

## Synergising Workload of Mathematics Teachers on Students' Academic Performance in Mathematics in Two States of South-West Nigeria

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### Abstract

Mathematics teachers in secondary schools in Nigeria have at least five periods of mathematics per week coupled with other administrative duties they are often saddled with in the school. Their workload compared to other teachers in the same school are overwhelming. The study looked at the workload of teachers in Mathematics with regards to the academic performance of students in Mathematics in two states (Ogun and Oyo) of the South-Western part of Nigeria. Descriptive survey design was used with simple random sampling technique to select 500 Mathematics teachers (300 males and 200 females) with 624 male students and 723 female students for the study. Simple descriptive statistics was used to answer the research questions postulated. Two research instruments - "Workload Teachers Questionnaire (WTQ) and Mathematics Achievement Test (MAT)" were self-developed and used for data gathering. Four research questions were postulated and answered. The result showed that on the average Mathematics teachers have at least twenty-four (24) periods of Mathematics per week and that they spend at least eight (8) hours attending to student supervision, student counselling, administrative duties, individual curriculum planning and other cooperative curriculum planning in a week. The results also showed that Mathematics teachers spend at least twelve (12) hours per week in preparing or grading students test or examinations, reading and grading other students work, planning lessons by themselves, meeting with students outside of classroom time, meeting with parents, professional reading and developing activities, keeping student's records up to date, administrative tasks including staff meetings. There was a good positive relationship between the number of periods of teaching mathematics and academic performance of students in mathematics ( $r = 0.67, p < 0.05$ ) and also there was a good negative relationship between the number of hours spent on other duties and academic performance of students in mathematics ( $r = - 0.75, p < 0.05$ ). It is recommended that the workload of Mathematics teachers be drastically reduced to enable them to be productive and useful to themselves after school hours as most of their time are spent in teaching and performing other duties in the school.

### Keywords:

Workload,  
Mathematics  
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### **Background to the Study**

Mathematics is the study of patterns and relations expressed in numbers or symbols. It is also the science of numbers, quantity and space. The way the world is created is mathematical even as God is the greatest mathematician. The human body is mathematically fashioned by God and we can demonstrate very many mathematical ideas and symbols from it. It is fundamental to the understanding of basic science that is necessary for the understanding of most other school subjects. The usefulness of mathematics in everyday life is obvious in areas like measuring, estimating the prices of goods when shopping, cooking, sewing, woodwork, household wares. Understanding of percent, large numbers and basic statistics are essential in order to understand information in newspapers and school books. As adults, we need to be able to calculate taxes, compare payment methods, figure out loans and home budgets. The contributions that mathematical knowledge and skills have made to economic, industrial and technological growth of modern world are quite obvious to almost everyone. It enters into all areas of human activities. The importance of mathematics does not only lie in its contributions to scientific and technological development but also in its utility in day-to-day interactions at the market places, transportations, business of all sorts by both literate and illiterate members of the society. Mathematics is needed in the world today much more than before since a lot of equipment based on digital development is going on and calculations are becoming much more complex. Hence we cannot escape mathematics because there is real value in and real-life applications for mathematics. Mathematics has beauty just as it has patterns. Mathematics is a tool and is a language even as it has many uses. For students to be effective in the present age there is need for them to be properly prepared and equipped to face the challenges ahead.

Mathematics as a subject is a very important tool that could be used for the understanding of science and technology and its application cuts across all areas of human endeavour. Mathematics as a school subject has over the years attracted the interest of mathematics educators and researchers who are concerned about the teaching and learning of the subject and also how the workload of the teachers had impacted on the performance of their students. The importance of mathematics in daily life and its contribution to mankind has given the subject the prominence it enjoys among other school subjects. This has earned it the status of the core subject in the school curriculum at both primary and secondary levels and that is why the Federal Government of Nigeria has made it a compulsory subject in the Primary and Secondary schools (National Policy on Education, 2004, section 4(19) page 17). Its inclusion as a core subject in the secondary school calls for the need to teach it effectively. This is because effective mathematics teaching can lead to the attainment of scientific and technological greatness. Mathematics teaching can only be result-oriented when students are willing and the teachers are favourably disposed, using the appropriate methods and resources in teaching the students. The learning of mathematics depends on the way it is presented to the learner, the way the learner actively interacts with the learning experiences presented to him and the environment within which the learning takes place. With the current increase in scientific knowledge the world over, much demand is placed and emphasis is laid on the teacher.

The workload of teachers include the actual teaching carried out in the classroom, marking of students' work and assignment, supervision of students during the school time and after school like preparatory time, games, time-tabling, examination, supervision of other teachers at work and other duties that may be assigned to them by the school authority. There has been conflicting research reports as to whether the workload of teachers of mathematics has improved their productivity and made them better teachers or not. Just as some researchers are of the view that workload of teachers with larger class size have greatly impacted on their dwindling productivity others like Scott, Stone and Dinham (2001) are of the view that the introduction of many reporting and documenting requirements as well as the standardization of many aspects of teaching contributes both to increase in overall workload and to the erosion of the pleasures like flexibility, creativity, challenge teachers have on the job. Other research reports like the Australian Council for Education Research (ACER, 2004) report have shown that what create extra stress or work for teachers are their perception of level of personal commitment to teaching and students, support for and management of student behaviour, adequacy of resources and support, effective use of Information and Communication Technology (ICT), compliance requirement and paperwork.

The Secondary Section of the National Council of Teachers of English (NCTE, 1990) recommends that schools, districts, and states adopt plans and implement activities resulting in class sizes of not more than 20 and a workload of not more than 80 for English language arts teachers by the year 2000. Effective learning demands opportunities for students to become actively involved in their education, and demands many roles for their teachers like teacher as facilitator, as enabler, not only as lecturer and transmitter of knowledge. These opportunities and roles cannot be achieved when teachers are faced with large classes and heavy workloads. According to the report:

1. A teacher who faces 25 students in a class period of 50 minutes has no more than 2 minutes, at best, per pupil for one-to-one interaction during any period.
2. The greater the number of students in a class, the fewer the opportunities for students to participate orally.
3. The larger the number of students in a class, the greater the amount of time devoted to classroom management rather than instruction.
4. The larger the class size, the less likely teachers are to develop lessons encouraging higher-level thinking.
5. Teachers of larger classes are more likely to spend less time with each student paper, and to concentrate on mechanics rather than on style and content.

The NCTE (2000) also noted that policymakers must realize that when a teacher spends 20 minutes reading, analyzing, and responding to each paper for a class of 25 students, the teacher must have 500 minutes for those processes alone. A teacher with 125 students who spends only 20 minutes per paper must have at least 2500 minutes, or a total of nearly 42 hours, to respond to each assignment. Therefore, responding to one paper per week for each of their 125 students requires English teachers to work over 80 hours a week.

In an independent review carried out by Pricewaterhouse Coopers in 2004 in England on workload of teachers in schools that made teachers' suspending a dispute which had forced some schools onto a four-day week, it was revealed that teachers' unions have long complained that staff were suffering from over-work, with a combination of paperwork, staff shortages and government initiatives leading to a wave of stress, ill-health and early retirement. In place of what they claim is an overload, teachers are calling for a 35-hour working week. An interim report from the review confirmed that many teachers are working over 50 hours a week some exceeding 60 hours. Although as an annual average, teachers do not work longer than other comparable professions; the report found that teachers faced more "intensive" hours than "most other occupations". Among the practical ways of reducing workload according to the report are:

1. passing on non-teaching tasks to administrative staff
2. making greater use of new technology
3. increase planning time for teachers
4. examine the organisation of schools where there appears to be less of a problem
5. the government should consider the staffing implications of reforms

Smithers (2007) reported in the Education Guardian of United Kingdom of Thursday February 2007 in a survey carried out that teachers and lecturers typically work more than 11 hours of unpaid overtime every week - more than any other professional group. If they were paid for their regular overtime, they would be taking home almost an extra £10,000 a year according to the new figures from the Trades Union Congress. The survey also showed that despite a slight downturn in the amount of unpaid overtime, education professionals top the poll of occupations with the most additional unpaid hours. The report also revealed that teachers work over an hour a week more than the second busiest group - senior officers in the police, fire and armed services.

The Australian Council for Educational Research (ACER) and the New Zealand Council for Educational Research (NZCER) undertook case studies of secondary teachers' workload in 2004 and came up with the following findings. The key findings of the study are:

1. That "moderate to severe" workload problems among teachers and managers in New Zealand secondary schools.
2. That the actual number of hours worked by teachers and middle managers in secondary schools was high, but comparable with hours worked by teachers in other countries and by people in comparable professions.
3. That middle managers (mainly Head of Departments) were clearly the group most affected by workload, largely related to their responsibilities in the areas of assessment, curriculum and performance review. Middle managers indicated that the difficulties experienced related less to the nature of the duties than to the lack of time and support to perform them.
4. That manageability of workload relates more to stress than to the number of actual hours worked. The report suggested that identified sources of stress need to be further investigated and addressed.

5. That middle managers and teachers were observed to be strongly motivated and committed to helping students achieve their academic and personal potential.
6. That Principals, middle managers and teachers see the most important factors in addressing workload and stress which include increased support to reduce workload/stress coming from the provision of additional (quality) staffing, and additional provision for time to do professional work outside of the classroom.

The findings also revealed how hard teachers work and found out that the total average hours per week worked by teachers without management responsibilities was 43 (based on teachers' own estimates at interview) or 49 (based on figures from the survey). The total average hours per week worked by middle managers were 51 (based on middle managers' own estimates at interview) or 59 (based on figures from the survey). This comprised scheduled classroom duties and management duties. The averages include weekends but not holiday periods. Almost all teachers described their workload as 'heavy', but said it was manageable, most of the time. A significant number said that at certain 'peak' periods, workload exceeded their capacity to manage it and that this negatively affected their teaching.

Part of the report identified those things that create extra work or stress and found out that different factors in different schools made a difference to teachers' perceptions of workload. These were: levels of personal commitment to teaching and students; support for and management of student behaviour/pastoral care; adequacy of resources and support; leadership and shared vision; development of best practice through professional communities and professional learning; effective use of ICT; amount of non-contact time; the number of support staff; compliance requirements, particularly paperwork associated with National Council of Educational Administration (NCEA).

On the question of how satisfied are teachers with their work, the findings revealed that managers and teachers in schools showed very high levels of personal commitment to their work. Teachers and senior managers, overall, were more satisfied with work-life balance than middle managers. Females were less satisfied with their workload and work-life balance than males. New teachers, on average, found their work more manageable and were more satisfied with their workload and life-work balance than other teachers. The findings further revealed the strategies teachers and schools developed to manage workloads and found out that teachers and schools have developed a range of strategies to facilitate managing of workloads, for example prioritising tasks, using support staff for non-professional duties, minimising the number of meetings and using the meeting time more effectively, timetabling blocks of time for teachers to meet, and 'filtering' the demands of outside agencies.

A valuable strategy for managing teachers' workload was that of capacity building - providing teachers with the knowledge and skills they needed to work as competent professionals. More effective performance lightens workload and increases job satisfaction. The report suggested a range of support measures which could be developed, such as:

1. Building supportive and accountable professional cultures in schools.
2. Providing managers and teachers with more time for collaborative planning and individual work outside the classroom.
3. Improving professional development to increase efficiency as well as effectiveness, especially in areas such as planning and marking students' work.
4. Improving policies and strategies for managing student behaviour, including the employment of specialist staff.
5. Improving and increasing the use of ICT
6. Transferring clerical and administrative work to non-teaching support staff
7. Making more resources available through electronic means, especially to support the NCEA
8. Improving the quality of the work environment.

The research findings finally concluded that teachers' perceptions of workload appeared to be more positive when they were working collaboratively in accordance with a shared vision under strong leadership. Schools are most effective when staff have shared goals and values, strive to achieve strong professional community and ensure access to on-going professional learning.

Garfinkle (2019) was of the view that the following tips can be applied to reducing workload and stress levels of people. Prioritizing, scheduling day around those priorities, learning to say no, don't be afraid to negotiate, dare to delegate, setting boundaries and sticking to them, taking advantage of time management training, getting the tools you need to be more efficient, brainstorming with team members and asking for help.

The Cooper Gibson research report of the British Department for Education (2019) titled "Exploring Teacher Workload: qualitative research" – research report in March 2018 gave the following in their executive summary of ways to reduce workload of teachers – reduction in reporting requirements, encouraging collaboration, new marking and planning strategies, use of specific software, increased focus on staff wellbeing, developing home-work strategies, limiting working hours, administrative self-discipline.

In Nigeria secondary schools, most Mathematics teachers in public schools generally have between five to eight periods of Mathematics classes in a week. This is apart from the other duties that are assigned to them like preparation of school time-table, examination time table, class tutor, supervision of classes and other administrative duties. The numbers of students in these classes also add more work on the Mathematics teachers as they have to mark the class work given to the students and their assignments. The workload of teachers in Nigerian secondary schools is so much that the teacher is always worn-out after the days' work. The researcher is of the view that less periods (preferably three periods per week) of Mathematics be allotted to Mathematics teachers in order for them to be able to manage effectively the classes and the students and be able

to give individual attention to students for better performance. It is against this background that this study looked at the effect of the workload of teachers of Mathematics on the performance of their students.

### **Methodology**

**Research Design:** The descriptive survey research design is used for this study. This is because the researcher had no direct control over the independent variables as they have manifested already.

**Research question:** The study was guided by the question postulated thus:

1. What is the average number of periods spent on teaching Mathematics per week?
2. What is the average number of periods spent on other duties by Mathematics teachers per week?
3. Is there any relationship between the number of periods of teaching mathematics and academic performance of students in mathematics?
4. Is there any relationship between the number of hours spent on other duties and academic performance of students in mathematics?

### **Sample and sampling technique:**

Simple random sampling procedure was used to select schools and subjects for the study. Two public senior secondary schools were selected in each of the senatorial districts of Ogun and Oyo states (making a total of 12 schools) for uniformity sake. Simple random sampling technique was used in selecting an arm of SS2 class from each of the two schools in the three senatorial districts from Ogun and Oyo states. All the mathematics teachers teaching senior secondary classes were selected from each school. Intact classes were used during the study. Students in senior secondary two classes in these schools were used for the study.

### **Instruments**

Two instruments; Mathematics Achievement Test (MAT), Workload Teachers Questionnaire(WTQ) were used in collecting data for the study.

MAT was self-developed instrument to assess the level of acquisition of mathematical concepts of the students. It covers the main topics of mathematics taught in SS2 up to the third term of the school year. It consists of 40-item multiple-choice questions with 4 options A to D and was based on three cognitive levels – “knowledge”, “understanding” and “application”. The MAT was given to some Mathematics teachers in secondary schools and mathematics educators for scrutiny to ascertain its content validity. MAT was trial tested on 50 SS II students in three different schools in Ibadan metropolis. Kuder- Richardson formula KR-20 was used to determine the reliability coefficient. The value obtained was 0.65. The discriminating indices for each of the 40 items in the MAT as well as the average difficulty levels were computed. In order to ensure that it contains task at the various cognitive levels, the table of specification as shown in Table 1 was used. The average difficulty index obtained was 0.52 which shows that the instrument was neither too difficult nor too simple.

**Table 1:** Table of Specification for MAT

SN	Topics	Knowledge No. of item 30%	Understanding No. of item 47%	Application No. of item 23%	Total No. of items
1	Mensuration (22)	4	4	2	10
2	Numbers and Numeration (16)	2	3	2	7
3	Plane Geometry(20)	2	4	2	8
4	Equations & Inequalities (12)	1	1	1	3
5	Algebraic expressions (14)	2	3	1	6
6	Statistics and Probability (16)	1	4	1	6
	<b>Total</b>	12	19	9	40

WTQ was developed by adapting the Third International Mathematics and Science Study (TIMSS) questionnaire. It consists of 10 questions dealing with the name of the school, age, gender, qualification, years of experience, number of students in the mathematics class of teachers, number of periods of teaching mathematics in a week, number of hours spent on other activities outside the formal school day like keeping students' records up to date and administrative tasks including staff meetings which has the options "None", "less than 1 hour", "1-2 hours", "3-4 hours", "more than 4 hours". The WTQ was given to some Mathematics teachers in secondary schools and mathematics educators for scrutiny. The WTQ was administered on 20 senior secondary 2 mathematics teachers in eight different schools in Ibadan metropolis. The Cronbach alpha was used to determine the reliability coefficient. The value obtained was 0.58. The Mathematics Achievement Test (MAT) was administered to the SS2 students while the Workload Teachers Questionnaire (WTQ) was given to senior secondary mathematics teachers to respond to and collected thereafter.

### Data Analysis

The data collected were analyzed using simple descriptive statistics and Pearson Moment Correlation statistics to answer the four research questions raised.

### Results and Discussions

The results are discussed according to the research questions postulated.

**Research question one:** What is the average number of periods spent on teaching Mathematics per week? From the results of the respondents, it was discovered that the average number of periods spent on teaching Mathematics from Monday to Friday of Mathematics teachers in the schools used for the study was 24 periods. This implies that Mathematics teachers spent on the average 24 hours per week to teach Mathematics. This is apart from other administrative duties that are assigned to them. It also implies that on a daily basis, a Mathematics teacher teaches for at least five (5) hours. This could be



strenuous and stressful and really very exerting on the physical well-being of the teachers and ultimately results into their being worn-out on a daily basis. This also may be one of the reasons why teachers do not have enough time to take care of individual differences among students in the class even as the population of the students may be too large for this to be effected.

**Research question two:** What is the average number of periods spent on other duties by Mathematics teachers per week? The results showed that in one week from Monday to Friday number of single periods used in performing each of the following are: (a) Student supervision = 3 hours (b) Student counselling/appraisal = 1 hour (c) Administrative duties = 1 hour (d) Individual curriculum panning = 1hour (e) Cooperative curriculum planning = 1hour (f) Other non-student contact time = 1hour. The results also showed that the number of hours spent per week to do the following are: (a) Preparing or grading student test or exams = 2hours (b) Reading and grading other student work = 1 hour. (c) Planning lessons by yourself = 1 hour. (d) Meeting with students outside of classroom time = 1 hour. (e) Meeting with parents =1 hour. (f) Professional reading & development activity = 1 hour. (g) Keeping students' records up to date = 2 hours. (h) Administrative tasks including staff meetings = 1 hour. (i) Others = 1 hour. This showed that on the average the teacher spends at least 19 hours attending to other administrative duties per week. This is rather too high and too much for the teacher to bear. This will invariably weary out the teacher who may not be able to do any tangible thing for himself after school.

**Research Question three:** Is there any relationship between the number of periods of teaching mathematics and academic performance of students in mathematics?

**Table 2.**

N	MEAN	SD	R	Sig.
1347	23.75	9.87	0.67	*

a. Sig. at  $p < 0.05$

From the results in table 2, there is a significant relationship between the number of periods of teaching Mathematics and the academic performance of students in Mathematics. This result is indicative of the fact that the number of periods the Mathematics teacher uses in teaching the subject do a great deal to the understanding of the subject to the learners. The more periods or time spent with the students, the better the understanding of the subject matter to the students. This is imperative in the sense that the teacher of Mathematics need to interact with the students to explain more difficult areas of the subject to the students. It is serves as a means of getting to know the weaknesses of the students in order to meliorate such deficiencies in them. It also serves as an avenue for the teacher to understand individual differences and areas of needs of the students in order to ameliorate such. The closer the teacher of Mathematics to the students, the more the students get to know the teacher better and this will serve as an

avenue for the students to know the teacher better. It will serve as a break in attitude difference between the teacher and the students which will ultimately lead to better understanding of the subject by the students.

**Research Question four:** Is there any relationship between the number of hours spent on other duties and academic performance of students in mathematics?

**Table 3.**

N	MEAN	SD	R	Sig.
1346	34.57	8.96	-0.75	*

a. Sig. at  $p < 0.05$

From the results in table 3, there is a good negative relationship between the number of hours spent on other duties and academic achievement of students in Mathematics. This shows that the more hours spent by Mathematics teachers on other duties the poorer the students are academically. This results clearly showed that the Mathematics teachers would have been worn-out after spending quality time with the students teaching Mathematics and as such could not perform better when faced with other duties. On the other hand, the results showed that the better the academic performance of students in Mathematics, the less number of periods spent on other duties by Mathematics teachers. This is in line with what some researchers like Annesley (2001), Scott, Stone and Dinham (2001) said that the introduction of many reporting and documenting requirements as well as the standardization of many aspects of teaching contributes both to increase in overall workload and to the erosion of the pleasures like flexibility, creativity, challenge teachers have on the job. Other research reports like the Australian Council for Education Research (ACER, 2004) report have shown that what create extra stress or work for teachers are their perception of level of personal commitment to teaching and students, support for and management of student behaviour, adequacy of resources and support, effective use of Information and Communication Technology (ICT), compliance requirement and paperwork.

### **Conclusion and Recommendation**

The results from the study showed that there a positive good relationship between the number of periods spent teaching Mathematics and academic achievement of students. It also showed that there a good negative relationship between the periods spent on other duties and academic achievement of students in Mathematics. This results showed that the more periods spent in teaching Mathematics the better the academic achievement of students in Mathematics and the more hours spent on other duties the poorer the academic achievement of students in Mathematics. The implication of this result is a pointer to the reality of what is happening in the classroom in most of our schools. Most teachers of mathematics have an average of five periods of teaching mathematics a day. This is apart from the other duties they are engaged in the day-to-day running of the school like preparation of the school time-table, examination committee and other school activities. It is therefore recommended that mathematics teachers should be allowed to

teach at most three periods of mathematics a day to be able to attend to other important duties like marking of students' class work and assignment, giving attention to individual students' needs and be saddled with less administrative duties. This will make the Mathematics teacher more productive after school hours.

### References

- ACER (2004). *Teachers workforce and Careers*. Secondary teacher workload study report. Australian Council for Educational Research Report of 2005.
- Federal Republic of Nigeria (2004). *National Policy on Education (Revised)*, Lagos: NERC Press.
- Garfinkle, J. (2019). *Tips to reduce both your workload and stress levels*. Retrieved from <https://careeradvancement.blog.com/reduce-work-load-stress> on Monday 18, 2019.
- Gibson, C. (2019). Workload Challenge: Retrieved from <https://www.gov.uk/government/publications/workload-challenge-analysis-of-teacher-responses> on Monday 18, 2019.
- Scott, C., Stone, B., & Dinham, S. (2001). I love Teaching ...in International Patterns of Teacher Disconnect. *Education Policy Analysis Archives*, 9 (28), ISSN 1068 – 2341
- Smithers, C (2007). *Education Guardian of United Kingdom*, February.
- N.E.A. Report (1986). *Class Size*, Nashville Tennessee State. Department and Education.
- NCTE (1990). *National Council of Teachers Education*
- NCTE (2000). *National Council of Teachers Education*
- NCEA- National Council of Educational Administration
- NZCER (2004). *New Zealand Council for Educational Research*. Report of 2004-2005 Executive Summary.