EXECUTIVE SUMMARY

Changing Face of Teaching & Learning: The Impact of Technology-Enhanced Learning on Pedagogy, Assessment and Learning Environments in IB Diploma Programme Schools

Jeff Thompson Research Award Report

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Literature Review

The literature was examined using a thematic review process and was organised under three broad themes:

Technology enhanced learning and teaching (TEL), teaching & learning during COVID-19 pandemic, the way forward with new technologies in education.

Some of the key ideas and concepts emerging from the literature are categorised under the following themes.

- Technological developments and Learning Environments
- Pedagogy and Instruction include
- Assessment and Feedback
- Well-Being
- Innovation in Teaching and Learning

Research Methodology

This study was developed using a mixed methods research approach. The data collection was done virtually since this study was conducted during the COVID-19 pandemic. The quantitative data was gathered using an online survey in Studies A and B which served as an important tool to identify issues, ideas and themes which were later used to develop the follow-up qualitative interviews. The qualitative aspect of this research complements the quantitative data for generating personal interpretations and accounts through an in-depth investigation using individual semi-structured interviews.

Research Findings

The findings reflect data collected through online surveys and follow up individual interviews in Studies A and B. The findings are presented below.

Introduction

Digital technology has emerged as one of the most important topics concerning learning in present times. The rapid pace of technological development has led to a transformation in teaching, learning and assessment. This transformation is driven by the quest to develop new ways of learning and augment the classroom environment by including new technologies and methods. The recent global pandemic has accelerated the transformation in school settings worldwide, with school closures that began in early 2020 causing severe disruption to teaching and led to a major shift in the online learning environment.

The research in this thesis was conducted during the challenging period of COVID-19, while schools across the globe were experiencing a major shift to remote and hybrid models of teaching and learning. The research set out to capture the significant impact of Technology Enhanced Learning on pedagogy, assessment and learning environments in the context of the International Baccalaureate (IB) Diploma Programme (DP). It was carried out in two stages. Study A explored IBDP teachers' and coordinators' views on the transitioning experiences caused by the shift to online learning during the pandemic. The participants in this study were 80 IB Diploma Programme (DP) teachers, coordinators, and administrators. Study B was a case study in an IB school that explored the role of Artificial Intelligence (AI) in teaching and learning of mathematics in an international (IB) school. There were in total 6 students who participated in this study, 3 core level mathematics students from grade 9, 3 higher-level mathematics students from grade 11- IB Diploma Programme and a mathematics teacher.

My interest in this topic stems from my varied experiences with the IB schools. As an IB Diploma Programme teacher, Coordinator and later as Head of Senior School, I have been fascinated by the transformative role of Technology Enhanced Learning (TEL) in supporting pedagogy and formative assessment practices in the classroom. And ways it can further evolve to support the autonomous and personalised learning opportunities for students. Furthermore, I have actively supported IB's development as a DP consultant, workshop leader, examiner, and school site visitor. In these roles, whilst interacting with the DP teachers in several settings, I identified common issues and patterns related to pedagogy and assessment that emerged across different contexts. I found that some of the areas where teachers struggled to evidence their practice were around differentiation, autonomous learning, formative assessments, individualised support to students. Additionally, during these interactions and visits to different schools, I observed that integration of technology to aid teaching and learning in the IBDP is an area that was not put to optimum use, it was either neglected or obstructed due to contextual challenges. This further piqued my interest and provided me with ideas to explore it as a part of my doctoral research.

Summary of the Research Findings from Study A

- The findings elucidate a lack of contingency planning and processes in schools which led to severe disruption in teaching and learning caused due to the global pandemic.
- The findings highlight issues concerning the transition to online teaching that includes access to reliable and consistent digital infrastructure and digital resources that led to difficulties in the planning and delivery of online teaching.
- The findings reveal the amplified digital divide in several settings and illuminates a distinct need for a robust digital infrastructure, consistent learning management systems and clear processes arising from the shift to online teaching.
- The findings reveal that the school leaders shouldered the additional responsibility of monitoring the curriculum delivery and ensuring the ongoing professional development of the teachers. Implementing all this at an organisational level required a system-wide approach which was lacking and consequently made this transition extremely challenging. Some other administrative challenges encountered by the school leaders include managing parental expectations, access and availability to digital resources, online timetabling, student engagement, and local government regulations pertaining to the pandemic which added to the transitioning challenges of the administrative staff in IBDP schools.
- The findings demonstrate several challenges around online curriculum delivery in the IBDP. Internal assessments (IA) and Extended Essays (EE) components in the IBDP posed the greatest challenge due to lack of organised digital resources to support the process. Teachers expressed difficulties in finding substitutes for collecting primary data for IA and EE using online tools which constrained the delivery of these components.
- Differentiated instruction emerged as an area of significant challenge and needs more pedagogic support in the online curriculum delivery. The findings reveal several challenges in creating study material for differentiated learning, maintaining a learner portfolio for differentiation, identifying differentiated instruction and assessment tools for the IBDP.
- The findings reveal several other issues around autonomous learning, student engagement, student motivation and organising group work online. Moreover, the pandemic has elucidated a distinct dearth of personal autonomy of the teachers which was revealed in the strict accountability measures in various contexts, school policies, and parental expectations. Consequently, this impeded the design and delivery of the curriculum during online teaching
- Lack of collaborative time for teachers during online teaching has emerged as a notable concern, schools ran with very less or reduced collaborative time that needs redressal to extend pedagogical support.
- The findings suggest existing pedagogy used for face-to-face learning is not a feasible option for online learning in future. The findings reveal the areas that need specific pedagogic support to incorporate digital technology effectively in the IBDP include access to quality digital content and more subject-specific resources, explaining content and extended concepts to students in an online environment, student-friendly instructional aids, online assessment tools for the IBDP, collaboration and group work for students. Teachers suggested a more flexible curriculum at the DP level might ease the pressure on the teachers.
- The teacher's responses reveal several challenges in using digital technology in designing, monitoring, and conducting assessments. Teachers expressed difficulties in following the IB paper exams model in an online environment, structuring multiple choice questions, analytical essays, and graph-related questions were difficult to design and implement, and marking handwritten essay-based responses was found difficult. Most teachers expressed conducting a range of formative assessments using short assessment tasks.
- Academic honesty emerged as a central concern in conducting online assessments in the IBDP.
- Teachers expressed providing individual feedback online was challenging.
- The findings reinforced the need for professional development of the IBDP teachers arising in view of the sudden shift caused due to the pandemic. The findings draw a clear need to focus on continuous training in furthering the digital skills and competencies of the IBDP teachers. The findings suggest a strong need for a system-wide organisational approach that includes strategies for professional development as an important agenda for the adaptation of technology for the future.
- The findings also draw concerns towards the well-being of the school leaders, a subject that needs more focus and development. There is limited evidence of research studies capturing the challenges of the school leaders during the pandemic.
- The findings elucidate that online format of learning did not cater for the inclusive learning requirements of IBDP students and it emerges as an area that requires significant focus and consideration in future.

Summary of the Research Findings from Study B

- Key findings from Study B suggest that the implementation of AI in mathematics offered personalised learning support that included an individual learning path based on the diagnostic assessment, additional practice, revision assistance, and improved the learning experience through scaffolding support, and strengthening of foundational skills.
- It supported self-paced and self-directed learning approaches that enhanced student motivation and engagement.
- The findings reveal a distinct benefit witnessed in teaching; the application provided individually designed tasks which helped the teacher in differentiating the learning activities without having to spend time physically in designing separate tasks for each student.
- The findings demonstrate that students received immediate feedback on their learning while using the AI application which not only served as a motivation for the academic progress but also helped in continuously reflecting on the learning process.
- The findings in Study B demonstrate continuous monitoring support and clear ownership of learning by students.
- Interestingly, it includes a continuous cycle of inquiry, action, and reflection created by the individual learning path for every student. The AI application fostered this process and helped students in progressing independently which reinforces the IB philosophy and augments student-centred and student driven learning approaches.
- The findings also emphasize the value of human input in the teaching and learning process.

Discussion

- Discussion on the themes emerging from Study A and the implication of transition to online teaching on curriculum delivery and assessments in the IBDP.
- Discussion on the themes emerging from Study B.
- Discussion on considerations for incorporating new digital technologies to personalise learning experiences in the IBDP which led to the development of proposed strategies.

Proposed Actions

To summarise the implications of this study and in view of the changes reflected in the learning environments, the study culminates with a set of proposed strategies that are grounded in the published literature and draw from the data gathered during this research. The study also suggests strategies specific to the IBDP using Programme & Standards 2020 framework. These strategies may be used as guidelines to create opportunities for integrating new digital technologies like Learning Analytics and AI to improve the quality and efficacy of the pedagogical design, promote an inclusive approach to learning, to support personalised feedback and critical reflection and demonstrate efficiency and transparency in teaching and learning processes.

Conclusion

The findings from Studies A and B aptly present the issues and dilemmas faced by the teachers and administrators in addressing the shift to the digital environment. The perspectives of the teachers also accentuate the uncertainty that dominates the present educational landscape and the opportunities it presents alongside.

The data in Study A identified ways in which digital technology influenced and changed the teaching practices and the underlying factors reported for these changes during the shift to online teaching due to the COVID-19 pandemic. The findings from Study B elucidate the role of new emerging technologies in this case AI and its potential benefit in teaching and learning. The implications of these changes on teaching and learning are manifold hence implementation of new digital technologies in educational settings require careful consideration and nuanced discussions. Additionally, it requires regular trials to evaluate the assistance and limitations of human-machine interactions in different learning environments.

Though it was not a direct focus of this study, however, General Data Protection Regulation (GDPR) to handle the personal data of students and staff emerges as an important concern from this research. Therefore, the GDPR norms and ethical use of digital technologies must be factored in as a significant consideration for the learning environments in future.

Closing remarks

The results of this research further our understanding on several key issues in relation to pedagogy, assessment, learning environments and experiences of students and teachers during a period of enormous change arising due to the global pandemic. The burgeoning area of AI and learning analytics offer an encouraging opportunity for further research to understand its implications on teaching and learning in the context of IB Diploma Programme in future.