Incorporating Brain Colour into the Multiple Intelligences to Create a Blended Learning Context: Homogeneous and Heterogeneous Groups

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Abstract

This paper introduces a blended learning context that creates a community of practice. This community of practice presents a combination of face-to-face facilitated learning, e-learning, and self-study. A set of in-class and online linguistic activities was used in the implementation of this experiment to investigate the efficacy of performing these linguistic activities in homogeneous and heterogeneous groups. The incorporation of target learners' brain color into their multiple intelligences was based on using two inventories which identified learners' brain color and multiple intelligences. The two inventories were Carmazzi's (2009) Coloured Brain Communication Inventory (CBCI) and Sahakian's (2001) Multiple Intelligences Inventory (MII). They were administered to a group of Arab Open University (AOU) students during their Grammar in English Language Contexts course tutorial sessions. This incorporation helped the researcher ascertain the learners' preferred means of learning and assessment. In addition students were divided into heterogeneous and homogeneous groups to detect the efficacy of performing selected linguistic activities whether in-class or online in groups. The results of these two inventories (CBCI and MII) were statistically analyzed and a correlation was observed. The statistical analysis of the learners' performance in analyzing and solving the given linguistic activities revealed distinct advantages of working in heterogeneous groups with individuals who possessed a variety of brain colors and multiple intelligences.

Keywords: blended learning, brain colour, multiple intelligence

The human brain is an amazing organ in the body. Researchers have been trying to study and analyse its parts and functions for decades and centuries. Some of them have presented a great deal of data about the human brain and the biology of learning, and new discoveries are continually adding to that knowledge every day. Many authors, including Gardner (1983), Caine and Caine (1994), Goleman (1995), Sylwester (1995), McGeehan (1999), Jensen (2000), and Wolfe (2001), were concerned about brain-based learning. These authors have applied some of the latest scientific medical findings related to the brain on learning. Jensen (2008) defined brain-based education as a multidisciplinary approach in which learning happens in accordance with the way the brain is naturally designed to learn. Numerous people, especially educators and parents, are interested in finding out more about this organ and how its unique functioning impacts the learning process. Educators and researchers continue to explore the biology of learning and its applications to discover which teaching practices can maximize learning through the use of new theories and approaches that eliminate the more traditional ways of learning and improve the quality of instruction. Constructivism, multiple intelligences theory, active learning, inquiry-based learning, problem-based learning, and project-based learning are some of the relatively new approaches (Thomas & Swamy, 2014).

One of these applications is the theory of multiple intelligences (MI) by Howard Gardner (1985). The view of an individual's intelligence or how one may be described as intelligent has changed. The idea that there is a single general intelligence that is measured by a person's intelligence quotient (IQ) is questionable even though IQ has been the most common way of measuring intelligence. In measuring IQ, intelligent people are those who can score high grades in paper-and-pencil tests that usually rely heavily on verbal-linguistic and logical-mathematical capacities. Gardner (1998, p. 20) says, "Rather than having just an intelligence defined by IQ, humans are better thought of as having eight, maybe nine, kinds of intelligences, including musical, spatial and kinaesthetic." He defines intelligence as "a psychobiological potential to solve problems or to fashion products that are valued in at least one cultural context" (p. 19). Another application is the identification of students' brain colour and the way they receive and process information. "Knowing the kinds of learning experiences that students most value may help instructors develop alternative course structures that provide a better fit between their instructional goals and the learning style preferences of their students" (Canfield, 1992, p. 1).

Review of Literature

This age of technological advances necessitates employing outstanding approaches of teaching and learning based on current brain research and technological applications. This does not mean that everything teachers have done in the past is wrong, but rather it means they should make best use of the available technology and information of this age. Caine and Caine (1994, p.82) have developed twelve principles of brain-based learning. They declared "We do not simply learn. What we learn is influenced and organized by emotions and mind sets based on expectancy, personal biases and prejudices, degree of self-esteem, and the need for social interaction. ... Emotions operate on many levels, somewhat like the weather. They are ongoing, and the emotional impact of any lesson or life experience may continue to reverberate long after the specific event."

Caine and Caine (1994) also believed that educators must consider the way in which students learn and the type of environment that promotes learning when designing a curriculum. They stated that each person's brain is able to detect patterns, memorize, self-correct, learn from

experience and create. Hence, teachers should take advantage of these natural processes by designing lifelike, enriching and appropriate experiences for learners. They should ensure that the learners process these experiences in order to increase the efficiency of their learning. Consequently, having consistent brain-compatible instruction based on the actual biology of the brain's learning can improve the learning/teaching process.

Carmazzi (2009), founder of Directive Communication Methodology, states that people are distinguished from each other by their own specific way of processing the world around them, processing information, learning and problem-solving, communicating, and relating to others. To harness the power of understanding how these communication processes affect our personal and organizational effectiveness, he formed a model of four brain colours; red, blue, green and purple and then statistically tested it across 60 different corporate and 6 cultural environments with over 8,000 people. The result was the *Coloured Brain Communication Inventory (CBCI)* – a tool to improve personal and work relationships and promote better decisions.

This tool has four criterion measures. First, the inventory measures *natural mental processing strength*; the natural genetic strengths that determine how an individual's brain processes information, and how he/she will take action in a given situation. Second, it measures *learned mental processing strength* which is the learned ability to get results in an area unrelated to the individual's natural brain processing. Third, it measures *mental flexibility* of an individual represented in his/her ability to productively work and communicate with others who operate with different mental processors. Finally, it identifies *communication improvement areas* by determining what brain processing types are difficult for an individual to mix with, which can prevent potential problems in learning, management and teamwork.

Carmazzi (2009) mentions some benefits of identifying one's brain colour such as understanding one's coloured brain processing, how one is affected by other different coloured brains, one's strengths and how to develop them, one's weaknesses and how to overcome them in addition to cultivating one's productivity, influence, and mental ability. He depicts the analogy of coloured brain as two computers, a Macintosh and a PC. Both can run "Microsoft Excel" and both can run "Adobe Photoshop" (graphics software), yet one cannot run software written for one type of computer on the other. And, even the same programs have a slightly different look and feel to them. Additionally, Excel runs very fast on a PC and a bit slower on a Mac, but Photoshop runs far faster on the Mac than on the PC.

The brain works in the same way. If humans are genetically built to process information in a certain way and are "forced" to swallow systems or procedures or management styles that are "designed" for a different brain processor, there is a tendency to be less efficient and less fulfilled. However, if there exists a greater understanding of the processor running in the brain, it becomes easier to design the right "software" to do the job better and more effectively. The first part of CBCI profile helps individuals do just that; whereas, the second part determines the areas necessary to gain more "Communication Flexibility" in order to work well with other types of brain processors.

Carmazzi (2009) presented an observation summary for each brain colour. He states that the person who has a blue brain is an intuitive person who can achieve clarity through reflection and intuitive referencing of past experiences. This person is rather emotional and quick in taking actions by gathering information and getting a form of sensitivity feedback from the effects of previous personal experience. This is due to an amazing efficiency in connecting to

people, a great flexibility in unknown environments, a consistent assimilation of the surroundings, a multi-tasking in thinking process and persistent resilience in tough situations. This person overcomes ambiguity by being highly empathetic and sensitive to the environment and people (Coloured Brain ^{TM}, 2017).

In contrast, a person with a purple brain takes more time to collect and assimilate information compared to others. Carmazzi (2009) clarifies that this person is relational to the degree that necessitates having abundant information to make a connection and get clarity. Hence, this person reacts to a situation based on the extraction of substantial details related to the issue under investigation. People who possess characteristics of a purple brain are systematic in reaching reasoning and generating ideas by referencing current and stored information and making comparisons. Thus, reasoning and idea generating are internally categorized and connected to other related categories. People who possess characteristics of a purple brain are less resilient in situations that are negative without enough details or options. While these people have a more individual identity, when in groups, they usually want to make sure that everyone is aware of the details and is more comfortable with consistent feedback (Coloured Brain ^{TM}, 2017).

Similarly, a person with a red brain needs structure to achieve clarity, and the time needed to take an action is dependent on the available structure and the speed at which clarity is achieved. Such a person is a linear one since s/he identifies and organizes facts and resources before acting. This person usually connects tangible elements with logic, organizes information into chunks, and identifies discrepancies and cross-references to reach understanding. People who possess characteristics of a red brain are less comfortable with unstructured processes or instructions and tend to be objective in communication, which is often misunderstood as uncaring. Red brains are less resilient in situations that are negative or do not show a logical reason for flexibility or change because they seek an understanding of new environment before experiencing them. They make less mistakes than others do, but they take longer to recover from mistakes (Coloured Brain ^{TM}, 2017).

People who possess characteristics of a green brain generally need to see the whole picture of a topic or objective in order to comprehend what is expected. They must take some kind of action to get clarity. Time needed to act is almost immediate (sometimes impulsive), and clarity is directly related to the revelations from their actions. They shape and reshape ideas and solutions in the process of acting on issues, getting others involved, asking for feedback and processing their surroundings as a summary of the overall situation. For people who possess characteristics of a green brain, a little information quickly forms a comprehensive but vague perspective of what the situation is, can be, or how it could affect another situation. Individuals with green brain characteristics simply know that they are on the right track without being able to justify it. They are disorganized but effective, connect as they act, perform poorly with too much structure. As a result, reasoning and idea generating is in non-linear random chunks based on testing elements in the action process to connect to the big picture. Though these people tend to work on multiple projects, they often can fully concentrate on one situation at a time. People who possess characteristics of a green brain are flexible in unknown environments and resilient, getting beyond negative issues in shorter periods of time compared to others (Coloured Brain ^{TM}, 2017).

Interestingly, the Multiple Intelligences (MI) theory set by Haward Gardener (1983) can contribute in understanding the Directive Communication Methodology set by Carmazzi (2009). Gardener (1983) identified seven Multiple Intelligences namely; *Verbal-Linguistic*,

which includes the ability to manipulate language, to express oneself rhetorically and use language as a means to remember information, *Logical-Mathematical*, which includes the ability to detect patterns, to think logically and reason deductively, *Musical-Rhythmic*, which includes the ability to recognize and compose musical pitches, tones, and rhythms, *Visual-Spatial*, which includes the ability to create mental images, *Bodily-Kinaesthetic*, which includes the ability to coordinate one's mental abilities with one's own bodily movements, *Interpersonal*, which includes the ability to understand and discern the feelings and intentions of others, and *Intrapersonal*, which includes the ability to understand one's own feelings and motivations. In 1995, he added the eighth intelligence; the *Naturalist Intelligence*, which includes the ability to enjoy nature and have a strong connection to the outside world. He also considered the possibility of a ninth intelligence; the *Existential Intelligence*, which includes the ability to enjoy thinking and questioning the way things are; showing a philosophical awareness and interest.

In relation to MI theory, Sahakian (2001) first thought of an inventory that would illustrate the profile of learners and teachers. Prior to this, Christison (1998) had applied MI theory in pre-service and in-service TEFL education programs and has written A Multiple Intelligences Inventory for ESL Teachers. In her inventory, she collected ten related statements under each of the eight intelligences, totalling 80 items. The respondents rank each statement by writing 0, 1 or 2 in the blank next to the statement, and then compare the scores in different intelligences to see their highest or lowest scores. Christison's (1998) inventory, similar to others, was too long. It only addressed ESL teachers, and the statements were neatly collected under every intelligence topic, which made things obvious for the respondents. This did not serve Sahakian's purpose, as she preferred not to have the respondents guess, but react to the items naturally. Hence, she devised an MI inventory namely, Know Me/You More, and its profile, MI Profile, that could be used by teachers, students, or others. She added two more intelligences after validating them namely Taste and Smell intelligences. Taste Intelligence in which knowing occurs through the sense of taste and ability to differentiate among such things as different tastes of food and spices, and Smell Intelligence in which the knowing occurs through the sense of scent and ability to differentiate among smells associated with different perfumes and food which are included in her inventory.

Sahakian (2001), with her additional two intelligences, Taste and Smell intelligences, included sectors such as students majoring in Home Economics. Their sensitivity to sensing the slightest extra amount or lack of spices surpassed that of some teachers who boast for their cooking. Similar to tasting, she thought of those who had a strong sense for smelling. Sahakian's (2001) Know Me/You More tool can be used for different purposes; 1) primarily as an identifier or indicator; to know one's intelligence strengths and weaknesses, 2) as a starter; to introduce the MI theory, 3) as a grabber; to capture the audience's/participants' attention in a short time, 4) as an identifier of others; to administer on others to determine their intelligences' profiles and see how similar and/or different they are, 5) as an identifier of teachers and learners; to administer it to anyone including teachers and learners, 6) as an identifier of other nations and cultures; to administer to those of a variety of cultures as cultural aspects are accommodated when validated and 7) as an amusement relief; to play a game, to introduce the concept in a light way and/or add enjoyment to the context.

The MI inventory Know Me/You More is also intended to help pre- and in-service teachers think of ways to broaden the range of intelligences their students use in English language classes, within the constraints of the textbooks and culture. The tool offers help for teachers who want to create classes in which students enthusiastically participate in constructive

activities. The inventory consists of an introductory section followed by 30 items including 10 domains/intelligences, namely; Verbal-Linguistic (VL), Logical-Mathematical (LM), Visual-Spatial (VS), Bodily-Kinaesthetic (BK), Musical (M), Interpersonal (Inter), Intrapersonal (Intra), Taste (T) and Smell (S) intelligences. Each type of intelligence is represented by an item in the order above with intelligences being repeated in different statements, but in every 10th order. For example, VL items are: 1, 11, 21; LM items are: 2, 12, 22 and so on.

These above mentioned two inventories were used in the implementation of this study to help Arab Open University (AOU) students identify their brain colour and multiple intelligences that would give them a clear insight into their preferred means of learning. What will follow is the methodology, implications and results of the experiment undertaken at AOU.

Methodology

The conceptual framework of this implementation includes its research question, objectives procedures, duration, participants, design, instruments, assessment and results.

Research Questions

The overarching question for the study was to what extent identifying the brain colour and multiple intelligences of AOU students registered in a Grammar in Context course could help in grouping them into homogeneous and heterogeneous groups to perform linguistic activities in-class and online more accurately and in less time.

This main question led to the following sub-questions:

1. What is the brain colour of each AOU student registered in the selected Grammar in Context course?
2. What is the multiple intelligence profile of each AOU student registered in the Grammar in Context course?
3. Do homogenous or heterogeneous groups perform the given linguistic activities more accurately?
4. Do homogenous or heterogeneous groups perform the given linguistic activities faster?

Research Objectives

The underlying research objectives were clear. It was anticipated that by the end of the implementation, the students would able to:

- Distinguish between different brain communication processes.
- Identify one's own brain colour.
- Identify one's dominant multiple intelligences.
- Analyse a variety of linguistic activities in both homogeneous and heterogeneous groups, and
- Learn from each other.

Research Significance

The significance of the research stemmed from several possible outcomes and opportunities:

- To present to tutors and curriculum designers in the humanities and language learning an alternative way of planning, designing, and implementing a blended context in which different brain colours and multiple intelligences are accommodated;
- To help tutors and educators incorporate different brain colours and multiple intelligences effectively in the teaching and learning processes;
- To add to the literature's quantitative and qualitative findings on the effectiveness of performing linguistic activities in blended contexts with homogenous and heterogeneous groups; and
- To pave the way for other studies in different domains to further develop and improve the understanding of different brain colours and the multiple intelligences model.

Research Hypotheses

The study tests the following hypotheses:

1. There is a statistically significant difference in the students' mean scores on the accuracy of performing the given linguistic activities in heterogeneous groups of different brain colours and multiple intelligences than in homogenous ones.
2. There is a statistically significant difference in the students' mean scores on the speed of performing the given linguistic activities in heterogeneous groups of different brain colours and multiple intelligences than in homogenous ones.

Participants

The participants were 42 students registered in a level three course "*Grammar in Context*" at Arab Open University (AOU), Kuwait Branch. The group of participants consisted of 11 male students and 31 female students. The age group of the participants ranged from 24 to 53 years of age.

Procedures

The study was conducted with a group of Arab Open University students to identify their brain colour and multiple intelligences. A session was presented by the researcher to familiarize the students with the concept of brain colour and multiple intelligences theory. Then, the two inventories "*Coloured Brain Communication Inventory (CBCI)*" and "*Multiple Intelligences Inventory (MII) Know Me/You More*" were administered to these students. During the semester, the students were divided into groups based on their brain colour and multiple intelligences. There were two types of groups; homogeneous groups with the same brain colour and identified multiple intelligence strengths and heterogeneous groups. The students were given a set of in-class and online linguistic activities to analyse the linguistic features in each activity. The aim was to determine the efficacy of each group type in problem solving and analysing linguistic texts.

This implementation was conducted in 12 weeks during the second semester of the 2015–2016 academic year. A two-hour session was conducted to familiarize the students with the brain colour and multiple intelligences theories. The students were guided through detailed instruction to respond to Carmazzi's and Sahakian's inventories. After that, the students were divided into groups to analyse different types of linguistic activities in class and online.

Design

The implementation adopted the descriptive design to review and survey previous literature and studies related to certain variables as identified in both the Coloured Brain and Multiple Intelligences inventories. A quasi-experimental design was adopted to identify the students' brain colour and dominant intelligences to facilitate dividing them into homogenous and heterogeneous groups as well as to evaluate the quality of the interaction while performing the linguistic activities in both group types. The quasi-experimental design was chosen because the current research is a research that resembles experimental study, but it is not a true experimental research study. Although the independent variable is manipulated, participants are not randomly assigned to conditions or orders of conditions (Cook & Campbell, 1979).

Instruments

The following instruments were used:

- Coloured Brain Communication Inventory (CBCI) to identify one's brain colour
- Multiple Intelligences Inventory (MII) to identify one's multiple intelligences profile.
- Observation checklist to detect the speed and accuracy of performing the linguistic activities in homogenous groups and then compare this with performing in heterogeneous groups.

Assessment

For assessing students' performance in light of the type of their group, they were asked to do the given linguistic activities in class and online in specific groups specified by the researcher. This was assessed by using an observation checklist to detect the speed and accuracy of performing number of activities by each group type. The students were free to choose from alternative methods to present and deliver their own linguistic analysis of the given texts in class and online. These instruments were created for conducting formative assessments of students' learning. Feedback was given at the end of each presentation and students' answers were marked with comments and re-uploaded on the University Educational Platform; Learning Management System (LMS). A comparison between the students' level of accuracy and speed while performing the given linguistic activities in homogenous and heterogeneous groups was found to be in favour of the heterogenous groups.

Findings

The results of the two inventories, CBCI and Know Me/You More, were statistically analysed and correlations were noted as follows:

- Green Brains showed a propensity to three of the intelligence areas – Bodily-Kinaesthetic (68%), Naturalist (17%) and Musical (15%).
- Red Brains tended to be stronger in two intelligence areas as well as Smell and taste to some extent – Visual-spatial (45%), Logical-mathematical (39%), Smell (7%), and Taste (9%),
- Purple Brains usually were Intrapersonal (52%), Logical-mathematical (40%) and musical (8%).

- Blue Brains typically were Interpersonal (41%), Verbal-Linguistic (38%), Musical (12%), and to a small degree, Smell (4%) and Taste (5%).

The observation checklist of students' accuracy and speed level while performing the set of linguistic activities was statistically analysed. The results showed that students' accuracy level while performing the specified linguistic tasks in heterogenous groups was better than their accuracy level while performing in homogeneous groups as shown below in Table 1.

Table 1. Students' Accuracy Level in Responding to Linguistic Activities

No.	Checklist Items	Distinguished Performance	Very Good Performance	Acceptable Performance	Fair Performance	Poor Performance
1	Analysing noun phrases in homogeneous groups	7%	41%	43%	9%	0%
2	Analysing noun phrases in heterogeneous groups	19%	53%	28%	0%	0%
3	Analysing verb phrases in homogeneous groups	8%	42%	41%	9%	0%
4	Analysing verb phrases in heterogeneous groups	21%	53%	26%	0%	0%
5	Analysing adjective phrases in homogeneous groups	9%	39%	41%	11%	0%
6	Analysing adjective phrase in heterogeneous groups	24%	56%	20%	0%	0%
7	Analysing adverb phrases in homogeneous groups	6%	37%	43%	14%	0%
8	Analysing adverb phrases in heterogeneous groups	30%	52%	18%	0%	0%
9	Analysing Systematic Functional Linguistics (SFL) in spoken texts in homogeneous groups	4%	16%	41%	29%	10%
10	Analysing Systematic Functional Linguistics (SFL) in spoken texts in heterogeneous groups	11%	39%	30%	16%	4%
11	Analysing Systematic Functional Linguistics (SFL) in written texts in homogeneous groups	7%	33%	43%	9%	8%
12	Analysing Systematic Functional Linguistics (SFL) in written texts in heterogeneous groups	10%	37%	30%	19%	4%

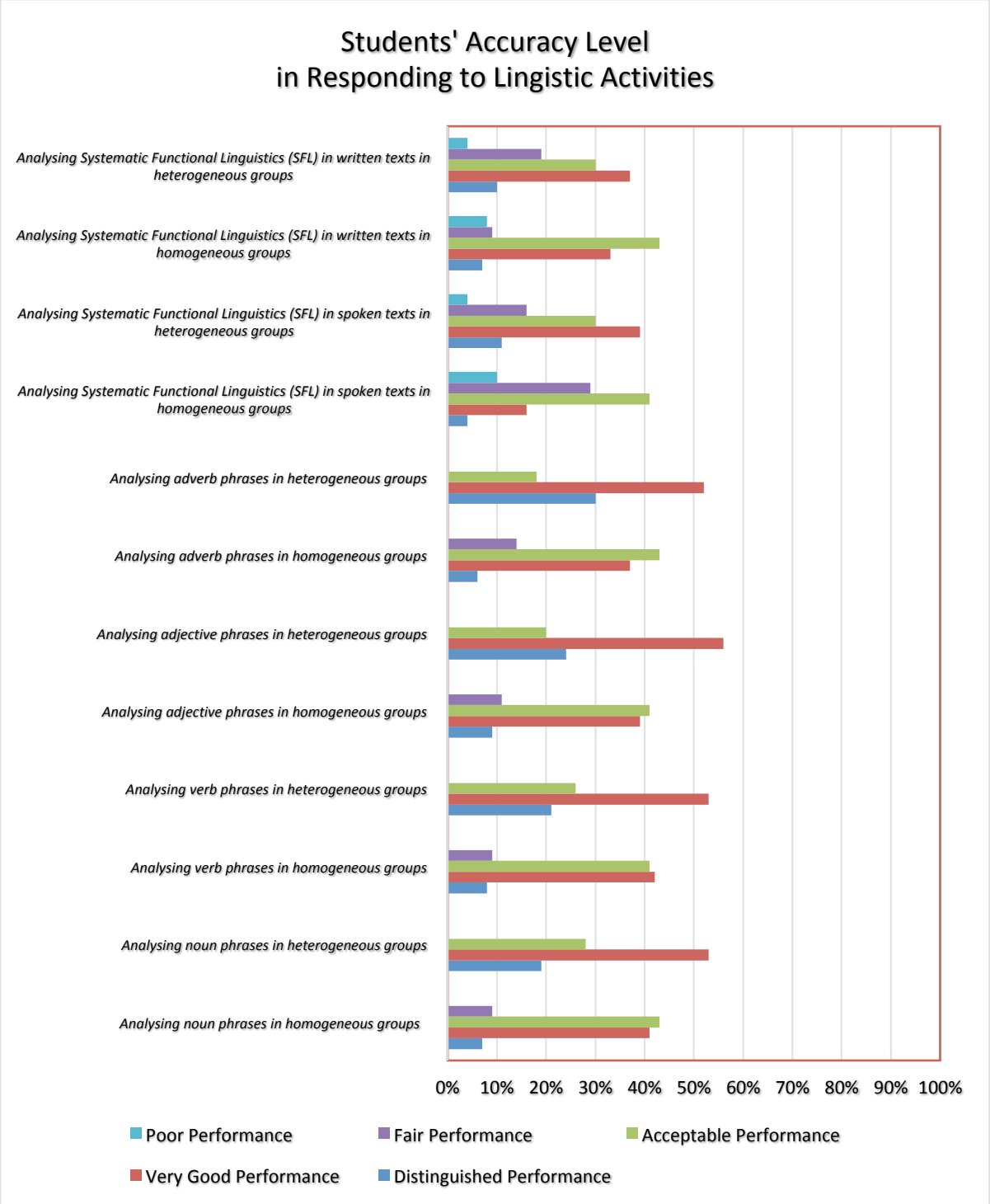

Figure 1. Students' Accuracy Level while Responding to Linguistic Activities

Students' speed level while performing the provided linguistic tasks in heterogeneous groups is faster than their speed level in homogenous groups. Conversely, the time spent in performing the linguistic activities in heterogeneous groups is less than the time spent in homogeneous ones.

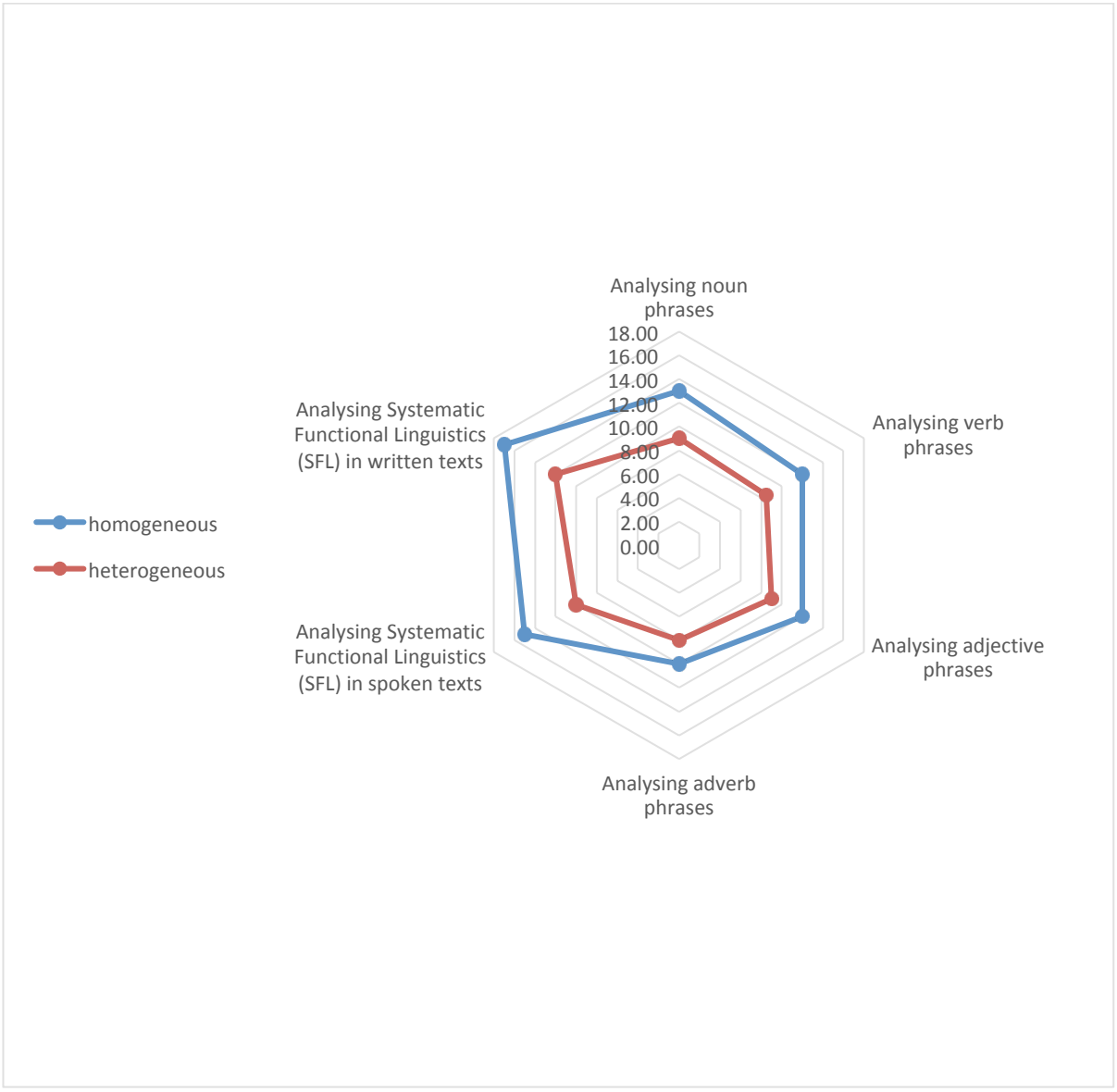

Figure 2. Students' Speed Level in Minutes while Responding to Linguistic Activities

Discussion of Findings

The interpretation of the results of the two inventories is as follows:

- Students who exhibited characteristics consistent with the research on green brains, mostly had strengths in the Bodily-Kinaesthetic intelligence and were found to be *Tactile/Kinesthetic* learners who learn best from hands-on activities and movement.
- Students who displayed characteristics consistent with the research on red brains, commonly had Visual and Logical intelligences and were found to be *visual* learners who learn best by seeing material.
- Students possessing attributes consistent with the research on purple brains primarily had strengths in the Intrapersonal and Logical intelligences and were observed to be *analytical* learners who learn best logically and individually.

- Those students who revealed traits consistent with the research on blue brains, mostly had Verbal-Linguistic and Interpersonal intelligences were inclined to be *global* learners who learn best spontaneously and cooperatively.

The interpretation of the results of the checklist is as follows:

- Students' accuracy level in performing the linguistic activities in heterogenous groups was better than that of their performance in homogeneous groups. However, this variance was reduced towards the end of the experiment when the group members became familiar with each other. The students spent an entire semester interacting in groups, and thus, they became very familiar with each other's preferred way of learning and approaching a linguistic activity.
- Students' speed level in performing the given linguistic activities in heterogenous groups was faster than their performance in homogeneous groups. Yet, as in the case of the students working in homogeneous groups, by the end of the experiment, students' speed in performing the activities increased due to the familiarity among group members. This is due to the fact that during that time, they grew to know each other's preferred way of learning and approaching a linguistic activity.

Conclusion

Learning and language learning can occur through several means in different environments. Educators should respect and consider the learners' individual differences and how to divide them for optimum group work. They should be familiar with the implications of the different brain colours and multiple intelligences and try to apply them on varied types of activities in order to guarantee each learner's involvement in the learning process. Educators should encourage their verbal-linguistic learners to employ several leaning activities such as listening to verbal lectures, reading texts, taking notes while listening to lectures, and recorded books. As for logical-mathematical learners, teachers can present information in sequential steps, analyse structure and goals, specifically spell out requirements, and utilize puzzles of logic. For visual- spatial learners to be successful, educators are compelled to have the learners look at pictures to gain clues to meaning, and to draw diagrams, graphics, charts, maps and pictures that will facilitate comprehension. Those students with the bodily-kinaesthetic intelligence can be encouraged to perform experiments, play games, complete creative projects and models, follow instructions to make something, participate in role playing or other cooperative learning activities. Regarding musical learners, teachers may have students sing songs and chants, drill, listen to recorded books, and read and recite poetry. Interpersonal learners will benefit from discussing ideas in groups, participating in choral reading, collaborative learning, and peer teaching. Intrapersonal learners will profit by keeping diaries and journals, and writing short essays and stories. Similarly, naturalist learners can learn through field trips and realia. Learners who use their smell and taste intelligences can learn through discriminating different odours, flavours and spices. All the previous activities may be useful in improving learning and language acquisition in heterogenous groups through establishing a blended learning context that incorporates brain colours and multiple intelligences during face-to-face and online tutorials. Taking the time to identify the students' brain colour and multiple intelligences profiles at the beginning of the

learning process would facilitate establishing a proper educational context that suits a variety of learners in one classroom.

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