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Overcoming Mathematics anxiety through CPD interventions and implementation

Innocent Katule, Nigeria

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School context

Deeper Life High School is a unity school with 23 campuses in 21 states of the Federal Republic of Nigeria. The school is coordinated centrally by the education secretary through the school principals of each campus. As a Cambridge International School, it runs a hybrid curriculum, a mixture of British and Nigerian curricula.

About the author



Innocent Katule is a Mathematics educator, zonal officer (ICT and media), and Assistant Coordinator of CPD at Deeper Life High School (DLHS), Opete Campus, Delta State, Nigeria. He holds an MSc in Industrial Mathematics, a PGDE and an International Diploma in Education from the University of Buckingham.

Key findings

- The CPD programmes positively influenced teachers' practices, with increased confidence and competence in addressing Maths phobia and integrating active learning strategies.
- Teachers reported enhanced skills in differentiated instruction and using technology to engage students. This led to improved classroom environments and a more supportive atmosphere for students struggling with Mathematics.
- However, challenges remain. Time constraints hinder the consistent implementation of new strategies. Varying levels of technological proficiency among teachers require ongoing support. There is a need for continued emphasis on addressing the emotional and psychological aspects of Maths anxiety. Sustained effort is needed to ensure long-term impact and embed these practices within the school culture.

Action Research rationale

My topic is overcoming Mathematics anxiety through continuous professional development (CPD) interventions and implementation, using Deeper Life High School as a case study. As a unity school, having teachers from different cultural and socio-economic backgrounds would require CPD to help teachers, who can be posted to any campus, to be able to seamlessly demystify Mathematics phobia among their students and get optimal results.

Exploratory Action Research questions

1. What is my perception of the relationship between CPD for teachers and students' experiences with Mathematics?
2. What are students' perceptions related to their experiences with Mathematics?
3. What do teachers do when students show hesitation or struggle with Mathematics?

Data collection tools

Methodology

1. What is my perception of the relationship between CPD for teachers and students' experiences with Mathematics?

Focus group: This will involve about 30 teachers in Deeper Life High School in the south-south of Nigeria, about six campuses. This will be done via Zoom, which will be recorded and conducted under the supervision of the school's National Mathematics Coordinator.

2. What are students' perceptions related to their experiences with Mathematics?

Survey/questionnaire: To explore students' views on Mathematics anxiety, we shall design 10–15 questions for about 180 students (30 from each of the six campuses).

3. What do teachers do when students show hesitation or struggle with Mathematics?

Interview: Twelve teachers (two from six of the campuses) will be interviewed individually; in this, we shall explore what the teachers would do after workshops we shall organise for them on Maths phobia.

Consent: As a full-boarding school, we already have consent from parents to carry out this research, as it is part of what was agreed upon by parents during admission and teachers during employment. Notwithstanding, consent forms would be designed and sent to parents specifically for this research work.



Data analysis for the exploration stage

Key findings from the exploration

- Approximately 77.3 per cent of students have adequate Maths resources available at school.
- About 59.8 per cent find the curriculum relevant and feel supported by their teachers.
- Their peers positively influence 59.8 per cent and have received extra help.
- However, around 17 per cent of students experience Maths anxiety, which may be under-reported due to shyness or discomfort in admitting it. Addressing these issues through supportive teaching practices, differentiated instruction and additional support can enhance students' learning experiences and outcomes in Mathematics.
- Based on the data, approximately 27.5 per cent of the students reported having negative experiences with Mathematics. These experiences include failing tests, being teased or other incidents that have negatively influenced their current attitudes towards the subject. Addressing these negative experiences through supportive teaching practices and creating a positive learning environment can help improve students' attitudes and performance in Mathematics.

'As the training has equipped the educators and made them ready for work, the School Principal should support them with more hands. Maths educators are supposed not to be overloaded. Thank you.'

Mathematics educator's feedback

Data analysis and designing an action plan

Action plan

Action plan for CPD sessions based on the recommendation.

Objectives

1. Recognise and address Mathematics phobia

- Equip teachers with the ability to identify signs, triggers and causes of Maths phobia in students.
- Help teachers understand the psychological and social impacts of Maths anxiety on learners.

2. Develop and implement confidence-building strategies

- Enable teachers to use growth mindset techniques and stress-reduction strategies to help students build a positive attitude toward Mathematics.

3. Integrate technology to make Mathematics engaging

- Familiarise teachers with technology-based tools (e.g. Kahoot, GeoGebra) to simplify complex concepts and reduce anxiety among students.

4. Promote collaborative learning

- Encourage peer-learning strategies to foster supportive classroom environments and reduce the fear of failure in students.

5. Adopt differentiated instruction

- Train teachers to design and implement customised teaching strategies that cater to the diverse needs of learners, addressing individual anxiety triggers effectively.

6. Design low-stakes assessments

- Equip teachers with techniques to create assessments that minimise pressure and encourage positive student performance in Mathematics.

7. Establish continual reflection and evaluation

- Develop teachers' capacity to evaluate the effectiveness of these strategies and make continual improvements to their teaching approaches.

Participants

Number of teachers: 100–150 teachers (regional grouping if required)

Duration and schedule

Total duration: one month

Number of sessions: four sessions (one per week)

Sessions length: three hours each

Session details and content

Session 1:

Understanding Mathematics phobia

Focus:

- Identify signs, causes and impacts of Maths anxiety.
- Discuss teacher experiences and analyse real-life case studies.

Activities:

- Collaborative discussion to share experiences.
- Analyse case studies to identify common anxiety triggers.

Session 2:

Building student confidence in Mathematics

Focus:

- Growth mindset and stress management techniques for students.
- Positive reinforcement strategies to boost student morale.

Activities:

- Role play scenarios for confidence-building techniques.
- Practise pre-assessment relaxation and engagement methods.

Session 3:

Technology and collaborative learning strategies

Focus:

- Use of gamified learning platforms (e.g. Kahoot, GeoGebra) to simplify Maths concepts.
- Collaborative learning strategies to reduce fear and promote peer support.

Activities:

- Hands-on session to create a Maths lesson with an app.
- Role-play activity for managing inclusive group dynamics.

Session 4:

Differentiated instruction and evaluation

Focus:

- Tailoring teaching strategies to diverse learner needs.
- Designing low-stakes assessments to minimise Maths anxiety.

Activities:

- Develop differentiated lesson plans for a Maths challenge.
- Redesign a Maths assessment for anxiety reduction.

Expected outcomes

- Teachers will acquire practical tools to identify and address Maths phobia effectively.
- Increased confidence among teachers in using technology and collaborative learning strategies.
- Enhanced understanding of how to create a supportive and differentiated learning environment.

Evaluation of pilot programme

1. Conduct pre- and post-programme surveys for teachers to gauge confidence and preparedness.
2. Collect feedback on the usefulness and applicability of the CPD sessions.
3. Observe the impact of new strategies in pilot classrooms for future scaling.

Action plan evaluation tools

Evaluation methods

- 1. Pre- and post-programme surveys**
Conduct surveys before and after the CPD sessions to measure changes in teachers' confidence, preparedness and attitudes towards addressing Maths anxiety. These surveys will include both quantitative and qualitative questions to capture a comprehensive view of the impact.
- 2. Feedback forms**
Collect detailed feedback from participants after each session to assess the usefulness and applicability of the content. This will help identify areas of improvement and highlight successful strategies.
- 3. Classroom observations**
Observe pilot classrooms where teachers implement the new strategies. This will provide real-time insights into how the strategies are being applied and their effectiveness in reducing Maths anxiety and improving student engagement.
- 4. Student performance data**
Analyse student performance data before and after the implementation of the action plan. This will help determine if there are measurable improvements in student outcomes, such as test scores and class participation.
- 5. Focus groups**
Conduct focus group discussions with a subset of teachers and students to gather in-depth feedback on the impact of the strategies. This qualitative data will provide a deeper understanding of the experiences and perceptions of both teachers and students.

Tools

- 1. Survey platforms**
Online tools like Google Forms or SurveyMonkey for pre- and post-programme surveys.
- 2. Observation checklists**
Standardised checklists for classroom observations.
- 3. Data analysis software**
Tools like Excel or SPSS for analysing student performance data.
- 4. Recording devices**
These are used to capture focus group discussions.

Data analysis and conclusions

Action plan implementation

The CPD sessions were generally well received by participating teachers, who showed enthusiasm for applying the newly learned strategies in their classrooms. Teachers particularly valued the focus on practical tools and collaborative learning techniques.

Challenges during implementation included time constraints for teachers balancing CPD with their regular duties and the varying levels of technological proficiency among teachers, which required differentiated support for integrating digital tools.

A key surprise was the extent to which teachers shared personal experiences with Maths anxiety, highlighting the importance of addressing the emotional aspects of Mathematics education. The strong collaborative spirit among teachers and their eagerness to implement peer-learning strategies were also positive surprises. Overall, the CPD initiative demonstrated a positive impact and revealed important considerations for future implementation and scaling.



Key findings

The CPD programmes positively influenced teachers' practices, with increased confidence and competence in addressing Maths phobia and integrating active learning strategies. Teachers reported enhanced skills in differentiated instruction and using technology to engage students. This led to improved classroom environments and a more supportive atmosphere for students struggling with Mathematics.

However, challenges remain. Time constraints hinder the consistent implementation of new strategies. Varying levels of technological proficiency among teachers require ongoing support. There's a need for continued emphasis on addressing the emotional and psychological aspects of Maths anxiety. Sustained effort is needed to ensure long-term impact and embed these practices within the school culture.

Conclusions

This Action Research demonstrates the positive impact of targeted CPD interventions on addressing Maths anxiety and improving Mathematics education within Deeper Life High School. The findings highlight the importance of equipping teachers with strategies to identify and support students experiencing Maths phobia, fostering a more positive and engaging learning environment.

The learning from this study can be valuable in a global context, particularly for schools seeking to enhance Mathematics outcomes and create inclusive classrooms. The emphasis on practical strategies, technology integration and collaborative learning can be adapted to diverse educational settings.

Improvements to the school development cycle include embedding ongoing CPD focused on pedagogical innovation and student well-being. Future actions could involve:

- establishing peer mentoring programmes for teachers
- implementing student-led initiatives to promote a positive Maths culture
- developing resources for parents to support their children's Maths learning at home.

These steps can contribute to a cycle of continual improvement in Mathematics education.

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Future actions

This Action Research has demonstrated that targeted CPD focused on addressing Maths anxiety can positively impact the learning environment and teaching practices within Deeper Life High School. The study highlights the importance of empowering teachers with strategies to support students' emotional and academic needs in Mathematics. Key learnings include the value of practical, actionable CPD content, the importance of addressing diverse teacher skill levels (particularly in technology) and the power of collaborative learning approaches.

The impact of this research extends beyond the immediate setting. The findings offer valuable insights for other schools, both nationally and globally, seeking to improve Mathematics education and promote inclusive learning environments. The emphasis and importance of teacher training, practical application and addressing students' anxiety can be adapted to various contexts.

Possible enhancements to the school development cycle include:

- **embedding regular cycles of Action Research to address specific school needs and challenges**
- **establishing a robust system for ongoing professional development, with a focus on teacher-led initiatives and peer support**
- **integrating student feedback mechanisms to ensure that educational practices are responsive to their needs and experiences.**

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