Effect of Time Management and Monetary Rewards on Cognitive Task Accomplishment among Students of Nnamdi Azikiwe Secondary School, Awka, Anambra State, Nigeria

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Abstract

Good secondary education is critical to higher education and career paths. Many University secondary/high schools have distinguished themselves with good management leading to excellent performance of their students. However, it is worrisome why the performance of some students in such high impacting schools cannot average. In view of this problem, this study explored differences in cognitive task accomplishment as probable part of the causes; and evaluated time management and monetary rewards as factors. The design for the study was non-randomized control group, pre-test, post-test quasi experimental design utilizing analysis of co-variance (ANCOVA) as statistical tool. Purposive and simple random sampling was used to select 90 students from the population of 145 JS2 students of Nnamdi Azikiwe Secondary School, Awka. Three hypotheses guided the study while the Fifteen Puzzle Cognitive Task developed by Chapman (1874) to test for spatial ability in children was adopted as the instrument for engaging the participants in cognitive task ability using two experimental and two control groups. Result indicated that groups with better time management was better in cognitive task accomplishment but monetary reward was not a strong force for better performance in cognitive task accomplishment among secondary school students. The result implies that many of the participants have difficulty solving an academic within the allowed time. It is recommended while emphasizing other aspects of scholarship for improving better performance of students, students need to be trained on time management as to improve the minimum time they take to solve an academic problem both in in-course assessments and during examinations.

Key words: Academic performance; Cognitive task accomplishment; Monetary reward; Spatial ability; Time management

1. INTRODUCTION

With the greater awareness on the value chain of education, majority of today's parents want their kids to further their education to higher levels especially to tertiary levels. This is because higher education creates formal career paths for the recipients and further integrates many aspects of human development. The current competitiveness of admission into tertiary institutions is orchestrated by inadequate number of tertiary institutions in relation to Nigeria's population. Lack of infrastructure and adequate manpower (teachers) attributable to institutional and systematic corruption in Nigeria (Eze & Etodike, 2017) to utilize and maximize the capacity of existing tertiary institutions has reduced the chances for many intending students from gaining admission into tertiary institutions (Mba, 2019). This problem (challenges in education sector in Nigeria) together with individual student's challenges such as self-esteem problems (Etodike, Ike & Chukwura, 2017), lack of confidence, anxiety etc. have created untold pressures and negative outcomes in the Nigerian education system (Mba, 2019).

Without good secondary education, the hope of any secondary school student getting admission into tertiary education is jeopardized (Harry, 2020); hence, stakeholders are head over heels researching on how to improve the quality of secondary education especially as regards academic performance. Tertiary institutions such as the University have taken a lead in providing qualitative secondary education for students. However, despite their efforts in this venture; most times, the performance of their students is still lacking in relation to the competition for admission into the tertiary institutions in Nigeria (Achinewhu-Nworgu, 2019). One of the reasons for poor academic performance could be as a result of poor cognitive task accomplishment which in the long run affects the overall academic performance of students (Peng & Kievit, 2020) since learning outcomes is strongly associated with cognitive development (Alves, Gomes, Martins & da Silva Almeida, 2017). Thus, exploring factors (such as time management and monetary rewards) which may be influencing and affecting students' cognitive task accomplishment is adjudged a critical success factor to solving an academic performance puzzle.

Cognitive tasks are usually meant to generate and organize new information; it is an essential part of learning and knowledge creation and it requires the mental process of a learner to define and associate schema such that given same or similar circumstances, it can be easily recalled and retrieved from the human storage system (Kester & Kirschner 2012). According to Peng and Kievit (2020), cognitive task essentially involve memory or brain activity towards creation, identification, association, retrieval sharing and transfer of information. Cognitive abilities are brain-based abilities an individual needs to carry out any task such as memory recall (Ezeh, Okoye, Etodike & Udeze, 2018); they involve the mechanisms of how we learn, remember, problem-solve and pay attention, rather than with any actual knowledge (Alvaro & Elkhonon, 2013). Cognitive activities are deeply embedded in the concept of human intelligence (Sternberg, 2012), have been recognized in literature as critical factors in the quality of learning outcomes (Sternberg, 2012; Strenze, 2007) and thus influence academic achievement levels of students. Cognitive task accomplishment could therefore be said in relation to other factors in school setting to affect students' academic performance (Lemos, Almeida & Colom, 2011; Primi, Ferrão & Almeida 2010) albeit other influential factors of learning such family involvement (Eslava, Deaño, Alfonso, Conde & García-Señorán, 2016) and socio-economic factors (Alves, Gomes, Martins & Almeida, 2016).

The importance of cognitive task accomplishment is that task as an activity needs to be accomplished within a defined period of time; usually with certain levels of difficulty (Peng & Kievit, 2020). A task for an academic evaluation and assessment may be broken down into assignments, quizzes, projects etc which have a defined start and deadline for completion. How students perform between the time for start and completion in relation to role of combining the integration of time, energy, rewards, efforts, and ability and individual resources to meet a required set goal is referred to as task accomplishment level (Cheng, 2019). While accomplishment is something done, achieved or completed either successfully or unsuccessfully, whereas task accomplishment represents the successful completion of a task within a defined period of time. Two major types of tasks exits namely; cognitive tasks and behavioural tasks, cognitive tasks most times influence behavioural tasks and hence are usually determining factors for behaviour. This study was focused on cognitive tasks and factors (e.g. time management and monetary rewards) which may influence among students.

Time management is the action or process of planning and conducting conscious control on the time spent on particular activities, especially generating more efficiency as well as increasing productivity in relation to the task and allowed duration of task (Teng & Bidayatul, 2017). Based on definition, time management is purely solution and problem solving oriented. Major aspects of managing time may involve: organization of tasks by events or precedence, estimation of how much time that may be required for completion and the adjustments due to the occurrence of unforeseen contingence. Seelig (2019), in relating time with money emphasized that is evaluated as a sequence of and these sequences have other utility. Time importance of time management in learning outcome is overwhelming since academic ability, competence and performance are evaluated based on time; the ability differences does not lie in reproducing the actual knowledge alone but equally reproducing them within the allowed time during assessment periods (Adams & Blair, 2019). Effective management of time as a person is tipped as a success factor in academic competence as it helps in efficient academic task accomplishment (Nofsinger, 2019), therefore to improve on students academic achievement, there is need to enhance their task accomplishment through proper regulation and time management. Going by the above, the first research question and hypothesis for the study were posed:

RQ1: What is the effect of time management on cognitive task accomplishment among secondary school students?

H1: Cognitive task accomplishment among secondary school students will significantly differ across groups with different time management.

Furthermore, it is only time management that may affect cognitive task accomplishment; monetary rewards may also do. Monetary rewards is anchored on Expectancy theory (Vroom, 1964) which propounded that people

act to maximize expected satisfaction with outcomes which thus energize their ''effort-outcome expectancy'' and the valence of the outcome. Thus, the expectation of monetary reward should motivate the participants in the study to complete their tasks earlier than the participants not expecting money at the completion of the task.

In many schools setting, motivational paradigms are deployed strategically to stimulate students' zeal and resolve for academic performance. School management could utilize such paradigms such as cash or gift prizes for outstanding performance, scholarship awards, bursary, and other financial recognitions during to prizing giving day to motivate students to better performance (Al-Zoubi, 2015). Literature is consistent that increasing students' motivation is very important for educationists especially in today's educational system, where schools are continuously under pressure to improve students' performance, responsibility and accountability owing to stiff competition for fewer opportunities (Bijleveld, 2011). For instance, some teachers motivate students with the promise of rewards for the best student, extra marks for answering questions correctly and different forms of reward for good behaviour, neatness and punctuality. In practice, of all the rewards given, extrinsic rewards are the most common reward (Obi, Anebi & Dibia, 2012) in motivating individuals for accomplishing tasks. For example, in a study carried out by Bijleveld (2011) on the distinctive effects of conscious and unconscious rewards on task performance; the results indicated that participants that were consciously reminded of monetary rewards performed better on the task than the participants that were unconsciously reminded of monetary rewards. This is also supported by money motivation theory by Lea and Webley (2006) which emphasizes that people value money for its instrumentality; money enables people to achieve goals without aid from others.

In school and education system, students are also influenced by monetary rewards. One reason for this interest is the impression that students often do not exert sufficient study effort. Standard economic theory predicts a positive relationship between monetary incentives and achievement. When rewards are given, students do not perceive themselves in control of learning, they approach and complete tasks differently than when rewards are not given, and their work is judged as less creative (Al-Zoubi, 2015). By implication, repeated failures in school cause students to build barriers to protect themselves, and therefore they become uninvolved in school. Students who are motivated by extrinsic factors complete activities in order to receive an external reward. As a result, they do not work because they are interested in what they do rather; they work only to receive a reward. Considering the possible effects of monetary rewards on cognitive task accomplishment, second research question and hypothesis for the study were posed:

RQ2: What is the effect of monetary rewards on cognitive task accomplishment among secondary school students?

H2: Cognitive task accomplishment among secondary school students will significantly differ across groups with different monetary rewards.

Since monetary rewards also convey a symbolic meaning beyond their monetary value (Ponnusamy, 2016; Farooq, 2019) and facilitate performance on behavioural and cognitive tasks (Bijleveld, 2011), it may be utilized simultaneously as a method of motivating and improving the students' time management and cognitive task accomplishment; thus, an interaction effect was posed between the effects of time management and the effects of monetary rewards on cognitive task accomplishment.

RQ3: What is the interaction effect between time management and monetary reward on cognitive task accomplishment among secondary school students?

H3: There will be a significant interaction effect on Cognitive task accomplishment among secondary school students.
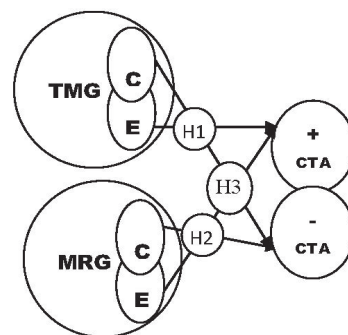
Figure 1
Conceptual model depicting the expected group effects of effective time management/non-effective time management and monetary/non-monetary groups on cognitive task accomplishment

KEY: TMG = Time management group, C = control group (non-effective time management group), E = experimental group (effective time management group), MRG = Monetary reward group, C = control group (non-monetary reward group), E = experimental groups (monetary reward group) +CTA = High level of cognitive task accomplishment, - CTA = low level of cognitive task accomplishment.

Source: Authors, 2020.

From Fig.1 depicting the conceptual model illustrated that both the experimental groups of time management group (TMG) and monetary reward group (MRG) will impact higher levels of cognitive task accomplishment than their counterpart control groups in both the time management group (TMG) and monetary reward group (MRG) with expected lower levels of cognitive task accomplishment as represented by H1 and H2. Equally the intercept as in H3 indicated an interaction effect

between time management group (TMG) and monetary reward group (MRG) on cognitive task accomplishment. The conceptual model is support by Pickle Jar theory by Wright (2002) and Expectancy theory of motivation by Vroom (1964) supporting effective management of time and use of monetary rewards expectancy could help in improving students' cognitive task accomplishment.

2. METHOD

The study employed a 3x3 factorial design; time (high time, low time, no time) and money (high money, low money, no money). The population of this study consisted of one hundred and forty-five (145) junior secondary 1 (Jss1) students in NnamdiAzikiwe university secondary school. A total number of ninety (90) students were sampled from population using the simple random sampling technique to participate in this study. Among the 90 participants, 42 were males (46.2%) and 48 were females (52.7%). The participants age ranges from 10 to 14 years with mean age of 12.47 years and a standard deviation of .8101. The jss1 class was selected because they were the only class available at the time. To carry out this research, the fifteen Puzzle developed by Chapman in 1874 was adopted as the instrument for engaging the participants in cognitive task. The puzzle is a cognitive task developed to test for spatial ability in children and it consists 15 squares numbered from number 1 to 15 that are placed in a box leaving one position out of the sixteen empty. The goal is to reposition the squares from a given starting arrangement by sliding one at a time to the proper position in which it is supposed to be. Also stopwatches were used in the study to measure time used by each participant to complete the task. Paper and pen were used to write the numbers that the participants picked. Five bowls were used to put the papers that were picked by the students. The students were told that only eighteen participants would be selected from each of the five classes since the researcher needed only 90 students for the study. Nevertheless, the students were told that they all had an opportunity to be selected. After this, they were presented with the bowls and were asked to pick one paper each from the pool of papers. After picking the papers, the students that picked the papers with No 1 to 18 were selected and the rest were asked to leave.

Experiment 1 - In the first experiment the first 45 participants were randomly assigned among one of three conditions; high time condition (25mins), low time condition (15mins), and control condition (no time) with fifteen participants in each condition and they were placed in three different classes. The participants placed on high time condition were placed in class A and were given 25mins to solve the puzzle and they comprised of 9 males and 6 females; the participants placed on low time were placed in class B and were given 15mins to solve the

puzzle and they consisted of 7 males and 8 females; while the participants placed on no time were placed in class C and they were not time bound to solve the puzzle and they consisted of 5 males and 10 females. The participants in class A with 25mins and class B with 15mins served as the experimental group while the participants in class C with no time served as the control group. It is necessary to note that the participants were matched according to their intelligence quotient before placing them in the three different groups. This was achieved with the help of the teachers who helped by placing them in groups according to their performances in their previous exams. The essence of matching them was to avoid placing more intelligent students on one particular group. Instead, they were randomly selected and randomly placed in the three different groups such that they did not differ in intelligence level at the beginning of the task. The three groups contained a total of 45 participants. The puzzle task was administered to the three groups at the same time but the ones in class B with 15mins stopped after 15mins, followed by the participants in class A with 25mins while those in class C without time were allowed as much time as they wanted. The scores were collected and served as data which was coded according to the groups in SPSS for analysis.

Experiment 2 - In experiment 2 (money condition), the participants were placed in the different classrooms: those on high money condition were placed in different classrooms; those on high money condition were placed in class D and were promised 500naira at the completion of the task; those on low money were placed in class E and were promised 200naira at the completion of the puzzle task and those on no money condition were placed in class F and were not promised money at the completion of the puzzle task. The participants in class D with 500naira and the participants in class E with 200naira served as the experimental group while the participants in class F with no time served as the control group. It is necessary to note that the participants were matched according to their intelligence quotient before placing them in the three different groups. This was achieved with the help of the teachers who helped by placing them in groups according to their performances in their previous exams. The essence of matching them was to avoid placing more intelligent students on one particular group. Instead, they were randomly selected and randomly placed in the three different groups such that they did not differ in intelligence level at the beginning of the task. The three groups contained a total of 45 participants. The puzzle task was administered to the three groups at the same time with all the groups working with a constant time which is 30mins. The scores were collected and served as data which was coded according to the groups in SPSS for analysis.

3. RESULT

Table 1
Summary table of mean and standard deviation of time management and monetary reward on cognitive task accomplishment
Descriptive statistics

Time, money code group		Mean	Std. deviation	N
High	time variables	2.6000	.63246	15
	money variables	2.4667	.51640	15
	total	2.5333	.57135	30
Low	time variables	2.3333	.48795	15
	money variables	2.4667	.74322	15
	total	2.4000	.62146	30
Control	time variables	1.5333	.51640	15
	money variables	1.7333	.59362	15
	total	1.6333	.55605	30
Total	time variables	2.1556	.70568	45
	money variables	2.2222	.70353	45
	total	2.1889	.70143	90

The mean and standard deviation result as presented in Table 1 of experiment 1 indicated that participants placed in high time (M= 2.6000, SD= .6325) performed better than those placed on low time (M= 2.333, SD= .48795) whereas those in low time condition performed better than those in no time condition (M= 1.5333, SD= .5164) in respect to cognitive task accomplishment. In experiment 2, the mean and standard deviation result as shown in table 1 indicated that participants placed in low money condition (M= 2.467, SD= .7432) performed better than the participants in the high money condition (M= 2.467, SD= .5164) whereas the latter performed better than those in no money condition (M= 1.733, SD= .5936) in respect to cognitive task accomplishment.

Table 2
ANOVA summary table of time and monetary reward on cognitive task accomplishment
Test of between subjects effects

Source	Type III sum of squares	df	Mean square	F	Sig.
Time	14.156	2	7.078	20.454	000
Money	.100	1	.100	.289	.592
Time * Money	.467	2	.233	.674	.512

From Table 2, the result indicated that statistically significant difference was found on cognitive task accomplishment between time management groups at F(2, 43) = 20.5, p < .001 therefore the first hypothesis which stated that cognitive task accomplishment among secondary school students will significantly differ across groups with different time management was confirmed. However, no statistically significant group difference was found on cognitive task accomplishment between monetary rewards groups at F (2, 43) = .289, p > .001 therefore hypothesis 2 which stated that cognitive task accomplishment among secondary school students will significantly differ across groups with different monetary rewards was not confirmed. Also, interaction effect was not found between time and monetary reward on cognitive task accomplishment as indicated at F (2, 88) = .674, p > .001, therefore hypothesis 3 was not confirmed.

4. DISCUSSION

The study investigated the effect of time and monetary reward on cognitive task accomplishment among NnamdiAzikiwe University Secondary School Students. In the first hypothesis cognitive task accomplishment among secondary school students was affected by different time management groups emphasizing the importance of prudent management of time in timely execution of cognitive tasks. The result as indicated by the statistical data in line with the findings of Gupta and Chitkara (2018) on the effect of time management on academic performance of management students which indicated that both long term time management and short term time management were significant predictors of academic performances thereby emphasizing that students with poor time management may find it difficult to accomplish cognitive tasks which are central to academic assessment. For instance, Brandstätter, Giesinger, Job and Frank (2015) on the role of deliberative versus implemental mindsets in time prediction and task accomplishment which found that on management of time, an implemental (vs. deliberative) mindset increases motivation and therefore leads to shorter, but equally biased time predictions on task accomplishment. Therefore poor task accomplishment may be associated with individual's levels of time management. The result equally indicated no interaction effect between the factors (time management and monetary reward) on cognitive task accomplishment as intra-groups (monetary reward group with effective time management group, non-monetary reward group with non-effective time management etc). Differences in other factors like: age, intelligent quotient, appropriate motivational drive or experience of the participant may have also affected the findings.

4.1 Implications of the Study

The implication of this study is that students being intelligent and the school having good management team may not be enough to translate to success factor without paying attention to individual unique academic challenges of the students. There is need to emphasize and train students not only on the school curriculum but also on the technical skills required to pass an examination such as how to effectively manage the allotted time for questions and answers and how to apportion adequate time in preparation in accordance to the subject difficulty to a particular student. For students in secondary education, monetary motivation should not be deployed as the major motivational paradigm rather other captivating activities for adolescents such as camping, picnic, and other

exciting programmes may be evaluated and integrated as motivational constructs. In order to impact on the academic performance directly and indirectly, students ought to be drilled on effective methods of cognitive task accomplishment to boost their competence and ability of mental processing which is the success recipe for outstanding academic performance.

4.2 Conclusion

Time plays a significant role in life. Students must learn early the proper use and management of time since it is a major assessment criteria throughout their academic career. Given our African background and third world status, monetary incentives may prove important in driving students' performance as they get older with more needs, they will also begin to understand the instrumentality of money and hence get motivated by it. Although managing young participants and reducing hawthorns effect to the barest minimum was a limiting and challenging factor during this experimental study; however, measures taken to reduce their effects proved efficacious. Future studies are therefore suggested to ascertain likely factors which affect students' time use and comparisons with different modes of students may also be required to confirm if this behaviour pattern is consistent across socio-cultural differences.

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