AFRICAN PERSPECTIVES OF RESEARCH IN TEACHING AND LEARNING ISSN PRINT: 2521-0262 ISSN ONLINE: 2662-012X

Learners' Opportunities to Learn Algebra Content in Grade 9

Hloniphile TP Mtshali, Ugorji I. Ogbonnaya and David Sekao
University of Pretoria
Corresponding author: htpmtshali@gmail.com

ABSTRACT

The aim of this research was to examine the extent to which algebra content was taught to Grade 9 mathematics learners in four schools within a specific education district in Gauteng province, South Africa. This qualitative case study was conducted within the framework of interpretive qualitative research. Document analysis was employed as the method of data collection. The findings of the study indicate that the coverage of algebra content in the participating schools did not align with the prescribed curriculum. Consequently, it can be inferred that the learners did not have adequate opportunities to learn the algebra content. It is recommended that teachers adhere to the curriculum guidelines when delivering instruction.

Keywords: Algebra, Algebraic expressions, Algebraic language, Content coverage, Factorisation, Opportunity to learn

INTRODUCTION

Algebra is a fundamental topic in school mathematics. Strong knowledge of algebra at the lower school level is important for successful learning of mathematics at higher school levels (Blanton, et al., 2019; Bråting & Pejlare, 2019). According to Cai and Knuth (2011, p. 628), "an early development of algebraic thinking may, in particular, ease learners' contact with algebraic symbolism". Algebra provides tools that assist in the development of other areas of mathematics, such as geometry, trigonometry, statistics, and calculus (Cetner, 2015; Moru & Mathunya, 2022; Welder, 2012). Hence, algebra is included in the school mathematics curricula of many countries, including South Africa, even from the early years of schooling (Bråting & Pejlare, 2019). In South Africa's mathematics school curriculum (the Curriculum and Assessment Policy Statement [CAPS]), the content area of Patterns, Functions, and Algebra carries a 35% weighting of the year's work in Grade 9, making it the largest of the five content areas (Number, Operations and Relations; Patterns, Functions and Algebra; Space and Shape Geometry; Measurement; and Data Handling). However, the findings of Baidoo (2019), Marange and Adendorff (2021), and Pournara (2020), show that algebra is one of the topics that many learners in South Africa struggle with.

One reason for the observed learners' challenges in algebra could be that the learners do not have sufficient opportunity to learn (OTL) the algebra content they are expected to learn. OTL relates to the inputs and processes that are required in the school context for producing acceptable student achievement and intended outcomes (Elliott & Bartlett, 2016; Suter, 2017). The concept of OTL was originally employed by the International Association for the Evaluation of Educational Achievement (IEA) to aid in interpreting the performance of participating learners (Burstein, 2014). OTL, therefore, can be used to allow valid comparisons of learners' achievement in international studies (Wijaya et al., 2015).

Kurz et al. (2020), Mohale and Mafumbate (2019), and Stols (2013) report that OTL is a major factor that impacts students learning of a subject. Learners perform better in Large Scale Assessments if they have had the opportunity to be exposed to more and deeper content (Schmidt et al., 2009). Brewer and Stasz (1996) offer an approach where three categories of focus are distinguished when assessing OTL. Firstly, there is the curriculum content, assessing whether the prescribed content required to attain the required standards has been taught. The second category includes instructional strategies, determining the experiences of the learners with the kinds of tasks and solution processes related to the topic being taught. The third category covers instructional resources.

Learners' OTL may be influenced by a variety of issues such as teaching methods, resources available for teaching and learning, teachers' knowledge and qualifications, experience, issues of economic deprivation, and deficient learning culture in schools (Khoza, 2015; Ogbonnaya, 2021). Teacher preparedness, class size, and the socio-economic background of the school may further influence the OTL that is available to the learners. Content coverage is an aspect of OTL that is used to ascertain whether the teacher teaches the subject topic and the subtopics prescribed in the curriculum. Therefore, through content coverage, one can determine whether the learners are provided with information to master the curriculum content prescribed for their age and grade level, or not.

Hiebert and Grouws (2007) assert that the nature of classroom mathematics teaching significantly determines the nature and level of learning experienced by learners. Yet, research has been almost completely silent on this issue until recent studies, which have pointed out that attention must be given to the content to enhance the OTL experienced in the classroom and ensure meaningful learning (Jensen et al., 2016; Kurz et al., 2012).

The purpose of this study was to investigate the coverage of algebra content taught in schools as prescribed in the curriculum. In doing so, the study addressed the research question: What is the extent of coverage of algebra content by the Grade 9 teachers?

BACKGROUND

Algebra in the South African school curriculum

The Curriculum and Assessment Policy Statement (CAPS) is organised according to five broad areas referred to as content areas. The content area Patterns, Functions and Algebra and its overarching focus is on, "the language for investigating and communicating most of mathematics and can be extended to the study of functions and other relationships between variables" (Department of Basic Education [DBE], 2011, p. 10). The algebra content prescribed for Grade 9, which was also the focus of our investigation, comprises of four subtopics.

a) Algebraic language

- *recognise and identify conventions for writing algebraic expressions*

- *identify and classify like and unlike terms in algebraic expressions*

- *recognise and identify coefficients and exponents in algebraic expressions,*

- *Recognise and differentiate between monomials, binomials and trinomials.* (DBE, 2011, p. 24)

b) Expansion and simplification of algebraic expressions *using the commutative, associative and distributive laws for rational numbers and laws of exponents to:*

add and subtract like terms in algebraic expressions.

multiply integers and monomials by monomials, binomials and trinomials.

divide the following by integers or monomials: monomials, binomials and trinomials.

simplify algebraic expressions involving the above operations.

Determine the squares, cubes, square roots and cube roots of single algebraic terms or like algebraic terms.

Determine the numerical value of algebraic expressions by substitution.

Extend the above algebraic manipulations to include:

Multiply integers and monomials by polynomials.

Divide polynomials by integers or monomials.

The product of two binomials

The square of a binomial (DBE, 2011, p. 24)

c) Factorisation of algebraic expressions

Factorise algebraic expressions that involve common factors, difference of two squares and trinomials of the form: $x^2 + bx + c$ *and* $ax^2 + bx + c$*, where 'a' is a common factor.*

Simplify algebraic expressions that involve the above factorisation processes.

Simplify algebraic fractions using factorisation (DBE, 2011).

d) Equations

Set up equations to describe problem situations.

Analyse and interpret equations that describe the given situation.

Solve equations by: Inspection, using additive and multiplicative inverses, using laws of exponents.

Determine the numerical value of an expression by substitution.

Use substitution in equations to generate tables of ordered pairs.

Extend solving equations to include Using factorisation, equations of the form: a product of factors = 0 (DBE, 2011, p. 25).

THEORETICAL FRAMEWORK

This study is framed within Kurz's (2011) conceptualisation of OTL comprising of three aspects, namely content covered, time spent on teaching and learning (time on task), and quality of instruction. Content coverage, which is the focus of this study, compares the content entrenched in the academic standards (curriculum) with the content taught in class to determine if the learners were afforded opportunities to learn the content. It is the specific mathematics topics covered in classroom instruction (Schmidt, 2009).

Time on task is the amount of time spent on teaching the contents of the topics by the schools. It is "the period of time during which a learner is actively engaged in a learning activity." (Kunene, 2013, p. 49). Elliott and Bartlett (2016) note that time on task has been adjudged an important factor of OTL by researchers in education.

The quality of instruction evaluates the cognitive processes emphasised in instructional activities including assessments. Several classification approaches, such as Bloom's taxonomy of educational objectives, emphasise a range of cognitive processes from lower-order to higher-order (Elliott & Bartlett, 2016). One aspect of quality used in OTL studies is the cognitive levels of questions used in teaching (Stein et al., 2009). The cognitive processes used in mathematics teaching can indicate how classroom interactions provide opportunities for appropriate intellectual challenges to stimulate learners' mathematical development (Schoenfeld, 2011).

RESEARCH METHODOLOGY

To acquire a deeper understanding of the curriculum being implemented in the classroom, this study employed a qualitative approach, examining teaching and learning artifacts. This study, being naturalistic, warranted the use of a case study comprising of four schools, focusing on Grade 9 mathematics teaching. A case study best addressed the goal of understanding the OTL presented to the learners in the classrooms. The qualitative case study assisted the researchers to gain insight into the coverage algebra content taught to the learners and presented in the learner's workbooks and notebooks.

Convenience sampling was adopted for the selection of the district and the schools for this study. The district and the schools were the most accessible to the first author who collected the data for the study. The schools were quintile 3 schools; of low socio-economic status and were in a local township.

The study used document analysis as the data collection method. The documents were learners' workbooks and notebooks. Two learners' workbooks and notebooks were selected from each school. The learners were top performers in their classes. They were selected by their teachers on the basis that they always wrote notes, did assignments and homework, and attended classes. Hence, the teachers believed their notes would reflect the work done. The workbooks and notebooks of the learners were books used by the learners to write notes, solve examples, and do class work and homework. Document analysis is particularly applicable to qualitative studies producing rich descriptions of a single phenomenon or event (Harrison et al., 2017; Wood et al., 2020). Document analysis was found to be very appropriate for this study because of the stability of data (Morgan, 2022), eliminating any possible influence the researcher may have had on the teachers and students in lesson observations or interviews (Merriam & Tisdell, 2016).

A data collection instrument that listed all the subtopics of algebra in the Grade 9 curriculum was used for data collection by the first author and a research assistant. The instrument was used to indicate if each subtopic was covered in each school. The researchers also collected excerpts from the students' notebooks and workbooks as evidence of the algebra content taught in the schools.

FINDINGS

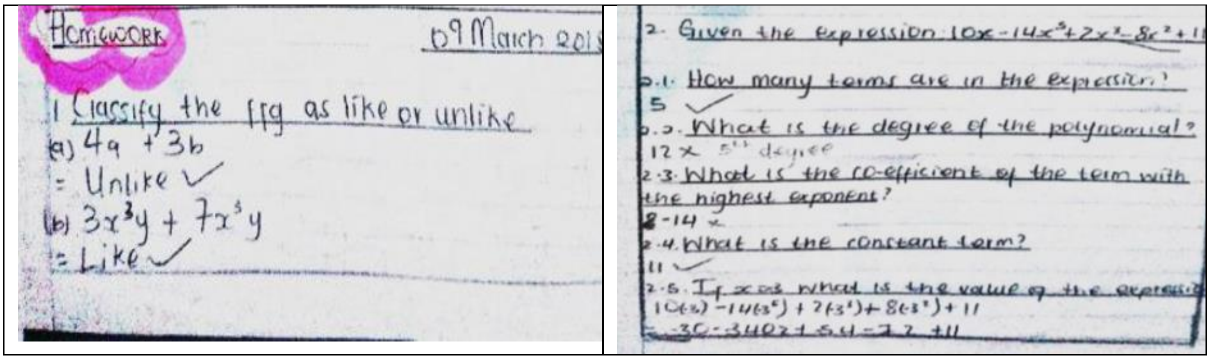
The algebra contents treated in the four schools (identified here as Schools A, B, C & D) are presented according to the four subtopics.

Algebraic Language

There was evidence of coverage of the algebraic language in Schools A, B, and C but no evidence of teaching algebraic language was found in documents in School D. In School A all four subtopics listed in the curriculum were addressed. In School B three subtopics were addressed. The subtopic that was not addresses was recognition and differentiation between monomials, binomials, and trinomials. Figure 1 depicts an example of the content coverage of algebraic language in Schools A and B. Similarly, in School C there was evidence of the teaching of algebraic language. However, only two subtopics were addressed. The subtopics that were not addressed were identification and classification of like and unlike terms in algebraic expressions, and recognition and differentiation between monomials, binomials, and trinomials.

The summary of algebraic language coverage in the schools is depicted in Table 1

Figure 1: *Examples of algebraic language addressed in Schools A and B*



(a) School A (b) School B

Table 1: *Algebraic language content coverage per school*

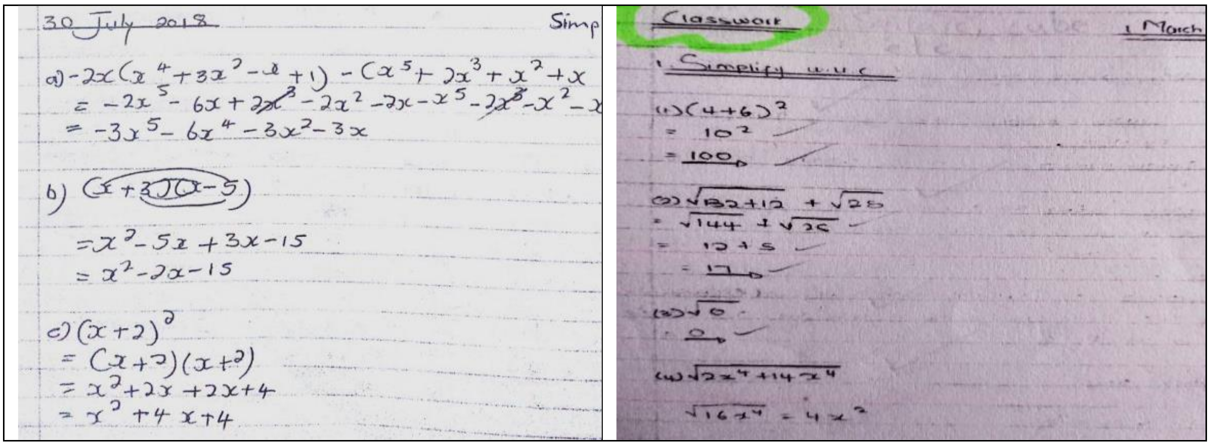
Content - CAPS		School A	School B	School C	School D
Algebraic language	Recognition and identification of conversions for writing algebraic expressions	✓	✓	✓	-
	Identification and classification of like and unlike terms in algebraic expressions	✓	-	-	-
	Recognition and identification coefficients and exponents in algebraic expressions	✓	✓	✓	-
	Recognition and differentiation between monomials, binomials and trinomials	✓	-	-	-
	Total	4	2	2	0

Note: A tick (✓) signifies *Content covered*

Expansion and Simplification of Algebraic Expressions

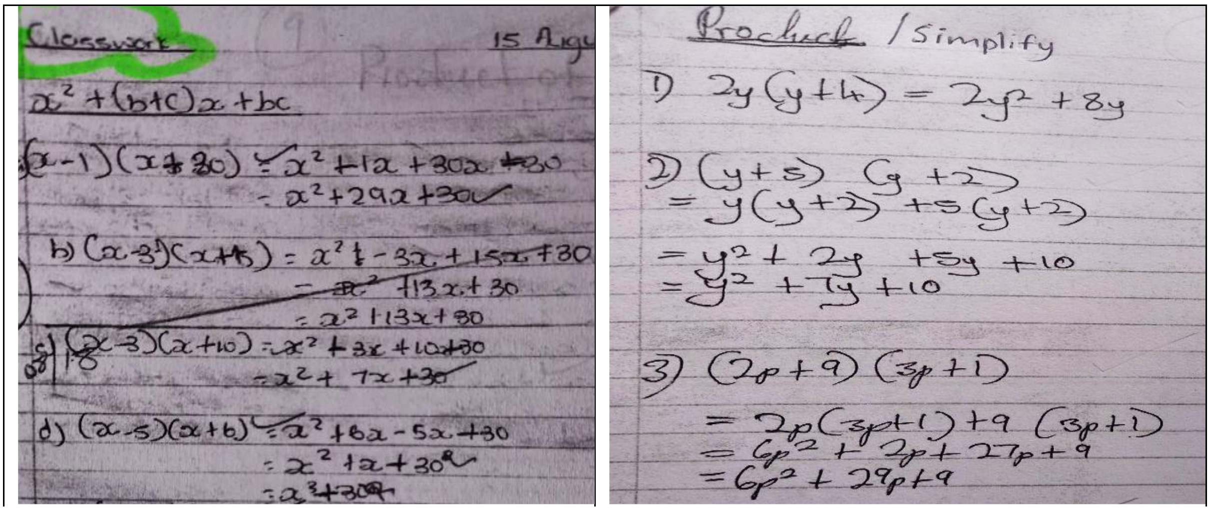
In Schools A and C, there was evidence of all the subtopics of the expansion and simplification of algebraic expressions being addressed. Figure 2 depicts an example of content coverage of expansion and simplification of algebraic expressions in Schools A and C In School B, there was evidence of the teaching of the following subtopics except for the division of the integers or monomials by monomials and trinomials. In School D, most of the subtopics were not addressed; only the multiplication of integers and monomials by monomials and binomials, the product of two binomials, and the square of a binomial were found addressed. Figure 3 depicts an example of content coverage of expansion and simplification of algebraic expressions in Schools B and D.

Figure 2: *Examples of expansion and simplification of algebraic expressions in Schools A and C.*



(a) School A (b) School C

Figure 3: *Example of content coverage of expansion and simplification of algebraic expressions in Schools B and D*



(a) School B (b) School D

The summary of expansion and simplification of algebraic expressions coverage in the schools is depicted in Table 2.

The findings in the table show the number of subtopics that were covered for each school, out of a total of 10 subtopics. School A covered all 10 subtopics, which were the target number of subtopics. School D covered three subtopics, which was the least number of subtopics. Schools B and C covered a total of 10 and four subtopics respectively.

Factorisation of Algebraic Expressions

In School A, all the subtopics under factorisation of algebraic expressions were addressed. In School B, most of the subtopics were addressed except the factorisation of algebraic expressions that involve: $ax^2+ bx+ c$, where 'a' is a common factor was not treated. Figure 4 shows examples of the treatment of factorisation of algebraic expressions in Schools A and B.

Table 2: *Expansion and simplification of algebraic expressions content coverage per school*

Table 2

Expansion and simplification of algebraic expressions content coverage per school

Content - CAPS		School A	School B	School C	School D
Expand and simplify algebraic expressions	Add and subtract like terms in algebraic expressions	✓	✓	✓	-
	Multiplication of integers and monomials by monomials, binomials, and trinomials	✓	✓	✓	✓
	Division of integers or monomials by monomials, binomials, and trinomials	✓	✓	-	-
	Simplification of algebraic expressions involving the above operations	✓	✓	-	-
	Determining the squares, cubes, square roots and cube roots of single algebraic terms or like algebraic terms	✓	✓	✓	-
	Determining the numerical value of algebraic expressions by substitution	✓	✓	✓	-
	Extension of the above algebraic manipulations to include: Multiplication of integers and monomials by polynomials.	✓	✓	-	-
	Division of polynomials by integers or monomials.	✓	✓	-	-
	The product of two binomials	✓	✓	-	✓
	The square of a binomial	✓	✓	-	✓
	Total	10	10	4	3

Note: A tick (✓) signifies *Content covered*

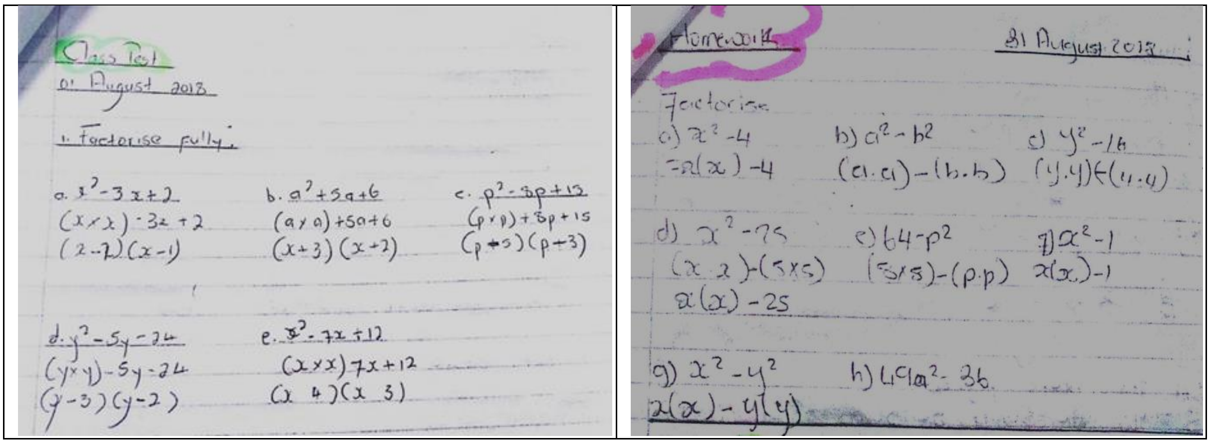
In School C, only four subtopics under factorisation algebraic expressions were treated out of the six that were expected. The subtopics treated were factorisation of algebraic expressions that involve common factors, difference of two squares simplification of algebraic expressions that involve the above factorisation processes, and simplification of algebraic fractions using factorisation. The subtopics, trinomials of the form: x^2+bx+c *and* ax^2+bx+c, where 'a' is a common factor (DBE, 2011) were not addressed.

In School D only three subtopics out of the six that were prescribed were addressed. These were factorisation of algebraic expressions that involve common factors, the difference of two squares, and trinomials of the form x^2+bx+c. It was found that the following subtopics were not addressed, factorisation of algebraic expressions that involve ax^2+bx+c, where 'a' is a common factor, simplification of algebraic expressions that involve the above factorisation processes and simplification of algebraic fractions using factorisation.

The subtopic, trinomials of the form: x^2+bx+c and ax^2+bx+c, where 'a' is a common factor (DBE, 2011) was not addressed.

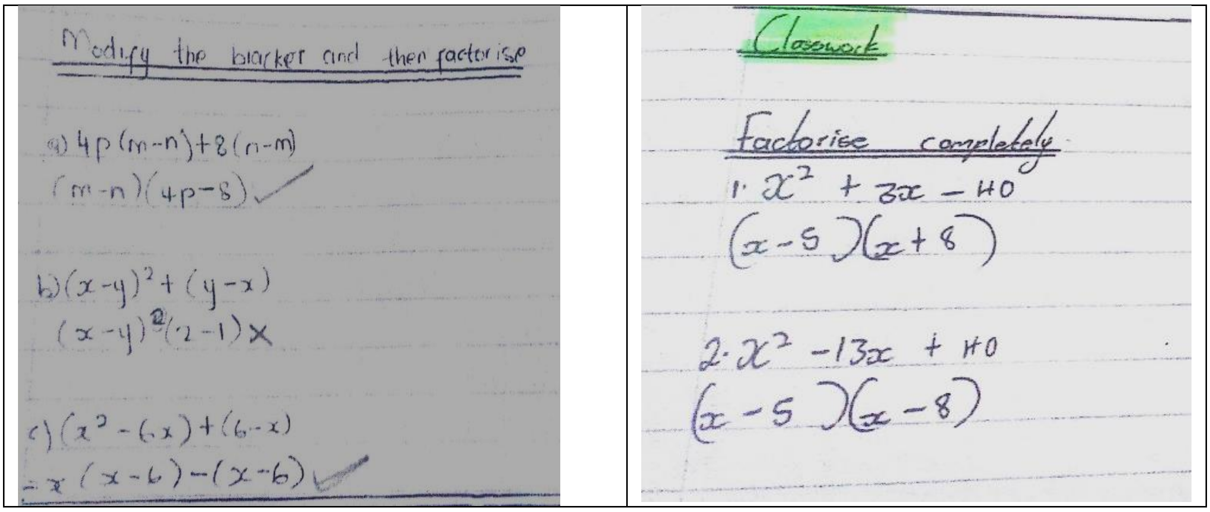
Figure 5 (a) and Figure 5 (b) depict examples of content coverage of factorisation of algebraic expressions in School C and School D respectively.

Figure 4: *Example of content coverage of factorisation of algebraic expressions.*



(a) School A (b) School B

Figure 5: *Example of content coverage of factorisation of algebraic expressions in Schools C and D*



(a) School C (b) School D

Table 3: *Factorisation of algebraic expressions content coverage per school*

Content - CAPS		School A	B	C	D
"Factorise algebraic expressions."	Factorisation of algebraic expressions that involve: Common factors,	✓	✓	✓	✓
	the difference of two squares,	✓	✓	-	✓
	the trinomial of the form $x^2 + bx + c$	✓	✓	-	✓
	$ax^2 + bx + c$, where *a* is a common factor.	✓	-	-	-
	Simplification of algebraic expressions that involve the above factorisation processes.	✓	✓	✓	-
	Simplification of algebraic fractions using factorisation	✓	✓	✓	-
Total		6	5	3	3

Note: A tick (✓) signifies *Content covered*

In School D, just like in School C, only three subtopics out of the six that were prescribed were addressed. These were factorisation of algebraic expressions that involve common factors, the difference of two squares, and trinomials of the form $x^2+ bx+ c$ (DBE, 2011).

It was found that the following subtopics were not addressed, factorisation of algebraic expressions that involve $ax^2+ bx+ c$, where '*a*' is a common factor, simplification of algebraic expressions that involve the above factorisation processes and simplification of algebraic fractions using factorisation.

Table 3 shows the summary of factorisation of algebraic expressions coverage in the schools.

The findings in the table show the number of subtopics that were covered for each school, out of a total of six subtopics. School A covered all six subtopics, which was the target number of subtopics. School B covered five subtopics. Schools C and D covered a total of three subtopics each, which was the least number of subtopics covered.

Algebraic Equations

There was evidence of the teaching of all the content algebraic equations being addressed in School A except solve equations by inspection. Figure 12 is a vignette of the subtopic, solving equations by using laws of exponents in School A.

Figure 6 (a) depicts an example of content coverage of algebraic equations in School A. In School B, there was evidence of the treatment of the subtopics of algebraic equations except solving equations by inspection and equations where a product of factors = 0. Figure 6 (b) depicts an example of content coverage of algebraic equations in School B.

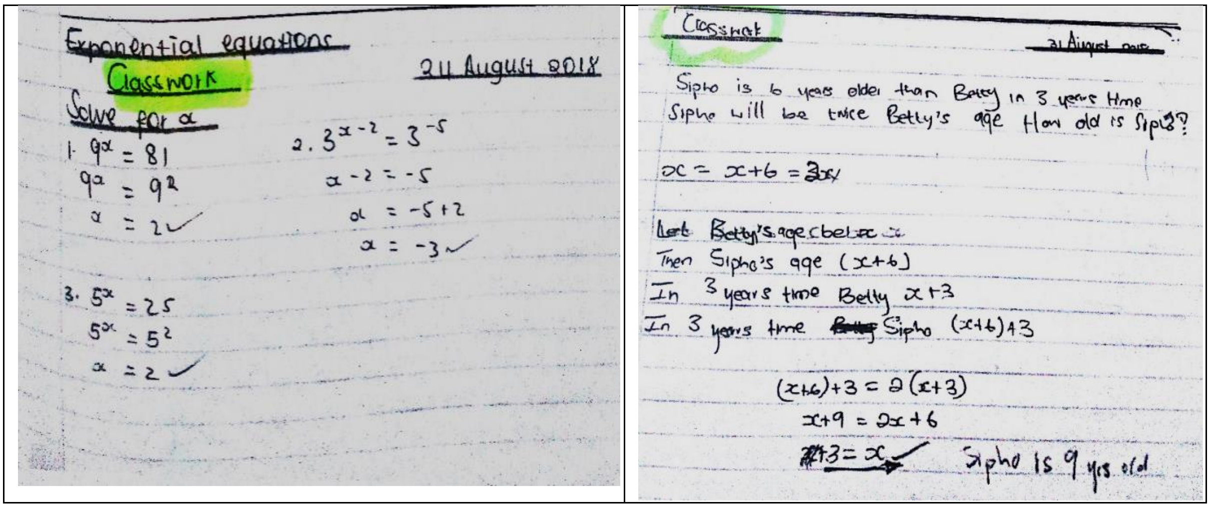
In School C, there was evidence of the teaching of the following content algebraic equations except setting up equations to describe problem situations and solve equations by inspection.

Figure 7 (a) and (b) show examples of content coverage of algebraic equations in School C and D respectively. Only three subtopics of algebraic equations (solve equations by using additive and multiplicative inverses, using laws of exponents, and the use of substitution in equations to generate tables of ordered pairs) were treated in School D.

Figure 7 (b) depicts an example of content coverage of algebraic equations in School D.

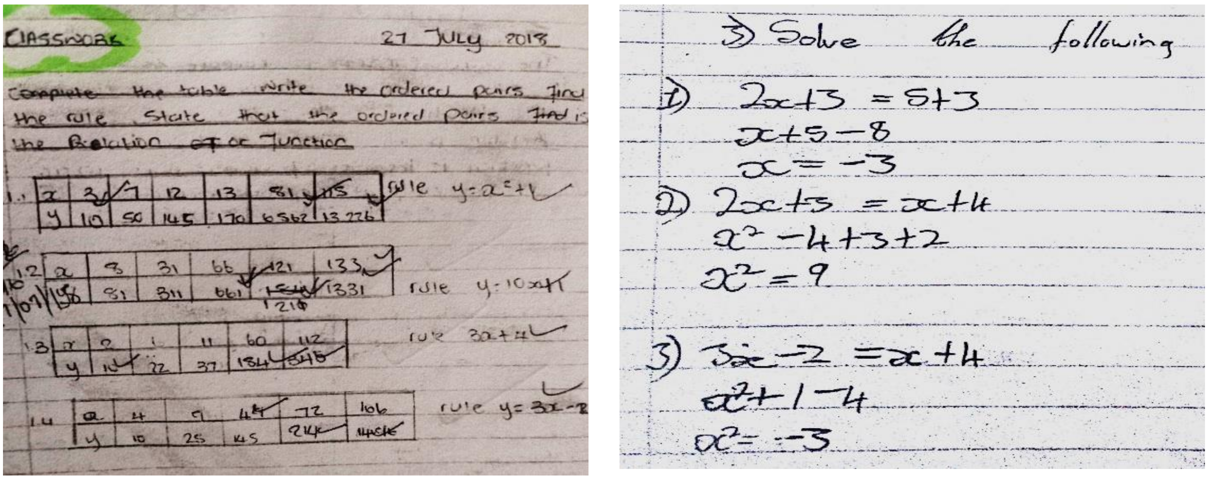
The summary of algebraic equations coverage in the schools is depicted in Table 4

Figure 6: *Example of content coverage of algebraic equations in Schools A and B*



(a) School A (b) School B

Figure 7: *Example of content coverage of algebraic equations in Schools C and D*



(a) School C (b) School D

DISCUSSION OF FINDINGS

The findings show that out of a total of 29 subtopics, 28 (96,6%) were covered in School A, 24 (82,8%) and 16 (55,2%.) were covered in Schools B and C respectively, while 9 (31%) were covered in School D. The findings indicate that schools did not address all the algebra content as stipulated in the curriculum. Particularly, the content covered in two of the four schools was grossly inadequate and hence not in alignment with the curriculum.

Table 4: *Algebraic equations content coverage per school*

Content - CAPS		School A	School B	School C	School D
Equations	Set up equations to describe problem situations.	✓	✓	-	-
	Analyse and interpret equations that describe the given situation.	✓	✓	✓	-
	Solve equation by inspection,	-	-	-	-
	-Using additive and multiplicative inverses	✓	✓	✓	✓
	-Using laws of exponents	✓	✓	✓	✓
	Determination of the numerical value of an expression by substitution.	✓	✓	✓	-
	Use substitution in equations to generate tables of ordered pairs.	✓	✓	✓	✓
	Extend solving equations to include: Using factorisation	✓	✓	✓	-
	Equations of the form, a product of factors = 0	✓	-	✓	-
Total		8	7	7	3

Note: A tick (✓) signifies *Content covered*

The average coverage of the content in the four schools was 66,4%. In general, the learners were not afforded sufficient opportunity to learn the content of algebra. Although the literature does not provide an acceptable measure of a gap, the researchers regard the 33,6% uncovered content as too high; therefore, the content coverage was inadequate. Many subtopics were not covered in three of the four schools. This implies poor OTL afforded to the learners in those schools.

When learners have not learned a particular mathematical concept, they will not be able to apply that concept in real life. Analyses and interpretations of equations that describe a given situation, which is very significant in real-life, was not treated in two schools. The content not being covered creates a gap in the learners' knowledge that could negatively impact their future mathematics learning and their application of the concept in real life. This is an indication of how much foundation is lacking for the learners to progress to a higher grade in school. The findings of this study are similar to the findings of Stols (2013), that some curriculum content was not covered in some schools. Kokonyane (2015) observed that there were challenges with the implementation of the curriculum in schools as teachers sometimes diverged from what the curriculum prescribed. The non-coverage of the curriculum content could be due to teachers' poor knowledge of the content or large class size (Ogbonnaya et al., 2016) which makes it difficult for teachers to have sufficient time to cover the content. It could also be due to the incorrect interpretation and understanding of the curriculum policy (CAPS).

CONCLUSION

The study explored Grade 9 learners' OTL algebra content in some schools. The main focus of this study was to explore the extent of algebra content coverage by teachers in relation to the curriculum policy. It was found that the

Grade 9 learners were not afforded sufficient opportunity to learn the expected content of algebra as stipulated in the curriculum, in that the content was not completely covered in the schools studied.

RECOMMENDATIONS

For teachers to provide optimal OTL for the learners, the teachers must dedicate instructional time to covering the content prescribed. Therefore, it is recommended that teachers should follow the guidelines during teaching to cover the content. To ensure this, the mathematics subject advisors (i.e., subject experts based at the education district offices who support the schoolteachers on curriculum implementation) should continually monitor teachers' implementation of the curriculum. The mathematics subject advisors should also guide the teachers on how to effectively sequence subtopics to cover the contents of the curriculum adequately. At the beginning of each term, teacher development workshops may be organised for teachers to collectively plan their teaching.

REFERENCES

Baidoo, J. (2019). Dealing with Grade 10 learners' misconceptions and errors when simplifying algebraic fractions. *Journal of Emerging Trends in Educational Research and Policy Studies, 10*(1), 47-55.

Blanton, M., Stroud, R., Stephens, A., Gardiner, A. M., Stylianou, D. A., Knuth, E., & Strachota, S. (2019). Does early algebra matter? The effectiveness of an early algebra intervention in Grades 3 to 5. *American Educational Research Journal, 56*(5), 1930-1972

Bråting, K. & Pejlare, J. (2019) The role of Swedish school algebra in a historical perspective In: *NERA 2019 Education in a globalized world* (pp. 279-280). Uppsala

Brewer, D. J., & Stasz, C. (1996). *Enhancing opportunity to learn measures in NCES data*. R. Corporation.

Burstein, R. (2014). *The IEA study of mathematics III: Student growth and classroom processes* (Vol. 3). Elsevier.

Cai, J., & Knuth, E. (2011). *Early algebraization.* New York: Springer.

Cetner, M. (2015). Weaving geometry and algebra together. *The Mathematics Teacher, 108*(8), 584–590. https://doi.org/10.5951/mathteacher.108.8.0584

Department of Basic Education. (2011). *Curriculum Assessment Policy Statement Grades 7 to 9 Mathematics*. Pretoria, Department of Basic Education.

Elliott, S.N., Bartlett, B.J., (2016). Opportunity to Learn. *Oxford Handbook Topics in Psychology*, pp. 1–14.

Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. In *Forum qualitative Sozialforschung/Forum: Qualitative Social Research, 18*(1),1-17.

Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. *Second handbook of research on mathematics teaching and learning, 1*, 371-404.

Jensen, B., Perez Martinez, M. G., & Aguilar Escobar, A. (2016). Framing and assessing classroom opportunity to learn: The case of Mexico. *Assessment in Education:*

Principles, Policy & Practice, *23*(1), 149-172.

Khoza, S. B. (2015). Student teachers' reflections on their practices of the curriculum and assessment policy statement. *South African Journal of Higher Education*, *29*(4), 179-197.

Kokonyane, M. J. (2015). *A comparative study of opportunity to learn in natural sciences: case studies of two standard 7 classes in Botha-Bothe, Lesotho.* [Doctoral dissertation, University of the Free State].

Kunene, L. L. Z. (2013). *Classroom level factors affecting mathematics achievement: A comparative study between South Africa and Australia using TIMSS 2003*. University of Pretoria. Pretoria.

Kurz, A. (2011). *Opportunity to learn the intended curriculum: Measuring key instructional indicators and examining relations to achievement for students with disabilities* Vanderbilt University. Nashville, Tennessee.

Kurz, A., Reichenberg, R. E., Elliott, S. N., & Yel, N. (2020). Opportunity-to-learn performance levels and student achievement gains for students with and without disabilities. *Teaching and Teacher Education*, *94*, 103092.

Kurz, A., Talapatra, D., & Roach, A. T. (2012). Meeting the curricular challenges of inclusive assessment: The role of alignment, opportunity to learn, and student engagement. *International Journal of Disability, Development and Education*, *59*(1), 37-52.

Marange, T., & Adendorff, S.A. (2021). The contribution of online mathematics games to algebra understanding in Grade 8. *Pythagoras*, *42*(1), a586. https://doi.org/10.4102/pythagoras.v42i1.586

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey Bass.

Mohale, N. & Mafumbate, R. (2019). Effects of resource materials on implementation of Life Skills education programme in Manzini Region High Schools of Eswatini. *Journal of Education and Practice, 10*(27), 46-53. https://www.iiste.org/Journals/index.php/JEP/article/view/49710/51357

Morgan, H. (2022). Conducting a qualitative document analysis. *The Qualitative Report*, 27(1), 64-77. https://doi.org/10.46743/2160-3715/2022.5044

Moru, E. K., & Mathunya, M. (2022). A constructivist analysis of Grade 8 learners' errors and misconceptions in simplifying mathematical algebraic expressions. *Journal of Research and Advances in Mathematics Education*, *7*(3), 130-144. https://doi.org/10.23917/jramathedu.v7i3.16784

Ogbonnaya, U. I. (2021). The opportunity to learn Euclidean geometry in two mathematics textbooks of tenth grade in South Africa. *Edumatika: Jurnal Riset Pendidikan Matematika*, *4*(2), 112-125. https://doi.org/10.32939/ejrpm.v4i2.976

Ogbonnaya, U. I., Mji, A. & Mohapi, S. J. (2016). Identifying some hindrances to students' achievement in mathematics in South Africa. *Dirasat: Educational Sciences*, *43*(2), 705-714.

https://platform.almanhal.com/Files/Articles/96771

Pournara, C. (2020). Grade 9 learners' algebra performance: Comparisons across quintiles, insights from errors and curriculum implications. *South African Journal of Science, 116*(9-10), 1-7. http://dx.doi.org/10.17159/sajs.2020/8125

Schmidt, W. H. (2009). Exploring the relationship between content coverage and achievement: Unpacking the meaning of tracking in eighth grade mathematics. *Education Policy Center at Michigan State University*.

Schmidt, W. H., Cogan, L. S., Houang, R. T., & McKnight, C. (2009). *Equality of educational opportunity: A myth or reality in US schooling*. Education Policy Center at Michigan State University.

Schoenfeld, A. H. (2011). Noticing matters. A lot. Now what? In *Mathematics teacher noticing* (pp. 253-268). Routledge.

Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. A. (2009). *Implementing standards-based math instruction: A casebook for professional development*. Teachers College Press.

Stols, G. (2013). An investigation into the opportunity to learn that is available to Grade 12 mathematics learners. *South African Journal of Education, 33*(1), 1-18.

Suter, L. E. (2017). How international studies contributed to educational theory and methods through measurement of opportunity to learn mathematics. *Research in Comparative and International Education,* 12(2), 174-197. https://doi.org/10.1177/1745499917711549

Welder, R. M. (2012). Improving algebra preparation: Implications from research on student misconceptions and difficulties. *School Science and Mathematics, 112*(4), 255-264.

Wijaya, A., van den Heuvel-Panhuizen, M., & Doorman, M. (2015). Opportunity-to-learn context-based tasks provided by mathematics textbooks. *Educational Studies in Mathematics, 89*(1), 41-65.

Wood, L. M., Sebar, B., & Vecchio, N. (2020). Application of rigour and credibility in qualitative document analysis: Lessons learnt from a case study. *The Qualitative Report, 25*(2), 456-470. https://doi.org/10.46743/2160-3715/2020.4240