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A Study of Birth Order, Learning Styles and Academic Performance of Senior Secondary School Science Students in Osun State, Nigeria.

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Abstract: *This study examined the relationship between birth order, learning style and academic performance in core science subjects-Biology, Chemistry and Physics among senior secondary school students. Three research questions and objectives are enumerated and achieved. The study employed descriptive correlational research design. The research instrument tagged-Birth order and learning style indicators was used with reliability of 0.65 Cronbach Coefficient alpha values to assess students' learning styles. And the students' scores in core science subjects-Biology, Chemistry and Physics were used to proxy academic performance. The result revealed that there was a significant relationship between birth order and learning styles (Visual, Auditory and Kinesthetic) which was in favour of only child. Also, significant difference existed between birth order and academic performance of students in sciences. Finally, positive and significant correlation existed between visual and kinaesthetic learning styles and academic performance in both Biology and Physics. However, positive insignificant correlation was found between auditory and academic performance in Biology, Chemistry and Physics.*

Keywords: Birth Order, Learning Styles, Personality, Academic Performance, Grade XII (Senior Secondary School III) students.

Introduction

Differences in intelligence, personality and learning styles exist among children of a family despite the fact that they were raised in the same environment such as neighbourhood and share the same genetic traits from both parents. These differences are caused by heredity and child's environment. Alfred Adler (1870-1937) who was thought of as the father of birth order research claimed that birth order can have lasting effect on one's personality. Personality can be described as the ways by which an individual thinks feels and behaves in order to interact with his or her immediate or distance environment.

If learning occurs as a result of the interaction of the learners with the environment, therefore, one can say that birth order which many researchers claimed influence personality may have effect on the unique ways by which an individual learns best in order to be successful in his or her environment. These unique ways by which an individual learns best refer to that individual's learning style. This means that birth order can have effect on personality which may in turn determine learning style.

The first teachers in the life of a child are the parents which mean that a child starts to learn by interacting with the parents and other siblings within the family. The birth position of siblings more often than not influences the type of behaviours parents put up in dealing with the children. This may subsequently determine the ways by which their children may like to learn within the family setting. This may later influence the way they may prefer to learn in the classroom situation. Thus, birth order in relation to learning style and academic performance deserve the attention of researchers and other stakeholders of secondary school education. Teachers especially need to have an in depth understanding of birth order and learning styles in relation to academic performance because greater percentage of students that come into the classroom comes from families that are composed of more than one child. Asides, the teachers should know that these categories of children will exhibit different learning styles during the course of teaching and learning. In fact, Moeinikia and Zahed-Babehan (2010) confirmed that there is a positive link between learning styles and academic performance in the University settings. Therefore, effective teachers need to look at the whole child and the combination of children they have in their classroom.

Learning style is defined as the characteristics, strengths, and preferences in the wat by which people receive and process information (Hsieh, Jang, Hwang and Chen, 2011). It also refers to the fact that every person has his or her own method or set of strategies which he or she exhibits learning (Gokalp, 2013). Consequently, Reid, (1987) defined learning styles as the changes among learners in using one or more senses to understand, organize and retain experiences. Considering the definitions of learning style as given by these researchers, one can deduce that, if learners are aware of their learning styles (such as visual, auditory, and kinaesthetic), and teachers are able to employ teaching methods that could accommodate students' varied learning styles, it may go a long way in making teaching and learning more effective.

A very relevant learning style model to the teaching and learning of sciences is VAK (Visual, Auditory, and Kinaesthetic) learning styles which were developed by Dun and Dun (Dun and Griggs, 2003). According to Chislett and Chapman (2005), students' preferences identified for each of the VAK learning styles are:

Visual learning style: Visual learners have preferences for written information, notes, diagrams and pictures. They remember much of what they read. They may be good writers, journalists, graphic designers.

Auditory Learning Style: Auditory learners have preferences for listening, for verbal explanation, for talking over their notes, for discussions, for repeating words and key points in their head. They are good listeners. They may be good speakers and specialize in law politics.

Kinaesthetic Learning Style: They have preferences for sport activities, for practical work. They get physically involved in activities.

Children, according to their birth position may exhibit any or both of 'VAK' learning styles in other to interact with their environment (home or classroom). For instance, the first born child who is expected to play the role of a leader; listen to instructions from parents; watch how domestic duties are carried out; and at times do same may likely develop and exhibit visual, auditory and kinaesthetic learning styles to meet up with the expectations.

The second born children are not given adequate attention as given to the first born by the parents. Thus, second born children rely on older siblings as a role model and they often try to catch up with them. The second born children may like to do whatever the older child does. In view of this, they may likely develop and exhibit kinaesthetic learning styles in order to learn new things or skills.

For the last born children, Beck, Burnet and Vosper (2006), said last born children often want to put up behaviour that can make them to be recognised among their older siblings. In an attempt to make the difference, they like to be creative and a creative mind may likely develop and exhibit visual and kinaesthetic learning styles. Whereas the only child is equipped to entertain himself or herself without any intervention from an adult. This may help them develop self-awareness and sense of maturity which may demand the exhibition of visual and kinaesthetic learning styles.

Examining the role of birth order on academic achievement, Zajonc and Markus (1975) claimed that the impact of birth order on cognitive achievement was largely influenced by familial intellectual environment and the opportunity to serve as intellectual resources. Familial intellectual environment decrease in respond to increased family size. First borns were born to a higher intellectual environment as compared to the later-born children. This implies that birth order may create an environmental challenge that may have different effects on these categories of children. For example, Travis and Kohli (1995) found that birth order did impact the total years of education completed among the middle class population. The authors also reported that the only children appeared to excel academically too. Nutstall, Nuttall and Hunter 1976) said that first born girls had better academic attainment than the later born girls. However, Hauser and Sewell (1985) reported no significant birth order effect on academic achievement when other confounding variables were controlled.

The influence which learning styles can have on academic performance may not be overemphasized. For instance, Barman, Aziz and Yusuff (2014) studied the learning style awareness and academic performance of students and concluded that students' awareness of their strengths such as learning style and how to utilize their strengths may improve their academic performance. Teevan, Michael and Schlesselman (2011) reported that knowledge of the learning styles can help facilitate teachers to employ suitable teaching strategies and at the same time help students strengthen self-actualization. Sanni (2014) acknowledged that kinaesthetic learning style had direct effects on biology achievement. Ogecinyere and Ereme (2017) found that visual, auditory and kinaesthetic learning styles alike enhances academic performance of students. In his own contribution to the body of knowledge, Iviana (2018) reported no significant relationship between learning styles and academic achievement in different forms of teaching.

From available literature, several authors concentrated on finding the relationship between birth order, personality and academic performance. Very few studies have been conducted on the relationship between birth order and learning styles. In view of the forgoing, this study examined the relationship between birth order, learning styles and academic performance of senior secondary school students in sciences.

Statement of the Problem

The poor performance of senior secondary school students in science subjects has been considered a serious problem in senior secondary school education. This poor performance in science subjects has been confirmed by low level of performance of students in examinations conducted by external body like the West African Examinations Council (WEAC) over the years. Many researchers have attributed students' poor academic performance to factors which bear on relationship among students' academic performance, government factor, school factor, teacher factor and parent factor. Few work has been carried out on factors such as birth order and learning styles which are exclusive to students. In view of this, the present study examined birth order and learning styles in relation to students' academic performance in sciences at secondary school level.

Research Questions

i. What is the relationship between birth order and students' preferred learning styles in science subjects?

ii. What is the relationship between birth order and students' academic achievement in science subjects?

iii. What is the relationship between learning style preferences and academic achievement of senior secondary school science students?

Methodology

Research Design

The study employed a descriptive correlational design. Descriptive component of the study revolved on the personal profile of the respondents, their learning style preferences, birth order and academic achievement. The design is considered adequate due to the fact that it aims at not only to describe and interpret what is concerned with issues, conditions and practices that prevail or exist, beliefs, points of views that are going on concerning nexus among birth order, learning styles preferences and academic achievement but also involve large numbers of people and describe population characteristics by the selection of unbiased. Therefore, in ex-post facto design, the dependent variable (academic performance) is observed while several other independent variables (learning styles preferences vis-à-vis Visual, Auditory and Kinesthetic/Physical) and birth order are being examined. Besides, the observation of the dependent variable may occur before, after and at the same time with the independent variables. In the light of this, it is clear to infer that students' learning styles preferences such as Visual, Auditory and Kinesthetic/Physical as well as birth order had been in existence before the determination of students' academic performance in school subjects.

Population of the Study

All Grade XII students in public secondary schools most especially those who offered science subjects like Biology, Chemistry and Physics during 2017/2018 academic session in Irewole Local Government Area of Osun State formed the target population.

Sample and Sampling Technique

One-hundred and thirteen (113) Grade XII (Senior Secondary School III) students were sampled from four public high school within the study area. This was done with the aid of purposive sampling technique in which the researcher carefully and consciously chooses the subjects to be included in the sample so that the sample can be developed for his needs. Hence, only those who offered three compulsory science subjects such as Biology, Chemistry and Physics in Unified Promotion Examination (UPE) conducted by the Osun state Ministry of Education, Osogbo during 2017/2018 academic session were used.

Instrumentation

The instrument used for the study was adapted from the instrument (VAK learning style indicators) developed by Chislett and Chapman (2005) tagged '***Birth Order and Learning Styles Indicators (BOLSI)***' comprised two segments. The first segment consisted of demographic attributes of the respondents' birth order information inclusive. The second segment entailed twenty-two (22) items on learning styles preferences. Each of the test items is accompanied with three (3) learning style preferences that is visual, auditory and kinaesthetic from which the respondent is expected to choose. Besides, raw scores of these students on Biology, Chemistry and Physics were extracted from Unified Promotion Examination (UPE) results during 2017/2018 academic calendar.

Method of Data Analysis

The study employed inferential statistics to analyse the data generated from the research instrument. These are correlation analysis and student t-test.

Empirical Results

Research Question I: What is the relationship between birth order and students' preferred learning styles in science subjects?

Table 1: T-test result showing the relationship between birth order and students' preferred learning styles in science subjects.

Birth Order	N	Visual Learning Style	Auditory Learning Style	Kinesthetic Learning Style	Visual Learning Style	Auditory Learning Style	Kinesthetic Learning Style	DF
Ist	25	23.3(3.23)	24.0(5.19)	20.7(7.51)	1.13	0.22	0.93	55
Midd	32	22.2(4.11)	23.7(4.93)	22.5(6.92)	(2.00)	(2.00)	(2.00)	
Ist	25	28.5(7.84)	26.7(5.62)	27.2(6.11)	1.59	1.40	1.16	52
Last	29	25.2(7.35)	24.6(5.21)	25.3(5.87)	(2.00)	(2.00)	(2.00)	
Ist	25	23.9(5.43)	25.1(7.12)	24.6(5.20)	2.32*	1.96	0.55	50
Only	27	27.7(6.36)	29.2(7.98)	25.5(6.51)	(2.00)	(2.00)	(2.00)	
Midd	32	22.4(3.11)	27.7(6.16)	26.8(5.73)	1.53	0.98	1.07	59
Last	29	24.1(5.19)	29.5(7.99)	28.7(7.85)	(2.00)	(2.00)	(2.00)	
Midd	32	22.9(5.23)	23.5(6.92)	26.3(5.54)	3.12*	2.53*	1.54	57
Only	27	27.7(6.36)	27.8(6.13)	29.1(7.96)	(2.00)	(2.00)	(2.00)	
Last	29	24.6(5.23)	26.7(5.62)	26.3(5.54)	1.91	1.40	2.53*	54

Only	27	28.0(7.77)	24.6(5.21)	29.1(7.96)	(2.00)	(2.00)	(2.00)	

Source: Field Work (2019). Two-Tailed Test at 5% level of Significant.

Table 1 contained the empirical analysis of the relationship between students' birth order and preferred learning styles. The mean scores and corresponding standard deviation with respect to three kind of learning styles examined in the paper (Visual, Auditory and Kinesthetic Learning Style) are indicated. The empirical outcomes revealed that there was significant difference in the preferred learning styles based on their birth order with regard to Visual Learning Style, Auditory Learning Style and Kinesthetic Learning Style in favour of only child. This is inferred from the t-calculated values of 2.32, 3.12 and 2.53 which are higher than t-tabulated valu of 2.00.

Research Question II: What is the relationship between birth order and students' academic achievement in science subjects?

Table 2: T-test result showing the relationship between birth order and students' academic achievement in science subjects.

Birth Order	N	Biology M(S.D)	Chemistry M(S.D)	Physics M(S.D)	Biology $T_c(T_b)$	Chemistry $T_c(T_b)$	Physics $T_c(T_b)$	DF
Ist	25	48.2(5.64)	49.2(5.66)	48.7(5.68)	1.92 (2.00)	1.88 (2.00)	2.16* (2.00)	55
Midd	32	45.4(5.21)	46.4(5.52)	45.5(5.37)				
Ist	25	48.2(5.64)	49.2(5.66)	48.7(5.68)	0.26 (2.00)	1.72 (2.00)	1.32 (2.00)	52
Last	29	47.8(5.45)	46.6(5.42)	46.7(5.43)				
Ist	25	48.2(5.64)	49.2(5.66)	48.7(5.68)	1.20 (2.00)	1.33 (2.00)	0.95 (2.00)	50
Only	27	50.1(5.72)	51.3(5.69)	50.2(5.73)				
Midd	32	45.4(5.21)	46.4(5.52)	45.5(5.37)	1.75 (2.00)	0.14 (2.00)	0.86 (2.00)	59
Last	29	47.8(5.45)	46.6(5.42)	46.7(5.43)				
Midd	32	45.4(5.21)	46.4(5.52)	45.5(5.37)	3.27* (2.00)	3.33* (2.00)	3.22* (2.00)	57
Only	27	50.1(5.72)	51.3(5.69)	50.2(5.73)				
Last	29	47.8(5.45)	46.6(5.42)	46.7(5.43)	1.54 (2.00)	3.15* (2.00)	2.33* (2.00)	54
Only	27	50.1(5.72)	51.3(5.69)	50.2(5.73)				

Source: Field Work (2019). Two-Tailed Test at 5% level of Significant. * Indicate Significant

Table 2 showed the relationship between students' birth order and academic achievement in science subjects-Biology, Chemistry and Physics. The empirical outcomes revealed that there was significant difference between middle born and only child in all the three science subjects in favour of only child of the family, this is depicted with the t-calculated values of 3.27, 3.33 and 3.22 which are greater than t-tabulated value of 2.00. Also, it revealed that there was significant different in the academic achievement of last born and only child in both Chemistry and Physics which is in favour of only child as well. In addition, significant difference existed in Physics between first born and middle born which was in favour of first born of the family. This could in part be attributed to the fact that, all things being equal, the parents of only child and first born will mobilise their resources to meet the educational needs of their child and make home environment ambient enough for such a child to advantage for academic related activities. While no significant different was revealed among other pairs of birth order in connection with academic achievement in science.

Research Question III: What is the relationship between learning style preferences and students' academic achievement in science subjects?

Table 3: Correlation analysis showing the relationship between learning style preferences and academic achievement in science subjects.

learning style preferences	**Biology r(p)**	**Chemistry r(p)**	**Physics r(p)**
Visual Learning Style	0.560(0.023)*	0.413(0.018)*	0.537(0.004)*
Auditory Learning Style	0.362(0.068)**	0.602(0.070)**	0.491(0.069)**
Kinesthetic Learning Style	0.621(0.001)*	0.295(0.002)*	0.535(0.009)*

Sources: Field Work (2019) * Significant at 0.005 ** Insignificant at 0.005

Table 3 revealed positive and significant correlation between visual and kinaesthetic learning styles on academic performance in both Biology and Physics. This indicated that the more the students engage their visual sensory organ and physical component during teaching-learning process of the science subjects that is Biology and Physics, the more they are likely to perform wonderfully well in these subjects during examinations (both internal and external examination). In addition, there is positive and insignificant correlation between auditory and academic performance in Biology, Chemistry and Physic. This exhibited that auditory organ of the students is not of paramount important when it comes to their performance. This may in part be attributed to the fact that these subjects

are practical oriented which require participatory approach during classroom interaction. The outcomes is in congruent with the submission made by Vaishnav (2013) and Abidin, Rezae, Abdullah and Singh (2011) in which a positive association between learning styles and academic performance was reported. Similarly, it is in tandem with recent finding conducted on students of Filipino University in Philippines by Magulod, (2019) in which significant relationships between learning styles and students' academic performance in applied science courses was acknowledged.

Recommendation

Based on the finding of this research work, the following recommendations are made.

i. Parents need to give equal opportunities to their sibling regardless of their birth position.
ii. Students should develop and exhibit visual and kinaesthetic preferences to learn Biology, Chemistry and Physics effectively.
iii. Finally, teachers should adopt and combine teaching strategies that would accommodate students' birth order characteristics and varied learning styles.

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