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The Impacts of Overcrowded Classes on Mathematics Education

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Abstract- The effectiveness of mathematics education is pivotal in shaping students problem solving abilities, critical thinking and overall academic success. However, one of the challenges facing educators and policy makers today is the issue of overcrowded classrooms. Overcrowding in educational settings has been identified as a key factor that adversely affects the quality of instruction and learning outcomes. This article aims to explore the effects of having large numbers of students in a single mathematics classroom, highlighting how excessive student numbers can strain teaching resources, hamper personalised instruction and inhibit student's engagement. Furthermore we will explore existing research and case studies that illustrate the correlation between class size and students performance in mathematics as well as potential strategies for mitigating these challenges. By understanding the multifaceted effects of overcrowded classrooms, we can better advocate for effective policies and practices that enhance the learning experience for all students in mathematics education. The article on the impact of overcrowded classes on mathematics education in been discussed under the following sub-headings: overcrowded classes in developing countries, challenges of teaching in overcrowded classrooms, challenges of learning in overcrowded classrooms, impact of overcrowded classes on mathematics curriculum and instruction, special education in overcrowded classrooms and strategies that can help improve the quality of mathematics education in overcrowded classes.

Keywords- Teacher-Pupil Ratio, Limited Teaching Resources, Curriculum Delivery

I. OVERCROWDED CLASSES IN DEVELOPING COUNTRIES

Hall (2016) stipulates that in developing countries, overcrowded classes are a common issue that have negative implications on both the teacher and students. There are several reasons for overcrowding in developing countries like Zambia such as the ones discussed below;

- **Limited resources:** UNESCO (2007) reported that developing countries in Africa often lack the necessary resources to build and maintain sufficient classroom space for all students. As a result, classrooms may be overcrowded with students, making it difficult for teachers to provide individualized instruction and attention to each student. The other reason for overcrowding in developing counties is high student-teacher ratios. With one teacher responsible for a large number of students. This can lead to overcrowding, making it challenging for a teacher to effectively manage and engage with all the students. Inadequate infrastructure is another reason for overcrowded classes. In some cases, developing countries may have inadequate infrastructure such as lack of

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schools or classrooms, which can result in overcrowded classrooms as students are forced to share limited spaces. Another reason for overcrowded classes in developing countries may be lack of qualified teachers. Developing countries may also face a shortage of qualified teachers, leading to large class sizes as the few available teachers are responsible for teaching more students (Moore, 2015).

Research has shown that overcrowding of classrooms in developing countries can have several negative consequences including:

Limited individualized attention- With large class sizes, teachers may struggle to provide each student with the individual attention and support they may need to succeed academically.

- **Limited resources-** overcrowded classes may strain limited resources such as classrooms, materials, textbooks and technology, making it difficult for students to fully engage and learn.
- **Discipline issue-** overcrowded classrooms can make it difficult for teachers to effectively manage student's behaviour, leading to disruptions and a lack of focus in the classroom.

Impact on students' performance-(Likuru, 2000) conducted a study on effects of overcrowded classrooms on teaching and learning in public schools which showed that students in overcrowded classes have lower academic outcomes and are less likely to excel academically compared to students in smaller class sizes.

Research has shown that to address the issues of overcrowded classes in developing countries, government and policy makers must prioritize education funding and must invest in building more schools and classrooms to accommodate all students. Additionally, efforts should be made to recruit and train more qualified teachers, reduce student-teacher ratios and provide teachers with the support and resources they need to effectively teach in overcrowded classes. By addressing these challenges, developing countries can help ensure that children have access and quality education and the opportunity to succeed (Likuru, 2000).

II. CHALLENGES OF TEACHING MATHEMATICS IN OVERCROWDED CLASSROOMS

Teaching in overcrowded classrooms pose several challenges for educators ultimately affecting the quality of education and students learning outcomes. Some common challenges of teaching in overcrowded classrooms according to research includes:

Limited individualized attention IA- Smith (2019) states that with a large number of students, teachers have a challenge of struggling to provide each student with personalised attention and support. This can hinder student's engagement, understanding of concepts and academic progress.

Classroom management issues- Moore (2015) postulates that overcrowded classrooms make it difficult for teachers to effectively manage student's behaviour

and maintain a conducive learning environment. Discipline problems may arise more frequently, leading to disruptions in the teaching and learning process.
Teacher burnout- research has shown that the demand of teaching in overcrowded classrooms can lead to teacher burnout or increased stress levels. Educators may struggle to cope with the work load, maintain high teaching standards and provide quality education to all the students.

Impact on teacher professional development- Mwila (2022) has alluded that teaching in overcrowded classes can limit opportunities for teacher collaboration, feedback and professional development. Teachers may have fewer chances to engage in reflective practices, share best practices and improve their teaching skills.
Time constraints- with limited time available in each class period, teachers may find it challenging to cover the required syllabus thoroughly and provide additional support to struggling students. This can result in rushed lessons and superficial understanding of concepts (Sadiqa, 2018).

Diverse learning needs DLN- in an overcrowded classroom, students have diverse learning needs and abilities. Meeting the individual learning needs of each student becomes challenging for teachers, as they may not have the time or resources to differentiate instruction effectively (Mankgele, 2023). Overcrowded classrooms often faces recourses constraints such as limited materials, textbooks and technology. This may impede hands-on learning activities and engagement opportunities for students.
Overall, teaching in overcrowded classrooms can be a significant barrier to effective instructions and students learning. additionally, the challenges requires systematic reforms such as reducing class sizes, providing additional recourses and support for educators and prioritising teacher well-being and professional development. By addressing these issues, students can create a more conducive learning environment that promotes students success and overall academic achievement.

III. CHALLENGES OF LEARNING MATHEMATICS IN OVERCROWDED CLASSROOMS

Research has shown a lot of challenges attributed to overcrowded classrooms. Discussed below are some of the challenges faced by learners in overcrowded mathematics classrooms:
Lack of individual attention- Stipek (2015) alludes that in overcrowded classroom, teachers may struggle to provide adequate attention to each student. This can result in students not receiving the necessary help or feedback they need to fully understand the material.

Difficulty in staying focused- Mankgele (2023) postulates that with a large number of students in the classroom, it can be challenging for students to stay focused and engage in the lesson. Distractors from other students and noise levels can make it difficult for students to concentrate.

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Limited interaction with the teacher- Marsh & Lang (2018) records that in overcrowded classes, there may be limited opportunities for students to ask questions or participate in class discussions. This can limit their ability to fully participate or engage with the material and deeper their understanding. Overcrowded classes also increases the pressure on the student's to perform. In overcrowded classes, students may feel pressured to compete with their peers for attention and recognition. This can create a stressful learning environment and impact their self-esteem (Bartlett, 2017).
Reduced opportunities for personalised learning-in overcrowded classes, Goodman (2015) has argued that teachers may not have the time and resources take instruction to each student's individual needs and learning style. This can result in some students failing behind not reaching their full potential (Sadiqa, 2018).

Lack of resources- with limited space and resources in overcrowded classes, students may not have access to necessary materials or technology to support their learning. This can further hinder their academic progress.
Classroom management issues- Ajayi (2018) alludes that overcrowded classes can make it difficult for teachers to manage student's behaviour and maintain a positive learning environment. This can lead to disruptions in the classroom and hinder the learning experiences for all the learners.

Unequal access to learning opportunities-in overcrowded classes, some students may receive more attention and support from the teacher than others. This can create unequal opportunities for learning and hinder the academic progress of certain students (Bartlett,2017).
Limited physical space- overcrowded classrooms may lack enough space for all students to sit comfortably and move around freely. This can lead to students feeling cramped and restricted, which can impact their ability to focus and engage in the lesson (Burts, 2017).

IV. IMPACT OF OVERCROWDED CLASSES ON MATHEMATICS CURRICULUM AND INSTRUCTION

Overcrowded classes can have a significant impact on mathematics curriculum and instruction in mathematics education. The first impact of overcrowded classrooms on the mathematics curriculum and instruction is limited individualized attention; in overcrowded classes, teachers may struggle to provide individualised instruction to the learners, leading to learners receiving less feedback and support in their learning. This can hinder their understanding of mathematical concepts and skills (Murry, 1996).

Another impact of overcrowded classes on curriculum instruction in mathematics education is reduced engagement: With a large number of students in class, it can be challenging for teachers to engage all students effectively (MESVTEE, 2013). This can result in some students becoming disengaged or falling behind in their learning.

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Another impact is less time for personalised instruction: teachers may have less time to provide personalised instruction or address individual learning needs in overcrowded classes. This can lead to students not receiving the support they need to succeed in mathematics (Boaler, 2016).

Limited opportunity for active learning is another impact of overcrowded classes on mathematics education. Overcrowded classes may limit the opportunities for students to engage in hands on activities, group work and other active learning experiences that are important for developing mathematical concepts, skills and understanding. Increased stress and behaviour issues is another impact of overcrowded classes on curriculum and instruction in mathematics education (Burns, 2027). Overcrowded classrooms can create a chaotic learning environment which may lead to increased stress for both teachers and students. This can have a negative impact on student's behaviour and overall classroom dynamics (MESVTEE, 2013).

Hall & Flirt (2016) stipulates that in order to address the impact of overcrowded classes on curriculum and instruction in mathematics education, schools and educators may need to consider strategies such as reducing class sizes, providing additional support for teachers and incorporating technology to enhance earning experiences. Additionally, professional development for teachers on effective classroom management techniques and differentiated instruction can help to address the challenges associated with overcrowded classes (Moore D & Goodman J, 2015).

V. SPECIAL EDUCATION IN OVERCROWDED MATHEMATICS CLASSROOMS

Special education in overcrowded mathematics classes presents additional challenges for both students with special educational needs and their teachers. Some of the specific issues that arises in this context includes:

Individualised support- students with special education needs often requires individualised support and accommodation to help them succeed academically. In overcrowded classes, it can be difficult for teachers to provide the necessary support, attention and tailored instruction to the students (Friend, 2018).

Limited resources- special education programs may already face resource constraints, and overcrowded classrooms can exacerbate these challenges, students with special educational needs may not have access to the specialised materials, assistive technology or support services they may need or require (MESVTEE, 2013).

Inclusive practices- in overcrowded classes, it can be challenging to provide inclusive practices that supports students with special education needs. Bursuck (2018) has argued that students in overcrowded classes may not receive differentiated instructions, collaborative learning opportunities or behavioural support they need in an overcrowded and potentially overwhelming classroom environment.

Individualised education plan (IEP) - Students with special education needs have IEPs that outlines their special learning goals, accommodations and services. It can be

difficult for teachers to effectively implement and monitor these plans in overcrowded classrooms where they may be limited time and resources.
Teacher burnout- teachers of overcrowded classes including those students with special education needs, may experience increased stress and burnouts. the demands of managing a large number of students, addressing the diverse learning needs and supporting individualised education plans IEPs can be overwhelming (Bursuck, 2018).

Collaboration and communication- effective communication and collaboration among teachers, support staff, parents and students are essential in special education settings. In overcrowded classes, it may be challenging to coordinate and maintain these relationships due to limited time and competing priorities.
Student's well-being- overcrowded classes can impact the overall well-being of students with special education needs, leading to feelings of isolation, anxiety and frustration. These students may struggle to engage in the learning process and develop positive social connections in a crowded environment. Additionally, the needs of students with special education needs in overcrowded classes requires a comprehensive approach that prioritises individualised support, access to resources and collaboration among all stakeholders. Schools and districts must consider strategies to reduce class sizes, provide targeted support for teachers and promote inclusive practices to ensure all students thrive academically and socially.

VI. STRATEGIES THAT CAN HELP IMPROVE THE QUALITY OF MATHEMATICS EDUCATION IN OVERCROWDED CLASSES

The following are some of the strategies and interventions that can be used to improve the quality of teaching and learning of mathematics in overcrowded classes:

- Differentiated instruction- tailoring instruction to meet the diverse needs of students in the classroom can help improve the quality of mathematics education. This may involve providing extra support or extension activities to students based on their individual abilities.
- Small group work-breaking the class into smaller groups for collaborative problem-solving activities can help provide more individualized support and feedback to students. This can also help students develop critical thinking and communication skills.
- Utilizing technology-incorporating technology tools such as online tutorials, education apps, or interactive whiteboards can provide additional resources and support for students in overcrowded classrooms.
- Peer tutoring: encouraging peer tutoring can help distribute the workload among students and provide opportunities for collaborative learning. This can also help reinforce learning materials by having students explain concepts to their peers.
- Formative assessment-regularly assessing students' progress through formative assessment such as quizzes, exit tickets, or group discussion can help teachers

identify areas where students may need additional support and adjust their instruction accordingly.

- Providing hands on activities: incorporating hand on activities and manipulations can help engage students in the learning process and make abstract concepts more concrete. This can be particularly helpful in overcrowded classes where students may benefit from more active and kinesthetic learning experiences.

In conclusion, the impacts of overcrowded classes on mathematics education are profound and multifaceted. The overwhelming evidence suggests that large class sizes hinder effective learning and teaching, leading to diminished students engagement, reduced individualised attention and lower academic performance in mathematics education. As teachers struggle to manage large groups, the quality of instruction often suffers, making it challenging to address the diverse needs of students. Moreover the psychological and well-being of students can be adversely affected in overcrowded settings, further exacerbating the challenges they face in mastering mathematical concepts. Addressing these issues requires a concerted effort from educators, policy makers to advocate for smaller class sizes, allocate resources effectively and implement innovative teaching strategies that can accommodate larger groups. Ultimately, ensuring that students receive a high quality mathematics education is essential for their future success and for fostering a society that values critical thinking and problem solving skills. By recognising and addressing the impacts of overcrowded classrooms, we can work towards creating a more equitable and effective educational environment that empowers all students to thrive in mathematics and beyond.

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