

Camtree Digital Library



Levelling up Maths learning through digital platforms to improve fifth grade students' problem-solving skills

Author	Hamdan, Shireen
Title	Levelling up Maths learning through digital platforms to improve fifth grade students' problem-solving skills
Publisher	British Council
Publication date	2024
Download date	2026-03-08 13:07:38
Link to Item	https://hdl.handle.net/20.500.14069/1189

British Council
Partner Schools

Levelling up Maths learning through digital platforms to improve fifth grade students' problem-solving skills

Shireen Hamdan, Jordan

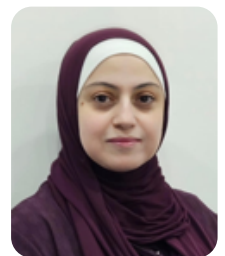
Levelling up Maths learning through digital platforms: Using digital resources to improve fifth grade students' problem-solving skills

School context

Al-Ridwan School is located in Amman, Jordan. It was established 27 years ago and has taught the national Jordanian curriculum since then for pre-school to secondary students. In 2021, the Cambridge International Programme started with 60 students in grades one to five. Now in its third year, the international section has 240 students in grades one to eight and is expanding to the Cambridge Upper Secondary stage next year.

About the author

Shireen Hamdan has been in the field of education since 2006. She is currently the International Programme Coordinator at her school. Shireen and the school leadership team contributed to establishing the international section at Al-Ridwan School in 2021. She is responsible for ensuring the successful implementation of the curriculum. She also conducts and supervises training programmes for teachers and contributes to the selection of suitable learning resources at her school. Shireen holds a post-graduate degree in Advanced Instructional Leadership and has a great passion for teacher coaching and utilising technology in education.



Key learnings

This research studied how Maths digital resources could improve conceptual understanding for fifth-grade students.

- Students showed higher engagement levels and improved ability to achieve conceptual understanding of Maths concepts. They also appreciated continuous access and flexibility when using the resources independently.
- Teachers found the training satisfying as the programme addressed how digital resources could be integrated with teachers' regular practices and it offered practical ideas and tutorials.
- Teachers appreciated the categorisation of digital resources in the modules based on their usage, which helped them select the most suitable resource for their lesson objectives.
- The principal played an important role by integrating the training into the timetable. She emphasised the importance of exploring technology's role in education, and expanding the use of digital resources in other subjects.

‘Technology is an area where we really need to explore more in our practice. Once it works well in mathematics, we will be able to look into how we can use it in all subjects.’

Bahija Mawas, School Principal

Action research rationale

As a recently established Cambridge International School serving diverse learners from various backgrounds after the pandemic, it was evident that students faced significant challenges in problem-solving and retaining math skills. It was crucial to bridge proficiency gaps relative to Cambridge standards. Integrating technology both inside and outside the classroom could be a valuable tool to improve learning, engagement, and alignment with students’ digital competencies. Digital resources can also enable personalised remediation plans.

The aim of this research was to study how Maths digital resources, featuring interactive animations, activities and quizzes, can improve conceptual understanding and problem-solving skills for fifth-grade students. The research was conducted with the assistance of a fellow Maths teacher who teaches the fifth grade. The digital resources used align with the Cambridge Primary Framework; their inclusion of videos and manipulatives provides visualisation to enhance comprehension and performance. Students can progress at their own pace and revisit materials as needed.

This research is key as the fifth grade caps the primary curriculum, and strong Maths skills here facilitate the transition to the lower secondary stage.

Exploratory research questions

1. Why do I believe that implementation of digital resources in teaching Maths will positively affect the problem-solving skills of fifth grade students?
2. What are students’ perceptions of using digital resources in Maths?
3. How would other Maths teachers perceive the impact of using the digital resources to enhance students’ conceptual understanding and problem-solving skills in Maths?

Methodology

The primary aim of this research was to enhance Maths learning through the use of digital platforms. This study focused on fifth grade students in the international section of Al-Ridwan Schools in Amman, Jordan. The methodology incorporated a mixed-method approach, including lesson observations, a focus group of students, and a survey of teachers.

For lesson observations, four different maths classes at the fifth-grade level were observed on separate days. Two of these observations were conducted while employing digital platforms, and the other two were conducted without their use. Classes were recorded, and notes were taken regarding students’ engagement and problem-solving abilities.

A focus group discussion was held to allow students to articulate their opinions and thoughts regarding the use of digital resources in Maths. The class consisted of 15 students, and the focus group included eight students with varying levels of achievement.

A survey was completed by Maths teachers in the international section at Al-Ridwan Schools. This survey collected teachers’ reflections, notes and concerns regarding the use of digital resources.

Before commencing the research, consent was obtained from all participants, ensuring they understood the purpose of the study and their rights. For students, consent from guardians was mandatory. Guardians received information sheets and consent forms, and it was ensured that the students understood the research and were willing to participate. All participants and guardians were briefed on how their data would be employed, stored, and safeguarded. All data collected remained confidential, and any identifying particulars were anonymised to safeguard participants’ privacy.



Figure 1: Students of the focus group with their Maths teacher.

Key findings from exploration

The class observations revealed that digital resources facilitated clear content delivery through animated mathematical models and virtual manipulatives, smoothly benefiting the achievement of lesson objectives. These tools enhanced explanations, provided visual aids for complex concepts, and addressed diverse learning styles. In classes without digital resources, the teacher relied on pictorial models, which required more time for explanations and left less time for practice. Student engagement was notably lower in these classes, except during cooperative learning activities.

The focus group discussion highlighted students' appreciation for the accessibility of digital resources during vacations, which aided their understanding in areas like estimation and long division. While 60% of students preferred interactive exercises and videos, 40% favoured traditional methods due to perceived challenges or distractions. Despite digital resources increasing interest for 70% of the students, 30% found them occasionally boring or overwhelming. Additionally, 80% believed these resources improved their problem-solving skills, although 20% found certain questions overly challenging.

The teachers' survey indicated that 85% of Maths teachers used digital resources including videos and virtual manipulatives. Teachers found the digital resources beneficial in aiding students' understanding, making lessons engaging and interactive, particularly in reinforcing concepts or illustrating problems pictorially. Technical issues and complexities in concept presentation were reported by around 30% of teachers. Concerns regarding internet safety and distractions were voiced by 15% of teachers, while 10% were concerned about unequal student interaction due to device shortages.

Teachers recommended various resources like Marshall Cavendish Digital Suites and GeoGebra for modelling mathematical concepts.

The comprehensive analysis underscored the invaluable impact of digital resources in enhancing both teaching and learning experiences in mathematics. Students exhibited greater engagement, diverse learning opportunities, and improved problem-solving skills when aided by digital tools. However, the varied preferences and challenges highlighted, such as technical issues and concerns about access and complexity, emphasised the need for a balanced approach to accommodate different learning styles and address technological problems.

Action plan

After analysing the findings from our exploration, the following action plan was formulated to address the identified needs.

- Provide a professional development programme for teachers by developing online training modules for teachers. The training modules are to introduce best instructional practice for utilising digital resources in teaching Maths.
- Enhance Maths lesson plans for better implementation of digital resources in teaching and assessment.
- Provide the required resources such as enough devices for students, internet connection, and a reliable digital platform that can be used in Maths classes.

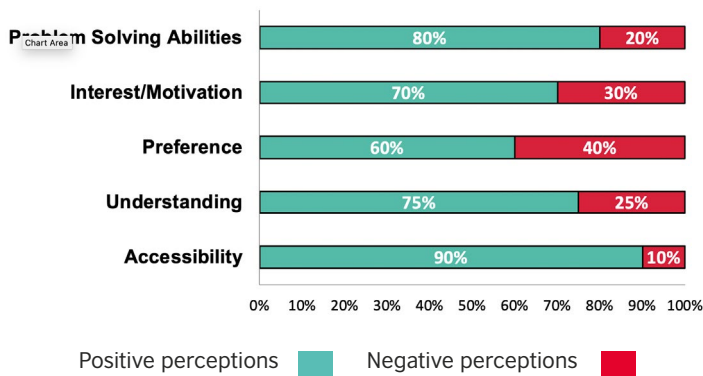


Figure 2: Students' perceptions of using digital resources in Maths

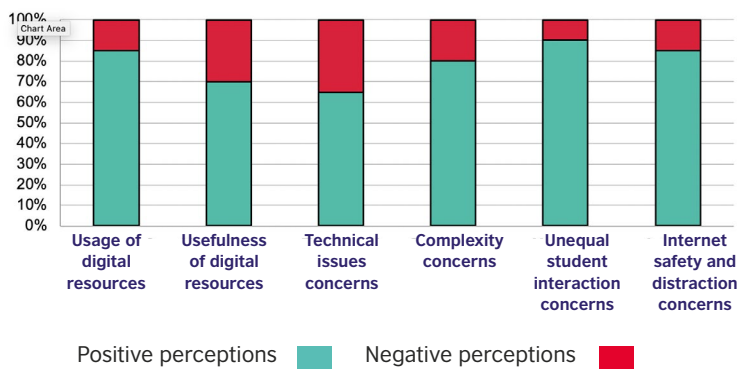


Figure 3: Teachers' perceptions of using digital resources in Maths

Action plan implementation

Online training modules were designed in collaboration with Maths teachers to identify and incorporate the best instructional practices for integrating digital resources into Maths teaching. Teachers were asked to send all resources they thought might be useful to share among the Maths team. The contributions from the teachers were combined to create the material for the training. Microsoft Teams was used to create user-friendly, engaging, and accessible training modules.

The training programme included reading materials, recorded videos, and downloadable resources featuring various suggested Maths applications and platforms that can be integrated into Maths classes. It also focused on the value that can be added by using these resources within the Concrete – Pictorial – Abstract approach, which is employed in teaching Maths at the primary stage in Al-Ridwan International Section.

The training was self-paced, allowing teachers to access it at their convenience. Teachers were required to fill in a pre-training survey and a post-training survey to reflect on their experience and the benefits of the training. A collaborative learning environment was fostered, encouraging participation through discussion groups.

Feedback and reflection were essential components of the implementation process. Feedback was collected from teachers regarding the effectiveness and relevance of the training modules and was then analysed to identify strengths and areas for improvement. Reflection on the implementation process allowed for the identification of successes, challenges, and lessons learned.

Data collection procedure

Data was collected to explore the challenges and benefits anticipated by the researcher in implementing the teacher training on using digital resources. It also aimed to examine the teachers' expectations and concerns before and after the training, as well as to understand the leaders' perceptions of the action plan regarding resources, support and expectations.

The researcher kept a reflective journal for the purpose of exploring her own perceptions of implementing the training. This journal served to reflect the researcher's thoughts and feelings about the training, including potential challenges and benefits. It also explored the researcher's perspective on the best method to implement the action plan and assess its effectiveness.

Surveys were administered to teachers before and after the training to explore the impact of the training on their confidence in using digital resources in their Maths classes and the frequency of their usage. These surveys also aimed to gather feedback on the training's benefits and possible improvements.

'Detailing the benefits and providing explanations about digital resources has enlightened me and drawn my attention to benefits I hadn't previously noticed.'
A Maths teacher reflecting on the training programme

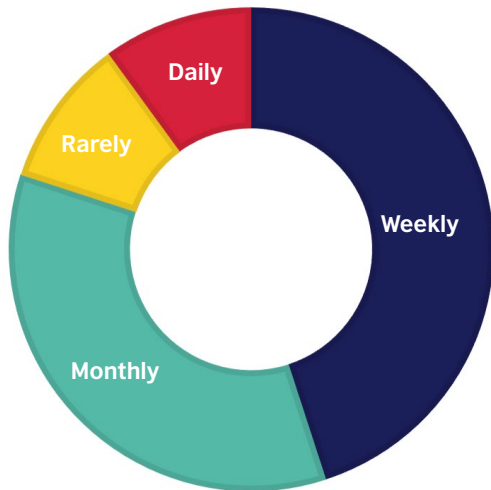


Figure 4: Frequency of using digital resources in Maths before training

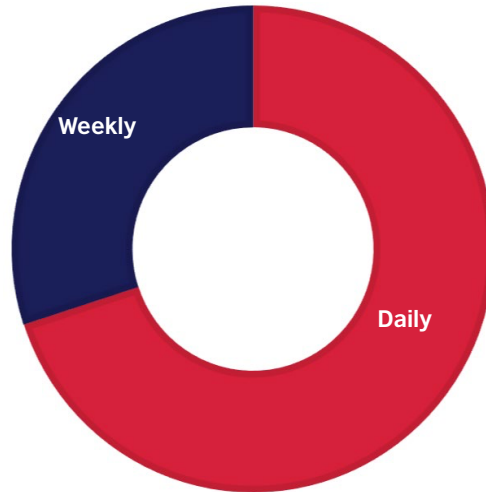


Figure 5: Frequency of using digital resources in Maths after training

To collect data related to the support provided by school leaders, an interview was conducted with the principal of the international section. This interview aimed to provide insights into how school leaders were involved in facilitating the training programme and their expectations of it. It also sought to explore their assessment of the training's impact on teachers and students, as well as their views on the next steps in the research process.

All participants granted their consent to take part in the data collection process.


Key findings

These are the key findings from a study on the implementation of a teacher training programme designed to enhance the integration of digital resources in maths teaching.

- The researcher had positive thoughts towards implementing the teacher training programme, despite potential challenges in finding the appropriate time and format for training.
- The researcher believed the training would be highly beneficial for Maths teachers due to several reasons: the programme addressed the 'why' behind using digital resources and how they could be integrated in harmony with teachers' regular practices. It also offered practical ideas and tutorials for various digital resources applicable to Maths instruction.

- Teachers found the training satisfying, leading to increased usage of digital resources in Maths teaching.
- Teachers appreciated the categorisation of digital resources in the modules based on their usage, which greatly assisted in selecting the most suitable resource for lesson objectives.
- Teachers found that further training on finding the suitable digital resources can assist them further in their practice.
- The principal played an extremely important role in implementing the training programme by facilitating arrangements and integrating it into the timetable alongside other training programmes. She held high expectations for the training to equip Maths teachers with new skills to effectively utilise digital resources in Maths classes.
- The principal emphasised the importance of exploring technology's role in education, suggesting potential expansion of research to improve student outcomes across various subjects beyond mathematics.





**‘I love how it’s like playing a video game,
but I’m learning at the same time!’
A fifth grader in the focus group discussion**

Conclusion

The action research on integrating digital resources in Maths instruction provided valuable insights. Students showed higher engagement levels and improved ability to achieve conceptual understanding of Maths concepts. They also appreciated continuous access and flexibility when using independently. The teacher training programme, focusing on the expected benefits and providing practical tools, contributed to enhanced teachers’ confidence and increased digital resource usage in their Maths classes. The principal’s beliefs regarding using digital resources in education, assisted in successful implementation of the training programme and will direct its application for a larger number of students and for multiple subjects other than Maths.

Moving forward, enhancements in the school development cycle could include refining and expanding teacher training programmes, and incorporating feedback to meet evolving needs. Efforts to ensure equitable access to digital resources for all students are also crucial.

Use of digital resources can be expanded to other subjects aiming to enhance students’ learning in all subjects. By prioritising the integration of digital resources and leveraging insights from this research, the school can foster innovation and excellence in mathematics education, benefiting both students and educators.

These findings are not confined to the specific school but hold relevance globally. The successful integration of digital resources is imperative, as demonstrated by the outcomes of this research. It emphasises the need for ongoing professional development opportunities to equip educators with the skills to effectively integrate digital tools into their teaching practices.

References

- Smith, R., & Rebolledo, P. (2018). *A Handbook for Exploratory Action Research*. London: The British Council
- McNiff, J. (2013). *Action Research: Principles and Practice*. London: Routledge.
- Selimi, A., Saracevic, M., & Useini, A. (2020). Impact of Using Digital Tools in High School Mathematics: A Case Study in North Macedonia. *Universal Journal of Educational Research*, 8(8), pp. 3615–3624. Available at: DOI: 10.13189/ujer.2020.080838
- Viberg O., Grönlund Å., & Andersson A. (2023). Integrating digital technology in mathematics education: a Swedish case study, *Interactive Learning Environments*, 31:1, 232-243, DOI: 10.1080/10494820.2020.1770801

Acknowledgements

I would like to thank the British Council for funding and facilitating this research. I am sincerely thankful to my mentors, Sirin Soyoz and Kathleen O’Hare, for their guidance and support throughout this journey.

I would also like to express my gratitude to the leadership team at Al-Ridwan Schools for their encouragement and facilitation of this research. My thanks also extend to the Maths teachers, students, and parents who took part in this study.

Lastly, I am grateful to my family for the help and support they provided, without which this work would not have been possible.

AI tools were utilised for data analysis and summarisation.