a study carried out to evaluate the effectiveness of an academic skills training programme that prepares new university college teachers for teaching. Videotaped recordings of training, classroom observation of teaching and student evaluation of teaching were carried out and the results were analyzed to evaluate the effectiveness of the delivery and the activities for one of the module in achieving the stated objectives of the module. New teachers found the two activities in the Module 1 useful and were able to apply what they learned through these activities in their classroom teaching. The activities carried out supported the achievements of the intended outcomes of the module. However the new teachers demonstrated different levels of competence.

Keywords: Teachers Training, Higher Education

1. Introduction

Since Dearing's Report [1] universities in UK have acknowledged the importance of preparing new teaching staff with basic teaching skills as part of the quality assurance for teaching and learning. The commitment of the institutions is demonstrated by the setting up of units responsible for ensuring quality teaching and learning [2]. These units conduct training on teaching and learning, promote good practices and carry out research in teaching and learning. Studies carried out [3] have reported evidence of a range of positive changes in university teachers in the training group, and in their students, and a contrasting lack of change, or negative changes, in untrained teachers from the control group. Many institutions of higher learning in Malaysia have collaborative arrangements with UK universities to franchise their degree programmes. Likewise, these institutions are expected to provide training to their new teachers. They have also set up units to provide initial training to new teachers and more advanced trainings in specific areas relating to teaching and learning [4].

2. Description of the Programme

The Academic Skills Training programme consists of nine modules. The topics covered by these modules are classroom presentation skills, teaching methods and techniques, teaching and learning theories, assessment

and evaluation, and microteaching. All newly appointed teachers are required to attend and complete the Academic Skills Training Programme before they commence teaching. Those with formal training and qualification in teaching can apply to be exempted from the programme.

The objectives for each of the nine modules in the programme are:

1) Classroom Presentation Skills—Module 1

Participants will learn how to start a lesson effectively using set induction. To guide the teachers and the students in a lecture, clear and precise instructional objectives are needed. Participants will also learn that to teach well in a class, they have to plan their instructional events that include the teaching media needed to bring the message across to the students.

2) Classroom Presentation Skills—Module 2

PowerPoint can be an effective instructional medium if the teachers know how to tap into its power. This module also touches on how to search for useful information in the Internet and use it to support classroom teaching. Participants are also introduced to the use of Learning Management System in supporting teaching and learning.

3) Teaching Method and Techniques—Module 3 and Module 4

Participants will learn the importance of active learning and ways to implement active learning in their classes. The process of active learning is then related to some of the common teaching methods currently used

such as small group discussions, lectures, brainstorming and tutorials. The important technique of questioning effectively is discussed with emphasis placed on wait times and the use of different levels and types of questions in relation to Bloom's taxonomy.

4) Teaching and Learning Theories—Module 5

Participants will learn how the theories of behaviourism, cognitivism and constructivism help in the understanding of the process of learning, and their implications to teaching. The theory of multiple intelligences and its relationship to learning styles is examined with regard to implications to the teaching and learning situations. Participants will be able to relate the ideas gained from the learning theories as important guides in the structuring and implementation of effective teaching methods.

5) Assessment and Evaluation—Module 6 and Module 7

Participants will learn how to use the marking scheme to ensure fair assessment of learning outcomes. Assessment can also be used to support and improve teaching. They will also learn how to set the various types of test questions and new assessment methods such as performance assessment and portfolio assessment.

6) Outcome-based Education—Module 8

Participants will be introduced to outcome based education, distinguishing it from the current education. They will learn how to redesign the current contents, instructional strategies and assessment in line with outcome based education. The module also discusses its advantages and challenges.

7) Microteaching—Module 9

Participants are assigned into groups. Each group consists of between 8-10 participants. Each participant is allocated 15 minutes in a microteaching session which is videotaped. The group will view the videotape together with the trainer as facilitator. The aim is to learn from each other and not to criticise. The participants will comment on their own teaching in particular their strong points. The other participants are welcomed to give their suggestions.

3. About this Study

This study was carried out on Module 1 which is on classroom presentation skills. The duration of the module is 3 hours and it is delivered using a combination of lectures, video screenings and activities. Information on the module including the objectives, activities and teaching and learning strategies are presented in **Table 1**.

Table 1. Module 1 – classroom presentation skills: module information, objectives, activities, teaching & learning strategies

Module Title	Classroom Presentation Skills		
Module Outcomes	Participants will acquire the knowledge on: 1) how to start a lesson, 2) how to write learning objectives and outcomes, and 3) how to conduct lesson effectively.		
Module Duration	3 hours		
Mode of Delivery	Lectures, mock classroom presentation, discussions, video, activities		
No	Objectives	Activities	Teaching & Learning Strategies
1	Define set induction. Use them confidently to catch students' attention when you start a class.	How to handle a class? 1) Get a volunteer to teach for 20 minutes while another 5 volunteers are to act the roles of students who talk in the class, sleep in the class; answer call from mobile phone; ask questions and challenge the lecturer's answers and do not respond to undirected questions. 2) Discuss how the volunteer handles the class	1) Classroom Presentation by a volunteer 2) Discussion of Classroom Presentation by volunteer 3) Video on Presentation using Set induction 4) Lectures and discussions
2	Define advance organizers. Use them confidently to catch students' attention when you start a class.	None	Lecture and discussions
3	Distinguish between learning objectives and learning outcomes. Write your learning objectives and learning outcomes for each of your lessons so that students know exactly what they are expected to learn in your lesson.	Writing Learning Objectives and Outcomes Each group is given one level of the Bloom taxonomy. The group members are to produce one learning objective and the required number of learning outcomes.	1) Lecture and discussion 2) Review of Written Learning Objectives and Outcomes from the group. 3) Elicit suggestions from participants and provide suggestions for improving the written learning objectives and outcomes.
4	Describe Gagne's instructional event. Decide when to use any specific events in your lesson in order to deliver your lessons effectively to the students.	None	Lecture and discussion

4. Sample and Method

This study was carried out for the training conducted in the Dec 2008 session attended by 23 teachers from various faculties, schools and centres. Out of these 23 teachers, 9 of them were newly appointed teachers who had completed all the nine modules and started teaching in the January 2009 session. This study focussed on these 9 newly appointed teachers who had no prior training in teaching. Four of the new teachers had less than 1 year teaching experience while the other five had more than 3 years of teaching experience.

Participants were given a quiz at the end of the module. They also completed a training feedback form at the end of the module. Post-training evaluations on the classroom presentation skills of the teachers were conducted through classroom observations of teaching carried out during the first semester of teaching by the new teachers. This was to determine whether the new teachers were applying the classroom presentation skills they learned in the training and to evaluate their competence. Student evaluation of classroom teaching provided a quantitative measure on the effectiveness of the teaching in general and the classroom presentation skills in particular.

This study also looked at the training materials given to the participants and the video recording of the training conducted, focussing on the activities carried out to determine the effectiveness of these activities in achieving the outcomes of the modules.

5. Some Results of the Study

From the quiz which consisted of 10 objective questions given immediately after the module, it was found that the average score of the participants was 6-7 questions correctly answered.

The post training survey questionnaires asked the participants whether the training provided had been beneficial to prepare them for their teaching. The analysis of the post training feedback showed that all the participants found the training beneficial and helped them to prepare for their teaching. In particular, they found that the training helped them to handle student's behaviour, prepare materials for lessons, apply active learning and get student involvement, capitalise on student's answers, identify and stop bad habits and promote best teaching practices.

The classroom observation of teaching was conducted for each of the nine new teachers. Generally it was observed that the new teachers practised what they learned and were able to apply set induction and learning objectives and outcomes in the classes. Most of them were observed to have demonstrated the use of set induction and learning objectives except for one new teacher with no prior teaching experience. Those with teaching experience accomplished them very well.

The results from the interviews supported the findings from the classroom observation of teaching that the activities for Module 1 were useful. They were able to apply the knowledge acquired through these activities in their teaching.

The first interviewee was a new teacher with no prior teaching experience. He said that he found the training and particularly the activities in Module 1 very helpful. He added that through Activity 1, he learned how to build rapport with students before starting the classes. He was able to apply it in his classes. He also learned how to capitalise on students incomplete responses and turned them into constructive responses and correct answers. He also found Activity 2 useful as it facilitated him in his preparation of lessons. He added that he observed that students often failed to see the importance of the learning outcomes statements. He observed that it was necessary for him to highlight at a specific point of the lessons where the outcome was achieved.

The second interviewee was a new lecturer with more than 3 years of teaching experience but no formal training in teaching. He found both Activity 1 and Activity 2 useful. He highlighted the ice-breaking with students before starting the lessons as the most useful skill he learned from Activity 1 and he practised it in his classes. The learning outcomes were useful as they informed the students what they can expect to learn from the lessons. He added that he found Bloom's taxonomy very useful and he was able to apply the knowledge for setting final examination questions.

A quantitative analysis was also carried out from the data obtained through the questionnaires on Student Evaluation of Teaching. Seven of them scored above 80% meeting the benchmark of the institution; whilst two of the new teachers with no prior teaching experience scored about 60%.

6. Conclusions

Initial findings showed that the participants found the two activities in Module 1 useful and were able to apply them in their classroom teaching. The activities carried out supported the achievements of the stated objectives of the modules. However the new teachers demonstrated different levels of competence. More activities and case studies relating to classroom presentation skills may help to improve the effectiveness of the module.

7. Acknowledgements

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The Use of Magic in Optics in Higher Education

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ABSTRACT

Why use Magic for teaching Optics? Magicians know that, once the surprise has worn off, the audience will seek to understand how the trick works. The aim of every teacher is to interest their students, and a magic trick will bring them to ask how? And why? And how can I create one myself? In this article we consider a project I gave in 2006. I summarize the project scopes, the student theoretical studies, their “new” Grand Illusion realization. I conclude by the weak and strong points of this approach... but let's not reveal all the secrets just yet! Whatever the student's professional ambitions, they will be able to see the impact that originality and creativity have when combined with an interest in one's work. The students know how to “perform” a magic trick for their family and friends, a trick that they will be able to explain and so enjoy a certain amount of success. Sharing a mathematical/physical demonstration is not easy and that they do so means that they will have worked on, understood and are capable of explaining this knowledge. Isn't this the aim of all teaching?

Keywords: Optics, Ray Tracing, Use Magic for Teaching, Higher Education, Engineer, Educational Method, Grand Illusion, Hodges

1. Introduction

From the beginning of time people have feared what they don't understand and sought logical explanations for inexplicable phenomena. To begin with they considered them to be the work of magic, then the work of the gods, then the work of God himself. The church discouraged the spread of the conjurer's art as it preferred not to have rational explanations for what was considered supernatural.

The first magic tricks were performed in the Middle Ages by clowns and/or con-men who would entertain passers-by by getting them to bet on the position of a ball hidden in one of three up-turned goblets, the bet being usually lost. This trick is known nowadays under the name “cups and balls” [1]. The first book considered to be about modern Magic (or should we say “conjuring”) was written and printed the 16th Century. It was about Magic with ropes [2]. It wasn't until the end of the 19th Century that the word Magic took on its present-day meaning when the famous magician Houdini, father of modern Magic, made it the art it is today.

Since then a good number of principles have been invented and improved on by magicians and gamblers [3], especially for card tricks with bets. Since the 1980s the secrets that were once passed on from master to apprentice are now universally available through the use of

video cassettes and modern communication technology, and Magic has become a Big Business.

The aim of the magician is to hide the principles he uses (using maths, physics, psychology, sleight of hand, etc...) by disguising the trick so that the audience has no way of discovering how it is done thus allowing the Magic to remain.

The teacher can do exactly the opposite: unraveling a Magic trick to high-light the principles used!

2. The P.E.S Project of ESIEA in the French Higher Education

We shall see successively the organization of higher education in France, the scope and the objectives of the P.E.S project.

2.1 The Higher Education in France

In France, the secondary education is sanctioned by the high school diploma. Ideally the pupils obtain it the age of 18. Then, they have a plethora of possibilities following 3 axes:

1) Some undertake short studies called “professional” in an I.U.T¹ at the University or in high school with the aim of obtaining a BTS². Both programs lead to a 2-year

¹IUT: Institut Universitaire de Technologie (in French)

²BTS: Brevet de Technicien Supérieur (in French)

technical degree,

2) Others undertake longer studies. In this case, if they have obtained their high school diploma they can:

- Enrol in university,
- Or enter preparatory courses (classes for entrance into Grandes Ecoles) for 2 years, which will lead them, via national entrance examinations, to enter a 'Grande Ecole' in business or engineering.

The studies take 3 years and once they have their degree in hand, the students find employment easily.

The school in which I work, named E.S.I.E.A, is an engineering school.

2.2 The Scopes of the P.E.S Project (Project of Engineering Sciences)³

The P.E.S. is a 6th semester project, taking place between February and May (75 homework hours are planned for each student) and students are organized into groups of 4. Their work is closely followed by a professor. Because the project is to be developed during the student's free time, they also take other courses during this semester.

The subjects can be of three kinds:

- 1) "Professional" subjects requested directly by the partner companies of the school,
- 2) "Research" subjects' given by research centers,
- 3) "Educational" subjects proposed by the school's professors.

The subjects are collected by the school administration, communicated to the students and finally 3 subjects are chosen by each 4-student group. Though an internal process, the students are assigned a subject (most frequently their first request).

2.3 The P.E.S Educational Objectives

The main objective is to apply to a project the knowledge acquired during coursework, and if need be, to enrich this knowledge.

A second objective is to raise students' awareness that a project is not reduced to a single academic subject but is in fact a conglomerate of knowledge taught in various courses.

Finally, let us note the importance of project management among these objectives.

An extract of the program, available for consultation on internet [4], is given in Appendix A.

3. The Assigned P.E.S.

The contents of a project I assigned to a group of students, the motivations and my expectations are described below.

3.1 The Proposed Subject in 2005-2006

3.1.1 Study and Realization of a Grand Illusion

Purpose of the project: to study a new theory through the

³P.S.I. Projet des Sciences de l'Ingénieur (in French)

design performance of a Grand Illusion.

The magic arts consist of several specialties: close-up, cups and balls, coin tricks, transformists, card trick, and so on... The most mediatized specialty, enjoyed by all kinds of audience, is: the Grand Illusion.

We suggest that you design and perform a Grand Illusion which can be presented several times in the school year to all students and/or to parents and/or to future new students, etc....

3.1.2 Purpose of the P.E.S.

The purposes of the P.E.S are thus multiple:

- 1) To think about the management of confidential information within industry.
- 2) To read about and understand optics theory.
- 3) To find documentation about Grand Illusions, and to study it.
- 4) To write specifications for a NEW Grand Illusion and to construct it.

3.1.3 Summary

- 1) If you want to know the secrets of the greatest magicians, come!
- 2) If you want to learn a new theory of physics in a fun way, come!
- 3) Given the vast perspectives of this project, several groups of P.E.S can be trained. So if the work in collaboration between several teams (= services in the company) interests you, come!

ATTENTION: once the secret is known, the illusion loses all its magic... but not its spectacular beauty!

3.2 My Motivations to Propose Such a Subject

I chose the topic of magic, a subject which fascinates me, to be virtually certain that the topic would be completely new for the students. So they are in an unknown situation. They will thus have to implement all the necessary means complete the project successfully.

I also try to arouse the students' curiosity by proposing subject that is more playful than usual.

Following these objectives, I propose a project in optics, while the school in which I work does not teach this subject. I go out very slightly of the project scope because once in a company, the students will have to study or to solve problems that they have never seen during their academic career.

Consequently, the students have to look for, find and understand a new theory of physics.

After all I give them work that is more difficult than that expected by the school. Indeed there is little chance that I will have a student, who is the son or daughter of a magician or who is magician himself.

Finally, I try to change the traditional way of teaching: a downward method (the professor teaches the student) usually used in France, become an ascending method here (it is the student who will have to explain to the

professor).

The ascending method has the merit of showing whether the posed problem is well understood. As wrote Boileau [5] “what conceives well expresses itself clearly, and the words to say it arrive easily”^{4,5}.

3.3 My Expectations

I thus expect from my students:

- 1) That they make perform research on magic and Grand Illusions based on optical illusion,
- 2) That they perform research in optics:

- Geometrical optics:

Theory of beams for a single lens system.

Equivalent one lens for several lenses system (for example: the astronomical telescope).

- Undulatory optics (several Grand Illusions are based upon)

Study light interferences due to the electromagnetism taught in the 3rd and 4th semester (for example: Young's holes)

An introductory study of the phenomenon of diffraction.

- 3) That every group-member knows (by heart) the theories and that each of them can explain these theories to the professor.

- 4) That the realization is interesting about both angles: magic and optics.

The Grand Illusion will have to be original and creative and, it must solve the given problem correctly. Finally its presentation during the diva must be well organized and as magic as possible.

3.4 The Group Composition

Two groups chose this project. Each met one of the two objectives that I had set but neither managed to meet both objectives. Is this due to the subject or to the composition of the groups?

The first group consisted exclusively of students who were members of the Student Union⁶.

The second consisted of “above average” students according to the standards of evaluation used in France.

4. Realization of Group Number 1

4.1 Theory of Optics

In a few pages, the students gave only the theory of geometrical optics onto the forming of images (convergent and divergent simple lenses, mirrors, association of two simple lenses); this part of the work was relatively complete. But only one of them knew only approximately this theory (what we noticed during the oral

presentation).

Finally, they did no work on interferences and the notion of diffraction-in spite of my repeated requests during follow-up!

4.2 Summary of Grand Illusion in Literature

I think that among all Grand Illusions they found, the students have decided to explain in their report only one—with which a magician is able to make disappear an object, a human being or a part of it...—which is the base of their own Grand Illusion.

In their report, they wrote:

“The first idea, which we had, consists in being able to hide something or somebody behind a mirror⁷. The principle is simple. Our set up consists of a cube opened on the front (**Figure 1**).

Then we place a rectangular mirror in the same cube (**Figure 2**).

The right wall (BCGF) is reflected by the plane mirror when we⁸ are in front of the cube. So each person situated in front of the stage sees the background of the cube in the left side, and on the contrary, in the right side, the background is hidden by the mirror and the spectators see the reflected image of right side by the mirror (**Figure 3**). A bar placed on the (IJ) edge from top to bottom is enough to hide the mirror edge.

In small-scale cube (approximately 50 centimeters cube edge), we can hide small object or even our hand if we drill a trapdoor on the top⁹ to be able to reach inside

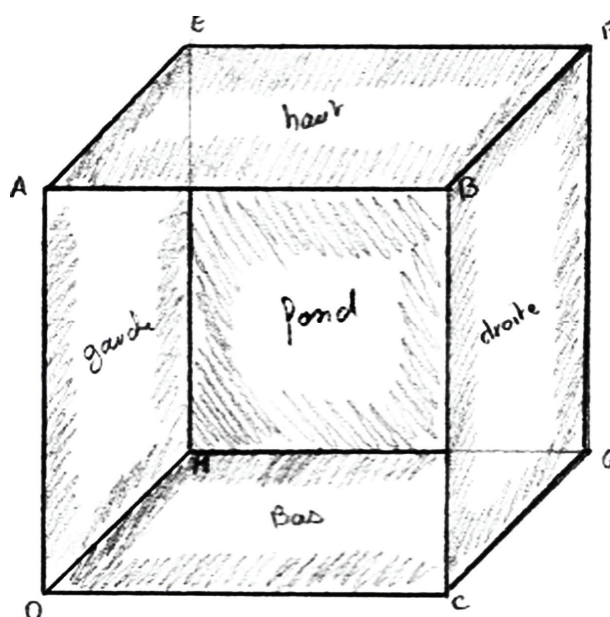


Figure 1. Display of the Grand Illusion “Disappearance”: simple cube

⁷Magician note: it would be greater to write “thanks a mirror”

⁸We = the spectators

⁹Lecturer note: better read bottom!

⁴“ce qui se conçoit bien s’énonce clairement, et les mots pour le dire arrivent aisément”

⁵Pierre Schott’s translation

⁶“B.D.E” in French as Bureau Des Etudiants

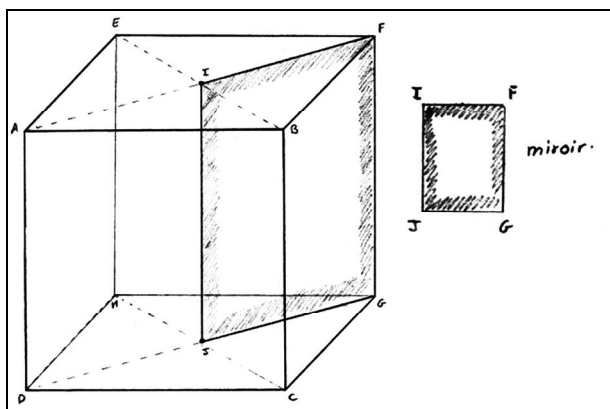


Figure 2. Display of the Grand Illusion “Disappearance”: simple cube with the mirror

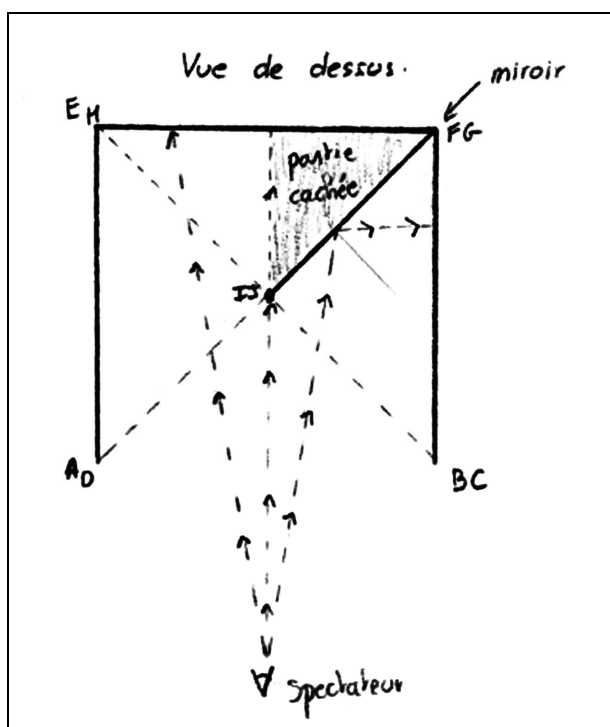


Figure 3. Display of the Grand Illusion “Disappearance”: multiple reflections beams

our stage. In large-scale cube (approximately 2 meters cube edge) we can remove persons but we do not envisage this eventuality in the first place due to the budget but also for handiness reasons on the stage. Even if this system is practicable, we did not intend to create it because a spectator situated too close to the stage could discover the secret.”

It is a very classic Grand Illusion which is a direct application of the image construction thanks to the geometrical optical theory. I am very satisfied that the students found this idea and even more that they do not content themselves with it. Indeed their project would lack of

personal creativity.

4.3 Their Own “New” Grand Illusion

“The second idea we had is to create an unlimited tunnel thanks to two opposite mirrors. The principle is slightly more complicated but can be more interesting. Our tunnel is also based on a cube (Figure 4).

This time, all the faces are closed. For the sides, the bottom and the top of the cube (AEGD, BFHC, CDGH, ABFE), we used some wood or some cardboard. On the background (EFHG), we placed a mirror and on the front side (ABCD) we placed a two-way mirror allowing the vision in the one way from outside to inside (direction AE for example).

It is necessary, for well working, that the inside of the cube is much more brilliant than the outside. Indeed, the two-way mirror although it makes dark all around the observer and it is luminous inside the cube. The simplest solution to remedy for this problem was to place a light source in our cube for becoming in darkness. To become the outside dark, it is necessary switch off any light sources.

The principle of such a construction is that the spectator looks through the two-way mirror the only thing which he can see is the reflection of a mirror on the other to infinity. Our cube gives the illusion to be an unlimited tunnel (Figure 5).” [6]

The technical drawing of this Grand Illusion is presented to the Figure 7, in Appendix B.

It is necessary to add that this idea is very old and was realized many times and not always in a “magic” way. For me, its most beautiful realization is the gallery of

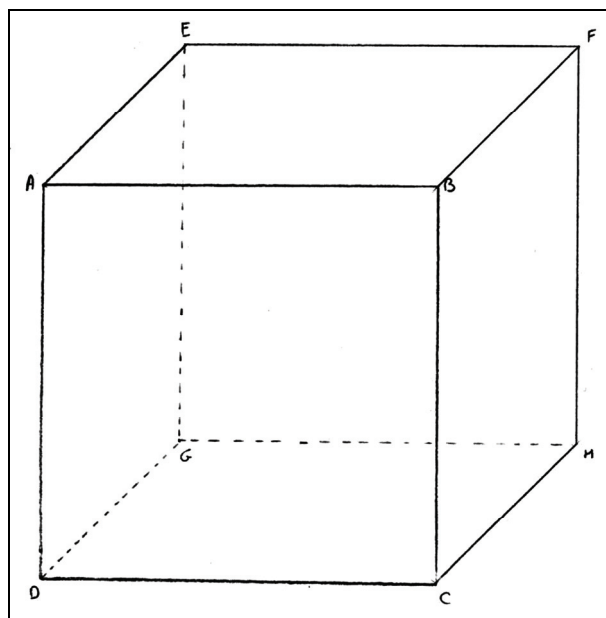


Figure 4. Display of the Grand Illusion “unlimited Tunnel”: simple cube

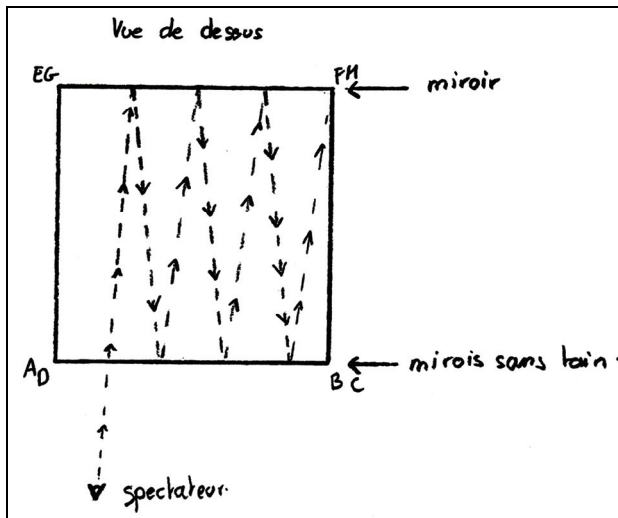


Figure 5. Display of the Grand Illusion “unlimited Tunnel”: explanation of the beams ways

mirrors, in the castle of Versailles wanted, by Louis XIV. What recovers of the originality of their project is to use a two-way mirror what allows to have really a magic trick which I am now going to describe below and what was presented to me during their oral presentation.

A student (finally I shall have to say the magician) takes a box and show it to the public who can test the rigidity of all the faces. He is standing and puts this box on his belly. The magician switches on the inside of the box and the spectators see the box lengthening towards the back through the magician stomach! The magician switches off the box and show it to the public (it takes back its initial size!). He taps too his abdominal muscles to show that they are very hard and that there is not a hole anymore!

5. Realization of the Group Number 2

5.1 Theory of the Optics

In few pages, the students gave all the theory of the geometrical optics onto the images construction (for convergent and divergent one lens system, mirrors, association of two lenses) and also simple applications of the undulatory optics by the study of the holes of Young.

5.2 The Grand Illusion

The idea we chose to realize a mini illusion is the idea of one of our P.S.E members: Charles Weisgerber. He saw it in the exhibition “La Seine des photographes” in the Conciergerie in Paris. Indeed, the concept of mirrors “W” was realized with Seine’s photos and impressed us at the first sight by its realism of three dimensions vision. We have chosen to conceive an appropriate model for our workgroup. That was going to help us to understand the physical phenomena which hide behind this illusion.

We naturally construct it with our personal touch to answer to our subject. We did not consequently invent anything but we understood an idea to reshape it for our P.E.S by bringing it the necessary modifications [7].

The example was put in the report and was explained during their oral presentation, is presented in **Figure 6**.

For me, there is no creativity enough and their realization is not at all magic! We find right now the optical illusion... and not a Grand Illusion.

6. Synthesis, Conclusions, Going Further and Prospects

Before asking the following question “Is it opportune to develop this type of teaching?”, let me make a synthesis of students’ work, then a conclusion in relation to my expectations and finally suggest ways to go further.

6.1 Synthesis

Let us sum up my expectations in **Table 1**:

[Rq 1]: The “grand” illusion is only a mirage!

[Rq 2]: The astronomical telescope was not dealt with.

[Rq 3]: This group invented a new Grand Illusion (to my knowledge), and presented it with an elaborated artistic sense: which gave a perfect answer to the magic problem.

[Rq 4]: This group learnt nothing in terms of theory except for one member.

[Rq 5]: The link between theory and practice was made for the oral presentation but regrettably not in their report.

6.2 Conclusions

Let us look at the work supplied by both groups in **Table 2**:

If the work of group 1 and group 2 could be brought together, the report would completely reach my expectations and objectives. That is why I can think that this method is efficient and practicable.

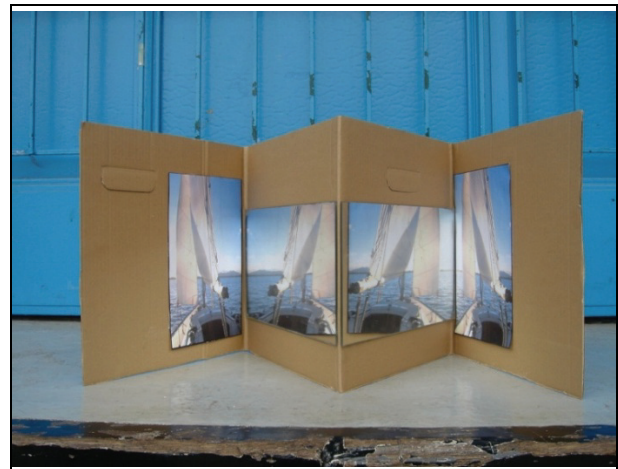


Figure 6. Realization of the “Grand Illusion” by the second group

Table 1. Synthesis of student work

	Expected objectives	Group 1	Group 2
	Magic documentation	Good	Average [Rq 1]
Geometrical optics	Theory of beams for a single lens system	Very Good	Very Good
	Equivalent one lens system for several lenses system	Good [Rq 2]	Good [Rq 2]
Undulatory optics	Approach the lightly interferences thanks to the electromagnetism given in the 3rd and 4th semester	Not done	Very good
	Approach slightly the diffraction phenomenon	Not done	Quite good
	Conception and realization of their new Grand Illusion	Excellent [Rq 3]	Nothing Magic
	Explanation of the theoretical points during the oral presentation	None [Rq 4]	Good – very good [Rq 5]

Table 2. Synthesis of students work by macro objectives

Objective N	Asking Objectives	Group 1	Group 2
1	discover a new (for students) existing theory and perfectly know it.	No	Yes
2	Implementation of a project in a very different context from theirs	Yes	No

But each group was interested in only a part of the whole project subject.

We can thus conclude that if each group had been less homogeneous, it would have been able to achieve fully the objectives and the expectations. This leads to a more directive role than I imagined on the part of the teacher regarding the composition of the groups.

These groups are formed spontaneously according to the affinities and the common points of the individuals. It is this homogeneity which will allow them to work together and to achieve successfully the given project.

6.3 Going Further

So I'm wondering if, half-way through, I should not have:

1) chosen one of the two illusions and imposed it on each group?

2) chosen one of the two illusions and imposed in on both groups to realize this project successfully by merging both groups into one?

3) mixed the ideas of both groups' proposed illusions in order to invent a new one and impose it on both groups (or both groups united together)?

4) mixed both groups by breaking their homogeneity but by obliging the students to use the talents of each?

None of these solutions seemed interesting to me be-

cause they break an essential aspect of the project: by choosing a single illusion, I depreciate the other one in the student's eyes, by mixing the groups I break their homogeneity and risk demobilizing them. It is therefore up to the teacher to show himself more directive when monitoring the project.

The project of group 1 shows that strangely, the written work is focused on the area of magic: the students left aside the physical problem to concentrate on the elaboration and the realization of the illusion. This group probably thought that, if the illusion was achieved, the project would be too and the professor would be clement with them.

The project of group 2 shows the opposite. By not being interested in the magic, the students doubtless thought that if the theoretical aspect was well learnt and displayed, the aim would be achieved.

The professor will thus have to remedy it by being inflexible: the students will have to reach the final aim and all the objectives and the sub-objectives must be achieved too. The teacher must be careful that the ludic aspect remains rewarding but without it predominating the given theoretical work.

6.4 Prospects

I continued to propose these kinds of subjects and by a more formal follow-up, the results improved. One group even suggested to me a different (magic) subject which I reformatted to fit the P.E.S imperatives.

What leads me to think about adapting this to the whole physics teaching is to use illusions (or magic) as a method of investigation to lead students to understand the principles of Physics and to come to love this subject.

7. Acknowledgements

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Appendix A

A.1 The Objectives

The Projects of Engineering Sciences (P.E.S), workshops proposed to the 6th semester students, group activities of project type which take place throughout the winter semester (from 01/30/2006 till 05/31/2006).

Their main objective is the study of concrete applications in companies, technico-scientific matters leading to a realization or an experiment. The aspects of human formation and of project management will have to be there approached.

They also allow developing the work in a group, the communication techniques as well as the collaborative work.

A.2 The Activities

The students, 3 to 5 students per group, are accompanied by a teacher.

- 1) They develop their project.
- 2) They make an intermediate report.
- 3) They draft a final report.
- 4) They speak during an oral presentation.

A.3 The Subjects

The subjects are proposed by teachers of various matters: electronic systems, physics, signal and Fourier-analysis, scientific calculation, human formation, communication, ...

The proposed subjects list will be available on the office of the assistant educational and posted at the latest on December 14th, 2005.

Every domain has a number of limited subjects.

A students group can propose a subject: they have to find a teacher who wants to follow this group with their subject. Then the group must contact the educational assistant which takes care to register the project.

A.4 The Teacher

He accompanies the students group in their work and is in charge of the evaluation.

He assures three major meetings:

- 1) In the beginning of activity, he advises and directs the students group.
- 2) During the intermediate balance report, he reorients possibly the group and estimates the presented work.
- 3) At the end of activity, during the oral presentation.

Appendix B: Technical Drawing of the Grand Illusion “Unlimited Tunnel”

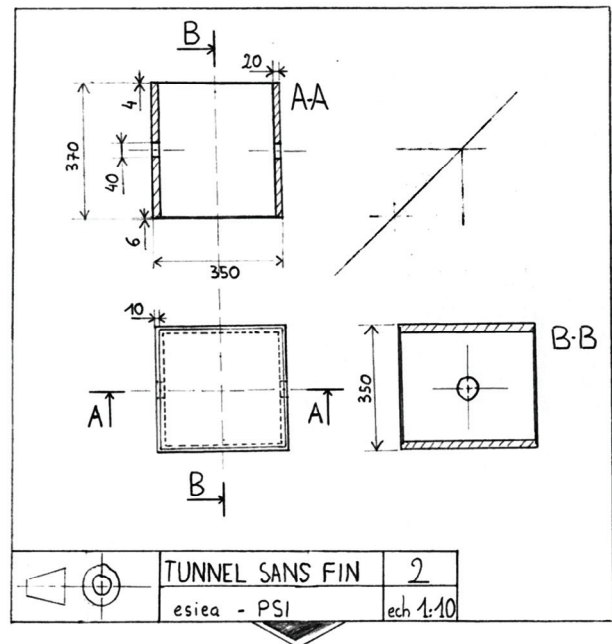


Figure 7. Display of the ‘Grand Illusion’ unlimited: unlimited drawing

Learning and Teaching Ethics through Stories: A Few Examples from the Buddhist Tradition

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ABSTRACT

The art of storytelling, similar to poetry, takes us to a different realm, yet always bringing us back to where we are. In many traditional societies, ethical concerns were taught through stories. A few stories from the Buddhist tradition have been selected to convey some basic teachings of the Buddha on ethical issues. This does not mean that these few stories capture the whole of Buddhist ethics. Furthermore, it is understood that similar stories can be found in other traditions, and therefore the same technique can be used in other religions as well. The universalities of these stories provide a means to teach ethics in a multi-cultural context.

Keywords: Ethics, Buddhism, Story Telling, Teaching

1. Introduction

“You cannot stay on the summit forever. You have to come down again, so why bother in the first place? Just this: What is above knows what is below, but what is below does not know what is above. One climbs and one sees; one descends and one sees no longer, but one has seen. There is an art of conducting oneself in the lower region by the memory of what one saw higher up. When one no longer sees, one can at least know.”

Rene Daumel. Mount Analogue [1].

Living a spiritual life is very much similar to a journey taken by a traveler, especially that of a mountain climber. A journey starts from one point and ends at another; in a spiritual journey one goes from the “lower” self to the “higher” self, although there is only the Self. To ascend the mountain and reach the peak is one of the main objectives of living a spiritual life. There is no highway to enlightenment. The journey takes time; it requires tremendous sacrifices and hardship; sometimes a guide is necessary; it demands discipline, faith, and dedication. To live ethically is the “*art of conducting oneself in the lower region*.” Occasional stopping and enjoying of the scenery is possible; but the goal is clear: To reach the mountaintop, to taste and experience the Truth. The teachers are the guides and the maps are the scriptures and the wisdom teachings; the task is to study the map and begin the climb. The teachers only point the way [2]. In his book, *Dimensions of the Sacred*, the scholar of

world religions, Ninian Smart [3] lists seven important dimensions of religions as: 1) the ritual or the practical dimension; 2) the doctrinal or philosophical; 3) the mythic or narrative; 4) the experiential or emotional; 5) the ethical or legal; 6) the organizational or social; and 7) the material or artistic. In this essay the focus will be on the mythic or the narrative aspect and an attempt is made to show that stories have been used in most spiritual traditions to teach not only about myths but also about ethics.

There are many ways to characterize different religions; any given religion has different elements. Two points need to be emphasized. *First:* any religion provides (or should provide) a guideline, a map, for what one needs to do, what one needs to avoid, etc. *Second:* any religion provides (or should provide) guidelines for how one needs to react to external and internal variations. In other words, the test of suitability of a religion for an individual, in addition to the first point, where certain social guidelines are updated, is the second point, namely, how well the individual is capable of using this religion to react, to respond, and to interact with the external (and internal) circumstances. Religion in its wholeness connects the individual to the Source-that which one has been separated from, whether it is called God, the Truth, the Unnamable... According to many scholars, religion is what makes the person whole. Lama Govinda [4] says:

“As long as a religion (re-ligio, from re-ligare, to join again) is able to link its followers to that universal

depth-zone of their consciousness, the nontransient, all-embracing “divine ground of all being” that is not limited by time and space, it has fulfilled its function. For a religion must be capable of giving some meaning to existence. It must also point the way beyond the data of the senses and individual limitation toward a higher reality which can be attained by personal effort. Such a religion has value.”

Religious ethics, unlike secular or humanistic ethics, is part of a bigger system; it is part of the religion which it originates from. Granting that certain aspects of all religions are historical, *i.e.*, time and culture-bound, each religion contains a general code of ethics [5]. Though philosophers have different ways of classifying various types of ethics, such as deontologist, consequentialist ethics, or virtue ethics [6-13]. In this brief essay the position is taken that associated with each religion, there is a body of teaching which can be called the ethics of that religion; it is not to be extracted or separated from that religion. To the question “What is ethics?” Singer [12] gives a general and comprehensive answer that can also be used here:

“The word itself is sometimes used to refer to the set of rules, principles, or ways of thinking that guide, or claim authority to guide, the actions of a particular group; and sometimes it stands for the systematic study of reasoning about how we ought to act... But “ethics” and “morality” have their roots in a word for “customs”, the former being a derivative of the Greek term from which we get “ethos”, and the latter from the Latin root that gives us “mores”, a word still used sometimes to describe the customs of a people.”

There are those who say that one can be spiritual without being ethical, and there are those who say that unless one is able to lead an ethical life, no genuine spirituality is possible. Buddhism, similar to other religions has to respond to the issues of “conveniency”, “efficiency”, and “expediency” in the contemporary world. Buddhism, similar to other religions, has certain aspects of its teaching that can be categorized or named as “Buddhist Ethics,” though perhaps it is more appropriate to talk of a Buddhist living a virtuous (ethical) life. Buddhist ethics can be called the “Ethics of Intention”, the “Ethics of Consequences,” the “Raft Ethics,” a “Non-violent Ethics,” the “Ethics of Interconnectedness,” or.... Among certain groups the “Raft Ethics” is very popular. In this approach, the simile given by the Buddha (in the collection of discourses named the Majjhima Nikaya), where he uses the analogy that SILA (virtues, ethics) is similar to a raft for crossing the river, where the other shore is Nirvana. Accordingly, the person who has reached the other shore, *i.e.*, an enlightened being, will not carry the raft on his or her back. Of course it goes without saying that the Buddha was referring to those who were already enlightened and had reached the other shore; for one who

is still crossing the river of life, getting rid of the raft will only result in one’s drowning.

Spirituality plays different roles at different times. Sometimes, one needs to comfort oneself and others about an unwanted situation. Sometimes one needs to be quiet and hope or pray. Sometimes one needs to address and challenge the injustices. While religion may conform to the laws of a society, spirituality can question those laws and the institutions enforcing those laws. In most spiritual traditions, frequent periods of retreat from the worldly activities are recommended, and in fact have become necessary. The two ultimate questions, namely 1) *who we are*, and 2) *what we ought to do*, are existential questions which one needs to struggle with and delve into, and while one is busy doing the same things and repeating the same activities, it would be very difficult to think of these two questions with any sense of *continuity and depth*.

In this essay, a few stories from the Buddhist tradition are selected to convey a sense of Buddhist ethics. This is not to say that these few stories capture the whole of Buddhist ethics; for comprehensive analysis of this issue see [14-17]. Furthermore, it is assumed that similar stories can be found in most other traditions, and therefore the same technique, *i.e.*, using stories to teach ethics, can be used in other religions as well. The universalities of these stories provide a means to teach ethics in a multi-cultural context. In the next section, a brief overview of the teachings of the Buddha is provided, followed by a few stories pointing to certain aspects of the Buddhist ethics. The final section attempts to relate ethics to self-realization.

2. The Basic Teachings of the Buddha

If one looks at Buddhism as a school of philosophy rather than a way of living, then it is possible to look at its various elements such as epistemology, ontology, metaphysics, ethics, etc. [18-28]. To translate some of these into everyday discourse entails studying questions such as *How do we know?*, *What do we know?*, *What should we do?* etc. In this essay the concern is with the last of these questions.

The Noble Eightfold Path of Buddhism, which leads to the extinction of DUKKHA (the unsatisfactory nature of existence), consists of the following steps:

- 1) Right Understanding
- 2) Right Thought
- 3) Right Speech
- 4) Right Action
- 5) Right Livelihood
- 6) Right Effort
- 7) Right Mindfulness
- 8) Right Concentration

Perhaps a better way of representing these steps, avoiding a possible misunderstanding implying a hierar-

chical or sequential structure, is to represent them in a circular manner. These eight steps are often represented or organized into three groups. In the first group, SILA (ethics, virtues) the three elements of Right Speech, Right Action, and Right Livelihood are put together. In the second group, SAMADHI (concentration, meditation), the three elements of Right Effort, Right Mindfulness, and Right Concentration are contained. In the third group, PRAJNA, the two elements of Right Understanding and Right Thought are grouped together. With a circular representation, one can see that each group affects the other two groups and is also affected by them.

The concern in this essay is with SILA (Right Speech, Right Action, and Right Livelihood). The word "Right" needs to be explained. While, the Pali word SAMMA is translated into English as "Right," it should be recognized that it is not the opposite of "Wrong," or "Bad." Lama Govinda [29] explains: "*Samma* (Skt. *Samyak*) means what is perfect or entire, that is, neither split nor one-sided; something, in fact, that is fully adequate to every level of consciousness." A Zen teacher, Albert Low [23] says: "The word 'right' does not mean right according to some perfect model or set of rules. Rather, it means without distortion brought about by the craving to be separate. Right mindfulness and right concentration, for example, establish a steady and clear mind, which is the foundation for an ethical and spiritual life." The traditional teachings of the Buddhist ethics are given in various SUTRAS (discourses) and books. For example, with regard to *Right Speech*, the Buddha said: [30]:

"1) *Herein someone avoids lying and abstains from it. He speaks the truth, is devoted to the truth, reliable, worthy of confidence, not a deceiver of men. Being at a meeting, or amongst people, or in the midst of his relatives, or in a society, or in the king's court, and called upon and asked as witness to tell what he knows, he answers, if he knows nothing: "I know nothing", and if he knows, he answers: "I know"; if he has seen nothing, he answers: "I have seen nothing", and if he has seen, he answers: "I have seen." Thus he never knowingly speaks a lie, either for the sake of his own advantage, or for the sake of another person's advantage, or for the sake of any advantage.*

2) *He avoids tale-bearing, and abstains from it. What he has heard here, he does not repeat there, so as to cause dissention there; and what he has heard there, he does not repeat here, so as to cause dissention here. Thus he unites those that are divided; and those that are united, he encourages. Concord gladdens him, he delights and rejoices in concord; and it is concord that he spreads by his words.*

3) *He avoids harsh language, and abstains from it. He speaks such words as are gentle, soothing to the ear, loving, such words as go to the heart, and are courteous, friendly, and agreeable to many.*

4) *He avoids vain talk, and abstains from it. He speaks at the right time, in accordance with facts, speaks what is useful, speaks of the law and the discipline; his speech is like a treasure, uttered at the right moment, accompanied by arguments, moderate and full of sense."*

The *Right Action* is described in [30]

"1) *Herein someone avoids the killing of living beings, and abstains from it. Without stick or sword, conscientious, full of sympathy, he is desirous of the welfare of all living beings.*

2) *He avoids stealing, and abstains from it; what another person possesses of goods and chattels in the village or in the wood, that he does not take away with thievish intent.*

3) *He avoids unlawful sexual intercourse, and abstains from it. He has no intercourse with such persons as are still under the protection of father, mother, brother, sister, or relatives, nor with married women, nor female convicts, nor lastly, with betrothed girls."*

And *Right Livelihood* is elaborated upon in different books and SUTRAS, for example [31]: "When the noble disciple, avoiding a wrong way of living, gets his livelihood by a right way of living, this is called Right Livelihood." In the Majjhima Nikaya [32] discourse No. 117, it is said: "To practice deceit, treachery, soothsaying, trickery, usury: this is wrong livelihood." And in the Anguttara Nikaya [30], it is said: "Five trades should be avoided by a disciple: trading in arms, in living beings, in flesh, in intoxicating drinks, and in poison." Included are the professions of a soldier, a fisherman, a hunter, etc.

What has been presented here in this section is really a very brief overview of the Buddha's teaching on ethics. More details can be found in [14,15,17]. In the next section, a few stories are taken mostly from the Zen Buddhist tradition to convey some of the essential ethical issues as presented in the Buddhist tradition.

3. The Stories

Stories have been used in many cultures throughout the ages not only to tell the story of a people, but also to point out to subtleties of life, to the intricacies of everyday dealings, often too dangerous or too sensitive to be mentioned in personal prose writings. Stories sometimes bring tears and sometimes laughter. Sometimes they present a sense of wonder and mystery. What may not be told in a logical and rational way, can be put in the form of a story. Stories are both means and ends. If they produce only tears and laughter, they are only a means for entertainment. On the other hand, if they point to a truth, then the stories themselves can become the ends. They are powerful tools for teaching, if used properly. Stories are at the heart of many spiritual traditions [33-35]. Stories need no introduction. They are in themselves the introduction, the content, and the conclusion. Stories have been used to teach, to point to a point, to emphasize

something ... They have been passed down from generation to generation. Most of the stories dealing with spirituality and wisdom do not belong to a particular class or group of people. They have come to us from emanations of that Ultimate Wisdom. Just as paintings of Nature are at best reflections of the Nature in the mind of the artist, stories of Wisdom are reflections of that Ultimate Wisdom in the mind of the person, the teacher who is telling that story. While in many traditions, story-telling is an essential element, it is observed that the same idea appears in similar form in different traditions.

In the remainder of this section, five representative stories from the (Zen) Buddhist tradition are discussed. The first story is about a ROSHI [a Zen Master] called the "Bird's Nest Roshi who was doing zazen (sitting meditation)" [36]:

"He was a teacher who lived in the Tang period and did zazen in a tree. The governor of his province, Po Chu-i, heard about Bird's Nest Roshi and went to see him. This Po Chu-i was no ordinary politician. He was one of China's greatest poets, well known for his expression of Zen Buddhism. Po Chu-i found Bird's Nest Roshi sitting in his tree, doing zazen. He called to him, saying, 'Oh, Bird's Nest, you look very insecure to me up there.' Bird's Nest Roshi looked down at Po Chu-i and replied, 'Oh Governor, you look very insecure to me down there.' All things are under the law of change and political position is the most ephemeral of all. Po Chu-i knew very well what Bird's Nest Roshi was talking about. So he took a different tact. 'Tell me,' he said, 'What is it that all the Buddhas taught?' Bird's Nest Roshi replied by quoting from the Dhammapada:

Never do evil;

Always do good;

Keep your mind pure;

Thus all the Buddhas taught.

So Po Chu-i said, 'Always do good; never do evil; keep your mind pure—I knew that when I was three years old.' 'Yes,' said Bird's Nest Roshi, 'A three-year-old child may know it, but even an eighty-year-old man cannot put it into practice.'"

This story which takes a few verses from the DHAMMAPADA [31], one of the sacred scriptures in Buddhism, can be considered to represent the *essence* of the teachings of the Buddha. It can be seen that the first statement (*Never do evil*) deals with the negative (or the preventive) aspects of the teachings, where evil actions in the context of Buddhist teachings become the unwholesome actions which are those actions related to unwholesome (improper) speech, conduct and thoughts. The second statement (*Always do good*) addresses the positive (or the prescriptive) aspects of the teaching. And the third statement (*To keep your mind pure*) points to the (inner) practices such as meditation, which are necessary to keep a balance between observing the precepts

and developing compassion and wisdom. This balancing act is brought out in the next story:

"Two Buddhist monks came to the bank of a river and found it flooded and difficult to cross. A woman was waiting on the banks and she begged them to help her across, as her children were alone and hungry. One monk refused, the other picked her up and crossed the stream, holding her on his back. When they had crossed and were on their way again, the first monk protested vehemently. He was horrified that a monk should touch a woman, let alone carry her on his back. The second monk turned to him and said, 'You mean you still carry the woman in your mind? I left her behind on the river-bank long ago.'"

This story points to a general theme, namely the relationship between the Letter of the Law and the Spirit of the Law. Developing the wisdom to know when the Spirit supersedes the Law is a challenge to a spiritual traveler. As a Zen Master said: "Zen is above morality, but morality is not below Zen." That is, Zen transcends morality but does not exclude it. A person who transcends morality is one who knows himself, one who has realized his true self, i.e., one who is enlightened, the subject matter of the third story [26]:

"When a rebel army swept into a town in Korea, all the monks of the Zen temple fled except the abbot. The general came into the temple and was annoyed that the abbot did not receive him with respect. 'Don't you know,' he shouted, 'that you are looking at a man who can run you through without blinking?'

'And you,' replied the abbot strongly, 'are looking at man who can be run through without blinking.'

The general stared at him, then made a bow and retired."

Only one who has realized his or her true nature can stand up and allow to be run through without blinking an eye. Only one who has tasted the Truth is capable of standing for Truth, Justice, Peace, Equality... This does not mean that one should wait until one is enlightened before one does anything helpful. It is the inner attitude of questioning and being humble that is of importance here. An enlightened (awaked or realized) being, similar to any other person, would encounter challenges and difficulties and it is the way in which he or she responds to the problems which reflects the degree of realization. Buddha told a parable [37]:

"A man was traveling across a field when he encountered a tiger. He began to run, and the tiger chased after him. Coming to a precipice, he slipped and was able to catch hold of the root of a wild strawberry bush, hanging in the air. The tiger sniffed at him from above. Trembling, the man looked down only to find that another tiger was waiting to eat him. He thought the bush could sustain him for a while, until he saw two mice gnawing away the vine. A tiger above, a tiger below. The man saw a ripe

strawberry near him. Grabbing the vine with one hand, he plucked the strawberry with the other, and ate it. How sweet and delicious."

Buddhism stresses living in the present, here-and-now, and thus faces the ethics of the inevitably. This can be thought of as the receptive and accepting aspect of the Buddha's teaching: In certain situations in life, in the middle of here-and-now, there is not much one can do, except being mindfully present. To live fully, to suffer fully, and to die fully. One's life is an expression of who one is and what one stands for. When one is fully awake and present, one emits rays of clarity. The concepts of ignorance (darkness) and inner light are mentioned in the following story.

"In early times in Japan, bamboo-and-paper lanterns were used with candles inside. A blind man, visiting a friend one night, was offered a lantern to carry home with him. 'I do not need a lantern,' he said. 'Darkness or light is all the same to me.'

'I know you do not need a lantern to find your way,' his friend replied, 'but if you don't have one, someone else may run into you. So you must take it.'

The blind man started off with the lantern and before he had walked very far someone ran squarely into him. 'Look out where you are going!' he exclaimed to the stranger. 'Can't you see this lantern?'

'Your candle has burned out, brother,' replied the stranger."

This story [38] represents what could be called the "Lantern Ethics." The principles that one holds dear and the virtues that one aspires to have, give fuel to this lantern of enlightenment. This intense desire for understanding and realization is the candle that never burns out. For the candle to sustain the blows and the outside wind, a transparent protective cover is necessary. That shield is the ethics—the principles that one believes and holds unto. It can be seen that in the Buddhist tradition, based on these few stories, there is a relationship between ethics and awakening: how much one can live a wholeheartedly ethical life depends on how much one has become enlightened.

4. The Importance of Ethics in (Self) Realization and Concluding Remarks

In Buddhism, the two questions of "Who are we?" and "What must we do?" are connected through the element of Right Livelihood. In order to find out *who we are*, we need to have a profession which is "right," and in order to know what a "right" livelihood is for us, we have to know who we are. There is no universally accepted or prescribed catalogue listing all possible right livelihoods. The teachings of Buddha only provide the basic foundation where one can build upon. It is for each individual to constantly search and question one's livelihood.

Unless and until one has had the experience of the

Unity of Existence (Oneness, Nirvana), *i.e.*, the feeling that "I" and "everything and everyone else" are transcendently the same and connected, the path of enquiry will be full of perils and trials. As Socrates said [39, The Republic]: "We are discussing no small matter, but how we ought to live." On a spiritual path, oftentimes it is not possible to know with *absolute* certainty what is a right or a wrong action. This does not, however, mean that everything is relative. Every action will have many consequences; while taking the action might be relative, the consequences are real. As with most spiritual dilemmas there are no easy choices¹. It is one thing to talk about or analyze various professions and categorize them accordingly as being "right," or "wrong," and it is another to judge people as "right" or "wrong" for having those professions. It is possible that a "good" father would be in a "bad" profession. The same act, depending on the circumstances and one's perception, could lead to different responses. What one may consider a right livelihood (for oneself), under different circumstances or at a different time and a different place may be considered a wrong livelihood. Whilst in the middle of a war, or living in a corrupt environment, one can still think and hope for peace, purity and good. Although it is difficult to generalize as to what constitutes "right livelihood," there are available guidelines. For example, Coomaraswamy [40] says: "...if there are any occupations that are not consistent with human dignity, or manufactures however profitable that are not of real *goods*, such occupations and manufactures must be abandoned by any society that has in view the dignity of all its members. It is only when measured in terms of dignity and not merely in terms of comfort that a 'standard of living' can properly be called 'high'". One can say that even though virtues may not be taught, virtues can be learned [41]. That is, as Aristotle said: "One becomes virtuous by performing virtues."

In Buddhism, the conception of the ideal, the ethical ideal, is one of happiness, perfection, realization, and liberation [42], where happiness is the desire for all beings to be happy. But if one does not know what gives rise to true happiness for oneself, how can one wish that happiness for all beings? Buddha in Sutta 21 of Digha Nikaya [43] discusses this:

"... I declare that there are two kinds of happiness: the kind to be pursued, and the kind to be avoided. The same

¹For a father whose children are starving, is it "right" to steal money or food? For a husband who wants to provide his wife with the necessary medicine, or a shelter, is it "right" to participate in *destructive* activities of any type? For a mother whose baby is dying, is it "right" to sell herself so that she can buy food for her baby? And.... Of course, we are not talking about greed, possessiveness, or aggressiveness here; we are talking about very caring people whose responsibility or love cause them to do something which someone else would judge as "wrong" livelihood. As Singer [11] says: "Ethics does not demand that we eliminate personal relationships and partial affections, but it does demand that when we act we assess the moral claims of those affected by our actions independently of our feelings for them."

applies to unhappiness and equanimity. Why have I declared this in regard to happiness? This is how I understood happiness: When I observed that in the pursuit of such happiness unwholesome factors increased and wholesome factors decreased, then that happiness was to be avoided. And when I observed that in the pursuit of such happiness unwholesome factors decreased and wholesome ones increased, then that happiness was to be sought after. Now, of such happiness as is accompanied by thinking and pondering, and of that which is not so accompanied, the latter is more excellent. The same applies to unhappiness, and to equanimity."

Therefore a skillful approach is to see what these unwholesome factors are; these are discussed in Sutta 9, of Majjhima Nikaya [32]:

"And what, friends, is the unwholesome, what is the root of the unwholesome, what is the wholesome, what is the root of the wholesome? Killing living beings is unwholesome; taking what is not given is unwholesome; misconduct in sensual pleasures is unwholesome; false speech is unwholesome; malicious speech is unwholesome; harsh speech is unwholesome; gossip is unwholesome; covetousness is unwholesome; ill will is unwholesome; wrong view is unwholesome. This is called the unwholesome. And what is the root of the unwholesome? Greed is a root of the unwholesome; hate is a root of the unwholesome; delusion is a root of the unwholesome. This is called the root of the unwholesome."

That is, real happiness is a happiness founded on an ethical life. One of the most distinctive aspects of Buddhist ethics, and in fact Buddhist philosophy, is that of "Interconnectedness" or the "Principle of Dependent Origination". This Principle implies that everything and everybeing is connected and related to every other thing and every other being; all beings inter-are or are interconnected throughout time and space, in a spiritual sense. The Buddha said [44]:

"When this is, that comes to be.

With the arising of this, that arises.

When this is not, that does not come to be.

With the cessation of this, that ceases."

It is this sense of connectedness which makes Buddhist approach to social issues such as peace, justice, equality different from the current trends of violent protests, name-calling, and finger-pointing [45]. One can infer from this Principle that for example, unless one has truly become a peaceful person, one cannot seek peace outside.

May we have the courage and the strength to become like the abbot who could be run through without blinking an eye.

May we acquire the mindfulness to remember and live the simple truths that even a three-year-old knows.

May we develop the compassion necessary to help others and relieve their suffering as the monk who car-

ried the woman to the other side of the river.

May our love reach those whom we have classified as our enemies, starting with one's self.

And may we learn that inner wisdom which shines like the lantern that never goes out.

There are those who say that one can be spiritual without being religious. There are those who say spirituality begins where religion ends. There are those who say that only religious people, *i.e.*, those who believe in a religion, can be spiritual. An analogy might be helpful. If one looks at a nut (walnut, almond, peanut, etc.), there is the shell, the seed, and the oil. The oil can be considered the essence: that which can be squeezed from the seed. But first the shell must be broken. The shell is the relative and the particular (dogmatic) aspects of the religion. The seed (spirituality) is that which will produce the oil: the truth within that religion (shell). If one just wants the oil without going through the process of breaking the shell, squeezing the seed, then this process of spiritual maturation is missed. There are no short cuts to the essence [46].

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Using Problem Based Learning in Training Health Professionals: Should it Suit the Individual's Learning Style?

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ABSTRACT

Context: Recently, problem-based learning (PBL) methods have been incorporated into occupational therapy (OT) curricula as in healthcare curricula worldwide. Yet, most studies examining the effectiveness of these methods have not taken into account the individuals' learning style and occupational functioning, despite of their importance. Objective: Our research examined the question of whether specific learning styles correlate with a higher self-evaluation by occupational therapy students of their occupational functioning (learning, studying) during a new course incorporating PBL method and with greater course satisfaction. Methods: 40 female students took part in the study. The various learning demands in the new PBL course are described. We assessed students' learning styles using Felder's Index of Learning Styles, while Self-Assessments of Occupational Functioning (SAOF) provided learning outcome data. We used both a modified 23-item SAOF and a novel 26-item adapted version, to examine the occupational functioning required of healthcare practitioners. Course satisfaction was assessed accordingly. Results: Occupational therapy students adopt all learning styles (sensing, intuitive, visual, verbal, active, reflective, sequential, and global) equally. Nevertheless, two-tailed Pearson's tests revealed that a sensing (i.e. practical, facts-oriented) learning style most strongly correlates with greater assessed occupational functioning in the areas of habituation and performance, e.g. time organization, routine flexibility, and communication ($r = 0.33$, $p < 0.05$). An intuitive learning style correlates with a significant ability to identify problems ($r = 0.35$, $p < 0.05$) and set goals ($r = 0.36$, $p < 0.05$), and global learning style yielded greater course satisfaction ($r = 0.56$, $p < 0.05$). Conclusions: Students having sensing and intuitive learning styles gain most from the use of PBL method. Thus, the apparently contradictory findings of earlier research regarding the efficacy of PBL methods may have arisen from differences in the learning styles of the populations surveyed. Since problem-based and traditional teaching methods appear to suit different learning styles and to better impart different skill sets, they should be regarded as complementary.

Keywords: Healthcare Education, Teaching Methods, Occupational Therapy, Occupational Performance (Functioning)

1. Introduction

The question of what constitute the best methods for educating healthcare professionals in a rapidly changing environment is the subject of worldwide debate [1-5]. Researchers and educators are aware of the need to use diverse teaching methods to improve the abilities of students with varied individual characteristics and needs [6]. Thus, over the past 30 years, teaching methods and educational programs designed in a problem-based and learner-centred manner have become common in medical, nursing, and health services curricular [3,7]. They have also been introduced into occupational therapy programs

as an adjunct or alternative to the traditional didactic, classroom-based model of teaching [8-10].

The central and common characteristic of most definitions of problem-based learning (PBL) is the use of problems to enhance learning [9] so that the problems or cases stimulate students to search and build the most appropriate solution for their clients, challenged by team and a faculty facilitator [6,8]. Students must motivate themselves and take responsibility for seeking out the relevant information, and for raising problems, questions, or dilemmas that are the impetus for the ongoing learning process [6].

Studies on PBL that have taken place in a medical

teaching context; have focused mainly on its effectiveness in comparison to the conventional teaching method in terms of: the academic performance of the learner [11-13], self-rated competencies, academic and clinical outcomes [14]. Although students generally prefer PBL methods over conventional instruction [9], numerous studies have yielded contradictory results in terms of the academic and clinical proficiency of students taught using problem-based learning methods compared to traditional didactic teaching [9,12,15,16].

The use of PBL in the occupational therapy context has yielded similarly inconclusive results. Thus, Reeves and his colleagues [17] found that, although a majority of newly qualified occupational therapists indicated that PBL equipped them well for their upcoming clinical practice, some graduates were more sceptical and viewed PBL as having a limited effect on their problem solving abilities, clinical knowledge, and skills. Other studies have focused on students' subjective evaluations of improvement in various areas, such as group skills [18] and clinical reasoning [19], as a consequence of problem-based learning demonstrating variability in the benefits ascribed to the PBL method [20].

The current study hypothesis was based on two main theoretic models: The Model of Human Occupation [21, 22] and Felder and Silverman's model of learning styles [23,24].

Students' learning styles were assessed according to the Felder and Silverman model [24,25]. According to Felder, a learning style reflects the individual's characteristics, strengths and preferences in the ways he or she processes information [26]. Learning styles vary from one individual to another. They indicate a person's predictions on five continua: sensing/intuitive, visual/verbal, inductive/deductive, active/reflective, and sequential/global, which are formalized into the Index of Learning Styles [24].

The Model of Human Occupation (MOHO) [21] was borrowed to examine the student as a person/individual performing a learning occupation. The MOHO describes three interrelated human characteristics relative to occupational functioning: volition (motivation, decision), habituation (behavioural patterns and routines), and performance capacity (the physical cognitive and mental abilities). The MOHO provides the theoretical background [21], to the Self Assessment of Occupational Functioning which has been used in the current study as a means to self evaluate the students' strengths and weaknesses relative to their occupational functioning as learners in the new course.

Thus, the question arises as to whether problem-based learning is suited only to individuals with certain learning styles. Yet, the issue of the effectiveness of PBL for students exhibiting different learning styles has not been the focus of research to date. Consequently, we posed the

following research question:

Do certain learning styles correlate with OT students' higher self-evaluation of performance and greater course satisfaction, during a new course aiming to prepare them for the transition from theory to practice, using problem-based learning method?

2. Methods

2.1 Participants

All third year students studying for a Bachelor's degree in occupational therapy in the University of Haifa during the 2004-2005 academic year chose to enrol in a new problem-based learning course and agreed to participate anonymously in this study. All students [48] were female, 43 (90%) were non-immigrant students while 5 (10%) were immigrants; 5 (10%) were single, and 29 (60%) had an urban background. Mean student age was 25.3 years, with a standard deviation of 1.5 years, which is representative of the local national undergraduate student population. Forty students (83.33%) signed the consent form and participated anonymously in the study.

2.2 The "Intervention along the Life Span" Course

The constant independent variable for all students in this study was their participation in a new course called "Intervention along the Life Span", which was established using PBL principles.

Three experienced occupational therapy teachers conducted the course, which ran for 12 intensive weeks and comprised of three parallel processes: The first process was three introductory lessons for the whole class ($N = 48$); the second was an on-going class-work performed in groups ($N = 16$) and teams ($N = 4$) whose purpose was interactive learning process with feedback provided by the peers; and the third was individual weekly meetings between each student and her client in the community. The final lesson (12th) served for, integrating the different processes into a whole intervention experience. From the fourth lesson on and parallel to the class-based learning, the students began to meet their clients in the community. Over the course of several meetings, each student was required to set an occupational goal and objectives with her client and apply a short term intervention. This major goal was accompanied by problem based methods and multi-interactions, supported by the teacher and the peers, along with: gather information in terms of the client's occupational performance and environment; search the literature for further knowledge about the client's needs and theoretical frameworks; discuss treatment barriers and facilitators with the client; and develop options for a subsequent short-term intervention. These aspects of the course design aimed at avoiding a common weak-point of PBL courses, which struggle to generate appropriate

real problems upon which to base the learning (*i.e.* using written case studies). The approach we adopted ensured the natural creation of sub-goals and required students to seek a wide-range of information. The on going counseling and team supervision ensured a constructive process, accompanied by variety of media, including videos, presentations, a course web-site, and role simulations [23].

The students were also required to document the entire process in a diary, to present their client to their team along each stage of the intervention plan, and to relate to feedback from their teams. The role of the course tutors was to facilitate independent learning (*i.e.* to facilitate group discussions, point out dilemmas, suggest new thinking directions and reflect personal progression or obstructions). At the end of the course, each student presented the process she had undertaken with the client to her 16-student group and submitted a comprehensive written assignment to her tutor. A variety of media were used in all course contexts, including videos, presentations, a course web-site, and role simulations.

2.3 Research Tools

2.3.1 The Index of Learning Styles (ILS)

Students' learning styles were assessed according to the Felder and Silverman model [24,25]. The Index of Learning Styles [ILS; 24,26,27] consists of four scales. Each scale comprises 11 items and, for each item, the learner is asked to choose between two dichotomous learning styles that suit him/her in various situations: *sensing* (concrete, practical, oriented towards facts) or *intuitive* (conceptual, innovative, oriented towards theories); *visual* (prefers visual representations of presented materials) or *verbal* (prefers written or spoken explanations); *active* (learns by trying things out) or *reflective* (learns by thinking things through); and *sequential* (adopts a linear thinking process, proceeds in incremental steps) or *global* (adopts holistic thinking, progresses in large leaps) [27]. The higher the value of the score in each of the four scales, the closer a person is to the first-mentioned term in each pair of styles.

The validity and reliability of this index has been extensively examined among many diverse student populations, including those surveyed in this research [27-30]. An acceptable alpha Chronbach value was found for the Sensing-Intuitive and Visual-Verbal scales ($\alpha = 0.70$), while lower alpha values were found for the Active-Reflective ($\alpha = 0.60$) and Sequential-Global ($\alpha = 0.56$) scales [27]. However, differences were found between genders and between engineering compared to liberal arts and education students by two-way ANOVA, using post-hoc tests for each of the four scales [27]. As a result, three problematic items (#30, #40 and #42) were excluded from the revised 41-item version of the ILS [31]

that we used for this research.

The students' scores on each of the four sub-scales constituted the learning styles variable for the current study. Internal reliability was confirmed by factor analysis, which yielded a strong Cronbach's alpha for the 41 item ILS ($\alpha = 0.85$).

2.3.2 Self Assessment of Occupational Functioning (SAOF)

The original purpose of the adult version of the revised Self Assessment of Occupational Functioning [SAOF; 32, 33] was to provide a tool for collaborative client-centered goal setting facilitated by the occupational therapist. The assessment enables individuals to evaluate their performance on 27 items in a framework that helps to identify challenges to performing desired roles, prior to the clinical goal-setting process. In the assessment, the subject (14 to 85 years old) is asked to grade his/her performance in each item on a three point performance scale: "strong" (3), "adequate" (2), or "requires improvement" (1).

Henry *et al.* [33] adapted the tool for use in assessing the occupational performance of students as learners. The student-adapted SAOF has been established as a reliable and useful tool for self evaluation by students of their performance [33,34].

We therefore used the student-adapted SAOF [33] to collect data from our students regarding their performance in the new problem-based learning course. Four items were deleted from the SAOF questionnaire (#5, #6, #20, and #21; see **Table 1**), due to low variance and missing data. The 23 remaining items showed a significant division into two primary factors, as confirmed by Cronbach's alpha, namely: *Volition* and a united *Habituation & Performance* factor (**Table 1**). No significant effects were found for the original single-item *Environment* factor, which is consistent with the findings Henry *et al.* [33], and we therefore omitted it from further analysis. This analysis, confirms the basic structure of the 23-item SAOF questionnaire, its content validity, and its relevance to our study. The total score on the 23-item SAOF constituted the first performance outcome measure for this study.

The healthcare sector places particular emphasis on students' abilities to define operative goals for clients and for themselves, and this was certainly a strong theme in our new course. Yet goal-setting abilities do not feature strongly in the 23-item SOAF, which includes only one question within this issue (item #24; identifying problems and their solutions). We therefore added three items to the 23-item SAOF: "setting goals suitable for the client" (item 28), "Implementing client's goals" (item 29), and "applying my own goals" (item 30) (**Table 2**). Chronbach's alpha confirmed that these 3 items formed

Table 1. Self assessment of occupational functioning (SAOF)¹, (N = 40)

Factor	Items	Cronbach's Alpha	Mean	SD
1. Sub-total (23 items)	1-4, 7-19, 22-27	$\alpha = 0.77$	2.11	0.27
2. Goal setting (3 new items added for current study)	28-30	$\alpha = 0.76$	2.06	0.50
3. Grand total (26 items)	1-4, 7-19, 22-27, 28-30	$\alpha = 0.79$	2.09	0.27
SAOF Factors				
1.a. Volition factor (11 items)	1-4, 7-13	$\alpha = 0.67$	2.21	0.35
1.b. Habituation & Performance factor (12 items)	14-19, 22-27	$\alpha = 0.69$	2.09	0.33
Deleted items	5, 6, 20, 21			

¹The Self-Assessment of Occupational Functioning (SAOF) used in this study comprised 23 items from Baron and Curtin's original 26-item SAOF [25] plus 3 new "goal setting" items added for the current research. In addition the factors and the deleted items are presented (5-"Staying with a frustrating Activity"; 6-"Making my own decisions"; 20-"Expressing myself to others"; 21-"Socializing with another person").

Table 2. Scores for the factors of the 26-item SAOF¹ and for the course satisfaction questionnaire

	N	Mean	Range	SD
Volition	40	2.21	1-3	0.34
Habituation & Performance	40	2.09	1-3	0.33
Goal setting	40	2.05	1-3	0.50
Satisfaction with the course	16	4.13	1-5	0.58
Satisfaction with the teacher	16	4.76	1-5	0.37

¹The 26-item Self-Assessment of Occupational Functioning (SAOF) comprised three factors: volition, habituation & performance, and goal setting

an additional "goal setting" factor within our 26-item SAOF, an aim which was to assess the occupational functioning requirements of healthcare students. The score achieved when these 3 goal-setting items were included, *i.e.* for the 26-item SAOF constituted our second performance outcome measure.

2.3.3 Course Satisfaction Survey

The Course Satisfaction survey used at the University of Haifa was established by Nevo [35] based on the literature and the similar tools used in other universities in order to evaluate teaching quality [35]. This standard survey is part of the University's routine evaluation system to examine student satisfaction at the end of every course taught at the university. It consists of 22 items that are rated on a five point scale (1 = low score, 5 = very high score), with a "not relevant" option. The questionnaire was tested on 11,901 students and on 426 teachers in 551 courses, within five faculties [35]. This testing revealed that the items are divided into two distinct factors: overall satisfaction with the course content and methods, and satisfaction with the teacher. In the current study, the students' overall satisfaction scores served as the third outcome measure.

2.4 Data Collection and Analysis

Students assessed their occupational functional performance (using the 23- and 26-item SAOFs) and their learning styles (using the ILS) on two occasions: once during the first lesson of the course, and again during the final lesson. During the final lesson of the course, the students also completed the course satisfaction survey.

The students were assured that the data would be collected and stored anonymously and utilized solely for this study and they signed consent forms (N = 40, on 83% participation rate). A student representative distributed a numerical code to each student that the students were to use instead of their name on the numerical research tools, *viz.*, the ILS, SAOFs, and the course satisfaction survey. The list of participants and their corresponding codes was kept confidentially by the students' representative. Forty students handed in completed ILS and SOAF forms. However, only 16 course satisfaction surveys were submitted with anonymous coding (a 40% completion rate).

All statistical analyses in this study were carried out using SPSS 14. Descriptive statistics were used to describe the participants' characteristics and the scores ob-

tained from the numerical research tools. The internal consistencies of these instruments were examined by Cronbach's alpha. The Pearson test was used to analyze correlations between each student's learning styles and the three numerical outcome measures of the course: the total scores for the 23- and 26-item SAOFs and course satisfaction grade. For interval components and when analyzing single items, we used the Spearman correlation.

3. Results

3.1 Learning Style

The learning styles adopted by students during the course are summarized in **Table 3**.

All the scores lay between 5.6 and 6.67, which dem-

onstrates that the students utilized all possible styles during the course (sensing and intuitive, visual and verbal, active and reflective, and sequential and global), with no single style strongly dominating.

3.2 Occupational Functioning

We validated the adapted 26-item SAOF by conducting a two-tailed Pearson's correlation between the items and factors of the original 23-item SAOF. Significant correlations were found between the new goal-setting factor of the 26-item SAOF and 1) the "identifying problems and their solutions" item (#24) ($r = 0.96$, $p < 0.01$) of the 23-item SAOF, and 2) the Volition factor ($r = 0.44$, $p < 0.01$) of the 23-item SAOF (**Table 4**), so confirming the validity of the new "goal setting" factor.

Table 3. Learning styles¹ adopted by occupational therapy students

Learning Style Scales	Mean Score	Standard Deviation	Median
Sequential-Global	5.81	2.12	6
Visual-Verbal	6.67	2.87	7
Sensing-Intuitive	5.60	2.57	6
Active-Reflective	6.46	2.51	6

¹Learning styles were assessed using the Index of Learning Styles, which comprises four scales. The higher the score for each scale, the closer a person's learning style is to the first-mentioned term in each pair of styles. A score of 5 to 6 indicates approximately equal usage of both styles

Table 4. Two-tailed pearson's correlations between learning styles, occupational functioning and satisfaction

	act_ref Style	sen_int Style	vis_ver Style	seq_glo Style	Goals SAOF factor	Volition SAOF factor	Perform SAOF factor	Satisfact' of the course	Satisfact' of the teacher	Identifying problems (item 24)
Learning Style Scales										
Active/Reflective (act_ref)	1									
Sensing/Intuitive (sen_int)	0.18	1								
Visual/Verbal (vis_ver)	0.08	0.12	1							
Sequential/Global (seq_glo)	0.00	0.35*	-0.27	1						
SAOF Factors										
Volition (volition)	0.10	-0.05	0.04	-0.10	0.39*	1				
Habituation/Performance (hab_per = Perform)	-0.12	0.33*	0.15	0.11	-0.02	0.46**	1			
Identifying problems (item 24)	-0.26	-0.35*	-0.11	-0.10	0.34*	0.39*	0.29	-0.24	-0.10	1
Setting goals (items 28-30)	-0.09	-0.36*	0.04	0.09	0.96**	0.44**	0.02	0.18	0.23	0.42**
Course Satisfaction Factors										
Satisfaction with Course (Satisfact' of the course)	0.06	0.10	0.19	-0.56 *	0.05	-0.11	-0.38	1		
Satisfaction with Teacher (Satisfact' of the teacher)	0.09	0.17	0.24	-0.39	0.12	-0.18	0.01	0.71**	1	

* $p < 0.05$; ** $p < 0.01$

3.3 Course Satisfaction

Our PBL course achieved mean course satisfaction scores of 4.13 for course content and 4.76 for the teachers, compared with average scores at the University of Haifa of 3.68 and 4.06, respectively.

3.4 Correlations between Learning Styles, Occupational Functioning and Satisfaction

Two-tailed Pearson's tests were used to investigate correlations between different learning styles and our three numerical outcome measures. The sensing-intuitive learning style was found to correlate with the habituation and performance factor of the new (26 items) SAOF ($r = 0.33$, $p < 0.05$), while the sequential-global learning style significantly correlated with course satisfaction ($r = -0.56$, $p < 0.05$).

A significant two tailed Spearman's correlation was found between item #24 (identifying problems and their solutions) and the sensitive-intuitive learning style ($r = -0.35$, $p < 0.05$), and between the scores for our goal setting factor (items: 28 to 30) and the same sensitive-intuitive learning style, $r = -0.36$ ($p < 0.05$). These correlations indicate that students with an intuitive learning style appraised themselves as having a significantly higher ability to identify problems and set goals (**Table 4**).

4. Discussion

Our research examined the question of whether specific learning styles correlate with a higher self-evaluation score by occupational therapy students of their occupational performance during a PBL course and with greater course satisfaction. Along the PBL course, students were exposed to a variety of contexts and activities (*i.e.* frontal classes; small groups; meetings with a client in the community; website forums), which required us, as facilitators, to adopt a variety of teaching styles, while challenging the students to adopt a wide range of learning styles.

Our results show that the students demonstrated all eight of the learning styles assessed by the ILS and to about equal extents. The variety of learning styles we found are similar to those found by previous studies that were conducted among occupational therapy students using distant learning [36,30]. In accordance with Felder's model, students may show an individual eclectic learning style rather than a single significant style [25]. This eclectic style enables students to cope with complexity of client-therapist process of intervention, in more efficient way. Although a variety of learning styles manifested among the students, certain styles were correlated with different outcomes.

4.1 Correlations between Learning Styles and Outcomes

4.1.1 Self-Assessed Occupational Functioning

Sensing learning style was found significantly correlated with better self-assessed habituation and performance. This finding may indicate that students with sensing learning style report of higher coping with professional practical demands such as time organization, routine flexibility, planning before acting, and communication. The same characteristic was found by Katz and Heimann [37], who found that the occupational therapy, nursing, and social work professions emphasize the concrete learning mode.

The intuitive learning style significantly correlated with greater self-assessed abilities to identify problems and set goals. The adapted 26 SAOF questionnaire, yielding this finding, supports the contribution of the additional three items to the original questions. Thus, the intuitive learning style enables the crucial phase of identify problems and set goals during intervention, which was the main goal of the real intervention with a client, along the course.

Thus, Occupational therapists with intuitive learning style are capable of intervention application in multidimensional community better than inductive style, which might address the clients diagnosis only.

4.1.2 Course Satisfaction

Caution is needed in interpreting the course satisfaction (3rd outcome measure) results due to the small number of course satisfaction questionnaires that were coded by the participants. Nevertheless, the current study shows a global learning style to be significantly correlated with greater satisfaction with the course content. Global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the entire picture [38]. This finding may be related to the nature of PBL course, which encourages students to be involved in the learning process and team work, while using their preferred learning styles, so enabling them to shine in their areas of expertise and excellence [3]. The climate within small groups generates opportunities for sound and open relationships in a collegial, collaborative way.

A PBL course that incorporates variety styles of teaching, may suit as a good media for transitioning health care students from the theoretical into the practical education, as found by Hammel *et al.* [20] who made a qualitative evaluation of students' perspectives on PBL in an occupational therapy curriculum. They found that students who adopted a PBL approach consistently across the curriculum contributed to the development of information management, critical reasoning, communication, and team-building skills. Those skills are generic for all health-care students, and are similar to the find-

ings from the SAOF Questionnaire.

4.2 Study Limitations

Student privacy and data anonymity considerations meant that we were unable to utilize the students' grades as a learning outcome measure. Student grades could potentially be included without compromising data anonymity if external investigators were to conduct future research.

Our study should be repeated on larger student populations to increase its validity. The participants in our study represented the average age of undergraduate students in our country. However, they were somewhat older than the norm for undergraduate students in other countries, and thus our results may be related to the relative maturity of the participating students. Therefore, this study should be repeated in other countries with younger undergraduate student populations.

5. Conclusions

Problem-based learning methods are particularly beneficial to students having sensing and intuitive learning styles. Thus, the apparently contradictory findings of earlier research regarding the efficacy of problem-based learning methods [9] may indeed have arisen from differences in learning styles of the populations surveyed. Since problem-based and traditional teaching methods appear to suit different learning styles and to better impart different skill sets, they should be regarded as complementary. Our experience of the integrative process during the new course raised the necessity of implementing the PBL method throughout the whole education program. The method facilitates the discussion of practical issues and dilemmas during intervention, as well as practicing team work. Nevertheless, we developed a tool for considering which of the professional subjects are appropriate for the use of the PBL method.

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Pupils' Perceptions of the Teacher's Changing Role in E-Learning Physics Classroom Instruction

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ABSTRACT

This article explores the pupils' view of the teacher's changing role as a result of the implementation of an innovation that involved electronic learning measurement lessons in a developing country, namely Kenya. 118 randomly pupils enrolled in schools that could be visited conveniently in Nakuru district, Kenya were exposed to an electronic learning program (ELP) in physics. The ELP physics module was developed from a physics course dealing with the concept of measurement. The content was based on the Kenya Institute of Education (KIE) approved syllabus for science education, science textbooks and other relevant materials. Part of the investigation was to determine the effect of the ELP physics module on pupils' perspectives of the teacher's role during the physics course. The participants were interviewed at random using the Pupils' Interview Guide (PIG). A selected group of pupils' own expressions were also analyzed. The results showed that the conceptions of the pupils who were exposed to the e-learning program and those not so exposed differed remarkably. For, the pupils in the experimental condition depended more on their peers and the program while their counterparts in the traditional class were more dependent on the teacher. The study concludes that the use of ELP module to support conventional physics instruction can have substantial advantages over other approaches.

Keywords: Electronic Learning, Expository Teaching, Changing Role, Innovation

1. Introduction

The initial goal of augmenting conventional instruction with the computer in the West was to improve the quality of instruction by providing individualized instruction. Although the overall effectiveness of electronic learning programs is still a subject of debate, there is a plethora of findings for and against its inclusion in instructional practice [1-4]. Moreover, there has also been a disagreement regarding the control of the sequence of instruction [5]. A review of the literature revealed that some argue that the control should be in the hands of the learner and/or the teacher while others suggest that it should be the responsibility of the program designer to provide such a mechanism. So long as it is able to collect and analyze the response data from the learners and thereby make optimal automatic decisions about the sequence of instruction. However, it is too early to pronounce a verdict on its effectiveness or otherwise until baseline data are available from the different regions in the world.

2. Outline of the Project

2.1 The Problem

Although studies about the effect of electronic learning

(e-learning) programs on pupils' learning of various subjects abound, no study known to this researcher has looked into the learner's own view regarding the role of the teacher during an e-learning instructional process. Its understanding, especially in a country where the teacher has been in total control of instruction is crucial because such views work together with other mediating factors to revamp the classroom practice and e-learning environments [5].

2.2 Purpose

The research reported here was undertaken to documents a comparative study of the views pupils hold regarding the role of the teacher in instructional processes that involve the use of e-learning program (ELP) to support conventional instruction in physics. In particular, it was hoped that the study would revealed features of the teacher's role that impinge on the pupils' classroom learning and participation during instruction. The study was conducted within normal classroom settings in which the pupils were viewed as the active participants in the construction of the new knowledge and/or experience.

2.3 Research Questions

The research questions center on 1) the source of cumulative knowledge and experience; 2) the manner in which they interpret their interactions with the teacher and 3) the instructional materials and the value of the presence of a teacher during the instructional process.

2.4 Method

The qualitative study design that guided the fieldwork and data analysis technique of the study reported in this article is the quasi-ethnographic. This was chosen because a review of the literature revealed that most of the findings about effects of new technology on learning are derived from quantitative data with very little or no data on direct observation and/or interviews of the learners [6-8].

In order to collect the necessary qualitative data, the researcher with the help of two assistants interviewed the participants and their teacher at random. Information was collected from the participating teacher and a randomly selected group of pupils during and after the physics lesson. Generally, the interview period lasted not more than 20 minutes. The pupils were interviewed to specifically understand the individual's own views of what they think their teacher should be doing during the lesson processes. To eliminate researcher and research assistants' biases, the information from the interviews were reviewed by the researcher and copies given back to the teacher or pupils concerned to confirm the data. This was done in order to increase investigator confidence in the reliability and validity of results [9-11].

The teacher and the randomly selected were interviewed on site, generally after the lesson using two instruments, the Pupil Interview Guide (PIG) and the Teacher Interview Guide (TIG). Throughout the interview sessions, the researcher and his assistants were able to collect sufficient descriptive details about the pupils' views of what they thought their teacher should be doing during the lesson process. The following format illustrates

the style and strategy of the interviews:

Pupils were interviewed at random depending on their selected response to the semi-structured interview item (**Table 1**). Also eight interviewees from each group were asked to elaborate further, why they chose a given choice (s). This was done in order to gain more insight about why they preferred a certain choice (s). In addition, the teacher was also interviewed about his experience with the new technology and role during implementation of the program (**Table 2**) to see whether his view would differ from those of the pupils.

2.5 Context

Three contrasting school sites were used to establish a basis for comparative analysis of qualitative data. A total of 118 pupils were randomly selected and randomly assigned to three intact classrooms easily accessible by Njoro-Menengai and Nakuru-Marigat roads in Nakuru district, Kenya. The participants consisted of 65 boys and 53 girls. To allay the schools authorities' confidentiality of their true identification, the three groups-control group I (C₁), control group II (C₂) and the experimental group (E) were categorized as schools A, B and C.

2.6 Data Analysis

Reference [12] has identified three categories of data viz:

1) *Baseline data*—this refers to the information about the human and technological context of the pupils and their teacher as they interacted with the instructional materials;

2) *Process data*—which refers to information derived from observations of human-machine interactions in these settings and some of their outcomes;

3) *Value data*—that refers to information about the values and/or meanings of the teacher and the subjects implied or attributed to the program.

The latter category had a major bearing on the data reported in this paper because the data obtained were analyzed in terms of qualitative descriptions.

Table 1. Pupils' interview question

What would you say your teacher should do when you are learning the physics course through the computer/new technology?
(a) Leave us alone and help us when we need his/her assistance
(b) Telling us what we should be doing
(c) Demonstrating with the computer
(e) Supervising our work
(e) Other (Explain)

Table 2. Teacher's interview question

What was your experience and what do you say your role should be when teaching the physics course using the new technology?

3. Results and Discussion

The main reason for the study was to explore the pupils' view of the teacher's role during instruction. Studies indicate that pre-existing pedagogical conceptions are critically important in understanding what teachers do with computers in the classroom milieu. It is gaining more insight of the teacher's practice and the pupils' views of that practice and its history that will allow us to understand how teachers utilize information technology (IT) to enhance instruction in the classroom and thereby incorporate them into their instructional culture.

Table 3 represents the pupils' responses to the interview item before their exposure to the physics course. The results indicate that the two groups that were pre-tested held similar views about what the role of the teacher should be during classroom instruction. However, this changed remarkably following their exposure to the physics course. But their views on the same had changed dramatically as a result of their exposure to the E-learning program (**Table 4**).

Results in **Table 4** below show that the views of the pupils in the E-learning classes expressed unanimity in that 70% and 72% of the pupils in the two experimental groups (E and C₂) as compared to only 25% in the true control group who were in agreement that "the teacher should leave them alone and only help whenever a need arises". In other words, a majority of the pupils in the regular classrooms seem to support the role of a teacher

who is in control of the learning process. Similarly, a very low number (17% and 19%) of those in the experimental condition (E and C₂ respectively) feel that the teacher's role should be that of telling them what they should do as compared to a large number (83%) of those in the control condition (C₁).

3.1 The Pupils' Views of the Teacher's Changing Role during the E-Learning Program in Science Instruction

Part of the main reasons of this study was to explore the students' view of the teacher's role during instruction. The findings reported in the excerpts that follow elaborate the students' own expressions.

3.1.1 Excerpt 1

1) Dan: The teacher should leave us alone and help us when we need him... because through the computer and our own experiences we learn more than just being taught by the teacher. The teacher may only help show us where we go wrong and what to do next after we finish experiments.

2) Rama: The teacher should leave us alone first to practice what we have learnt alone with peers ...this makes us to learn and understand physics lessons better.

3) Owuor: For me, it was fun to use the computer alone with my friends. But I agree that we need the teacher to help us only whenever we mess or are confused about something.

Table 3. Pupils' pre-responses to the interview question

DESCRIPTION OF TEACHER'S ROLE	GROUPS		
	E	C ₁	C ₂
1. Leave us alone and help us when we need his/her assistance	20	25	-
2. Telling us what we should be doing	85	83	-
3. Demonstrate when teaching	68	64	-
4. Supervising our work	16	15	-
5. Other (Explain)	12	07	-

Table 4. Pupils' post-responses to the interview question

DESCRIPTION OF TEACHER'S ROLE	GROUPS		
	E	C ₁	C ₂
1. Leave us alone and help us when we need his/her assistance	70	25	72
2. Telling us what we should be doing	17	83	19
3. Demonstrate when teaching	38	64	33
4. Supervising our work	76	15	79
5. Other (Explain)	12	77	09

4) Emmy: The teacher should leave us alone of course after teaching us how to use the computer so that we can be free to play with the computer and learn physics lessons with peers. That is what I think he should do.

5) Rael: The teacher should leave us alone so that we try our own best to use the computer to learn and discuss the physics lessons.

6) David: The teacher should leave us alone because it is for our own benefit to learn and discuss things by ourselves. We will understand them better than if the teacher just tells us.

7) Simon: The teacher should leave us alone because if he explains everything to us... it could be difficult for us to know how to use measuring equipment.

8) Kosi: The teacher should leave us alone I suppose because we should learn... Umm so that we may learn from each other and the computer of course (Group Interview, School B: C₂ Group 11/3/96).

3.1.2 Excerpt 2

1) Malaki: The teacher should leave us alone so that we develop confidence on operating the computer and talking about what we learn in the physics course.

2) Esther: The teacher should not leave us all alone but should be around to help us if we have difficulties in doing or solving problems about distance, mass and time.

3) Rotich: The teacher should not leave us alone completely because it will be easy for us to know or follow the lessons all by ourselves... but if he tells us everything it will be difficult to remember because that means all we do is just sit and listen to him and not have time to even think or discuss ideas about the course.

4) Carol: The teacher should not totally leave us alone but help if we are stagnant or having a problem... we like to learn from the computer and peers because we understand and remember more... first you must read, talk it over with friends and then apply it through class activities.

5) Bernard: The teacher should not leave us entirely alone but check on us if we are doing things right or wrong. He should be there to clarify where we don't understand.

6) Jane: The teacher should only tell us where we are wrong and if we are using the right apparatus to measure things.

7) Kimutai: The teacher should be around when we learn with the computer so that he explains complicated things. But after that, he should let us alone and only check to see our progress.

8) Lucy: The teacher should leave us alone so that we can get enough opportunity to learn from the computer and from peers... and not just the teacher alone (Group Interviews, School B: C₂ Group 6/3/1996).

A comparison of the subjects' responses reported in Excerpt 1 and 2 reveals identical learning protocols in the

treatment groups *i.e.*, E and C₂. They all agree that the teacher should leave them alone and only assist when they need help. But the responses of the selected group of subjects in the true control group (C₁) shown in Excerpt 3 differ markedly from those by the selected group of subjects in E and C₂. While the subjects in the C₁ group view learning as teacher dependent, those in the E and C₂ group view it as a process that involves the teacher, themselves and the instructional material. The following excerpt clarifies this point further.

3.1.3 Excerpt 3

1) Beggy: The teacher should not leave us alone but tell us what to learn and do. If he leaves us how can one learn without the teacher being present? We will end up making noise and fighting each other.

2) Malel: The teacher should be telling us what to learn and do so that we may know more about physics. We may read our textbooks but it is not like the teacher teaching us.

3) Jiro: If the teacher leaves us alone then we can't do anything. We need his guidance of course and he should teach us about measurement.

4) Franklin: The teacher should teach us and help us to learn how to measure objects in this course because without him we will not know how to use the apparatus.

5) Kyalo: The teacher should tell us what we should learn and do otherwise there will be chaos in the classroom. We don't know how to learn alone without a teacher. Therefore, he should be there to teach and show us how to measure things. Some students are mean and fight over the apparatus. So we need the teacher to help us out.

6) Kip: The teacher should tell us what to do and learn because he is more knowledgeable than us. He knows everything about measurement and how measuring of objects.

7) Nancy: The teacher should tell us more about measurement and give us more time to practice what he has taught rather than just telling and showing how to measure. We should measure things and not just sit and be told how.

8) Chebet: The teacher should not leave us alone but should show us what we should do because he is our guardian and he knows more about physics than us. He should give us that knowledge so that we know how to measure or use measurement tools during the lesson (Group Interviews, School A: C₁ Group 5/3/96).

3.2 Teachers' Own Expressions and Experience with the E-Learning Program

The teacher illustrated his own expression about his first experience with having to use the ELP in a real physics laboratory classroom depicted in Excerpt 4. Although the teacher felt change was desirable, the process was grad-

ual process. Once he had internalized the process, he seemed ready for it. Excerpt 4 depicts the process quite succinctly:

3.2.1 Excerpt 4

1) Teacher 1: My first experience with the use of computer was very chaotic. But now I know how to handle the whole situation. I did not know how then but I am just a little worried.

2) Researcher: Worried about your role?

3) Teacher: Yes. Imagine all along I had full control of the class and now it is just brief. Anyway I just have to learn to let go of the fear if I must make full use of the computer. This might not be easy though but it is something that I must try harder (School C: E Group 20/2/96).

An examination of Excerpt 4 seems to suggest the teacher's awareness of the need for a paradigm shift in his role during instructional practice. This emerged due to the realization that his role had to change from that of "full control" to that of "improving and fostering reciprocal relationship" between him and his students. This is quite apparent from the teacher's own expression of a willingness to abandon his previous approach that encouraged full control in order to embrace the new method, which he reckoned is not easy but as something that he must try harder. But the anecdote given in Excerpt 5 is a good illustration of how the use of computer changed the role of another teacher completely. This teacher revealed that he is no longer worried about his role being threatened by the computer use instead, he pointed out that he has realized its benefits in terms of the time saved and his ability to do what he has not been able to do with an expository approach.

3.2.2 Excerpt 5

Teacher 2: My biggest benefit for using the e-learning to teach the course of measurement is the time saved. With this I have been able to help weaker students and to supervise students' work. This is something I have not been able to do in my previous lessons (School C: E Group 14/3/96).

This finding is supported by an earlier claim that although most teachers tend to resist change, but they nevertheless as a result of some impasse they feel they have reached in their teaching may gravitate out of necessity towards change [13].

4. Conclusions

Most views of pupils in ELP classes have all pointed to the learners' need for mutual interaction during the learning process. The portrayal of these qualitative data about the teacher's role seem mixed but agree on one important fact underscored earlier *i.e.*, the teacher as the key factor in the classroom. The pupils in the ELP treatment seem to all agree that in as much as the teacher should leave them alone, they nonetheless concur also

that the teacher should be present to assist them in time of need. But the views of the students in the true control group seem to suggest a total reliance on the teacher as the guide and knowledge dispenser. Numerous studies have also found similar results [14-20].

On the overall, the relative effectiveness of the E-Learning program in promoting collaborative learning may form part of the solution to the emergence of large classes in the context of inadequate human and material resources. This finding indicates that e-learning system has the potential for encouraging pupil participation in science lessons and practical activities [5,19,21,22]. Also, there is evidence of instances where the use of the program provided the teacher more leeway to attend to individual pupils needs and to supervise their work. In addition, there is overriding evidence that the idea of operating the e-learning program gave them the impression of well-attested strategy of learning by doing. However, this impression and the findings reported need further corroboration by future studies.

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Teaching EFL to Jordanian Students: New Strategies for Enhancing English Acquisition in a Distinct Middle Eastern Student Population

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ABSTRACT

For EFL students in Jordan, the acquisition of English is particularly challenging because of the pronounced linguistic differences between Arabic and English. This study proposes intersections between communication and language acquisition practices to improve delivery of EFL instruction in Jordan, a country in which English enjoys a somewhat ambiguous status in the public school system, higher education, and business and social interactions. We present the results of a quantitative and qualitative analysis of EFL students in Jordan, an area in which little EFL/ESL research has been previously reported. We examine the current EFL pedagogical framework in Jordanian schools, present a quantitative and qualitative analysis of learners' attitudes, and present a pedagogy that distinctly addresses the needs of Jordanian EFL learners. We conclude with projections of successful EFL instruction as a resource in political, social, and commercial interactions among Jordan, its neighbors, and the United States.

Keywords: Arabic, Education, English, Jordan, Middle East, Teaching, TESL

1. Introduction

While much research exists on English as a foreign second language practices in diverse settings, (*i.e.*, China, France, Spain, Brazil, etc.) [1-5], ESL and EFL research has recently begun to examine L2 acquisition among learners in increasingly diverse settings, such as Vietnam, Malaysia and other Asian countries as well as African and Middle-Eastern countries [6-8]. However, despite Jordan's high profile global image and continual appearance in national and international contexts, little research has been conducted or published thus far on specific and effective EFL pedagogy for native Jordanian students. Although one recent study includes Jordanians among its research subjects [8], Lantaigne's work ultimately provides no insights into EFL practices in Jordan. Understandably, Middle-Eastern countries in general could be deemed as difficult for on-site, qualitative research(ers), especially for outsiders (*i.e.*, Americans, other foreigners, etc.) wanting to travel to this region for these investigative purposes involving these populations [9-11]. Too, with the constant media coverage and portrayals in line with agenda-setting theory [12] focusing on the violent conflicts taking place in this region of the world, oppor-

tunities for research and study of EFL methods in Jordan have been limited. The research study presented here, however, has transcended these limitations through the unique collaboration of an American specialist in communication and ESL, an American university professor specializing in pedagogy for bilingual speakers of English and Spanish, and a native Jordanian EFL instructor. The essential findings of this study indicate that by applying free-flowing conversations and impromptu oral presentations as primary EFL communication and teaching strategies, these Jordanian students tend to achieve effective and fast English language acquisition. Furthermore, we feel that as Jordan and neighboring areas of the Middle East continue to play major roles in global politics, this study could have implications for the advancement of cultural, political, and social understanding of this region.

2. Education in Jordan

The primary, governmentally-sanctioned language in Jordan is Arabic, but English is also commonly communicated in business, administrative, and political sectors in larger, metropolitan sections of the country [13,14].

English is sometimes informally spoken by the elite and educated populations throughout the country. Arabic and English are both oftentimes required classes in public and private schools [11]. Also, because many Arabic countries (*i.e.*, Algeria, Lebanon, Libya, Morocco, Syria, Tunisia, etc.) speak French for occasional communication in various sectors (such as in business and governmental settings), French is the only other supplementary language taught at some Jordanian-based schools [9,11,15].

Approximately 90% of Jordan's inhabitants are metropolitan, while fewer than 10% comprise rural, nomadic groups. Nearly 3 million Jordanian residents classified as Palestinian refugees and displaced individuals dwell in Jordan [13]. Beginning in 2003, a considerable number of Iraqis sought residence in Jordan, primarily due to the Iraqi conflict. However, given these refugees' reluctance to disclose religious and ethnic affiliations, it is difficult to determine an accurate number of displaced Iraqis [9].

Generally, publicly-sponsored education at the elementary levels in Jordan comprises a series of ten years of continuous and progressive teaching [13,14], similar, but not identical, to the American educational institutions, where K-12 in sequence is standard. Secondary education comes after this ten-year period. Although secondary education, which usually begins at age 16, is not mandatory, it consists of a two-year track of sequential study in which students, between 16 to 18, can enroll in either academic or vocational programs [9]. Once this two-year educational track ends, satisfactory students can take a general secondary examination, also known as the Tawjihi, according to their area of specialty [15]. The students who complete the test with a passing score are conferred with a special certificate [11]. When students reach the end of this full educational route, they are then automatically qualified to gain admission to universities. In addition, the students who pursue vocational or technical certifications are eligible for admission to local community colleges, universities, or the general business world, granted they satisfactorily complete tests specific to two subject areas [11,15]. The first consists of a series of vocational secondary educational classes. This string of courses gives ample vocational instruction, usually involves an apprenticeship, and eventually allows the student the opportunity to be awarded with another special certificate [15]. This kind of instruction is sponsored and delivered by the Vocational Training Corporation, under the auspices of the Ministry of Labor/Technical and Vocational Education and Training Higher Council [11].

Entry into post-secondary education is available to recipients of the General Secondary Education Certificate. These certificate holders have the options of selecting either private or public community colleges, or public or

private universities in Jordan [9]. There is also a program known as the credit-hour system, which enables students to freely choose subject-specific classes based on an approved study plan. This credit-hour system is practiced at many universities in Jordan [15].

Currently, there are eight public universities, including two that were recently certified, and 13 private universities, including four that recently became governmentally-approved. All locations where post-secondary education is delivered operate under the Ministry of Higher Education and Scientific Research [9].

English is generally integrated into Jordanian education and culture because of business, political, and tourism-related demands from international, interactive populations. Bedouins in particular, who are nomadic Arabs who live in the desert and away from cities, are typically without formal education, yet they are still able to communicate in English because of the frequent presence of tourists (tourism related to camel rides, desert exploration, and visits to ancient archeological landmarks) who speak English, as well as other languages. Further, all college graduates from Jordanian universities and colleges are required to complete coursework in English so that they have an acceptable level of proficiency in the language. Learning English as part of the university requirements is also intended to better enable graduates to secure employment in Jordan as well as abroad. Conversely, the absence of English language acquisition among Jordanians may result in reduced quality of employment, communication, and opportunities in general. Thus, developing communication skills in English provides diverse benefits for Jordanians.

2.1 Linguistic Differences between Arabic and English

At present, there is a serious gap and deficiency in Jordanian students' abilities to acquire and use spoken English effectively for the purpose of general and formal communication. Although English has become a common, global language for the purposes of industry, trade, education, and general communication [16], especially in Jordan school systems, Jordanian students oftentimes have a challenging time acquiring the language, both in written and oral forms. One reason has to do with the considerable differences in the two languages, in terms of alphabetic characters, grammar, syntax, and the overall linguistic logistics of the two languages. Researchers in a recent case study that examines an Arabic-speaking English Language Learner in an American school, acknowledge the vast differences between English and Arabic, citing numerous negative transfers that could easily interfere with the learner's acquisition of English (L2) [17]. A simple translation example illustrates the challenges faced by EFL students in our study. We offer a transla-

tion of a brief passage from the Jordanian newspaper Aldostor Times; also known in Arabic as (جريدة الدستور). In Arabic, the passage reads as follows:

وقع مدير إدارة الامتحانات في وزارة التربية والتعليم حسني الشريف الانتهاء من تصحيح كافة أوراق امتحان شهادة الدراسة الثانوية للدورة الشتوية الحالية في السادس والعشرين من الشهر الحالي ، علما أن آخر مبحث سيتقدم له الطلبة سيكون في السابع عشر من نفس الشهر

(Aldostor Times; January 13, 2008):

A smooth English translation of this passage would be the following:

On Dec. 26, Husni Al Shareef, Director of the Examination Department at the Ministry of Education signed off on the date for the final administration of exams for the Tawjihie certificate for fall 2007. January 17 will be the final date for administration of the exams which will be scored on January 26.

A transliteration of the passage, however, demonstrates the profound syntactic differences between Arabic and English:

Signed the director of examination department in ministry of the Education Husni Al Shareef the process final in correcting all papers exams the Tawjihie's the certificate for semester fall in 26th in month this, we know that final exam will take students will be in 17th in same month.

Transliteration is a rudimentary strategy for moving from L1 to L2, but in languages where syntactic and semantic similarities exist, such as between Italian and Spanish or even English and Spanish, an EFL or ESL learners' acquisition process is considerably eased by reliance on those similarities. The example cited above, however, shows that students whose native language is Arabic would have a particularly challenging learning curve in acquiring proficiency in English.

The differences between English and Arabic are too vast to enumerate in detail here, but we offer a short list of key differences to demonstrate the potential for negative transfer that could occur for EFL learners in Jordan [17]:

- 1) Arabic is written from right to left.
- 2) Arabic orthography is influenced by placement of the letter in the word; letter shapes vary depending on their occurrence in initial, medial, or end placement in a word. In English, letters change shape only when they are upper case at the beginning of proper nouns or at the beginning of the sentence.
- 3) Numerous but predictable rules govern the grapho-phonemic treatment of vowels in Arabic, whereas in English grapho-phonic rules are unpredictable and irregular.
- 4) Arabic allows verb-free sentences which in English would include a copula.
- 5) Arabic tenses are indicated by the addition of a suf-

fix to a root.

In short, the differences are so vast that reliance on Arabic (L1) competence for building English (L2) competence would be severely limited for the typical Jordanian EFL student.

2.2 ESL Instruction in Jordan

Although seemingly paradoxical, another challenge to effective EFL instruction in Jordan is the fact that many EFL instructors are not sufficiently educated, equipped, and/or prepared to specifically accommodate and understand the unique linguistic learning styles of some native Jordanian students. One would assume that Jordanian EFL instructors teaching Jordanian students would easily be able to exercise effective pedagogical strategies with learners from their own country; however, our study found that some Jordanian students still struggle in their acquisition of English, in part because instructors fail to apply effective EFL teaching methods.

2.3 Greater Focus on Grades Rather than Linguistic Acquisition

Another issue documented through observation and interviewing is that Jordanian students, in general, tend to be more focused on achieving good grades in their ESL classes as opposed to concentrating on learning the language itself. As common sense dictates, and as shown in general EFL/ESL literature [2,18-20], when ESL/EFL students privilege grades over knowledge/competence (which happens to be a common problem amongst many students across the globe), this attitude disposes students to a lack of willingness and motivation to learn. Especially in terms of learning other languages, particularly those that substantially differ from that of their own, this outlook and thinking style considerably interferes with their appreciation, concentration, and eventual acquisition of English [21].

2.4 Employing Native Language in the Instructional Process

Another instructional strategy appropriated by Jordanian EFL teachers is that when a word in English is taught, and if understanding of that word is not immediately gained by the students, the teachers revert back to the Arabic language to explain what the word means. Resorting to Arabic in providing translational explanations is usually ineffective because the students need to hear and learn as much English as possible when explanations are being given. This linguistic return in the explanatory process is also a common practice that impedes EFL instruction across a variety of cultures [20,22]. Using English as an alternative in explaining confusing words

maximizes student exposure to the English language, hence increasing the quantity of English that they hear, and possibly learn. Using more Arabic in this manner tends to slow down the EFL acquisition process, thereby impeding learners' linguistic development and minimizing the inherent and pursued benefits in learning the language quickly and efficaciously.

2.5 Student Diversity and Numbers in Classrooms are too Large

In most Jordanian classrooms where EFL is taught, the linguistic competence of students in the same classroom varies widely, but there seems to be little accommodation of the individual learners' readiness for English acquisition. This failure to take the individual learner into account is a common obstruction to learning in many classrooms across multiple geographic settings [18,23]. In addition, overcrowding in Jordanian EFL classrooms contributes to ineffective pedagogy. Given that EFL instructors have limited time to teach, and cannot accommodate, meet and answer to every student at every point in a lecture [24], some students fall behind and may stall in their learning process due to this lack of an individualized, teacher-student environment. This deficiency in individualized contact with every student also gives rise to a lack of motivation in some students. The teachers are partially to blame for this, because they simply cannot dedicate special efforts to each student to motivate their enthusiasm to learn effectively [24]. On the other side of the coin, the students are also partially responsible for this lack of motivation, because they, too, have accountability to themselves to desire and strive to learn the language by any means possible, even if this means visiting with the teacher outside of class.

Social presence theory [25], which posits that a medium's social effects are mainly caused by the extent of social presence which it affords to its users [26], may explain why some Jordanian EFL students feel their teachers lack a personalized interest in them, primarily due to this over-sized classroom environment. In other words, when some EFL students feel that they are not treated with and given sufficient attention by teachers who are supposed to guide them to learn English and ensure their knowledge acquisition, the students' perceptions of the teachers decline, sometimes causing a loss of respect and motivation to listen to the EFL instructor. This creates a block in pedagogical and interpersonal communication, and impairs the learning atmosphere.

2.6 An Attitude that ESL is not Important

Many Jordanian students in EFL programs also suffer in acquiring the English language because they oftentimes feel that the language itself is not a necessity; some of them feel it is not a practical tool that they'll use in the

future for employment or communication purposes. This attitude is actually a misconception at times, because English does become an important language, especially in Amman, the country's capitol, where international business and communication take place [11,15]. Of course, not all Jordanian citizens choose to live in regions of the country where English is spoken or used. Hence, it depends on the ambitions of the individual students and whether these individuals desire to venture into occupations or situations that will require a proficient or functional level of English understanding, including oral and written communication skills.

2.7 A Flaw at the Governmental Level

A major flaw in EFL teaching, which is due to how the government controls the development of student acquisition of the English language to native, Jordanian students, is that, although a student may not learn and succeed at grasping the language, the educational system is designed to only allow a student to fail once [15]. What this means is that a student can only retake the same level class twice. To clarify, if the student fails the first time, the student will retake the same class again the subsequent year. The second time around, teachers are required to pass and forward the student to the next stage of EFL, even if that student is not capable or prepared to handle the level of EFL taught in those next classes. This also means that the student automatically moves forward in the EFL program even if the quality of work presented by the student is equivalent to a failing grade.

3. Methodology

In the context of the obstacles to effective EFL pedagogy we have cited above, we constructed a study designed to identify features of language acquisition instruction that could benefit EFL learners in Jordan. We began with the hypothesis that communication theory and EFL pedagogy could be merged to provide a scaffolding effect for promoting competence in English in students in Jordan. Through a case-study approach, focused on intensive, formal interactions between the EFL instructor and a small population of EFL students in Jordan, we examined the following research questions:

R1: What pedagogical strategies seem to promote learning in EFL students in Jordan?

R2: What aspects of communication theory can be used to create a learner friendly environment?

The primary, on-site researcher who collected the quantitative data for this study is a native Jordanian and an EFL instructor in Jordan. Additionally, he is currently a graduate student at an American university. The study occurred in a three-week period of observational contact with one elementary and one secondary public school in Jordanian towns designated as a mix between rural and

metropolitan. Observations occurred twice each week, for a total of six formal and thorough meetings for the entire EFL sessions, each lasting two hours. The data was collected during the second half of the first semester of the 2005-2006 academic school year. Convenient and random sampling techniques were used to meet with EFL teachers ($n = 5$; four males and one female) and students ($n = 6$; five males and one female) on a continuous basis for that three-week period. The on-site researcher also attended many EFL classes, participated and socially interacted with the instructors and students in their activities and assignments, talked in depth with the teachers and students, and carefully observed and documented the strategies that were deemed “effective” and “ineffective”.

The six student participants were categorized into three groups according to their linguistic competence, behavioral characteristics and expressions, and their overall performance as students. We created aliases for our research subjects—P1, P2, P3, P4, P5, and P6. P1 and P2 were designated as “strong” students, P3 and P4 were designated as “average” students, and P5 and P6 were designated as “low-achieving” students. Features examined in the student participants included verbal and non-verbal communication. These included the following exhibitions: 1) nervousness, 2) shyness, 3) mispronunciation, 4) non-verbal communication, 5) translation, and 6) vocabulary. There were two students per group. A high score in features 1, 2, and 3 would indicate high levels of learner discomfort with performance negatively impacted by these features. Conversely, a low score in features 1, 2, and 3 would indicate increasing levels of comfort and increasingly competent linguistic performance in English (L2). A high score in Features 4, 5, and 6 would suggest strong competence in English (L2); a low score would suggest difficulties in demonstrated L2 performance. We used the following rubric in assigning rankings of “high,” “medium,” or “low” to each learner during our interview:

Data was collected in six meetings spanning a period of three weeks. In addition, other instructional aspects, such as the classroom settings and conditions, student conduct and attitudes, teacher behavior and demeanor, and other general conditions were observed, analyzed, and documented by the on-site researcher.

Participant observation, naturalistic observation, and interviewing were employed as the primary techniques of data collection, and data were examined using a standard ethnographic communication archetype [27-29]. All available data, including field notes of verbal and non-verbal communication (*i.e.*, words, gestures, eye contact, etc.) during the EFL classes, and informants’ verbal statements (impromptu and elicited) during individual interview sessions, supplied the evidence from which strategies deemed “effective” or “ineffective” were identified.

4. Findings and Results

Data compiled in interviews with and observations of our subjects is presented in **Tables 1, 2, and 3**. This tabular data as well as the textual reports suggest a pattern confirmed systematically via ethnographic and qualitative research methodologies [27,28]. In examining all the compiled qualitative data, as shown below in the tables, there are clear distinctions between ESL pedagogical techniques deemed to be effective and those which seem ineffective. It is assumed that as EFL learners become more comfortable with their instructor, the manifestations of nervousness, shyness, and mispronunciation would decrease. Increased competence in L2, fostered by effective ESL pedagogy, should theoretically result in increases in use of non-verbals, evidence of thinking in L2, and use of enough vocabulary to produce meaningful output [26]. The data in **Tables 1, 2, and 3** provide evidence that EFL pedagogical practices implemented by the on-site researcher during this study promote increases in EFL learners’ demonstration of competence in L2 (English). By the final meeting, all students demonstrated low levels of nervousness, shyness, and mispronunciation, while use of non-verbals was high for all students, and all students demonstrated at least medium performance levels in translation and use of adequate vocabulary.

Data presented here demonstrate that the interactions between the Jordanian EFL teacher/researcher and the research subjects, meetings characterized by free-flowing conversations and impromptu oral presentations, served to enhance EFL instruction and maximize student learning. Our recommendations for increased free-flowing conversations and impromptu oral presentations are based on qualitative and empirical data and support, and we believe that applying these tactics will develop ESL fluency and proficiency for these particular student populations in Jordan.

5. Recommendations for Effective EFL Instruction

The special circumstances of EFL instruction in Jordan, as detailed above, and the pronounced differences between Arabic (L1) and English (L2) clearly point to the need for research-based and learner-centered pedagogy for Jordanian EFL students. Much research has been conducted with observed, verifiable success on how to properly conduct EFL instruction to a variety of cultures and ethnicities [2,16,18,19,22,30-35]. These instructional strategies have been utilized by EFL teachers with a continuous, progressive movement to better train foreign or non-native English speakers in oral and written communication for informal and formal purposes, which are manifested as personal, social, political, and/or economic motivations for acquisition of English. We detail these as

		Performance Levels		
		High	Medium	Low
Linguistic and behavioral features	Nervousness	Numerous instances of the following physical manifestations: shaking or trembling, fidgeting, blushing, silence. Learners' demonstration of competence in L2 is significantly reduced by observed nervousness.	Some instances of the following physical manifestations: shaking or trembling, fidgeting, blushing, silence. Learners' demonstration of competence in L2 is somewhat reduced by observed nervousness.	Few to no instances of the following physical manifestations: shaking or trembling, fidgeting, blushing, silence. Learners' demonstration of competence in L2 is minimally or not reduced by observed nervousness.
	Shyness	Numerous instances of the following physical and linguistic manifestations: avoidance of eye contact, reluctance to ask questions, low vocal volume, mumbling. Learners' demonstration of competence in L2 is significantly reduced by observed shyness.	Some instances of the following physical and linguistic manifestations: avoidance of eye contact, reluctance to ask questions, low vocal volume, mumbling. Learners' demonstration of competence in L2 is somewhat reduced by observed shyness.	Few to no instances of the following physical and linguistic manifestations: avoidance of eye contact, reluctance to ask questions, low vocal volume, mumbling. Learners' demonstration of competence in L2 is minimally or not reduced by observed shyness.
	Mispronunciation	L2 vocabulary is mispronounced 50% or more of the time during the observation. Learners' demonstration of competence in L2 is significantly reduced by mispronunciations of L2 language structures.	L2 vocabulary is mispronounced 30%-50% of the time during the observation. Learners' demonstration of competence in L2 is somewhat reduced by mispronunciations of L2 language structures.	L2 vocabulary is mispronounced 10% to 0% of the time during the observation. Learners' demonstration of competence in L2 is minimally or not reduced by mispronunciations of L2 language structures.
	Non verbal communication	Learner's use of the following non-verbals significantly enhance performance in L2: facial gestures, body language (such as "speaking with your hands"), nodding or shaking the head, self-initiated movement from one place to another in the observation site, eye contact.	Learner's use of the following non-verbals somewhat enhance performance in L2: facial gestures, body language (such as "speaking with your hands"), nodding or shaking the head, self-initiated movement from one place to another in the observation site, eye contact.	Learner's use of the following non-verbals is limited and does not enhance performance in L2: facial gestures, body language (such as "speaking with your hands"), nodding or shaking the head, self-initiated movement from one place to another in the observation site, eye contact.
	Translation	Learner's performance in L2 demonstrates limited to no fluency, suggesting that the learner is primarily translating from L1 to L2 rather than thinking in L2. Lapses in fluency significantly diminish demonstration of competence in L2.	Learner's performance in L2 demonstrates some fluency, suggesting that the learner is attempting to think in L2 rather than translating from L1 to L2. Lapses in fluency are obvious but do not significantly diminish demonstration of competence in L2.	Learner's performance in L2 is fluid and fluent, suggesting that the learner is thinking in L2 rather than translating from L1 to L2.
	Vocabulary	Learner consistently uses varied, adequate, and appropriate vocabulary in L2. Learners' demonstration of competence in L2 is significantly enhanced by understanding and use of L2 vocabulary.	Learner inconsistently uses varied, adequate, and appropriate vocabulary in L2. Learners' demonstration of competence in L2 is somewhat reduced by inconsistent understanding and use of L2 vocabulary.	Learner consistently misuses vocabulary or fails to demonstrate use of sufficient vocabulary in L2. Learners' demonstration of competence in L2 is significantly reduced by inadequate understanding and use of L2 vocabulary.

Figure 1. Rubric for assessing Jordanian EFL learners' competence in English

Table 1. Meetings 1 and 2

Observed behaviors		Nervousness			Shyness			Mispronunciation			# of non-verbals			Translation from L1 to L2			Using enough vocabulary		
Frequency of observed behaviors		High	M	Low	High	M	Low	High	M	Low	High	M	Low	High	M	Low	High	M	Low
Strong students	P1			*			*		*			*				*	*		
	P2		*			*			*			*			*		*		
Average students	P3			*		*			*			*			*		*		
	P4		*			*				*		*			*			*	
Low achieving students	P5		*				*		*			*			*			*	
	P6		*				*		*			*			*			*	

Table 2. Meetings 3 and 4

Observed behaviors		Nervousness			Shyness			Mispronunciation			# of non-verbals			Translation from L1 to L2			Using enough vocabulary		
Frequency of observed behaviors		High	M	Low	High	M	Low	High	M	Low	High	M	Low	High	M	Low	High	M	Low
Strong students	P1			*			*		*			*				*	*		
	P2		*			*			*			*			*		*		
Average students	P3			*		*			*			*			*		*		
	P4		*			*				*		*			*			*	
Low achieving students	P5		*				*		*			*			*			*	
	P6		*				*		*			*			*			*	

Table 3. Meetings 5 and 6

Observed behaviors		Nervousness			Shyness			Mispronunciation			# of non-verbals			Translation from L1 to L2			Using enough vocabulary		
Frequency of observed behaviors		High	M	Low	High	M	Low	High	M	Low	High	M	Low	High	M	Low	High	M	Low
Strong students	P1			*			*			*	*					*	*		
	P2			*			*			*	*					*	*		
Average students	P3			*			*	*			*					*	*		
	P4			*			*	*			*					*	*		
Low achieving students	P5			*			*	*			*				*			*	
	P6			*			*	*			*				*			*	

recommendations for pedagogical practices that promote higher levels of EFL student achievement as documented by this study.

5.1 Initiate Amiable Relationships with Students and Demonstrate Support

When beginning a teacher/student EFL relationship, it is important for the teacher to clearly express and demonstrate to all students that although English may be seem far more difficult to learn than L1, full support and help are available from the instructor. Some standard and commonly accepted ways of outwardly communicating (both verbally and non-verbally) this supportive environment to students include acting and talking in an approachable, honest, and non-critical manner, with the sole intention of ensuring language acquisition in the students [16]. Uncertainty reduction theory [36,37], for instance, is a theory that can make sense of why teachers need to allow students to connect with them in order for the students to feel comfortable and “certain” about their teachers and the English language that is being taught. When students are uncertain about the difficulty of the EFL class, and immediately and naturally look to the teacher to be a source of support and friendship for linguistic assistance, these students are likely to examine the teacher by asking questions and observing the approachability of the teacher. The students do this in order

to determine whether they can feel “certainly” comfortable working together with that teacher [37]. If a feeling of security and confidence exists in the students’ minds as a result of such positive observation of the EFL instructor, the students are more likely to perform better. This connectivity will facilitate a more relaxed learning environment conducive to faster and more effective EFL acquisition.

Some other simple ways to achieve this, as identified by EFL scholars and practitioners [20,23,34,38], include acting interested in the students as individual people, asking where they are from, what they were doing previously, and asking other questions of a non-superficial nature [39]. Doing so will create a positive bond, allowing for trust, better listening, and less insecurity about performance. The instructor must take on a friendly, approachable image, enabling the students to lower their guards and defenses (and communication apprehension) and be at ease when receiving information, thus improving their performance [40].

Because EFL students oftentimes fear the difficulty in learning a new language, particularly English, expressing to students that language acquisition is achievable is a helpful tactic in maximizing overall language acquisition. EFL instructors must also point out that learning any new language, be it English, Romanian, or Turkish, is an interesting and enjoyable undertaking. Too, if the EFL in-

structor establishes rapport and a sense of community and connectivity with the students, increased cooperation, attentiveness, and attendance of the class are likely to result, thereby enhancing and facilitating the learning environment [23,39].

5.2 Identify Customs and Norms of Students and Act Them Out

A great deal of EFL and intercultural communication literature focuses on the importance of understanding the cultural and ethnic norms, customs, practices, and attitudes of EFL students, given their various international backgrounds [2,19,31,41]. Understanding these various aspects of ESL students will naturally enable the instructors to cater and conduct themselves in manners that will gain acceptance, appreciation, connectivity, and communication efficacy with the students. Watching behaviors of the students in class, too, based on social cognitive theory, a theory that posits that we learn and can then imitate behavioral styles based on observation [42,43], can enable the instructors to mimic the students and, therefore, mirror the behaviors and customs of the students. In another way, striving to transform oneself in a like image of the cultures in the EFL classroom, also in line with specific theoretical assumptions from face negotiation theory [44], will likely increase the chances of a general "opening up" of the students, decrease their communication apprehension [40], increase their general comfort levels in the learning atmosphere, and help to eliminate any interpersonal conflict so as to develop and secure a relational bond [44-46] between the students and the teacher. Put differently, if the teacher seems like an insider, as opposed to an outsider or foreigner, far better listening, reception and likeability are more apt to present themselves from the students to the teachers.

5.3 Patience, Gentleness, and a Polite Attitude

Because of intercultural and interpersonal communication issues in international students, such as communication apprehension, avoidance, and introversion, patience, gentleness, and a polite attitude and demeanor from the EFL instructor will help to facilitate connectivity with the students and thus minimize these barriers to learning [1]. As language expectancy theory posits, tactful linguistic word choices can be important predictors of persuasive success [47,48]. For example, if an EFL instructor uses words of a patient, gentle, and polite nature, the EFL students will be persuaded that the teacher is approachable, credible, supportive, and helpful. This will enable connectivity between the teachers and the students. Hence, the tone, intensity, and selection of the language used by the EFL instructor to encourage and persuade students to feel comfortable and capable of learning English has a significant impact on the efficacy of EFL

pedagogy and the rate of student learning acquisition. Politeness, specifically, builds trust between students, as suggested by politeness theory [49,50]. Too, allowing EFL students ample time to think, without exhibiting a sense of haste or pressure on the part of the teacher, will serve to alleviate the stress EFL students experience in wanting to pronounce words correctly, think of the correct words to use for questions and answers, and communicate their thoughts and expressions in a natural and graceful manner [41]. When an EFL student notices or senses that there is some pressure or impatience from the instructor to answer, levels of anxiety and communication apprehension usually escalate. This type of anxious elevation typically leads to deterioration in the student-teacher relationship, contributes to an increased level of performance anxiety and communication apprehension, and tends to decrease the overall learning process [2,19,41].

It is also important to take into account that creating a non-threatening environment, in which the students feel comfortable making mistakes in grammar, verbal communication, and writing, is crucial in making students feel secure making errors. It will also help persuade and convince them, without shame, that mistakes are a natural part of the learning process [19,48]. Plus, the EFL instructor should not resort to negative response to the learner's performance; that is counterproductive and unethical and has the potential to be irreversibly defeating to the relationships [2]. Research has shown that EFL instructors in particular who present themselves with a smile and other positive facial expressions, occasionally give compliments regarding the students' efforts, and refrain from showing any signs of upset or disappointment (such as sighs), enhance general student motivation and learning acquisition [2,19]. Also, such linguistic and non-verbal communication can be persuasive to students in their attitudes and desires to actively pursue learning [47], particularly in ESL programs. The students also lose any sense or belief in a lack of communication competence or aptness in learning their new language [20].

Clearly, patience and courtesy, especially, go a long way in breaking through many learning barriers and communication apprehensions [49]. When an EFL instructor slowly, clearly, and pleasantly pronounces L2 words, corrects grammar errors and explains the source of the error, and repeats him/ herself in an encouraging tone, the pedagogical result is continued rapport and increased learning in the EFL student [41].

In a similar vein, as with anyone learning a new language, the EFL instructor should also clearly articulate and pronounce words, using a placid and encouraging tone, in order to avoid or minimize misunderstanding or misinterpretation of the particular words orally commu-

nicated. If this strategy is applied and, still, misunderstanding occurs, it helps to gently repeat the word in question until the said EFL student can effectively grasp how to pronounce the word (s) properly. Further, sometimes EFL students will appear frustrated or despondent because they are unable to clearly and correctly pronounce certain words. Research suggests that assuring them that they will do fine, and, again, their mistakes are all part of the learning process, will usually maintain the EFL students' confidence and motivation [19].

Surprisingly, negative communication that interferes with the learning acquisition rates and abilities of EFL students, especially across a variety of cultures, involves the use of certain colored pens [2]. Instead of using a red pen to identify errors on written assignments for EFL students, which, as some researchers have found, implies harshness, negativity, scrutiny, and hurtfulness [51,52], EFL instructors should use more symbolically benign colored pens, such as blue, yellow, or another color, which do not represent or depict a *wrongdoing* and should clearly explain to the learner how linguistic and/or rhetorical problems can be corrected [51,53]. Although it is important to clearly document a mistake and assure that the EFL student is aware of what was done incorrectly, something commonly perceived as minor actually holds tremendous implications and can negatively affect student performance, motivation, and persistence [2,51].

6. Discussion and Future Directions

This qualitative and communication research report on language and social interaction has provided new insight into how the Jordanian EFL programs in elementary and secondary-level schools operate, and which teaching strategies appear to be effective in promoting higher levels of achievement in L2 competence and performance. It is important to recognize what strategies work best in teaching EFL to students in general and Jordanian students in particular. The intensive, focused study reported here permits extrapolation of data that can be applied to student populations larger than the research population. Data provided by the on-site researcher's extended interactions with Jordanian EFL students enables us to identify strategies that can be applied in a larger context for improved acquisition of English by Jordanian students. By identifying these proper strategies, and through mass implementation of them, a vast increase in English language acquisition could occur in this Middle-Eastern population. Too, because English is a common language used in business and governmental sectors within Jordan, particularly in the metropolitan areas, it is critical that the citizens of this country understand and can communicate the language properly so as to improve their economy, cross-cultural or intercultural communication, and inter-

national relations. More importantly, a country's (especially Jordan's, which is a Middle-Eastern country, surrounded by some dangerous populations) criminal justice experts or negotiators must be able to understand a language (such as English, intermittently) that terrorists from other countries may use to hold hostages or threaten to initiate some kind of violent or significant conflict [54] in order for the negotiators to attempt to ameliorate or resolve these types of conflicts before escalation or fatalities occur.

Moreover, although Jordan is only one of many Middle-Eastern countries in this region of the world, it is practically in the center of the Middle East, where Muslims are prevalent and predominant and where Arabic is the primary language. Also, because Jordan is a neutral country in terms of war and conflict [9,15], and because Jordan sits in the middle of Israel, Lebanon, Syria, Iraq, Iran, and Saudi Arabia—countries that always seem to be involved in some kind of violent conflict—increased acquisition and communication of English amongst Jordanian residents may serve to help other English-speaking countries in the fight against terrorism, extremist thinking and acts of violence, and overall conflict in all these other Middle-Eastern countries surrounding Jordan. Also, Jordan can serve as a buffer or mediator between all these Middle-Eastern countries, and can launch a massive campaign to publicly denounce, discourage, and attempt to bring to an end the pernicious conduct that pervades populations across the Middle East. The political and global implications of increasing understanding of the English language in Jordan and other areas of the Middle East cannot be overestimated. The need for understanding of language as a critical part of understanding of culture and politics [55] has made it expedient to recognize and promote effective pedagogy for EFL learners in Jordan and other Middle Eastern nations.

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Helping Oncology Nurses Advise Younger Patients about Self Care: Feasibility of Using Animated and DVD Formats for Nurse Instruction

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ABSTRACT

This study explored the perceptions of oncology nurses about the usefulness of a video-game or an animated DVD intervention designed to teach young patients about self care. The study also measured the effects of these interventions on nurses' cancer knowledge and perceived self-efficacy to communicate with patients about self-care. Twenty-two oncology nurses were randomly assigned either to use a video game "Re-Mission" or to view instructional animations from the game on DVD. They completed tests and rating scales before and after, then rated the acceptability of the game or DVD. Only ten participants completed the study. For these ten, ratings of the acceptability and credibility of the game or DVD were moderately positive, regardless of age or nursing experience. Self-efficacy for communicating to patients about self-care increased following use of the game or DVD. Cancer knowledge was not affected. It was concluded that oncology nurses in Australia are not generally enthusiastic about the concept of instruction via video game and animated DVD formats, although those who participated rated the experience positively.

Keywords: Digital-Based Learning, Nurse Instruction, Video Game, Media Acceptability

1. Introduction

Currently, patients diagnosed with cancer are likely to receive a range of information about their disease and its treatment, but there has been surprisingly little research on what that information should be, or when or how it is best to provide it [1-2]. A recent survey found that cancer patients in general regard specialist nurses as their preferred source of quality information, as opposed to other sources [3], so it is important that nurses are capable as providers and communicators.

1.1 Self Care

Cancer patients may experience many adverse symptoms arising directly from the disease itself or as side effects of treatment, especially chemotherapy or radiotherapy. To a large extent, patients' quality of life reflects their ability to learn certain strategies, which used either as preventive or reactive measures, can reduce the potential impact of these adverse symptoms. Such symptoms might range from psychological or cosmetic issues such as hair loss or deviations from normal appearance to severe pain and life-threatening infections. A patient's in-

tentional use of actions to improve or maintain health and well-being is referred to as "self care", a concept that has a central place in nursing theory [4-5] and has been subject to considerable research. There is evidence that the learning and effective practice of self care skills during treatment of cancer can improve both psychosocial and physical outcomes [6-8]. But patients' behaviour is also influenced by individual educational factors such as knowledge about self care skills, the source of such knowledge, the modality by which the knowledge is imparted [2], and training in the use of the skills [1]. For adults being treated for cancer, there is evidence that self care skills most used are typically self-taught and based on commonsense rather than on professional advice and that these self care measures often are ineffective [9].

1.2 Nurse Training in Patient Self-Care Instruction

It appears that good self care improves treatment outcomes, and that oncology nurses are the preferred providers (by patients) of self-care information. There is evidence that nurses are in general consistent in the cancer information [10] and the self-care information [11]

they believe is important to provide to patients. However, there is little research published on alternative methods of teaching nurses about patients' self-care needs, or how to communicate effectively with patients about self-care issues. A survey of oncology nurses in the U.S. indicates that they are amenable to receiving professional information through electronic media such as CD-ROM and the Internet [12]. There are some recent indications that nurses generally are becoming more game-oriented (board games) in their educational preferences [13,14], as well as more internet-oriented [15]. Also, a greater use of internet and other digital technology for nursing education is being strongly promoted. What seems to be lacking though, are empirical studies of how nurses respond when asked to engage with these new initiatives in digitally-based education. In particular, there seem to be no published studies of nurses' views of interactive video game or animated DVD formats as conduits for professional information or interaction with patients about treatment issues. Since younger patients appear to be receptive to the idea of using these types of media as part of their treatment, it is desirable to know the views of nurses also. If nurses are positive about the potential of these media for their own education and for their interactions with patients, the use of the media with patients is more likely to have beneficial outcomes than would be the case if nurses take a negative view. Nurses' perception aside, it would be useful to know whether nurses benefit directly from using these digital media either in knowledge gains or in greater confidence to carry out nursing tasks.

1.3 This Study

This research investigates the credibility/acceptability of two alternative interventions involving presenting educational material about cancer and patient self-care to oncology nurses. The research also examines the effects of these two interventions on nurses' knowledge about cancer treatment and on their perceived efficacy to communicate with young patients about self-care during treatment. One of the interventions is an interactive video game called Re-Mission [16], designed primarily to assist young cancer patients (15-30 years old) to understand and practise self-care during treatment. The other intervention is a series of non-interactive video animations that discuss the self-care issues central to the Re-Mission game.

A major objective for the Re-Mission game was to facilitate communication about cancer and self care between patients and their treating health professionals. However, Re-Mission might also assist nurses to understand cancer and the self-care issues experienced by patients. Also, experience with Re-Mission might assist nurses to communicate effectively with patients about their treatment and self-care issues, especially if patients

are themselves using Re-Mission.

Players of the Re-Mission game are exposed to its educational content throughout a series of game-play missions which may take 10 hours or more to complete. While this time commitment might be appropriate for patients undergoing treatment, it may be an unrealistic expectation for many nurses who already have heavy demands on their time. However, much of the educational content of Re-Mission exists in the game as non-interactive animated sequences that can be presented outside the game in DVD format of about one hour's duration. While lacking possible educational advantages of interactivity associated with game-play, this Re-Mission DVD may have advantages of its own. For example, it may be played on equipment that most nurses would have ready access to and does not require computer or video-game literacy, whereas the Re-Mission game requires a computer with advanced graphics capability and a degree of computer confidence. Also, the shorter playing time of the DVD potentially is an attractive feature for nurses with busy lives.

1.4 Re-Mission—A Brief Description

Re-Mission is a 3-D video game which can be played on a computer by a player using a hand-held game controller. The game comprises 20 "missions", in which the player can enter alternative 3-D virtual environments representing selected locations inside the bodies of "virtual cancer patients". Examples are lymph vessels, bone marrow, spinal cord, blood vessels, lungs and brain. Within these environments, the player pursues the goal of the chosen mission by controlling an avatar, in this case a humanoid character called a "nanobot", ostensibly specialized to fight cancer.

The environments contain features with which the nanobot can interact. For example, a lymph vessel, comprising several sections connected by valves, contains animated characters which are realistic representations of various cells that might be found in the lymph system of a lymphoma patient. Game-play consists of guiding the nanobot to complete a mission to destroy cancer cells or bacteria while avoiding injury or weakness. Cells are destroyed using weapons powered by chemotherapy. Bacteria are destroyed using antibiotic. The nanobot must prompt the patient to comply with the prescribed drug regime, in order for the nanobot to have ammunition for weapons. Also, the patient must be prompted to eat or drink to maintain a sufficient level of health.

The characteristics of the "virtual patients", cancer diagnoses and treatment issues represented in Re-Mission have been selected to maximize the relevance of the game to the issues experienced by young people with cancer. The efficacy of Re-Mission as a psychoeduca-

tional intervention for self-care and adherence which has been evaluated in an international multi-site trial and other more-focused studies conducted with cancer patients [17-19]. Re-Mission is available free to patients and clinicians from the developers, a non-profit research institute (available at www.hopelab.org). According to the developers, Re-Mission has been distributed on request to more than 200,000 patients and health providers worldwide, indicating that it might be widely used by young cancer patients.

1.5 Re-Mission as a Communication Tool

To the extent that Re-Mission is popular with young cancer patients, it could provide a useful context for discussion of treatment issues between patients and their families or friends, and between patients and their treatment providers. Patients might find it relatively easy to bring up treatment issues with others if they can do so by discussing game-play scenarios, as opposed to talking directly about their own problems. In particular, discussions between patients and nurses, about adherence and self-care generally, might be assisted by using Re-Mission scenarios. Such discussions would require that the nurses, as well as the patients, have experience with Re-Mission content. However, the acceptability to nurses of this approach is unknown and requires investigation. The current study explored this acceptability issue by giving nurses experience with Re-Mission content, either as a game or DVD, then administering a questionnaire about their perceptions of the likely value of that experience in their work with patients undergoing treatment. Additionally, the study measured resulting changes in cancer knowledge and perceived self-efficacy to communicate with patients about self care.

1.6 Re-Mission as an Education Aid in Oncology Nursing

The scenarios in the content of Re-Mission portray a number of self-care issues that have been rated as important issues by oncology professionals and patients [10, 11]. Both the game and the videos incorporated in it also provide extensive information about cancer and its treatment that is informed by recent surveys of health professionals and patients regarding patients' information needs. It is possible that nurses using the Re-Mission game or video will have their knowledge and understanding reinforced or extended by this experience. There is substantial evidence that these sorts of learning experience help the consolidation, generalization and ability to apply knowledge previously gained from other sources, such as reading and lectures [1,2].

2. Method

2.1 Participants

The participants were nurses currently work in or receiving training related to oncology nursing at two hospitals in a large metropolitan city in Australia.

2.2 Design

Randomized groups were used in a so-called "mixed effects" design that included a within subjects condition and a between subjects condition. The within subjects condition (repeated measures) consisted of two levels, pre-intervention (Pre) and post-intervention (Post). The between subjects condition consisted of two levels, Re-Mission game (G) and Re-Mission DVD (V). Condition "G" consisted of unrestricted access for one month to the Re-Mission video game loaded on a minicomputer. Condition "V" consisted of unrestricted access to a DVD containing all the animated informational video excerpts contained in the Re-Mission game. Sample size ($N = 22$) was based on Cohen's method of using standardized effect sizes as a basis for calculating the required sample size [20]. Power calculations indicate that 10 participants in each of the two conditions would be sufficient to detect contrasts representing large effect sizes (at $\alpha = 0.05$ and power = 0.8) in the proposed analyses. Given the practical rationale for this study, only large effect sizes on any dependent measure are likely to be of interest.

2.3 Procedure

Ethics approval for the project was sought and obtained from the ethics review committees at both hospitals where nurses were recruited. The study was certified as meeting consensual ethics criteria for safety, possible conflicts of interest, confidentiality and informed consent. Nurses were informed about the project by the researchers, and the project was also advertised on a website used for postgraduate nurse education (www.swahs.health.nsw.gov.au/NMPD/index). One of the researchers, a senior nurse educator, recruited participants singly or in small groups over a 2-year period. Participants were told that the minimum duration of their direct involvement in the project would be about one month. They were sequentially allocated to either the G or V conditions using a randomization sequence generated by a computer algorithm in BASIC.

1) Pre-test: All participants completed the following:

- Self-care knowledge test. This was an 18-item multi-choice test of knowledge related to self-care during treatment for cancer. The items in this test were based on previously published data from surveys of oncology nurses about the relative importance of different self care

practices. The test had been shown to have discriminative validity when used with young cancer patients, but had not previously been used with nurses [17]. The maximum score on this test is 18.

- **Communication self-efficacy rating scale.** This was a 27-item rating scale that asked respondents how easy or hard they found it (on a 7-point scale) to communicate with patients about each of 27 self-care items, such as “balancing rest and exercise to avoid fatigue” and “regularly washing hands to avoid infection”. The construction of this scale is based on the theory of self-efficacy developed by Bandura and on Bandura’s recommendations for the measurement of self-efficacy for health-related behaviours [21]. The items were selected from a longer list used in a survey of health professionals involved in the care of cancer patients, considered by respondents to be most important for effective care during treatment [10]. The validity and reliability of this scale as used in the current study with nurses is not known. However, when the same items were previously used in a scale designed to measure young cancer patients’ perceived self-efficacy for self-care, the scale was found to have discriminative validity for differentiating between patients receiving, or not receiving, a self-care knowledge intervention [18]. The single measure used to indicate performance on this scale is the mean rating across all 27 items. A mean score of 7 would indicate the highest possible level of perceived ease of communication with patients about self care.

- **A demographics questionnaire.** This questionnaire requested information on age, gender, cancer nursing experience and qualifications, and video game experience.

2) **Intervention:** Participants were asked to use either

the game (condition G) or the DVD (condition V) provided for at least one hour per week if possible.

3) **Post-test:** All participants repeated the Self-care knowledge test and the Communication self-efficacy rating scale. In addition they completed another measure, the Acceptability/credibility rating scale. This scale was adapted from a scale previously used to measure acceptability and credibility of the Re-Mission video game by young cancer patients (see **Table 1**), shown in a previous study to have adequate psychometric properties when used in a context similar to the current study [17].

2.4 Research Hypotheses

1) Acceptability/credibility ratings will not be different for Conditions G and V.

2) Ratings of acceptability/credibility of both the Re-Mission game (condition G) and the Re-Mission DVD (condition V) as a communication aid will be positive (mean rating between 3 & 5).

3) Scores on the knowledge test will be higher at post-test than at pre-test.

4) Scores on self-efficacy rating scale will be higher at post-test than at pre-test.

5) After adjustment for pre-test score levels on both the knowledge test and the self-efficacy scale, post-test levels will not be different for Conditions G and V.

In addition to allowing for specific hypotheses to be tested, the study also provided an opportunity to explore possible associations between demographic variables (age, nursing experience) and relevant dependent variables such as acceptability. It was also possible to measure the magnitude of associations between acceptability, knowledge and self-efficacy.

Table 1. Items from the Acceptability/Credibility Rating Scale. Data shown are the Mean, SD, Minimum and Maximum Rating for each Item. N = 10 for each Item

	Item	Mean	SD	Min	Max
1	I think it is OK for cancer nurses to use Re-Mission as part of their professional development/training	3.7	0.82	2	5
2	I would recommend Re-Mission to other cancer nurses	3.6	0.97	2	5
3	I think I benefited from using Re-Mission	3.4	1.07	2	5
4	I think that Re-Mission provided an easy way to learn about self-care during cancer treatment	3.5	0.97	2	5
5	I believe Re-Mission helped me to understand cancer treatment and side effects	3.6	0.84	2	5
6	I think Re-Mission takes about the right amount of time to complete to be a practical way of learning	3.0	1.50	1	5
7	Overall, I liked Re-Mission	3.6	1.17	1	5
8	I think most Australians would understand the American words and accent in Re-Mission	4.0	0.47	3	5

Note. On rating scale 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

3. Results

Twenty-two participants were recruited over two years. Of these, only ten (five in each condition) returned both the pre- and post-test questionnaires and tests. The characteristics of those completing the study were: age ($M = 39.30y$, $SD = 11.49$, range 23-53y); nursing experience ($M = 6.60y$, $SD = 6.90$, range 0.1-20y).

3.1 Data Analysis

Hypotheses 1 & 2. On the Acceptability/credibility rating scale, the maximum possible rating on each item was 5. A rating of 5 would indicate strong agreement with a positive statement about the acceptability or credibility of the game or DVD. **Table 1** shows the wording of the items and the mean rating and SD , across conditions G and V, for each item in the rating scale. The mean ratings vary between 3.0 (item 6) and 4.0 (item 8). Apart from item 3, which indicates a neutral position, the means for items indicate an overall weak positive rating of the Re-Mission game or video. The mean across all items was 3.55 ($SD = 0.80$). The difference between means on any item for conditions G and V was non-significant by independent t -test ($p > 0.05$).

Hypotheses 3 & 5: On the Self-care knowledge test, the maximum possible score was 18. Across conditions G and V, the mean score at Pre-test was 15.2 ($SD = 2.35$) and at Post-test was 15.8 ($SD = 1.69$). The difference between Pre- and Post-test means was not significant by correlated t -test ($p > 0.05$). The difference between means for conditions G and V at either Pre-test or Post-test was non-significant by independent t -test ($p > 0.05$). A repeated measures ANOVA with condition (G vs. V) as a between-subjects factor showed that the difference between Pre- and Post-test means was not significantly different for the G and V conditions ($p > 0.05$).

Hypotheses 4 & 5: On the Communication Self-efficacy rating scale, the maximum possible rating on each item was 7. The score analyzed for each participant was the mean rating across all 27 items. Across conditions G and V, the mean rating at Pre-test was 5.34 ($SD = 0.87$) and at Post-test was 5.83 ($SD = 0.88$). The difference between Pre- and Post-test means was significant by correlated t -test ($t(9) = -3.59$, $p = 0.006$). The difference between means for conditions G and V at either Pre-test or Post-test was non-significant by independent t -test ($p > 0.05$). A repeated measures ANOVA with condition (G vs. V) as a between-subjects factor showed that the difference between Pre- and Post-test means was not significantly different for the G and V conditions ($p > 0.05$).

Associations between variables: Exploratory correlational analyses were conducted, using appropriate parametric or nonparametric procedures, to test for significant associations between variables. Of particular interest

was whether ratings on the acceptability/credibility scale were significantly influenced by variables such as age, nursing experience, self-care knowledge, self-care efficacy, or Pre-Post changes in knowledge or self-efficacy. The only significant correlations found were a set of negative correlations between scores on the knowledge test and ratings on most items of the acceptability/credibility rating scale, especially at Post-test. The higher the knowledge score, the lower the rating given on all items except item 7, where the correlation was not significant. Correlations at Post-test (Pearson r) were item 1, -0.61 ; item 2, -0.67 ; item 3, -0.75 ; item 4, -0.75 ; item 5, -0.69 ; item 6, -0.71 ; item 8, -0.56 (all $p < 0.05$).

4. Discussion

Hypotheses 1 & 2 relate to the nurses' perceptions of acceptability/credibility of the intervention they received (condition G or V) as an aid to communicating with patients about self care. Relevant to these hypotheses is the great difficulty experienced by the researchers in recruiting participants, and the high attrition rate of those recruited (over 50%). Those who did complete the study mostly did not provide very positive ratings of Re-Mission's acceptability/credibility, either as a game (condition G) or video (condition V). The test for Hypothesis 1, that the acceptability/credibility ratings for condition G and condition V would not be different, was weaker than was planned. This is because the low numbers of participants completing the study severely reduced the statistical power of the study to detect even medium-sized differences between conditions G and V on any of the dependent measures. It therefore remains possible that there are real differences between these two conditions that could not be detected in this study.

Hypothesis 2, that participants' ratings of acceptability/credibility of Re-Mission as a communication aid will be positive, is only weakly confirmed by the evidence. Although those completing the study mostly gave positive ratings on the acceptability/credibility items (< 3), the low recruitment and completion rates suggests that most nurses approached were disinclined to get involved or to maintain their involvement. The conditions of the ethics approval for this study did not permit the researchers to ask nurses why they were disinclined, but some volunteered comments that suggested widespread disinterest in computer games and animated videos amongst this group. Had it been possible to use incentives to encourage participation in the study, it is likely that more nurses would have participated in and completed the study.

Hypothesis 3, that scores on the self-care knowledge test will be higher at post-test than at pre-test, was disconfirmed, indicating that neither intervention could be said to lead to an increase in knowledge. Hypothesis 4,

that scores on self-efficacy rating scale will be higher at post-test than at pre-test, was confirmed. This effect was of moderate size, representing a mean Pre-Post increase in self-efficacy ratings of about 0.5 of a scale unit. While this effect is consistent with a positive influence of Re-Mission content on perceived self-efficacy, the absence of a control for extraneous influences on self-efficacy means that other explanations of the increase in self-efficacy are equally plausible.

Hypothesis 5, that conditions G and V would not have different effects on either knowledge or self-efficacy, are consistent with the non-significant values obtained in the analyses conducted. Although the statistical power of the tests conducted was low consequent to the low completion rate, this result is at least consistent with the conclusion that neither condition had more effect than the other on either knowledge or self-efficacy.

An additional finding from exploratory analyses was that acceptability/credibility ratings were not positively correlated with post-test self-efficacy scores. However, participants with higher knowledge scores, especially at the Post-test, tended to rate their intervention lower on the acceptability/credibility rating scale. Essentially, those with better knowledge about self-care were less positive about the value of the intervention in this context. This effect was specific to knowledge as measured in this study, and was not associated with age, oncology nursing experience, or perceived self-efficacy to communicate about self care.

We conclude that the Re-Mission game and Re-Mission videos are found to be moderately acceptable/credible to the small proportion of oncology nurses who are willing to try them, especially to those whose knowledge about self care is limited. Using the game or video may result in significant improvement in perceived self-efficacy to communicate with patients about self care. However, our results indicate that nurse educators may find substantial resistance amongst nurses to educational initiatives involving the use of animated games or videos. This is in contrast to the positive view of digital and game-based education strategies prevalent in the nursing education literature [13,15]. It may reflect the difference between stated and revealed preferences, for example, asking nurses their preferences between hypothetical alternatives, versus requesting them to participate in actual educational activities. Alternatively, the findings of the current study may be specific to the Australian context, for example, Australian nurses might be less "digitally literate" than their North American counterparts.

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Physical Activity Improves Mental Rotation Performance

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ABSTRACT

Even there seemed to be general knowledge that physical activity enhanced spatial cognitive performance almost none experimental studies on this influence exist. For that the influence of physical activity on mental rotation performance is investigated in this study. Mental rotation is the ability to imagine how an object would look if rotated away from the original orientation. Two groups of 44 students of educational science each solved a psychometrical mental rotation task with three-dimensional block figures. After this, the participants of the physical activity group took part in a sport lesson, whereas the participants of the cognitive activity group attended an oral lesson of kinematics. Both lessons took 45 minutes. Thereafter, all participants solved the mental rotation task again. The results showed that the participants of the physical activity group improved their mental rotation performance whereas the participants of the cognitive activity showed no improvement.

Keywords: Physical and Cognitive Performance, Pedagogic Implication

1. Introduction

It is the main goal of this paper to investigate the influence of physical activity on cognitive performance, especially on spatial cognition. This relation was already formulated by Piaget [1]. In recent developmental research it is postulated that activity dependent multi-modal experience is a core mechanism creating developmental change [2]. This postulated relation is also evident in psychological research, where the relation between motor development and cognitive development is investigated in more detail in infancy [3] as well as in older adults [4]. Furthermore it was shown, that a dysfunction in motor development is often associated with a dysfunction in cognitive development and vice versa [5-7]. In sport science, a meta-analysis examined the relationship between motor and cognitive development [8,9] and revealed a positive correlation even though the results are, as a rule, restricted to adults.

This evidence from educational, psychological and sport science, is confirmed by the specific assumption [10] that motor development and movement experience are relevant factors for cognitive performance, especially for spatial ability [11]. Spatial abilities are cognitive processes composed of visualization, orientation and mental rotation [12]. Within these factors, mental rotation, *i.e.*, the ability to imagine how an object would look

if rotated away from the orientation, in which it is actually presented [13], is an important and well-investigated factor. Spatial cognition is fundamentally relevant for problem solving [14], mathematics [15] and science [16].

What is almost completely absent until now is the experimental investigation of physical activity on a spatial cognition task. According to our knowledge, only one study investigated the effect of a specific motor training in adults on mental rotation ability [17]. The authors provided evidence that a program of juggling training over a period of three months improved mental rotation performance in adults, compared to a control group that did not receive any training. Because the physical activation training in the former study lasted over three months, we were interested if a short physical activation (45 minutes) improved mental rotation as well. As a control group we chose a kind of cognitive activation. Students had to listen to a theoretical lesson of physical activation while they were allowed to ask something and to answer questions. Both groups were chosen because both were real educational situations, which enhance the ecological validity.

Because of the study of Jansen *et al.* [17] and the theoretical relation between motor and visual-spatial abilities [10], it is assumed that students would profit more from a physical activity lesson than from a theoretical lesson

regarding their mental rotation ability. This hypothesis is supported by studies of central nervous processes. Neuroscientific studies showed a motor cortex activation during mental rotation [18] as well as an increasing plasticity after training of juggling [19] in exactly that brain area (intraparietal sulcus) which is involved in mental rotation [20]. This evidence gives a hint for the assumed influence of physical activity on mental rotation performance.

2. Method

2.1 Participants

88 students of educational science with sport science as the main subject participated, 43 males (mean age: 23.66 years) and 45 females (mean age: 22.46 years). The students participated in the physical activity group (EG, 22 men and 22 females) or in the cognitive activity group, (CG, 21 men and 23 females). All participants gave their written consent for participation.

2.2 Material and Procedure

For the measurement of the mental rotation performance the paper-pencil mental rotation test, MRT, (Version A) redrawn by Peters *et al.* [16], which was originally developed by Vandenberg and Kuse [21] with figures created by Shepard and Metzler [13], was used. This test consists of two sets of 12 items each. Each item contains respectively a target figure on the left side and four sample stimuli that show the target figure in rotated versions. Two of the four sample stimuli were the same than the target figure. Participants had to find out these two items, which were the same. **Figure 1** shows an example of the items used.

In the original test of Peters *et al.* [16], the items were presented to the participants on four DIN A-4 sheets with six items per sheet and a 3-min deadline to solve a set of 12 items (6 min for the entire test). Instructions were

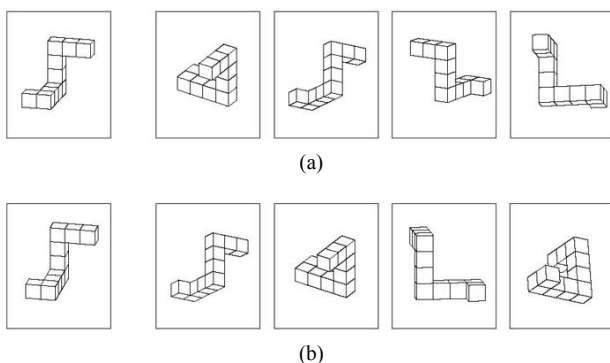


Figure 1. An example of two items used in the Mental Rotation Test. The target figure is shown on the left and the four sample stimuli are presented aside. Always two of these are identical to the target figure but are rotated in depth

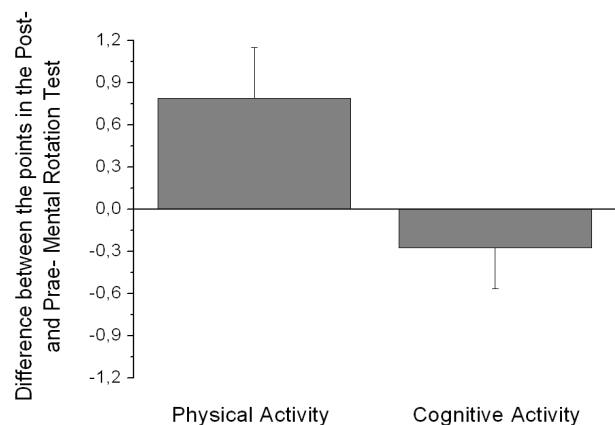


Figure 2. The difference score between the post- and prae-mental rotation test. The figure shows that participants in the physical activity group received more points in the Post Mental rotation test than in the pre-test, whereas the participants of the cognitive activity group did not. Error bars indicate standard errors

given in written form, followed by three training items so that participants became familiar with the task. The correct solutions of these training items were shown at the end of the page. Participants were instructed to attempt a solution for all 12 items within three minutes.

In this study the original test was used but the second set of 12 items was presented only after 45 minutes. In these 45 minutes participants of the physical activity group received physical activity lesson which comprises different activities as running, jumping, rope skipping and callisthenics. The participants of the cognitive activity group attended a lecture on kinematics, where they were allowed to ask something and to answer questions. The post mental rotation test was completed directly after the 45 minutes lasting physical or oral lesson.

2.3 Statistical Analysis

The standard scoring method by Peters *et al.* [16] was used: One point was given if and only if both correct sample stimuli of a target figure were marked correctly. Thus, participants could obtain 24 points maximum, 12 points in each test (pre-test, before the activity, and post-test after the activity).

Thus, a one-factorial design with the between-subject factor group (EG: physical activity, CG: cognitive activity) was used. The dependent variable was 1) number of points in the first time of the MRT, to reveal that there is no difference between two groups at the beginning of the test and 2) the difference between the two groups the number of correctly answered items in the MRT-A between the post- and the pre-test.

3. Results

There was no difference between the two groups in the

first part of the MRT, $F(1,87) = 0.294$, n.s.

Regarding the difference score, an ANOVA revealed a significant main effect of Group $F(1,87) = 5.03$, $p < 0.05$, $\eta^2 = 0.06$.

Figure 2 shows, that the participants from the physical activity group ($M = 0.73$, $SE = 0.31$) improved their mental rotation performance whereas the participants from the cognitive activity ($M = -0.28$, $SE = 0.29$) group did not.

4. Discussion

This study indicated the relation between physical activity and mental rotation performance. Participants improved their mental rotation performance after attending a sport class for 45 minutes. They did not improve their spatial performance when listening to an oral lesson between the two tests. Because we did not find an improvement in the cognitive activity group the post-pre improvement in performance after physical activity can not be expected from some kind of practice alone.

This study was a field experiment with a high ecological validity and the most possible intern validity. Both lessons were real educational settings. The lessons were chosen because of their high comparability concerning the duration, the time in the morning, they started and the level of social participation. It was the first step in a real educational setting investigating the importance of physical activity on one specific cognitive task. Further studies have to follow which examine the relevant factors for the obtained results. A measurement of physical and cognitive effort may be used in the following studies.

This result might have important implications for different disciplines, for sport science, psychology and especially for education. For people working in sport science it is important to see, that a sportive training does have this supporting effect on a cognitive task. That means in other words that sport might support not only physical but also cognitive fitness. For cognitive psychologists the assumed link between cognitive and motor processes is supported. Furthermore, this study has practical implications for educational science: It supports the claim for more physical activity in school, knowing that also cognitive learning will be enhanced by that. If one takes these results seriously school systems have to reassess their school curricula. Does it make any sense to have one cognitive lesson after the other one – for six to ten hours the day? These results provide evidence that physical activity between school lessons might be indispensable to obtain optimal cognitive performance in children.

Mental rotation is only one cognitive task, there are a lot of other ones like for example attention and memory tasks. Beside this there seems to be a link between mental rotation ability and math performance, as suggested

by the work of e.g. Casey, Nuttall and Pezaris [22]. Therefore, one might speculate that motor learning might also enhance maths performance. First evidence comes from a study of Nilges [23] who outlined 6 spatial abilities, which mediated both physical and mathematical learning. Further empirical studies should investigate this relation between physical activity and mathematic performance in more detail.

This is only one study investigating experimentally the influence of physical activity on cognitive performance. The advantage of this study is the real educational situation setting. Other studies have to follow where this influence is investigated in more detail. Is the effect still reliable if the second mental rotation test is not presented directly after the cognitive or physical activity? Is this effect also evident in children at school-age? Does this improvement hold true for different kinds of physical activity? More studies in this area might have a great influence on physical and cognitive education in schools.

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The Current Status of General Health Education Curriculum in Technical Institutes and Universities in Taiwan

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ABSTRACT

The purpose of this study is to understand the current status of the establishment of “general health education curriculum” by technical institutes and universities in Taiwan. A questionnaire survey method was used. A total of 75 questionnaires were sent and 41 were returned; the valid return rate was 54.7%. The result showed that the courses on general health can be categorized into four groups: physiological, psychological, nutritional, and fitness health. Group the curriculum by academic fields, and the natural sciences are the course offered by most schools. Group the curriculum by subjects, and courses offered by non-medical institutes focused mostly on psychological and lifestyles (health psychology), while that of the medical-related institutes offer most curriculums in health management (health promotion, health-related physical fitness), health and exercise, medicine and lifestyles (healthcare and life) and nutrition.

Keywords: Health, General Health Education, General Technological Vocational Education, Technical Institutes and Universities

1. Introduction

General education in Taiwan started as “liberal education” in Tunghai University in 1956. General education became a part of university education in 1984 when the Ministry of Education circulated a memorandum to the schools. However, the Interpretation No. 380 by the Supreme Court in 1995 considered that the common courses in the universities had exceeded University Law, and was in disagreement with the purposes of the Constitution. The interpretation opened the turning point for the schools to re-plan the common and general curriculum in Taiwan [1,2]. In response to the difference in the period of time, the difference in social and cultural backgrounds, the philosophy and the objectives, each school should establish various curriculums in general education [3]. Lin considered that the characteristics of students from technical institutes and universities are different from that of general universities since the basic functions of an university is to carry human cultural responsibility into academic research, development and inheritance,

while the nature of technical and vocational education is to take on the social construction in the use of professionalism and technology, research, development and innovation [4]. The aptitude of the students from technical institutes and universities should be considered when studying general technological and vocational education [5]. From the perspective of organization, Chen believed that if specialized courses are compared as line department, then general education is like the staff department; line and staff should be complementary to each other in order to accomplish the mission of the organization. The specialized education can satisfy the operating core, middle line and strategy apex of the organization, whereas general education provides technical structure and supporting staff services from a quality perspective to support the goal of professional subjects to cultivate the whole person. In another words, specialized and general curriculum should have a cooperative relationship [6].

Most of us spend our lifetime at the workplace; therefore, maintaining a safe working environment and a sound mind and body becomes very important issues [7, 8]. “Healthy” means a condition without diseases and that the body is at a comfortable physiological, psycho-

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logical, social, and spiritual state of health [7,9]. Since many epidemiological researches indicate that the cause of chronic diseases is related to unhealthy lifestyles, the engagement of health promotion activities can reduce the occurrence of diseases and death [10]. Thus, it is necessary to implant the students about health-related knowledge during school.

The nature of technical institutes and universities is focused on the workplace in the training of human resources, not on academic research; therefore, theoretically speaking, since every graduate from the technical institutes and universities will enter the work force, maintaining good health or paying attention to safety at work should be a basic skill for each student. The purpose of this study is to understand the current status of the establishment of general health education curriculum in technical institutes and universities in Taiwan, and to provide the findings to the education administration authority and every technical institute and universities as a reference.

2. Literature Review

2.1 General Technological and Vocational Curriculum

Wu defined general technological and vocational education as “the ‘professional development’ combining specialized and generalized skills. Together with technological and vocational specialization as a base to conduct orientation in the nature, the society, the humanity, the technology and the religion to promote the overall sustainable development of cognitions, skills, and attitudes according to the individual’s conditions, and thus to practice such skills in reality” [11]. Lee *et al.* pointed out that general education of university should be established with different contents according to the different periods of time, social and cultural background, school philosophy and objectives [3]. For example, Lee believed that the purpose of general education for military academies is to reflect the values of judging faithfulness and deceitfulness, obedience and disobedience, right and wrong, correctness and mistake, gains and losses, advantages and disadvantages, the fundamental and the incidental, and the state of urgency, by the students who received the basic education [12]. Sun deemed that the planning of the general education in teachers colleges should provide students a wider view to expand humanistic, social, cultural, scientific and philosophic perspective, and to cultivate knowledge integration, independent thinking, critical reflection, and lifelong learning abilities [13]. Focusing on the school’s characteristics, Fooyin University has designed the “Healthy life” general curriculum; from paying close attention at health issues to foster its students to become a professional, sentimental, macroscopic viewed, and graceful healthcare professional [14].

Yi indicated that the nature of technological and vocation, the instructor’s qualification and the quality of the student are the three predicaments faced by the technological and vocational education system in Taiwan when promoting general education [2]. Since the nature of the technological and vocational education system is career oriented, the mentality of the students usually emphasizes specialized subjects and neglects general curricula. If the philosophy of specializing general education and generalize special curricula cannot be blend in, the position of general education in technical institutes and universities will be more marginalized. Next is the dilemma of teachers’ qualification. Since many technical institutes and universities are mostly restructured from junior colleges, the ability of the instructors from junior colleges teaching general education and managing the requirement of a general diversified curriculum is rather worrying. In order to accommodate current teaching expertise and teaching hours, schools usually resort to teacher-based mode in setting up the curricula; which makes them twice as difficult to achieve the goal of diversified learning. Last is the problem with the source of the students. Since most students in technical institutes and universities come from students with unsatisfactory junior academic performance that are forced to select junior college or senior vocational school, their abilities in basic subject are weaker; which means that the student’s abilities in basic subjects should be considered when planning their curriculum.

2.2 General Health Education Curriculum

“Healthy” means a condition without diseases, and that the body is at a comfortable physiological, psychological, social, and spiritual state of health, therefore, physiological, psychological, social and spiritual aspect of health should be included [7,9]. In 1978, the WHO proposed the famous Alma-Ata Declaration that affirmed health as a fundamental human right, and the government is responsible to promote the health of its people through adequate activities. Chen and Lai included the four dimensions: self-responsibility, nutritional awareness, stress management, and physical fitness, into promoting a healthy lifestyle [15]. Walker, Sechrist and Pender defined healthy lifestyle promotion as: a multi-level spontaneous behavior and awareness of maintaining or promoting one’s health, self-realization and self-satisfaction [16]. Health-promoting behaviors should include regular exercises, leisure activities, resting, adequate nutrition, stress-reduction activities, and the development of social support system.

According to the national nutrition investigation in 2000, 14.6% male and 15.8% female adults in Taiwan suffer obesity from an improper lifestyle, such as inadequate exercise. It is estimated that there are approximately 2.2 million adults who are excessively obese.

Many medical reports point out that inadequate exercise complicated with obesity is the root of many chronic diseases such as hypertension, diabetes, and cardiovascular diseases [17]. In a long run, such a life style places a heavy influence on the health of the citizens. Promoting health education in technical institutes and universities and cultivating a healthy lifestyle has become the highest priority of current technological and vocational general education.

An investigation by Chen, Chang and Jing on 530 day and night school students from the Penghu Institute of Technology showed that interpersonal support ranked number one if ordered by average of each subentry in the health lifestyle; followed by self-realization, stress management, nutrition, and fitness. Health responsibility was ranked the lowest. The behavior for a healthy lifestyle has become a more common level [18]. From this, it should be realized that exercise, nutrition, health responsibility, health insurance and other health promotion issues are easily neglected by technical institutes and universities students. Therefore, it is necessary to require the students to pay attention to these issues in general health education curriculum; hopefully, the students' unhealthy lifestyles can be corrected through the curriculum and can be maintained until entrance of the workplace. Further, whether the technical institutes and universities pay attention to the teaching of general health education of the students should be further investigated.

3. Method

The questionnaire survey is used in this study. The questionnaire is constructed by the author. The contents included the fields of the schools' general curriculum and the status of general health education curriculum in the four-year technical institutes and universities.

The survey is sent to the director of General Education Division in 75 schools, which listed on the recruiting brochure for technical institutes and universities. A total of 41 surveys were returned after follow-up contact, and the valid return rate was 54.7%. The returned surveys were processed and statistical analyzed.

There were 15 technical universities (36.5%) and 26 technical institutes (63.5%) was returned; among which, 10 (24.4%) were public and 31 (75.6%) were private, and 8 (19.5%) has medical-related schools while 33 (80.5%) does not.

4. Results

The general curriculum credit among 12 schools (34.3%) of 35 technical universities and institutes ranked the highest, ranged 10~12; 7 schools (20%) ranked second with more than 30 credits, probably listed the common subjects in the general curriculum. Usually, general curriculums should range between 8 to 16 credits in techni-

cal institutes and universities. It shows in **Table 1**.

Classified by academic fields, 16 schools (39%) focused most of the subjects in general health education on nature sciences; followed by 9 schools (22%) that focused on social sciences; next were the 6 schools (14.6%) that focused on life education and lastly, 4 schools on physical fitness and health field. The findings indicate that the two levels of general health education in physiological and psychological health are the mainstream. It shows in **Table 2**.

According to the investigation, general health education subjects can be categorized into physiological, psychological, nutritional, and fitness health. Psychological health includes health management, health promotion, medicine and lifestyles, drugs and lifestyles, and etc; psychological health includes medicine and life, health and life, stress management, emotional management, psychology and lifestyles, healthy mind, and etc; food health includes diet and health, nutrition and lifestyles, food and health, and etc; physical health includes health and exercise, health-related physical fitness, traditional Chinese medicine and health preservation, Qigong and health preservation, leisure and sports, and etc.

The arrangements may be related to the teachers' structure; generally, teachers specialized in sports take charge

Table 1. The general health curriculum classified by credit

Credit	Number of Schools	Percentage
Under 8 credits	6	17.1%
10-12 credits	12	34.3%
14-16 credits	5	14.3%
26-28 credits	5	14.3%
30 credits up	7	20.0%
Total	35	

Table 2. The general health curriculum classified by academic fields

Subject	Number of Schools	Percentage	Ranking
Nature Sciences Field	16	39.0%	1
Social Sciences Field	9	22.0%	2
Life Education Field	6	14.6%	3
Physical Fitness Field	4	9.8%	4
Health Field	4	9.8%	4
Humanism and Arts Field	3	7.3%	6
Applied Science Field	3	7.3%	6

of courses related to health and exercise; those who specialize in counseling and psychology teach courses related to psychology and lifestyle or stress management.

The most common courses in general health education is health management (health promotion) and psychology and lifestyles (healthy mind) which is offered by 21 schools (51.6%); followed by health and exercise courses which is offered by 18 schools (43.9%); then courses in medicine and lifestyles (medicine and life) offered by 15 schools (36.6%); lastly, stress management (emotional management) and nutrition and health courses offered by 13 schools (31.7%). It shows in **Table 3**.

In the general health education curriculum offered by non-healthcare-related schools, psychology and lifestyles (healthy mind) ranked the top with 19 schools (57.6%), followed courses in health management (health promotion, health-related physical fitness) by 16 schools (48.5%), next are the courses in health and exercise with 13 schools (39.4%), then are the courses in medicine and lifestyles (medicine and life) and stress management (emotional management) with 10 schools (30.3%), and lastly, health and lifestyles with 9 schools (27.3%); the findings may be related to the instructors available in the type of the institutions. It shows in **Table 4**.

In the general health education curriculum offered by medical-related schools, courses in health management (health promotion, health-related physical fitness), health

and exercise, medicine and lifestyles (medicine and life) and diet and health ranked highest with 5 schools (62.5%).

The result is slightly different to that of non-medical schools where psychology and lifestyles (healthy mind) are not the most common courses, and diet and health, the subject ranked last in non-medical schools, was ranked first. It shows in **Table 5**.

5. Conclusions and Recommendations

5.1 Conclusions

The study concluded that:

1) It is necessary to implant the students about health-related knowledge during school. Promoting health education in technical institutes and universities and cultivating a healthy lifestyle has become the highest priority of current technological and vocational general education.

2) Each technical institutes and universities offers health-related general education.

3) General health education offered by the technical institutes and universities can be roughly categorized into physiology, psychology, diet and sports.

4) Categorized according to academic fields, the general health education focused mostly on natural sciences and social sciences.

Table 3. Curriculum in general health education offered by technical institutes and universities

Subject	Number of Schools	Percentage	Ranking
Health and Life	12	29.3%	7
Health Management, Health Promotion	21	51.2%	1
Health and Exercise, Health-related Physical Fitness	18	43.9%	3
Medicine and Lifestyles, Medicine and Life	15	36.6%	4
Traditional Chinese Medicine and Life Preservation, Qigong and Life Preservation	2	4.9%	11
Stress Management, Emotional Management	13	31.7%	5
Health Maintenance and Lifestyles, Prevention Medicine	10	24.4%	9
Food and Health	12	29.3%	7
Psychology and Lifestyle, Healthy Mind	21	51.2%	1
Drugs and Lifestyles	1	2.4%	13
Nutrition and Lifestyles	8	19.5%	10
Diet and Health	13	31.7%	5
Leisure Activities	2	4.9%	11
Exercise and Life Preservation	1	2.4%	13

Table 4. Curriculum in general health education offered by non-healthcare-related schools

Subject	Number of Schools	Percentage	Ranking
Health and Life	9	27.3%	6
Health Management, Health Promotion, Health-related Physical Fitness	16	48.5%	2
Health and Exercise	13	39.4%	3
Medicine and Lifestyles, Medicine and Life	10	30.3%	4
Traditional Chinese Medicine and Life Preservation, Qigong and Life Preservation	2	6.1%	11
Stress Management, Emotional Management	10	30.3%	4
Health Maintenance and Lifestyles, Prevention Medicine	7	21.2%	9
Food and Health	8	24.2%	7
Psychology and Lifestyle, Healthy Mind	19	57.6%	1
Drugs and Lifestyles	1	3.0%	13
Nutrition and Lifestyles	7	21.2%	9
Diet and Health	8	24.2%	7
Leisure Activities	2	6.1%	11
Exercise and Life Preservation	1	3.0%	13

Table 5. Curriculum in general health education offered by medical-related schools

Subject	Number of Schools	Percentage	Ranking
Health and Life	3	37.5%	6
Health Management, Health Promotion, Health-related Physical Fitness	5	62.5%	1
Health and Exercise	5	62.5%	1
Medicine and Lifestyles, Medicine and Life	5	62.5%	1
Stress Management, Emotional Management	3	37.5%	6
Health Maintenance and Lifestyles, Prevention Medicine	3	37.5%	6
Food and Health	4	50.0%	5
Psychology and Lifestyle, Healthy Mind	2	25.0%	9
Nutrition and Lifestyles	1	12.5%	10
Diet and Health	5	62.5%	1

5) Courses in health management (health promotion), and psychology and lifestyles (healthy mind) are most common in general health education, followed by health and exercise (health-related physical fitness), and lastly, medicine and lifestyles (medicine and life). Courses in psychology and lifestyle (healthy mind) ranked top in non-medical schools, followed by courses in health and exercise. Courses in health management (health promo-

tion, health-related physical fitness), health and exercise, medicine and lifestyles (medicine and life), and diet and health, are the most common curriculum offered in medical-related schools.

5.2 Recommendations

Due to the conclusions, the recommendation is proposed as follow:

1) The nature of technical institutes and universities is focused on the workplace in the training of human resources, since every graduate from the vocational and technological college will enter the work force, maintaining good health or paying attention to safety at work should be a basic skill for each student. It is recommended the health administration authority to encourage the schools to offer more courses in general health curricula.

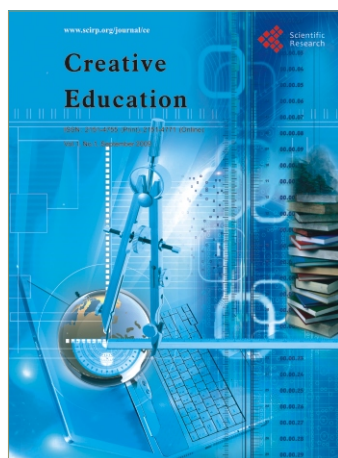
2) The returned surveys from 41 schools showed that the schools more or less offer general health-related curriculum. A further investigation may be needed to study the un-recovered portion of the surveys; to determine if the technical institutes and universities failed to return the survey because no courses were offered, or any other reasons.

3) The investigation for this study was on the subject of the course only. Further researches on the material used for each subject, how the student select courses, or effectiveness of the instruction are recommended.

4) A follow-up to see if the graduate has applied the skilled acquired from general health education in workplace is suggested for future studies.

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