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What Uses of Digital Technology Support and Enhance the Learning and the Engagement of Diverse Learners in High School Classes?

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Abstract

Digital technologies may play an important role in helping students from all walks of life to overcome barriers and benefit from teaching and learning. However, due to a lack of knowledge or skills related to educational technologies, K-12 teachers struggle to harness the full potential of digitalization to support student learning and engagement, causing further marginalization and exclusion that put diverse group of learners at risk of being left behind in education (Chevalère et al., 2021). In response to these research gaps, the aim of this paper is to explore which high school uses of digital technology cater to learners' needs and preferences for the sake of a more digitally inclusive environment that supports engagement and equitable learning opportunities for all students (Stenman & Pettersson, 2020). We adopted a qualitative approach to attend to the richness and depth of the phenomena under study. We conducted individual semi-structured interviews with 17 high school teachers, aiming to obtain in-depth qualitative data through open-ended questions. Then, a general inductive data analysis approach was followed to generate preliminary results on the research objectives, which are presented in this study.

Keywords: digital learning, ICTs, educational technology, digital divide, learners' needs, high school learning and teaching

French Abstract

Le numérique peut jouer un rôle important en aidant les apprenants à surmonter des obstacles et à mieux bénéficier de l'enseignement et de l'apprentissage. Cependant, en raison d'un manque de connaissances ou de compétences en matière de technologies éducatives, les enseignants de la maternelle à la 12e année ont de la difficulté à exploiter tout le potentiel du numérique pour soutenir l'apprentissage et l'engagement des élèves, ce qui peut entraîner une marginalisation et une exclusion supplémentaires de certains groupes d'apprenants (Chevalère et al., 2021). Ainsi, le but de cette étude est d'explorer quels usages du numérique au secondaire répondent aux besoins et aux préférences des apprenants dans un environnement numérique plus inclusif qui favorise l'engagement et des opportunités d'apprentissage équitables pour tous les élèves (Stenman & Pettersson, 2020). Une méthodologie de nature qualitative a été adoptée dans cette étude afin de proposer des explications riches et profondes sur le phénomène d'intérêt. Des entrevues individuelles semi-structurées ont été menées auprès de 17 enseignants du secondaire au Québec, qui visaient à obtenir des données qualitatives approfondies par le biais de questions ouvertes. Par la suite, une approche générale d'analyse inductive des données a été suivie afin de générer des résultats préliminaires sur les objectifs de la recherche, qui sont présentés dans cette étude.

Introduction

While the availability of the Internet and the ICT tools has indeed transformed the lives of individuals, the extent of its impact remains debatable. Over the years, while access to these technologies has been significantly increased, gaps still exist in terms of both skills or usage and beneficial outcomes. According to the literature, these gaps are referred to as the digital divide (Dijk, 2020). In the three-stage digital divide framework, the first-level digital divide, which refers to the inequality of access, is mainly associated with a socio-economic gap between those who have access to ICTs and those who do not. The second level of the digital divide, which consists of the differences in skills or usage of digital resources, may take place although equal access might have been attained. Individuals from different classes and groups might have equal access to digital resources but differ in regards to the used skills and knowledge. Overall, individuals with higher Internet and computer skills gain more benefits from technologies than others. This third level of digital divide is known as the digital outcome divide. This level of divide is present when the possession of digital skills and Internet use do not lead to beneficial outcomes (Scheerder et al., 2017).

During the COVID-19 pandemic, lockdowns forced most learners to experience remote education, much of which relied on digital technologies. Thus, digital inequalities have been a significant issue in education, as many children have not had access to education or sufficient quality education, and teachers have not always considered inclusive digital pedagogies that meet the needs of diverse learners (Cranmer, 2020). This can lead to segmented usage patterns and significant discrepancies in learners' capacity to make the most of digital learning (Kim et al., 2021).

ICTs and the Digital Divide

Digital inclusion aims at eliminating barriers to digital technologies, allowing learners to regain a sense of control over their learning (Marien & Prodnik, 2014). However, ICTs are sometimes seen as a “new arrival” in the field of education requiring new comprehensive approaches that not only facilitate learning but also cater for learners’ individual needs and preferences. It is by no means clear that teachers are the prime actors in implementing ICTs, but it frequently happens that they lack the necessary knowledge and training to use them. This raises the issue of whether teachers’ ICT skills would influence their attitude and confidence towards integrating digital learning into curriculum for fear of embarrassment or failure (Conger et al., 2015). In addition, certain teachers may have limited opportunities to use technology in ways that engage students in a meaningful way. As a consequence, students in these schools may have less opportunities to develop their reasoning and conceptual understanding (Warschauer & Xu, 2018).

One of the most important advantages of using ICTs in education is the promotion of collaborative learning space and the possibility for students to interact with each other, the teacher and the content ensuring inclusive and equitable education for all learners (Pruet et al., 2016). However, these conclusions have been recently challenged simply because the current research on digital learning, mainly in primary and high school classrooms, has categorized young learners as a homogeneous group without consideration to the variability of their needs and preferences which are crucial for their learning motivation and engagement (Voogt et al., 2018). In addition, most of the publications in the field are quantitative and fail to provide a clear description of how teachers are using digital technologies to enhance students’ engagement and to promote inclusive learning. To close these gaps, the present paper explores how high school teachers’ use of technology addresses students’ needs and preferences to enhance their learning and engagement. The following question guided our research: Taking into account learners' variability, what uses of digital technology support students' learning and engagement in high school classrooms?

Method

Data Collection

This study followed a qualitative research design, allowing us to explore and obtain in-dept insight into a problem or an issue (Leedy & Ormrod, 2021). The recruitment of participants was carried out through social media (Facebook and Twitter, now X) and through invitations made to school boards and to school principals. To this end, 17 high school teachers from all disciplines, working in public or private schools in the Quebec province, were interviewed (Table 1).

Table 1
Characteristics of Participants

Gender	9 men, 8 women
Age	1 [20, 29], 7 [30, 39], 4 [40-49], 3[50, 59]
Years of teaching experience	1 [1, 5], 5 [6, 10], 4 [11, 20], 4 > 20 years
Teaching level	From the first to the fifth year of high school.
Subjects taught	French, Mathematics, History, Social Studies and English as a Second Language.
Deprivation index	2 disadvantaged areas (ranked between 8 and 10), 3 medium areas, 5 advantaged areas and 6 private schools

Semi-structured individual interviews, lasting approximately 60 minutes, were conducted between October 2022 and March 2023. The interview guide addressed the participants' digital uses in their classes, the variability of students' needs and preferences, the type of support implemented to facilitate learning and engagement with digital technology as well as the potential challenges in addressing the variability of learners in terms of digital uses.

Data Analysis

The recordings of the interviews were transcribed verbatim and coded with MaxQDA using an inductive analysis approach. Prior to coding, a preliminary list of themes corresponding to the research objectives and questions was identified. Then, the interview transcripts were read carefully to proceed with an initial coding, allowing us to fracture the data into small segments to generate a detailed series of codes. Next, based on an in-depth analysis, we grouped the codes to establish a hierarchy and form conceptualizing categories (Miles et al., 2020). To ensure reliability, the results of the analysis as well as the interpretations and the conclusions were discussed among the research team members.

Preliminary Results

In what follows, we report the preliminary results of interviews. These are divided into two main subsections concerning students' learning and students' engagement.

Students' Learning

Self-Regulation

Our data has revealed that ICTs can help students develop self-correction. In one of the interviews, Participant 5 (P5) stated that "with the online exercises and the digital version of the textbooks, students can correct themselves easily." When asked how they would go about that, the participant answered that

> the online activities allow a certain dynamic interaction between the teacher and students and among students themselves. The teacher can provide more explanations, and students can take notes … it's time-saving compared to correcting on the board and asking students to correct afterwards.

Participants also indicated that digital technologies have a positive impact in empowering students to learn better. Actually, "students share things … they feel responsible for their learning because they feel they are leaders of the class ... they bring something to the community," as said by P8.

Diversifying Teaching Methods

P8 mentioned that digital technology has helped him to carry out multidisciplinary projects with other teachers. He stated that this offers an engaging way for teachers to merge project-based learning with digital media analysis and production skills. Teacher modeling for students can be an interactive, engaging demonstration of the skills and techniques that teachers want students to practise. According to P5, providing video explanations for assignments is much easier for students to understand. Students often do not have parents or other siblings that can assist them with an assignment while at home. Therefore, when teachers provide video explanations modeling how to do the task at hand, learners will be able to do it and do it well.

Making Learning Accessible

The next theme in enhancing learners' learning is making learning accessible. In fact, several teachers have declared using digital annotation tools with their students to provide analysis and opinion, highlight important points, etc. This has helped students to enhance their learning as they pay more attention in class. Digital learning also allows for learner-content interaction to occur. In other words, the learner can actively engage in the learning process, trying to understand and assimilate the study materials. Based on P1's feedback, a "Smartboard allows students to go through the course, attempt the assignments given and to participate actively. Therefore, learner-content interaction contributes towards the successful realization of the expected learning outcomes." Furthermore, learning is more accessible to learners when they are presented with several choices on how to execute the task.

Facilitating Feedback

Digital learning has also proven to facilitate feedback. In fact, at a school where one of the interviewed participants works, learners have the possibility to benefit from online remedial classes. P11 stated that "students can ask questions and get answers, can have support for lectures and more difficult course work, they can also have feedback on homework. Of course, having such support helps students enhance their learning". ICTs can also provide efficient and quick feedback. According to the same participant, "with the right technology, instructors deliver timely, effective feedback with the power to achieve greater learning." In addition, P8 revealed that

> Google Docs, for instance, is a helpful tool to share feedback with students during writing instruction. As students workshop their writing, we can use the comments button to leave feedback on specific parts of students' writing. Students can see this feedback, revisit it as necessary, and resolve the comment when completed.

Students' Engagement

Enhancing Students' Self-Determination

According to the self-determination theory, the satisfaction of three psychological needs (competence, autonomy, and relatedness) promotes learners' intrinsic motivation. Regarding autonomy, P10 stated that "digital learning provides students with several options on how and what to learn … students have the possibility of doing a visual presentation about a topic instead of writing texts". The same applies when "teachers allow students to select their own projects from a long list or suggest one themselves." To help students feel competent, "activities that are challenging enough to inspire the curiosity of learners help engage them," as said by P5. Setting clear and consistent goals also "helps learners to understand what's expected of them," again noted by P5. Finally, several participants mentioned that ICTs provide students with the possibility to interact with each other in different ways, such as group work, collaboration, and mutual aid.

Using Gamified Approaches

Another interesting result related to learners' engagement is the use of gamified approaches. In fact, several teachers indicated that some gamified elements embedded in digital learning are very efficient in engaging students. P4 mentioned that "using bonus points for instance is found fun and enjoyable by students." Other gamified features, such badges or leaderboards were also found to be appealing for students. Another gamified approach used in digital technology is the possibility of having competition between students. Most of the interviewed participants mentioned how learners love using Kahoot, an online platform that uses competitive quizzes. P4 explained how "students ask them to always let them play Kahoot. … Once they hear Kahoot, engagement is on."

Providing Interesting Learning Content

P8 admitted that "presenting content or allowing students to prepare content using different modalities can help them to engage with the material." Including images, videos, and animations, for instance, to illustrate concepts or provide additional information on topics related to a course content, help keep students interested throughout the lesson. The learning content with digital technology is also interesting because it's always up to date. As stated by P11, "the use of internet and digital learning platforms allows schools to instantly update course content or add additional materials and resources, which students can access to support their learning." He added that "the latest information about a subject matter helps keep students engaged."

Conclusion

This study yielded overall perceptions of high school teachers towards using ICTs in their classrooms and their insights about the potential of digital learning to address learners' needs and preferences. Although the preliminary results provide evidence suggesting that a meaningful use of digital technology can enhance students' learning and engagement, we are currently collecting more data from additional participants to carefully weigh the digital learning's true effects.

Author's Contributions

MM, FD, GH: data methodology, data analysis, writing; GH: project administration and supervision, study conceptualization, review, and editing; MM, FD: data collection.

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Ethics Statement

Ethical approval was granted at the authors' university (2022-086 A-1 / 28-09-2022).

Conflict of Interest

The authors do not declare any conflict of interest.

Data Availability Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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