Impacts of digital transformation on high school student learning in Nha Trang city, Khanh Hoa province, Vietnam

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Abstract:

This article gave an overview of digital transformation, and its impacts on education and training in general, high school students' learning in particular. For more details, the authors clarified the issue of impacts of digital transformation in five aspects: (1) student's mindset of learning, (2) communication in learning, (3) learning motivation, (4) compassion in learning, and (5) high school student's self-regulated learning. A survey was conducted on 390 high school students in Nha Trang city, Khanh Hoa city in the school year 2023-2024 to show critically these five aspects of digital transformation on student learning. Specifically, digital transformation has the biggest impact on student mindset of learning ($\bar{x}$=4.33), meanwhile, it has the least impact on student compassion in learning ($\bar{x}$=3.34). The two main reasons given are: the teaching methods in online learning now are not efficient and not properly learned by teachers and school students; the multimedia lectures have not been optimally applied. From these findings, the authors proposed main solutions to address this situation including developing a contract to use electronic devices in the classroom; raising student awareness and developing learning conditions for students to use software applications in classrooms; and their parents' coordination with the implementation outside of the classroom.

Keywords: **digital transformation, high school students, impacts, student learning, Vietnam.**

Classification numbers: **3.2, 3.3**

1. Introduction

In the present era, digital transformation is not only a trend but also a driving force for the Fourth Industrial Revolution. To date in Vietnam, digital transformation has taken place across various aspects and sectors. The government's Decree No. 42/2022/ND-CP [1] categorises online public services into two levels: comprehensive online public services and partial online public services. According to Report No. 91/BC-BTTTT dated June 30, 2022 [2], from the Ministry of Information and Communications (MIC), the rate of online public services meeting the level 4 criteria was 97.3%, constituting 53.56% of the total administrative procedures. This impressive progress aligns with Vietnam's broader digital transformation goals, which include expanding digital infrastructure and increasing the use of digital services across government and public sectors. Vietnam's digital economy also saw strong growth, with total sector revenue reaching VND 3.74 quadrillion in 2023. The government continues to strengthen its legislative framework, including the passage of key laws like the Electronic Transactions Law and Telecommunications Law, further facilitating the growth of digital services

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and ensuring the safety and efficiency of online transactions [3]. In the healthcare sector, statistics from the Information Technology Department of the Ministry of Health indicated that 100% of hospitals nationwide have implemented hospital information management systems, with a 99.5% connectivity rate to the health insurance payment assessment system, including some hospitals that fully utilise electronic medical records [4]. Additionally, the Ministry of Education and Training has recently issued criteria for evaluating the application of information technology and digital transformation in general and continuous education institutions (specifically, which document and decree number - specific citation to be included in the reference list) with the goal of promoting digital transformation activities within educational institutions to align with educational objectives and missions [5].

It is clear that in today's era, the process of digital transformation is not merely a technical issue, but also a significant turning point in reshaping societal activities, including educational endeavors [6]. The transformation in education involves not only technological infrastructure innovations but also the application of advanced teaching methods and changes in educational management and related services [6, 7]. This creates a new context where the learning process is not only about imparting knowledge but also involves close interaction between teachers and students [7, 8], thereby helping students develop the necessary competencies and skills [9].

Confronted with new challenges, the education system needs to rely on adaptability and transformation to create a flexible learning environment that aligns with the expectations and characteristics of today's high school students [6]. The interplay of these factors significantly affects students' learning activities, including cognitive factors and motivational aspects of students' learning interests. Furthermore, with the requirement to develop competencies, skills and qualities for high school students, the organisation and teaching processes also impact students' self-learning abilities and communication skills in the learning environment [6, 10, 11].

The purpose of this analysis is to accurately assess the impact of the digital transformation on high school students' learning activities, enabling teachers and education managers to better understand the situational influence on student academic performance within school. Simultaneously, this presented an opportunity to encourage innovation and development in the field of education at both local and national levels.

2. Review of the literature

Currently, the definition of the concept of digital transformation is still being clarified by scholars. However, the fundamental differences among the three concepts of digitisation, digitisation and digitised applications, and digital transformation, as presented by T.M. Siebel (2019) [10], can be outlined as follows: Firstly, digitisation involves the conversion of real-world information into digital form. Secondly, digitisation is the utilisation and application of digital data to perform tasks quickly and efficiently. Lastly, digital transformation involves applying and using digital technology on the basis of digital data to create new structured operational models that enhance social activities [6]. Therefore, digital transformation in education goes beyond digitising real-world information about students (teaching and learning activities, grades, etc.), or using such data to address existing school issues. It necessitates the establishment of a digital teaching and learning system, wherein the school organises data connectivity and its services. Digital transformation in teaching, learning, examination, and assessment involves digitising educational materials (e-books, e-lectures, e-learning lecture repositories, quiz banks), digital libraries, virtual laboratories, and

the implementation of online training systems [3, 9]. It also encompasses a complete transformation of teaching methods, classroom management techniques, and interaction with learners into the digital space, leveraging information technology to successfully organise teaching.

The process of digital transformation in education yields various benefits, as highlighted in previous studies [7, 10, 11]. These scholars conclude that digital transformation has significantly altered students' learning experiences, generating substantial value and minimising the limitations of traditional face-to-face teaching, such as spatial constraints, time limitations, and fostering creativity in both educators and learners. According to H. Pillay, et al. (2007) [12], learners are influenced by various factors, resulting in transformations in their perceptions of the learning processes and learning methods. Researchers assert in their studies on learning motivation that changes in external factors lead to internal motivational changes [13, 14]. Therefore, with changes in the learning environment, students' learning motivation will also undergo adjustments, making it crucial to adapt in order to promote students' learning motivation. Given these factors, if positive changes are made, and teaching activities are tailored to students' needs, students will become more interested in learning [15].

Currently, developing students' competencies is considered essential, emphasising a lifelong learning perspective. Forming self-directed learning capabilities for students is a highly important issue. Scholars and researchers define self-directed learning from various perspectives [16-19]. Nevertheless, the self-directed learning of students can be characterised by the following: firstly, students have clearly defined goals and requirements in their learning. Secondly, students have the ability to manage their own learning (according to learning requirements). Lastly, students can independently and through various tools and assistance control and evaluate their learning.

However, these factors are still influenced by the communication factor between teachers and students. According to M. Alawamleh, et al. (2020) [20], the process of digital transformation has impacted communication activities in both directions. On the one hand, students have more interaction channels; on the other hand, it requires ensuring effectiveness and timeliness to maintain the motivational factors and interests of students.

3. Methodology

This study utilised a qualitative research design, grounded in both literature reviews and empirical interviews, to explore the impacts of digital transformation on student learning. To assess these factors, a detailed review of global literature on digital transformation, specifically in relation to education and student learning culturally. Specifically, we compiled a large number of documents on characteristics of student learning, literature reviews of impacts of digital transformation on student learning and school settings, along with lists, comparisons, and analyses of (1) student's mindset of learning, (2) communication in learning, (3) learning motivation, (4) compassion in learning, and (5) high school student's self-regulated learning. Our interview participants must be junior high school students, their parents and the teachers. Also classroom observation was combined as one of the additional research methods.

The survey was conducted on 390 randomly selected students from various high schools in the city of Nha Trang (Ly Tu Trong High School, Le Thanh Ton High School, Ha Huy Tap High School, Pham Van Dong High School, Nguyen Thien Thuat High School, Nguyen Van Troi High School, etc.), and the characteristics of the participants are described in Table 1.

Table. 1. Description of the survey sample.

Student characteristics	N (%)
Gender	
Male	153 (39.23)
Female	237 (60.77)
Grade	
10	76 (19.49)
11	140 (35.90)
12	174 (44.61)
Academic performance	
Excellent	35 (8.97)
Good	148 (37.94)
Fair	176 (45.13)
Average	31 (7.96)
Poor	0
Online learning platforms	
Google Meet	78 (20)
Zoom	100 (25.64)
Microsoft Teams	168 (43.98)
Other	44 (10.38)
Devices for learning	
Smartphone	304 (77.95)
Computer	289 (74.10)
TV	17 (4.36)
Tablet	87 (22.31)
Other	11 (2.82)

Source: Authors'calculation.

Although online teaching and learning systems are considered temporary, the majority of students have achieved good academic results. Only 7.96% of the surveyed students achieved average academic performance.

The survey on the impacts of digital transformation on high school student learning in Nha Trang city was implemented with five aspects: (1) student's mindset of learning, (2) communication in learning, (3) learning motivation, (4) compassion in learning and (5) high school student's self-regulated learning.

The survey results depicting the current state of the impact of digital transformation on the learning activities of high school students in Nha Trang are presented in Fig. 1. These factors will be assessed on a 5-level scale, with the distance values calculated using the formula Distance value = (Max-Min): n = (5-1):5=0.8.

Level 1: Not applicable, not influenced, $1 \leq \bar{x} < 1.8$

Level 2: Rarely used, very little influence, seldom occurs; $1.61 \leq \bar{x} < 2.6$

Level 3: Used in specific situations, some influence, not frequent; $2.61 \leq \bar{x} < 3.4$

Level 4: Used in most subjects, influential, occurs regularly; $3.41 \leq \bar{x} < 4.2$

Level 5: Used in all subjects, highly influential, consistently present, enhances learning; $4.21 \leq \bar{x} < 5$.

4. Results

The study on the impact of digital transformation on the learning activities of high school students in the city of Nha Trang was conducted across five aspects: (1) student's mindset of learning, (2) communication in learning, (3) learning motivation, (4) compassion in learning, and (5) high school student's self-regulated learning which are shown with statistics as mentioned in Fig. 1.

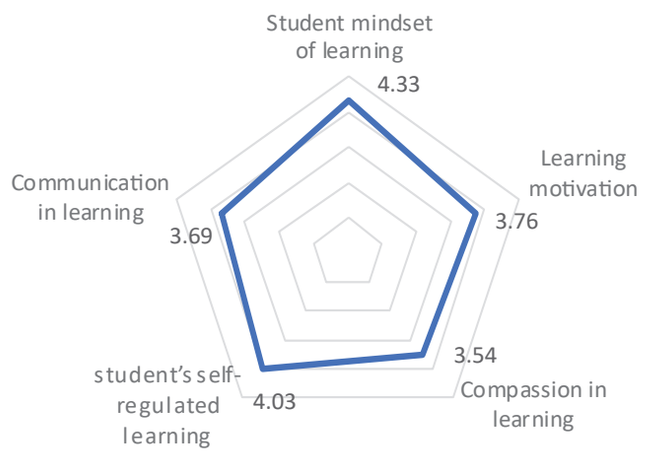

Fig. 1. Practice of the impact of digital transformation on high school students' learning activities in Nha Trang city.

In general, the current impact of digital transformation on the learning activities of high school students in Nha Trang city remains quite positive, with the most pronounced being the factor of learning mindset, scoring an average ($\overline{x}$) of 4.33 at level 5. This indicates a robust influence of digital transformation on the students' perspectives regarding learning. Specifically, the study delved into six aspects of the online learning mindset: (1) online learning can replace face-to-face learning; (2) online practical activities are more effective than in-person; (3) online interaction is more effective than face-to-face interaction; (4) using online learning materials is more effective than using physical materials; (5) online classes are more effective than in-person classes; and (6) online classes should be conducted more frequently.

The survey results revealed that the statement: "Online learning can replace face-to-face learning" received the highest score, with $\overline{x}$=4.4. After two years of online learning, students are gradually developing confidence in the efficacy of online education. However, the aspect "Online classes are more effective than in-person classes" ($\overline{x}$=3.68) suggests that high school students are not entirely convinced of the current effectiveness of online classes organised by their schools. Interviews with students indicate that online teaching at high schools lacks diversity, primarily relying on teacher presentations on online platforms or pre-recorded lectures. This has an impact on students' learning motivation, with this factor scoring $\overline{x}$=3.76.

The survey identified six fundamental causal factors, including: (1) diversification of the curriculum; (2) multimedia lectures; (3) diversification of learning materials; (4) positive teaching methods; (5) multiple forms of assessment; and (6) more positive interactions in learning. The results show that multimedia lectures scored $\overline{x}$=3.22 at level 3 (Influential, not frequent). The multimedia lectures provided by the schools are not diverse, and their designs are still relatively simple, contributing to the student's lack of trust in the online content taught at their schools. In contrast, participation in extracurricular programs outside of school has demonstrated the effectiveness of "More positive interaction in learning", scoring $\overline{x}$=4.86, reaching level 5 - the highest level. Easier interaction and connection also contribute to improving perceptions of online learning and become a crucial impact of digital transformation on high school students' learning.

5. Discussion

Although the Vietnam Ministry of Education and Training has issued numerous directives and guidelines on positive teaching methods, especially through the Comprehensive Education Program in 2018 [21], many educational institutions still face difficulties in terms of infrastructure and practical subjects [22, 23]. Therefore, while this is one of the factors strongly affecting students' learning motivation, its value has not reached a high level.

The factors of communication in learning and compassion in learning, as indicated by high school students in Nha Trang city, are at level 3, with means of 3.69 and 3.34, respectively. This suggests that the impact of digital transformation has not significantly improved communication in students' learning (including communication between students and teachers, students and students, and communication activities connecting students with experts). In terms of communication in learning, the survey introduces the statement "I do not feel hesitant to ask questions about the lesson" to gain a more specific understanding of communication in learning. However, our survey results align with those of V.T.N. Lan, et al. (2018) [24], indicating that students do feel very hesitant to ask questions about the lesson in crowded classes. They also do not discuss these questions with teachers outside of class hours. This highlights the need for schools to establish platforms with the purpose of resolving students' questions after class hours. Many studies indicate that creating an interest for learners begins with learning conditions (or external factors). However, one crucial point is that teachers need to be innovative and creative in methods and organise teaching by understanding the

significance, importance, and practical application of the subjects they teach. In doing so, teachers can implement pedagogical interventions that impact students' learning processes, maintaining their interest in the subjects. While digital transformation enhances students' learning experiences and increases their interest in learning, sustaining that learning motivation requires active contributions from teachers in their lessons.

Solutions to enhance the positive impact of digital transformation on high school students' learning activities: On the school front, one of the significant limitations is the still ineffective online activities of the schools. The empirical survey reveals that some schools do not permit students to bring phones to school, or if allowed, the phones are often not utilised for academic activities. Circular No. 32/2020/TT-BGDDT also encourages schools to diversify assessment activities, incorporating both simultaneous and non-simultaneous online assessments. This approach aims to enhance students' learning interest and reduce undue pressure arising from examination hours. Furthermore, providing guidance and organising sessions for students on the proper use of smart electronic devices (computers, phones, tablets, etc.) for academic purposes contributes to developing creative skills for students. To achieve this, schools need a plan that allows students to use smart devices on the school premises. In the context of this article, we present an illustration of the process for establishing an agreement on phone usage during class hours in high schools as Fig. 2.

When students are allowed to bring electronic devices into the classroom and use them according to strict rules, it provides them with numerous opportunities for more diverse learning methods and assessments. This approach stimulates learning motivation and maximises the utilisation of the school's online learning system. Allowing students to participate in constructing such an agreement is crucial as it helps them develop self-regulation skills. Moreover, this plan serves as a foundation for school leaders, department heads, subject teachers, and parents to effectively manage students' use of smartphones.

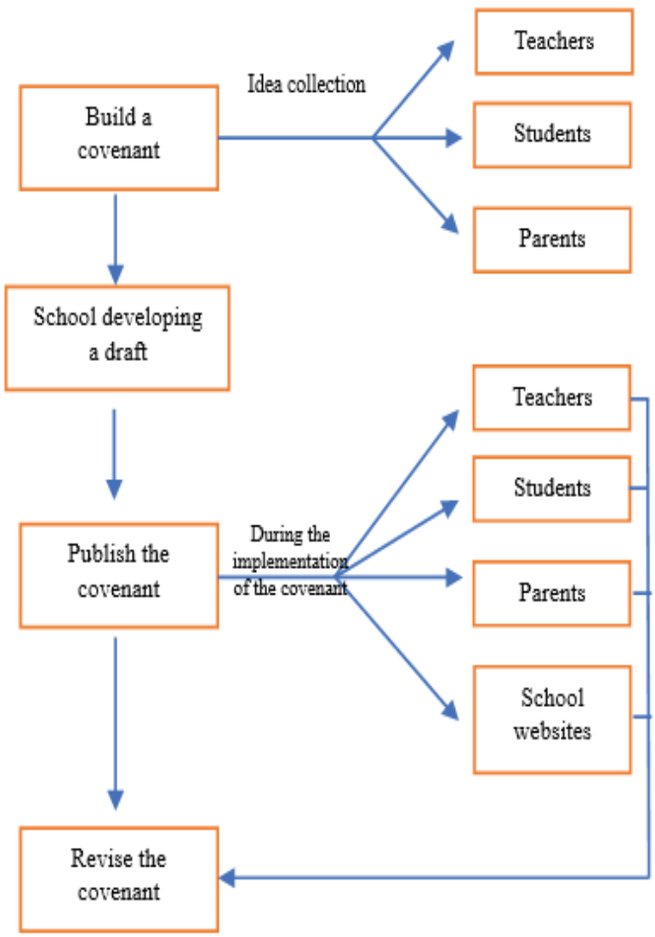

Fig. 2. Model of processing smart devices usage in classrooms at high schools.

The school directs subject departments and subject teachers to align their lesson plans with the curriculum, considering the knowledge and skills required for each lesson. The "commitment agreement on managing and using smartphones during class hours to serve teaching and learning activities" specifies the choice of lessons, the knowledge units that require smartphone usage, and the development of plans allowing students to bring phones to school. Teachers' plans must provide specific timetables and objectives for smartphone usage corresponding to each knowledge unit in each subject, extending beyond the textbook's content to include online resources. It should also detail the number of devices to be used in class and specify which software is to be installed on smartphones to serve educational purposes.

Furthermore, the institution needs to establish an electronic library system, which should serve as the foundation for the school's digital content development. Creating digitised learning content includes educational videos, online lectures, and e-books, allowing students to access various types of digitised content creatively aligned with the school curriculum.

Digital activities can be implemented through digitising books or utilising electronic book materials to ensure copyright compliance, reduce article waste, and enable learners to access materials at any time and place. Online lectures enable teachers to create and share presentations using tools such as Microsoft PowerPoint, Google Slides, Prezi, Canva, PowerPoint Online, and Keynote.

The need for consistency within the institutions and among educators is crucial. This implies that the school should utilise a shared citywide network, eventually expanding to a national level, to build a repository of educational resources. Through this platform, teachers can engage in mutual learning, sharing knowledge, and teaching methodologies, thereby enhancing the overall quality of education at the institutions.

On the part of students, based on certain realities, they still face challenges in navigating the school's online system and that of the Ministry of Education and Training. Particularly, issues arise regarding the use of learning software, time management, and information retrieval skills. Presently, surveys conducted in schools reveal the usage of up to four different software platforms. Therefore, students should not only test a single platform but also explore various platforms, being prepared to adapt. This necessitates students to develop information retrieval skills that are quick, efficient, and accurate from reputable sources.

In light of this, students should have a specific study plan that details academic activities, breaks, and supplementary activities. This helps students minimise factors that could affect concentration, such as electronic games and movies. Consequently, students can optimise the impact of digital technology and electronic devices solely for learning and research purposes.

Regarding families, parents need to collaborate closely with the school in implementing an agreement on the use of electronic devices in the classroom. Parents can encourage and support their children in constructing this agreement, ensuring supervision, and partnering with the school and students during the implementation of this agreement. Furthermore, parents can promote the positive effects of digital transformation on high school students' learning activities by setting an example and cultivating a healthy culture of electronic device use within the family.

6. Conclusions

The digital transformation has significantly impacted every aspect of human life, particularly for high school students who exhibit a strong desire for learning, a tendency to explore new things, and an eagerness to stay updated with modern applications. These students, still under the guardianship of their parents, primarily engage in educational activities within a school setting. Therefore, to ensure that digital transformation brings about positive and effective outcomes for high school students, alongside enhancing their awareness of digital transformation and proper use of electronic devices, there is a crucial need for close collaboration between the school and the family. This collaboration should involve the active participation and coordination of teachers, administrators, and relevant educational stakeholders, including parents of high school students.

CRediT author statement

Van Tu Nguyen: Conceptualisation, Methodology, Software; Nam Phuong Nguyen: Writing - Original draft preparation, Supervision, Reviewing and Editing; Vu Phuong-Nha Nguyen, Nguyen Phuong Khanh Pham: Data curation, Revision.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

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