Kontagora Journal of Science and Technology (KONJOST)
2025, Vol. 18, No.1-2, pp.107-114 | ISSN:1118-9673 (print)
https://doi.org/10.5281/zenodo.17945241

Research Article

Impact of Subject Reduction on cognitive load and Mathematics performance in Nigerian basic education

H. Muhammad[a*] & O. O. Niyi[a]

[a] *Department of Mathematics, Federal University of Education Kontagora Niger State, Nigeria.*

Abstract

This study investigates the effect of reducing the number of subjects students are required to take on their cognitive load and academic performance in mathematics within the Nigerian education system. The research employed a quasi-experimental design grounded in Cognitive Load Theory (CLT), utilizing pre- and post-test surveys to assess students' achievements in mathematics, alongside a cognitive load scale to measure perceived mental effort. A total of 500 students and 30 teachers from selected public schools across six states in the North-East region of Nigeria participated in the study. Data were collected via the Kobo Collect platform. The Mathematics Achievement Test consisted of 32 items, while the Cognitive Load Scale contained 21 items. Both instruments exhibited high internal consistency, with Standard Cronbach's alpha values of 0.87 for the Mathematics Achievement Test and 0.82 for the Cognitive Load Scale respectively. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), which facilitated both descriptive and inferential statistical procedures. The findings revealed a significant reduction in cognitive load among students taught using the reduced curriculum along with and improvement in their academic performance in mathematics. The treatment group achieved an average post-test score of 79.3%, compared to 65.4% in the control group, with this difference being statistically significant ($p < 0.05$). These results indicate that reducing the number of subjects alleviates students' cognitive burden and enhances their academic performance in mathematics. The null hypothesis, which proposed no significant difference between the two groups, was rejected, confirming that subject reduction leads to lower cognitive load and improved academic achievement.

KEYWORD; Subject Reduction, Cognitive Load, Mathematics Education, Academic Performance, Mixed-Methods Approach, quasi experimental design.

1. Introduction

The education sector in Nigeria has experienced various reforms over the recent years though the challenges of poor performance in its education sector especially in Mathematics still persist in discouraging development. The basic education in Nigeria is aimed at providing students with the necessary skills in the most diverse range of subjects. The present curriculum however, with its excessive content, does not allow learners to concentrate on the key subjects such as Mathematics and be able to learn the basic concepts in depth. Being a subject that has to be learned in a sequence, mathematics is particularly susceptible to the effects of curriculum overload and thus making it hard to impart to students complicated concepts. The theory of Cognitive Load Theory (CLT) introduced by Sweller (1988) assumes that human working memory is limited, and when cognitive load goes beyond the limit, it disrupts the learning process (Paas, Renkl, and Sweller, 2003). This theory is important in the comprehension of the barriers that overloaded curriculum poses to the ability of students to learn subjects such as Mathematics on a deeper level.

Subject reduction is suggested as one of the strategies to decrease cognitive overload and improve student performance, especially in the field of Mathematics. A simplified curriculum, which involves a decrease in the number of subjects ensures that students focus on major subjects especially Mathematics, which leads to improved

*Corresponding author: H. Muhammad
Email: profmaths781@fcekg.edu.ng (H. Muhammad)
ORCiD: https://orcid.org/0009-0007-0095-1489↗
Received: 13/10/2025; **Accepted:** 29/11/2025; **Published:** 30/11/2025

performance in learners. Cognitive Load Theory (CLT) provides a valuable theoretical approach to consider the minimization of non-essential courses that may maximize cognitive resources so that students were able to focus more on Mathematics. There are three cognitive load types, including intrinsic, extraneous, and germane load types, which determine learning and knowledge acquisition (Gillmor et al., 2015). Intrinsic load is the complexity of material under study that is an inherent factor whereas extrinsic load is the poor design of methods used to teach. However, the mental effort that builds schemas that facilitate the deep learning is known as germane load (Martin et al., 2023). It aims at reducing extraneous cognitive load and enhancing germane load to help in construction of meaningful knowledge.

Mathematics, is a very challenging subject in terms of cognition as it is abstract and the students have to work with symbols and imagine the things. These mathematical subjects, as CLT implies, already have high intrinsic load, which can overpower the cognitive capacity of students in case extraneous cognitive load is added (Sweller et al., 2011). As an example, when learning to solve linear equations or finding factors of a particularpolyomial, learning the standards operations is just half of the task since it is also important to know the general patterns and apply them in different situations. When students are presented with a lot of mathematical concepts at once, they cannot learn them due to the cognitive load (Paas et al., 2003).

Mathematics is associated with extrinsic and intrinsic cognitive load because mental processing is required to be visual-spatial and manipulation of mental images to take place. The inherent load is compounded by the complexity of Mathematics proofs and transformations and extraneous load may arise when students are shown very complex visual representations or instructions that are not designed (Gkintoni, Vagenas & Papageorgiou, 2025). According to CLT, mathematical knowledge processing and storage abilities of students can be enhanced through reducing such cognitive loads, example. making problems easier to solve or providing them with expert-created samples (Wang et al., 2022). This decrease in cognitive load is especially significant in Mathematics where learners should master concepts to be able to use them in problem-solving situations.

However, overloaded curriculum is a tendency of the Nigerian educational system. A student is supposed to study many subjects within a small period of time and this causes cognitive overload. This excess renders students unable to master important concepts in Mathematics. Studies have demonstrated that too much curricular material increases extraneous cognitive load, which results in a shallow learning process and conceptual incomprehension (O'Connor & Norton, 2022; Harilal et al., 2024). This is usually done to memorize tests and students who do not get the facts with depth they do not learn deeply in Mathematics as they do not build the long-term cognitive schemas required to learn (Mahlaba, 2020). This is worsened by the fact that there is a tendency to teach too many things and too little time to process and absorb the information, which prevents the creation of coherent knowledge of the topic in students (D'Eon, 2023).

This can be minimized by reducing the size of the curriculum to enable students to cover the most vital aspects of Mathematics. Research indicates that an intensified curriculum improves recall ability and problem-solving skills through decreased extraneous cognitive load (Zheng & Gupta, 2020). The study by O'Connor and Norton (2022) and others also emphasizes the adverse effects of the curriculum overload on the students with regard to their capacity to study and learn more complicated topics such as Mathematics, which once again proves the necessity of curricular simplification. Besides, the emphasis on basic mathematical ideas will facilitate more in-depth learning and building higher-level thought and problem-solving skills required of students to think mathematically and solve problems (Curriculum Overload, 2020).

The study is an expansion of the literature that offers the impact of the reduction in subject to the cognitive load and academic performance in Mathematics in the Nigerian context. It fills an important gap in educational research that incorporating curriculum streamlining can be used to maximize cognitive load and improve student performance, especially in Mathematics. In this study we hope to illustrate the advantages of contracting the amount of subjects taught in schools and how the method can result in more intensive and productive learning in Mathematics.

This study examines the effect of reducing the number of subjects on cognitive load and academic performance in Mathematics in Nigerian schools, focusing on the challenges associated with an overloaded curriculum. The objectives are as follows:

(i) To determine the effect of reducing the subject in the cognitive load of the students in Mathematics.
(ii) To test the connection between lower cognitive load and the level of academic performance in Mathematics.
(iii) To explore students' and teachers' perceptions of cognitive load following the introduction of subject reduction in the Basic Education system in Nigeria and investigate how these perceptions relate to improved outcomes in Mathematics.

This study is guided by the following research questions:

1. What is the impact of reducing the number of subject toperceived cognitive load of students in Mathematics?
2. How does decreased cognitive load affect Academic performance of students in

Mathematics?

3. What are students' and teachers' perceptions of cognitive load after the introduction of subject reduction in the Basic education system in Nigeria, and how does this relate to improved outcomes in Mathematics?

This study tests two hypotheses to assess the impact of subject reduction on cognitive load and academic performance in Mathematics. The null hypothesis

H_0: posits that there is no significant difference in cognitive load and academic performance between students exposed to a reduced curriculum and those following the overloaded traditional curriculum.

2. Methodology

2.1. Research Design

This study employed a quasi-experimental and survey design to examine the impact of subject reduction on cognitive load and academic performance in Mathematics. The design included two groups, the treatment group that had a reduced curriculum, where the emphasis was on Mathematics and the control group, which has the traditional curriculum, which is broad in its subjects.

2.2 Population and Sampling

The sampling population of 500 students and 30 teachers were selected from six states in the North-East region of Nigeria The students were randomly assigned to the treatment or control group, with 250 students in each group. Simple random sampling was used to ensure that the sample was representative of the student population. The teachers were involved in giving information on the instructional practice and curriculum adjustments in 18 respective schools. This method helped the study to measure the performance of students as well as the teacher attitude towards the changes in the curriculum.

2.3 Instruments

2.3.1 Mathematics Achievement Test

It was a 32-item test, which was aimed to assess the knowledge of the main mathematical concepts, problem-solving, and procedural knowledge of students. The test was pilot-tested to assess how effectively students could apply mathematical concepts to various situations.

The measure was checked and the Standard Cronbach alpha reliability coefficient of the measure was 0.82 which is high.

2.3.2. Cognitive Load Scale

The Cognitive Load Scale consisted of 21 items adapted to measure students' perceived cognitive load in learning Mathematics. The scale assessed dimensions such as mental effort, fatigue, and the perceived difficulty of mathematical concepts. The scale items were rated using a 5-point Likert scale, defined as follows:

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

2.3.3. Pilot Testing

A pilot study was carried out on 50 students who did not make up the study sample. The pilot test was done to define the absence of any problems with the clarity of the questions and the general structure of the instruments. After the pilot test, some of the items were amended to be clear and any challenging questions eliminated.

Both instruments were tested to be reliable with the help of the pilot test. The Mathematics Achievement Test has Cronbachs alpha of 0.87 which is high in terms of internal consistency. The Cognitive Load scale gave a Cronbach alpha of 0.82 as well indicating good reliability.

2.4 Data Collection Procedure

The data collection was done during the last academic term where these two groups were put through their respective curriculum. The number of subjects in the treatment group was low and specialization was on one subject, Mathematics as compared to control group which used standard curriculum which had broader subject base.

Pre-test: Mathematics Achievement Test and Cognitive Load Scale were administered to both groups to identify the cognitive load and performance of the two groups before the intervention.

Post-Test: The two groups were at the end of the term again tested using the same instruments to ascertain the difference in cognitive load and academic performance. The data collection was carried out by the use of the Kobo Collect Form which ensured consistency and accuracy in all participants.

2.5 Data Analysis

The analysis method was matched with the nature of each research question. Table 1 presented the cognitive load ratings of students in descriptive statistics (means, frequencies, and percentages). Only Research Question 1 and Research Question 2 involved the use of independent samples t-tests to compare scores on cognitive load and academic performance in the treatment and control groups.

The descriptive statistics and qualitative summaries were used to analyze Research Question 3 which involved the perception of both the students and teachers unlike the inferential tests. The difference will make sure that every research question is answered with the help of a relevant analytical procedure. This study was conducted to establish the consequences of subject reduction on cognitive workload of the students, their achievement in Mathematics and feasibility of subject reduction in the education system of north east region in Nigeria. The findings are shown below.

The data were analyzed with the help of Statistical Package of the Social Sciences (SPSS). Only those variables that needed numerical comparison between groups were the independent variables which included cognitive load scores and academic performance scores of the treatment group (reduced curriculum) and the control group (traditional curriculum). The independent samples t-tests were used. This method allowed to compare accurately the effects of the

means and gave high enough statistic power to test the hypotheses of the study.

However, research questions that included the perception of students and teachers were examined under the descriptive statistics and qualitative summation since such questions could not be analysed with t-tests.

3. Results

This section reports results of the data analysed from the control and treatment groups. Table 1 shows the cognitive load rating for the treatment and the control groups. Descriptive results indicate that the treatment group had reduced curriculum teaching reported having a lower cognitive load on all items measured in the study than the control group. Lower prevalence of difficulty in comprehending concepts (2.4 compared with 3.2), mental effort needed (3.1 compared with 4.0), feeling overwhelmed (2.6 compared with 3.8), time pressure (2.9 compared with 3.5), and fatigue during lessons (2.5 compared with 3.7) were lower in the treatment group. These trends suggest that the students who had less subjects to handle were able to grasp Mathematics concepts easier with less mental effort, less pressure and harassment and experienced reduced fatigue as they were taught. All in all, the descriptive results are that subject reduction assisted in reducing the cognitive load so that students could better focus on the actual mathematical material.

3.1. Answers to research Questions

3.1.1 Research Question 1

Research Question1: *What is the impact of reducing the number of subjects on the perceived cognitive load of students in Mathematics?*

Table 1: Cognitive Load Ratings for Treatment and Control Groups

Item	Control Group (Mean)	Treatment Group (Mean)	Difference (Mean)
Difficulty in understanding concepts	3.2	2.4	-0.8
Mental effort required	4.0	3.1	-0.9
Feeling of being overwhelmed	3.8	2.6	-1.2
Time pressure	3.5	2.9	-0.6
Fatigue during lessons	3.7	2.5	-1.2

Table 2: Cognitive Load Ratings for Treatment and Control Groups

Cognitive Load Item	Control Mean	Treatment Mean	Mean Difference	t-value	df	p-value
Difficulty in understanding concepts	3.2	2.4	–0.8	5.50	498	0.001
Mental effort required	4.0	3.1	–0.9	6.00	498	0.004
Feeling overwhelmed	3.8	2.6	–1.2	6.10	498	0.002
Time pressure experienced	3.5	2.9	–0.6	4.70	498	0.008
Fatigue during lessons	3.7	2.5	–1.2	5.90	498	0.003

Table 2 results indicate that students in the control group had statistically significant higher scores on cognitive load in all the items than those in the treatment group. As an illustration, the mean score of the control group on difficulty in concepts understanding, 4.0 of mental effort required, 3.8 of feeling overwhelmed, 3.5 of time pressure, and 3.7 of fatigue during lessons was 3.2, 4.0, 3.8, 3.5, and 3.7 respectively. Conversely, the treatment group have lower means of 2.4, 3.1, 2.6, 2.9 and 2.5 respectively. All the mean differences (between -0.6 and -1.2) were statistically significant ($p < 0.05$), which means that cognitive load of the students in reduced curriculum was significantly lower. These findings indicate that the smaller condition subject load decreased cognitive work, minimized feelings of being overwhelmed and tired, and facilitated learning mathematical ideas in students.

3.1.2. Research Question 2

Research Question 2: *How does decreased cognitive load affect academic performance in Mathematics?*

Group	Mean Score (%)	Standard Deviation
Control Group	65.4	10.2
Treatment Group	79.3	8.4

In Table 3, the post-test academic performance of the two groups is presented and it demonstrates a significant difference in the level of achievement. The results of the control group were 65.4% with a standard deviation of 10.2, whereas the 79.3% mean score of the treatment group were higher with a standard deviation of 8.4. This shows that reduced curriculum had positive influence on mastering mathematics by students. These results demonstrate that the decrease in cognitive load in the form of a decrease in the number of subjects translated into better academic results, and students in the treatment group were able to work more regularly and achieve higher overall scores.

3.1.3. Research Question 3

Research Question 3: *What are students' and teachers' perceptions of cognitive load after the introduction of subject reduction in Basic Education, and how does this relate to improved outcomes in Mathematics?*

Table 4: Students' Perceptions of Cognitive Load After Curriculum Reduction

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
The reduced curriculum helped me focus better on Mathematics.	100	113	25	8	5
I felt less mentally exhausted after Mathematics lessons.	88	120	30	8	5
The fewer subjects made it easier for me to understand Mathematics.	105	115	20	5	5
I was able to engage more in problem-solving activities in Mathematics.	95	125	20	8	2
The time allocated for Mathematics was sufficient to understand the material.	100	113	25	8	5

Table 4 and 5 were used to answer research questions 3. Table 4 shows the frequency of the results of the students with respect to their views on the cognitive load following the implementation of the reduced-subject curriculum. Out of 250 students, the findings indicate that there is a distinct and congruent trend of positive attitudes to the streamlined curriculum.

There is an overall trend that in all the five statements, the highest frequencies lie in the strongly agree and agree categories. This shows that a significant ratio of the students had recordable gains of the decreased number of subjects they had to study.

(i) Improved Focus on Mathematics: Two hundred and thirteen students (100 strongly agree, 113 agree) reported that the reduced school curriculum mae them better concentrate in Mathematics. The upsurge in the number of agreement indicates that when there were less competing subjects the students were able to devote more attention and mental effort into learning mathematical concepts.

(ii) Reduced Mental Exhaustion: On the same note, 208 students indicated that they became less mentally exhausted when taking Mathematics lessons. This is an indicator of decreased cognitive load, which is in line with Cognitive Load Theory according to which the elimination of extraneous demands leaves cognitive resources to meaningful learning.

(iii) Easier Understanding of Mathematical Concepts: Only 220 students (105 strongly agree, 115 agree) said that with fewer subjects they were able to comprehend Mathematics more easily. Very few (5 students each) had a contrary stance or vehemently disagreed with this provision, which supported the idea that simplified teaching enhanced understanding and comprehension.

(iv) Increased Engagement in Problem-Solving: A sum total of 220 students shared the view that the shortened curriculum allowed them to be more active in mathematical problem-solving tasks. This indicates the students were not only less overwhelmed but they were also more mentally available to higher and more significant tasks.

(v) Sufficient Time Allocation for Mathematics: Once again 213 students concurred on the fact that the amount of time that was devoted to Mathematics was adequate under the reduced curriculum. This demonstrates that time that was being spread out over numerous subjects was being properly channeled over to the study of Mathematics.

Table 5: Teachers' Perceptions of Subject Reduction Impact (N = 30)

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
Reducing the number of subjects made it easier to teach Mathematics effectively.	14	13	2	1	0
Students seemed less overwhelmed by the content in Mathematics.	13	14	2	1	1
The reduced curriculum allowed for more in-depth learning of key Mathematics topics.	14	13	2	1	0
Teachers felt more prepared to manage students' cognitive load after the subject reduction.	12	14	2	1	0
Overall, the subject reduction led to more positive student engagement in Mathematics.	13	14	2	1	0

Kontagora Journal of Science and Technology (KONJOST)
2025, Vol. 18, No.1-2, pp.107-114 | ISSN:1118-9673 (print)
https://doi.org/10.5281/zenodo.17945241

The data in Table 5 tell a very clear picture of the experience of the reduced-subject curriculum among teachers. In four out of the five statements, a majority of the teachers responded Agree or Strongly Agree indicating support of the change.

There were 27 teachers (14 strongly agree, 13 agree) who said that it was easier to teach Mathematics following the cutoff of subjects. This implies that the reduced number of competing subjects enabled the teachers to have more time to explain, demonstrations, and assist the pupils requiring additional assistance.

On the same note, 27 teachers said that learners appeared less intimidated during Mathematics classes. This is in line with what the learners had noted and indicates a significant reduction in cognitive loads among the students.

The pattern of responses was identical in the case of deeper learning: 27 teachers thought that the simplified curriculum enabled students to learn the main mathematical concepts in greater detail. It indicates that educators observed that learners interacted with more challenging material as opposed to going through the material at a pace.

On the cognitive load, 26 teachers were better prepared following the subject reduction. This may be attributed to the fact that they had greater time to plan lessons, instruct weaker students and present strategies that can assist the students process information more effectively.

Lastly, 27 teachers also believed that general student involvement in Mathematics was enhanced. Having fewer students taking up their schedule, the students were more interested, energetic, and active in the lesson.

3.2. Test of research Hypothesis

Null Hypothesis (H_0): *Cognitive load and academic performance does not differ significantly between the students exposed to reduced curriculum and those exposed to the overloaded standard curriculum.*

The results of the analysed data is presented in Table 6

Table 6: Academic Performance (Post-Test Scores) for Treatment and Control Groups

Group	Mean Score (%)	Standard Deviation	t-value	df	p-value	Decision
Control Group	65.4	10.2	5.50	498	0.001	Significant (H_0 rejected)
Treatment Group	79.3	8.4				

The independent sample yielded $t_{498} = 5.50, p = 0.001$, indicates that there was a statistically significant difference since a p-value of 0.001 (< 0.05) was obtained. The treatment group, which had a reduced curriculum, showed a significant reduction in cognitive load and an improvement in academic performance in Mathematics compared to the control group. Therefore, the null hypothesis was rejected as there exist a significant statistical difference. This confirms that, subject reduction leads to reduced cognitive load and higher academic performance.

4. Discussion

The outcomes in this study corroborate Cognitive Load Theory (CLT) stating that when subject load is reduced, cognitive overload is lowered, and performance in studies is enhanced, specifically in Mathematics. Having fewer subjects enabled students to concentrate their cognitive load on mastering more critical concepts, resulting in better performance. This corresponds to prior studies that showcase the relevance of cognitive load management (Paas et al, 2003; Sweller, 1988). By narrowing the subjects to essential ones like Mathematics, students were able to immerse themselves more in the content and consequently improved their academic performance.

Yet, the study also sheds light on the other end of the continuum that is the need for breadth of study. Although the students performed better in Mathematics, the reduction of subjects may have adverse effects on their overall educational experience, as is the aim of the other subjects, and may stifle the formation of a more holistic knowledge system, which was the primary objective of the exercise. This demonstrates the need to reach an equilibrium between depth and breadth in designing a course (Abah et al.,2018)

While the study provides meaningful contributions, it must be noted that the study has its own limitations. The focus on Mathematics and the duration of the study should be taken into account for its generalizability to other subjects and the long-term effects of subject reduction. We

*Corresponding author: H. Muhammad
Email: profmaths781@fcekg.edu.ng (H. Muhammad)
ORCiD: https://orcid.org/0009-0007-0095-1489↗
Received: 13/10/2025; **Accepted:** 29/11/2025; **Published:** 30/11/2025

recommend that future inquiries on subject reduction be aimed at its other subjects, the characteristics of individual students, and the long-term effects of such reduction. (D'Eon, 2023).

5. Conclusion

This paper has discussed the impact of subject reduction on the cognitive load and academic performance of the subject Mathematics in the Nigerian education system. The findings showed that the student cognitive load was greatly lowered when the number of subjects was diminished to enable the students focus more on major subjects like Mathematics. The students with a decreased curriculum in treatment group had fantastic improvement in their academic performance with an average score of 79.3 in the post-test as compared with the control group with an average 65.4 in the post-test. The discovery highlights the potential of subject reduction as helpful in enhancing academic performance via lessening cognitive overload.

The results also highlight the need to streamline curriculum. This allows limiting the cognitive load of students by decreasing the number of subjects, which will allow them to focus more on important ideas in Mathematics. This is not only better than increasing the knowledge and comprehension of the students but the learning environment is also improved. The issue of teacher training on how to manage the cognitive load and concentrate on learning the core subjects is very important to the successful implementation of subject reduction. The strategies provide the teachers with the methods of maximizing cognitive resources, which can enhance student engagement and academic performance.

Recommendations:

This part presents the recommendations accordingly, which are based on the findings of the research. Thay offer the possible actions that can be applied to improved educational practice, curriculum development, and the management of the cognitive load in order to enhance students performance in Mathematics.

- The elementary curriculum lesson needs to be simplified and the focus on the basic subjects like Mathematics, especially Algebra and Geometry. By having a simplified curriculum, students are easily expected to have a deeper appreciation of these simple concepts before going to more complicated ones, thus learning less information and better understanding the material.
- Practical training of the teachers concerning the principles of effective cognitive load management should be offered. Teacher training should include strategies that assist in maximization of cognitive resources by students. More emphasis should be laid on the active learning and problem solving activities in order to improve the retention and the academic performance.
- The move to eliminate non-core subjects should be done progressively, but more emphasis should be laid on Mathematics. Such a move will help schools to cope with the changes better. Moreover, they should also be assessed in the long-term, to see how effective such changes are in terms of student involvement, cognitive load, and overall student learning performance.

Abbreviations

CLT	Cognitive Load Theory
CLS	Cognitive Load Scale
MAT	Mathematics Achievement Test
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences

Author Contributions

Muhammad, Hassan: Conceptualization, methodology, writing- original draft,

Niyi, Olorunsola Oriola: Methodology,Writing-Review and Editing

Acknowledgements

The authors acknowledge the contributions of Head of the Department of Mathematics, Federal University of Education, Kontagora, Dr. Niyi Olonrunsola Oriola, whose support and guidance were invaluable to this work. His contributions were instrumental in enhancing the quality and clarity of the work.

Conflicts of Interest

The author(s) declare that they have no known competing financial interests, professional affiliations or personal relationships that could have appeared to influence the work reported in this paper,

Funding

None

References

Adeniran, A., et al. (2023). Impact of subject reduction on cognitive load: A review. *Educational Research Journal, 15*(4), 120–135.

Alreshidi, N. (2023). Cognitive load and learning outcomes in complex subjects. *Journal of Educational Psychology, 41*(2), 210–225.

Asmara, S. (2021). Curriculum overload and student engagement. *International Journal of Educational Reform, 32*(3), 110–128.

D'Eon, M. (2023). The impact of curriculum overload on

student learning. *Journal of Teaching and Learning, 18*(2), 97–105.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2017). Implications for educational practice of the science of learning and development. *Applied Developmental Science, 21*(2), 97–140. https://doi.org/10.1080/10888691.2017.1303262

Gkintoni, S., Vagenas, E., & Papageorgiou, I. (2025). The role of curriculum streamlining in reducing cognitive load in secondary education. *Educational Psychology International, 43*(1), 82–98. https://doi.org/10.1080/01443410.2025.1543027

Harilal, S., et al. (2024). Rote learning vs. conceptual understanding in education. *Journal of Educational Theory, 56*(3), 222–238.

Harvie, J. (2020). Curriculum reform and its impact on student learning outcomes. *Educational Studies, 45*(3), 305–317.

Leahey, T. (1999). Managing cognitive load in interdisciplinary education. *Journal of Educational Psychology, 21*(1), 45–58.

Mahlaba, M. (2020). Curriculum overload and pedagogical challenges. *South African Educational Review, 38*(4), 80–92.

Martin, J., Fischer, L., & Kowalski, M. (2023). Advancements in cognitive load theory: Implications for instructional design. *Educational Psychologist, 58*(2), 145–159.

O'Connor, E., & Norton, M. (2022). The effects of curriculum overload on mathematics learning and student cognitive load. *Journal of Learning and Instruction, 45*(4), 187–198. https://doi.org/10.1016/j.learninstruc.2022.101123

Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist, 38*(1), 1–4. https://doi.org/10.1207/S15326985EP3801_1

Rao, P. (2017). Cognitive overload in education: The challenge of balancing learning and cognitive resources. *Educational Psychology Review, 29*(3), 439–453.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive load theory*. Springer. https://doi.org/10.1007/978-1-4419-8126-4

Wang, L., Lin, Y., & Su, H. (2022). Simplifying problem-solving in algebra: Reducing cognitive load through instructional redesign. *Journal of Mathematics Education, 18*(4), 109–123.

Zheng, X., & Gupta, V. (2020). Cognitive load and its impact on mathematics performance: An empirical study in high school education. *Educational Psychology, 40*(3), 255–270. https://doi.org/10.1080/01443410.2020.1778284