Pair teaching of ICT in higher education: A multi-perspective reflection

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ABSTRACT

Information and Communication Technology (ICT) educators in higher education are constantly challenged to look for innovative ways to improve their pedagogical practices (i.e., facilitated learning, mentoring and assessment). Pair Teaching (PT) has many benefits allowing educators to design and present better learning experiences for students. The field of ICT is holistic by nature with right and left brained analytical thinking and learning. However, traditional teaching approaches and methods only focus to further left brain thinking and learning, involving study material such as textbooks and slides to educate students.

This paper argues that PT lends itself to design and present better whole-brain learning opportunities in ICT by working in pairs. The researchers found that PT contributes to educational quality by presenting broader and richer perspectives of subject matter, while PT allows educators to learn from one another. On the negative side, different teaching styles and personalities of educators, may cause confusion in the classroom and is regarded as a critical success factor for PT. Students agree that PT allowed for more interesting, enjoyable and interactive learning opportunities. Different perspectives of educators also aided in understanding subject matter better and more thoroughly. However, the students indicated that different perspectives of the subject matter often leads to confusion and takes up more time because of repeated information. The students also indicated that it is difficult to split their attention between two different educators with different teaching styles.

Keywords: Higher Education, ICT, Pair Teaching, Whole-Brain Learning

INTRODUCTION

Educators in Higher Educational Institutions (HEI) are under constant pressure to improve their pedagogical practices [1] in the constant wake of forces that influence pedagogical practices negatively and because of the diverse nature of students [33], [34], [35]. Pedagogical practices include a diverse set of performance areas such as teaching (facilitated learning), mentoring, supervision and assessment [1]. This responsibility to continuously improve pedagogical practices does not escape educators in Information and Communication Technology (ICT).

This paper investigates the impact of Pair Teaching (PT) on ICT pedagogical practices. A multi-perspective reflection of PT is presented after two educators used PT for first year students in Information Systems Development and Design course at a large urban institution in the administrative capital of South Africa. The reflections articulated in this paper include the views of both students and educators. PT is investigated to determine if working in pairs, design and present better whole-brain learning opportunities using the four quadrant's of the Hermann Whole Brain Model (HWBM).

THE HERMANN WHOLE BRAIN MODEL

Neuroscience researchers reported their findings in the 1960's on the concept of left/right brain dominance and how the brain functioned [2]. Insights gained from the research led to the development of Hermann's four quadrant whole brain model [3]. This model contributed to the understanding of how students think and learn [2]. Educators that strive to enhance their own knowledge of diverse students and their preferred thinking styles will ultimately give rise to delivery of preferred teaching and learning styles.

Practitioners, educators and students in the field of ICT are continuously challenged to practice, educate and think analytically (using the left brain), but also holistically (using the right brain) [4]. The field of ICT deals with complex programming logic and algorithms (analytical thinking), but at the same time participants in this field require creativity and a "bird's eye" view of the role that the final system will fulfil in the organisation to achieve its goals (holistic thinking) [4]. Furthermore, educators in ICT make use of dominant left brain teaching and learning methods such as textbooks, theory and logical rationales to educate newcomers to the field [2], [4]. It has been documented [5], [6], [7], [8] that effective learning takes place if the whole brain is involved. Educators in ICT are therefore challenged to develop creative and diverse teaching approaches and methods that cater for both holistic (right brain) and analytical (left brain) thinking and the resulting learning styles.

The brain is physically divided into a left and right hemisphere [3]. Each of the hemispheres is associated with specialised functions. The left hemisphere is shown to be logical, analytical, quantitative, rational and verbal while the right hemisphere is conceptual, holistic, synthesizing, integrating, intuitive, imaginative and non-verbal. Although each hemisphere is specialised, physical connections secure integrated brain activity [9]. The two hemispheres control vastly different aspects of thought and action [10].

Hermann [3] used various brain theories in the construction of his whole brain model. Theories included the left/right brain theory and the triune theory addressing the physical connections between the left and right hemispheres. The four quadrants of the Hermann model represent the different ways of thinking by the brain. Each quadrant has very distinct cognitive

functions. The upper left quadrant of the brain is responsible for logical, analytical, fact-based and quantitative thinking. The lower left quadrant is responsible for organised, sequential and detail kinds of thinking. The lower right quadrant is the focus of interpersonal, feeling based, kinaesthetic and emotional processes while the upper right quadrant focus on holistic, intuitive, integrating and synthesising thinking. These mental modes function together making up the whole brain in which one or more parts become naturally dominant. HBDI is used as an assessment tool to specify the degree of a person's preference for a specific thinking mode as indicated in Figure 1 (Appendix).

Whole brain learning is summarised well in the words of Felder [12:18] who states, "If professors teach exclusively in a manner that favour their students' less preferring style modes, the students' discomfort level may be great enough to interfere with their learning. On the other hand, if professors teach exclusively in their students' preferred modes, the students may not develop the mental dexterity they need to reach their professional potential for achievement in school and as professionals."

PAIR TEACHING

Pair Teaching (PT) is not an exact and clearly defined concept [13]. It is an umbrella term used to describe any form of teaching, in which two educators agree to share the responsibility and burden for teaching a group of students to achieve a specific educational outcome [14], [27], [28], [29], [30]. PT involves the educational activities of planning, teaching and evaluation [13], [15], [18], [28]. Just as the term PT lent itself to many interpretations, there are also many substantial differences in how PT is implemented [13]. Typically this type of teaching occurs in a well-defined area of the teaching curriculum [16], [17].

PT originated on the logical grounds of pairing a trainee teacher with a more experienced mentor, to ensure that trainee teachers do not become isolated in their educational practices, when they advance in their careers [13], [31]. In other words, PT provides an accelerated form of teacher training [13]. Advocates of PT argue that it provides additional support in the initial stage of the teaching experience, while others enjoy the fun element of tandem teaching [13], [31], [32].

An important aspect of PT is for teachers themselves, to decide whether or not to engage in a collaborative teaching arrangement [19], [28]. Some teachers dislike the artificial character of PT [13]. An important aspect of PT is the selection of a teaching partner [28]. Friction between partners is often caused by conflicting teaching styles, personalities, self-confidence, experience and insufficient familiarity with one another [13], [28], [32]. Therefore, emphasis is placed on personality traits that are vital for the success of PT [13], [28], [25], [32]. Such traits include tolerance, willingness to cooperate, empathy and openness to new ideas [13].

Educators state that PT has the following pros: PT provides mutual support between partners, PT allows teaching partners to learn from one another, PT provides a mechanism for teacher feedback and development, PT fosters a feeling of security and finally PT allows for a fair distribution of work [13], [28], [30], [31], [32]. To the contrary, some teachers involved in PT believe that: PT caused havoc when partners do not match, PT does not aid in developing individual teaching skills, PT is an artificial form of teaching, PT requires extra preparation time, PT leads to the dominance of one partner that requires too much compromise of the other partner and finally PT obscures the scope of responsibility [13], [30]. However, almost all teachers agree

that PT is an effective teaching practice and that students like this mode of teaching [13], [28], [25], [32].

Students involved in PT indicate that PT has the following characteristics: PT improved the quality of teaching, PT also provided a better atmosphere in the class, PT resulted in more interesting lessons, PT offers students more individual teacher attention, which aided them with their individual learning requirements [13], [27], [28]. In summary, students found that PT provided better learning opportunities [13], [27], [28], [31], [32]. On the other side, students involved in PT indicate that: PT often gives rise to problems with discipline, some students indicate that they prefer the one-teacher model and different teaching styles of educators often leads to confusion [13]. Still, students indicate that PT is a viable alternative to traditional patterns of teaching [13] and were more concerned about the quality of teaching [13], [27].

RESEARCH QUESTION

The literature indicates that PT has both positive and negative characteristics for educators and students in pedagogical contexts. However, PT has not been investigated in the ICT context of HEI. Therfore, the following research question that remains unanswered is: What insights can be gained from PT to improve ICT pedagogical delivery in HEI?

More specifically, this study sought to explore the following two research questions:

1) What lessons can ICT educators gain by practicing PT?
2) How do ICT university students react to the introduction of PT?

RESEARCH METHOD

In order to present multi-perspective reflection of PT in ICT education, the authors followed an interpretive research paradigm approach. This approach holds that social life is based on socially constructed meaning systems, social interaction and therefore people possess an internal experience sense of reality [20]. The methodological position of interpretive research is qualitative approaches, which are not mutually exclusive from positivist research approaches.

In this research project, data were collected from two ICT educators (male and female) and two first year higher education Information Systems Development and Design student classes in an urban university located in the administrative capital of South Africa. The educators presented PT for the students in these classes. The students presented their PT feedback in group format. A group consisted of four to six students. Feedback was received from 65 student groups totaling 273 students. The subjects represent different ethnic groups (blacks 50%, whites 42%, others 8%), social backgrounds and gender (males 53%, females 47%). The median age was 19 years, which is typical of first year students in South Africa with a Grade 12 education. Data was systematically coded into themes and categories with Microsoft Excel as they emerged using the constant comparative method [26].

The educators wrote a reflection report on how they had experienced the PT prior to interviewing the students. A questionnaire was developed and piloted on colleagues before being used to question the students with open and close-ended questions. A questionnaire was administered at the end of the first semester to the students in their groups. The subjects were asked to share what they found to be the positives and the negatives of PT. The students had to indicate if they preferred PT to the traditional single mode of teaching. The students were given

15 minutes to discuss the questions between themselves, before giving their answers to the researchers. This process resulted in richer responses from the groups that suite the interpretive nature of this research study.

The educators completed the HBDI exercise to determine the degree of an educator's preference for a specific thinking mode. Figure 2 (Appendix), indicates the preferred thinking modes of the two educators that were involved in the presentation of the PT.

As indicated in Figure 2 (Appendix), the dotted blue line represents the preferred thinking style of the male educator that was involved in the PT learning opportunity while the solid red line represents the female educator. As indicated in Figure 2 (Appendix), both the male and female educators, have a front brain thinking preference. This type of thinking style normally involves a preference for analytical and creative thinking. The male educator (dotted blue line) shows a strong preference for basal right thinking, which involves emotional based thinking and understanding. The female educator (solid red line) has more preference for basal left thinking, which involves procedural, organised types of work.

THE LEARNING OPPORTUNITY

The PT presented by the two educators covered the theoretical aspects of the Soft System Methodology (SSM). The SSM is as a set of guidelines for applying systems ideas and concepts to a problem situation [22]. The SSM consists of seven stages [23], [24] as indicated in Figure 3 (Appendix).

The central focus of the seven stage SSM is the search for a particular view or views of a problem situation or area through a process of debate [23]. This shared view of assumptions of the world is referred to as Weltanschauung [23]. Weltanschauung forms the basis for describing the system's requirements and is used as the platform for further stages of the methodology. This methodology compares the real world and to the systems world (as indicated in Figure 3 (Appendix)) and is used to take purposeful action to improve the real-life situation under scrutiny [23]. The real-life problem is either improved or solved. Multiple iterations of the SSM can be applied to seek solutions.

The educators interacted and even interrupted each other at any time during the lecture to add additional knowledge and richness to an explanation or to present further examples or perspectives. The educators made use of role-playing to illustrate to the students, how the SSM deals with different and sometimes conflicting viewpoints. To improve a real-life problem situation. Electronic slides were also created to illustrate the SSM (as indicated in Figure 4 (Appendix)). These slides provided the necessary structure for supporting the PT learning opportunity.

During the PT, the educators made use of diverse approaches and methods that catered for both holistic (right brain) and analytical (left brain) thinking and learning styles. The electronic slides for example, catered for students who have a dominant left brain learning preference, while the role playing and interaction of the educators, catered to students who have a dominant right brain learning preference. In other words, the educators constructed effective learning opportunities in which the whole brain of the student was involved no matter which side of the brain was dominant.

A MULTI-PERSPECTIVE REFLECTION OF PAIR TEACHING

Reflections of the Educators

The two ICT educators that were involved in the PT, experienced it in quite different ways.

The male educator enjoyed the PT experience. In his own words he states: "I enjoyed the experience and I think the students did as well. There was a bit more humor than normal and the different personalities caught the attention of the students, making it more interesting for them."

Reasons for enjoying the experience include: more fun and interesting lectures for students, different perspectives were presented about a certain theoretical aspect that enrich the learning opportunity, the educators can also learn from one another by hearing their perspectives on the course content, and the enjoyment of presenting with others. Comments of the male educator include:

"I like presenting with others, because one feels a sense of security if someone stands with you in the classroom. It is like playing in a team motivating each other to perform at your best for the team."

"The educators learn from one another by hearing different perspectives."

"I liked the PT experience, because it allowed us as educators to break away from our comfort zones to create more interesting lectures for students."

"PT also allowed the educators to present more perspectives about a certain theoretical aspect that enrich the learning opportunity for students."

On the negative side, the male educator stated that pairs need to spend more time teaching together to eliminate those "odd" moments. Furthermore, in PT there is repetition. In his own words:

"In some instances there was repetition of theory. Furthermore, it was the first time that we taught together. There were some 'funny' moments where you did not know how to react, but nothing serious."

The female educator did not enjoy the PT experience that much. In her own words she states, "My experience however of pair-teaching is not that glamorous and in fact, I did not enjoy it as much as I thought I would."

Reasons for not enjoying the experience include: Different educational styles (i.e., planning and teaching), differences in teacher personalities, the amount of time that PT takes up to complete a lecture, and the nature and suitability of PT in large student groups. Comments of the female educator include:

"I believe that one should prepare in depth for a class before presenting the class, thus planning what the pair should say in class and at what time, is also important. This would eliminate any unforeseen 'curve-balls' that might be thrown your way and you can plan certain reactions accordingly."

"Each person views things in different ways and react differently. And thus for pair teaching to work, first of all the personalities performing the pair teaching sessions have to know each other in-depth and thus will be able to handle certain situations better."

"Due to the nature of classes being big groups, I think one tends to easily 'loose' the student's attention as they have to constantly concentrate and react to a different voice… I think pair teaching might work better in a small group of students who are not in their first year of study where theory is being discussed."

"…because each party in the pair wants to have their say, a lot of the definitions and explanations are repeated, this makes the class long and the students might lose focus at some point."

On the positive side the female educator agreed that pair-teaching can be beneficial in certain lecturing situations and perspectives. PT further contributes in broadening the knowledge of students by presenting different viewpoints. In her own words the educator states: "I can also see some of the students like to hear someone else's explanation and viewpoint on certain aspects and thus broadening their knowledge... for the course it was presented, it might work, as the specific class was on different perspectives and how to analyze a system when looking at everybody's perspective and taking everybody's opinions into consideration."

The PT reflections of the two educators present two different experiences of the PT learning experience. The differences in teaching styles between the two educators can be traced back to their preferred thinking styles (Figure 2). The lower left quadrant of the brain or Basal Left (Figure 2) is responsible for organised, procedural, rigid, sequential and detail kinds of thinking [3]. As can be seen in Figure 2, the female educator scored higher than the male educator in this area of the brain and therefore the female educator had the urge for a more detailed planned and executed PT. On the other hand, the male educator scored higher than the female educator in the Basal Right area of the brain (Figure 2). The lower right quadrant is the focus of interpersonal, feeling based, kinaesthetic and emotional thinking processes. A high score in this area of the brain improves interaction and atmosphere in the classroom between students and educators. This was indeed the case as reflected in the feedback of the students. The differences between the educators in the basal left and right areas of the brain (Figure 2) could have contributed to the personality differences between the two educators that the female educator experienced. Cognisance should however be taken of the fact that it was the first time that the educators engaged in a PT together. It is therefore reasonable to expect that there will be unanticipated situations which are difficult to handle with such different teaching styles. But as suggested by the female educator, knowing one another better would improve this sort of scenario for the future. Both of the educators scored high in the frontal left area of the brain, the female educator slightly more than the male educator. The upper left quadrant of the brain is responsible for logical, analytical, fact-based and quantitative thinking [3]. Both of the educators used this part of the brain, to enrich the PT with different, fact-based perspectives of the subject matter, resulting in better quality education for the students, as reflected in the feedback of the students. Finally, both of the educators scored high in the frontal right area of the brain (Figure 2), which is responsible for inventive, holistic, intuitive, integrating and synthesising thinking [3]. In other words, this part of the brain is responsible for creativity. The creativity that was portrayed during the PT by the educators is also reflected in the feedback of the students.

Reflections of the Students

This section describes how the students experienced the PT learning opportunity with remarks of the students are presented in decreasing frequency.

On the positive side the students indicated that they: (a) have gained a better and more accurate understanding of the subject matter from the different perspectives (i.e., ideas, insights and opinions) of the educators (74%), (b) they have gained more and complete knowledge (29%) on the subject matter presented by the two educators, (c) they enjoyed the learning opportunity, because it introduced an element of fun, interaction and it was interesting (23%). These elements

contributed in keeping the concentration and focus of the students and finally (d) the students indicated that they could benefit from two different teaching styles (11%). Positive remarks from the students include:

"Two different perspectives, which makes it easier to understand."
"Learning is more enjoyable, because of the humor."
"It was a great idea, makes the lectures more fun."

On the negative side, the students indicated that: (a) different perspectives by educators may lead to confusion (92%), (b) PT learning opportunities takes longer to complete, requiring better time management (52%), (c) PT causes information overload and repetition (12%), and (d) in PT learning opportunities, it is difficult to split one's attention between two different educators (6%). Negative comments of the students include:

"Interrupting one another when speaking."
"Cover the material slower."
"Their different perspectives maybe confusing at times."

However, after their first PT learning experience in which the educators collaborated for the first time, 43% of the student groups indicated that they would rather prefer this mode of teaching, above or instead of the traditional single mode of teaching.

CONCLUSION

This paper presented a multi-perspective reflection of Pair Teaching (PT) in ICT education at a higher education institution. Two ICT educators presented a PT for first year System Analysis and Design students that explained the Soft System Methodology (SSM). In answering the research questions (What insights can be gained from PT to improve ICT pedagogical delivery in HEI?) it was found that:

1) Lessons ICT educators gained from PT: The two ICT educators presented two quite diverse reflections on how they experienced the PT. For one ICT educator it was quite an enjoyable experience, but for the other ICT educator it was a less pleasant experience. Both educators acknowledged that PT can contribute to educational quality by presenting broader and therefore richer perspectives of subject matter that will assist students to understand the subject better. PT also allows educators to learn from one another. On the negative side, different teaching styles and personalities may cause confusion in the classroom and can even be regarded as a critical success factor for PT. But educators can learn to assist and complement each other to provide better learning opportunities for students. The "Hermann Whole Brain Model" can be used as a starting point for this purpose, by identifying possible weaknesses and strengths in their educational practices of a paired educational team. Finally, the educators agree that PT learning opportunities required more planning and time in the classroom. Therefore, time management becomes an important factor in PT.

2) University ICT student reactions to PT: Students indicated that PT allows for more interesting, enjoyable and interactive learning opportunities. Different perspectives presented by the educators aided in understanding subject matter better and more thouroughly. Students can also benefit from the two different teaching styles of the educators. On the negative side, the

students indicated that different perspectives on subject matter often lead to confusion. The students also indicated that much more of their time is taken up in a PT because educators often repeated information. The students experienced information overload and some indicated that it is difficult to split their attention between two different educators.

The contributions of this paper lie in the insights and experiences that were shared by ICT educators and students in this specific ICT PT. This is typically the nature of interpretive research. In the future, the authors would like to extend this research with quantitative research, although this was not the intention of this paper. The authors close this paper by encouraging other participants and educators in the field of Information Technology to find creative ways to improve pedagogical practices and share this with other educators in the field.

ACKNOWLEDGEMENTS

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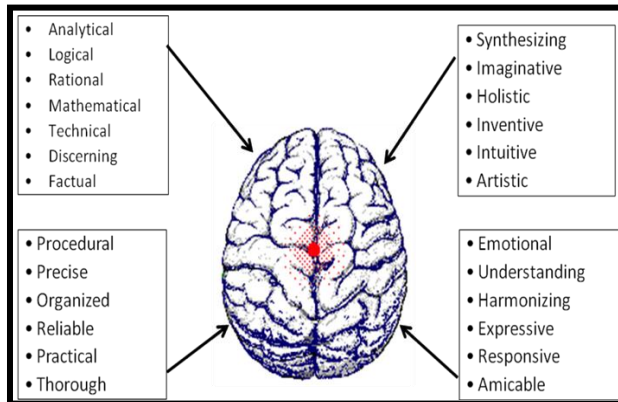
APPENDIX

Figure 1: The Herman Whole-Brain Model (adapted from Hermann, 1995)
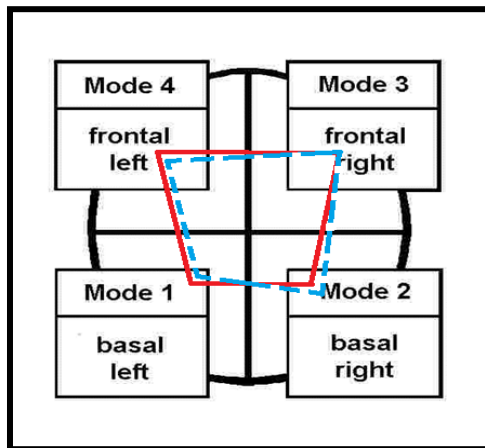

Figure 2: Preferred thinking modes of the educators that were involved in the PT learning opportunity
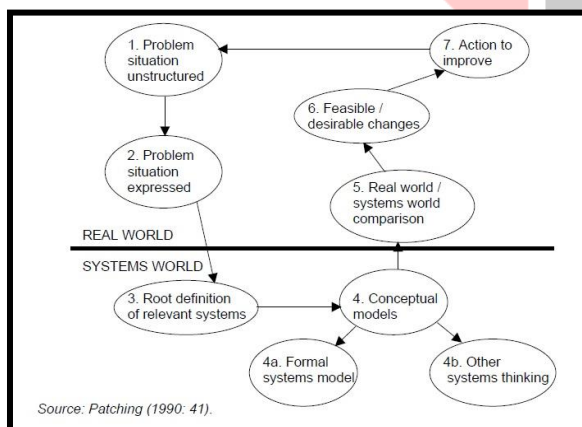

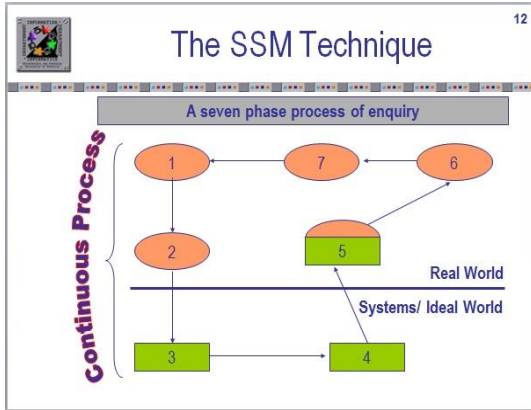Figure 3: The seven stages of the Soft Systems Methodology

Figure 4: Electronic slides created for the learning opportunity