

Efficacy of Blended Learning in Enhancing Learner's Subject Domain-specific Competence and Digital Literacy

Vu Anh Tuan¹, Chu Cam Tho², Nguyen Tien Dat³, Nguyen Thi Quynh Anh⁴

¹ tuanva@aeglobal.edu.vn, Adaptive Learning Global Education JSC (Vietnam)

² chucamtho1911@gmail.com, Vietnam National Institute of Educational Sciences (Vietnam)

³ ntat@hnue.edu.vn, Hanoi National University of Education (Vietnam)

⁴ anhntq@aeglobal.edu.vn, Adaptive Learning Global Education JSC (Vietnam)

ABSTRACT

Digital transformation has become an inevitable trend in Vietnam and worldwide. Digital society is one of the three pillars of a digital nation, in which digital citizens are the core of a digital society. The requirements of digital citizenship pose a new problem for education and training: how to form and foster digital literacy for learners while they are still in school to study, research and develop a career in the digital world and master the country's digital transformation. In this article, we find answers to the following questions (1) Is it possible to simultaneously develop digital literacy and subject-specific domain competency for learners during high school? (2) Can information technology be a foundation, tool, and objective to develop learners' competence? (3) How should blended learning be organized in the current Vietnamese context? The study also conducted experiments to adjust and explore a blended teaching model to develop digital and domain-specific competencies of Vietnamese students in the current digital transformation context.

KEYWORDS: *digital transformation, blended learning, digital literacy, domain-specific competence, developing competence*

1. Introduction

The Fourth Industrial Revolution and a series of connotative technologies have changed our conception of space, time, and the relationships between people and people, and people with machines and all aspects of social life. Instead of using space to quantify and structure the time (sun position, shadow length, number of drops of water, etc.) as before, time is now used to measure space (distance from A to B is 15 minutes on foot, the city is only 1 hour by motorbike), and digital has transformed (ontologically) the relationship between space and time by introducing the third variable, which is the speed of the processes of communication and manipulation of something, time is now understood through latency (Martínez et al., 2022). In today's human-machine interaction, the McLuhanist vision of "media as an extension of the human being" is realized through technological developments, where "If the interface is a network of human and technological actors that interact with each other" (Scolari, 2004) and the ecological metaphor of media as environment, i.e.,

the Internet as an ecosystem and a developing species (Scolari, 2015), leads us to reflect on people's cognitive and cognitive shifts in this environment, and learn from it. All this big picture leads to the fact that the Internet has changed how knowledge, information, products, and services are produced, consumed, and exchanged, even the expression of emotions (Serrano-Puche, 2015). It also helps to open up public spaces for cultural creativity, art, and social participation (Castells, 2006; Jenkins, 2008). The driving force driven by the public revolution. This technology configures new relationships with the world, society, and culture, as well as redefining what is known. If Vietnam wants to not be left behind in this 4.0 industrial revolution, or even become a pioneer, Vietnamese educational research needs to set new tasks: researching and developing models and teaching methods to apply the most up-to-date technological achievements of mankind to form and develop capabilities to meet the human needs of the new era in which digital competence is considered as a necessary condition, in parallel with the development of core competencies and subject-specific competencies. Only then will Vietnamese students, and later Vietnamese next generations, actively participate in and successfully lead the country's digital transformation.

2. Literature review

2.1. The relationship between digital literacy and other competencies of learners

To successfully participate in and adapt to such changes to thrive, people, in general, need to foster the development of new skills, not only technical but also cognitive and social. Many education and development organizations worldwide have developed skill sets - competencies to meet these needs, commonly known as 21st Century Skills or 21st Century Competencies. Voogt and Pareja-Roblin analyzed and compared eight popular 21st-century skills/competency frameworks including P21-US, EnGauge, ATCS, NETS/ISTE, NAEP, EU, OECD, and UNESCO to withdraw conclusions that, although there are differences in the use of grouping and classification processes and terminology, 21st-century competency-skills frameworks are consistently constructed horizontally. Specifically, 21st-century competency frameworks converge on a standard set of competencies: collaboration, communication, ICT literacy, and social and/or cultural competencies. Moreover, most frameworks also deal with creativity, critical thinking, productivity, and problem-solving. The central role of ICT in various policy frameworks. ICT is seen as both (a) the argument for the need for 21st-century competence and (b) a tool that can aid the acquisition and assessment of 21st-century competencies. Lastly, all frameworks recognize that the rapid development of ICT requires a whole new set of competencies in ICT understanding that go beyond the mere operational use of tools and applications ICT (Voogt & Pareja Roblin, 2012).

According to UNESCO, digital literacy is the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes 7 competencies that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy.

Table 1. DigComp 2.0 competence areas and competences (UNESCO, 2018)

Competence areas	Competences
0. Devices and software operations**	0.1 Physical operations of digital devices 0.2 Software operations in digital devices**
1. Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
2. Communication and collaboration	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3. Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licences 3.4 Programming
4. Safety	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
5. Problem-solving	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps 5.5 Computational thinking**
6. Career-related competences**	6.1 Operating specialised digital technologies for a particular field** 6.2 Interpreting and manipulating data, information and digital content for a particular field**

In 2016, European Commission presented the updated conceptual reference model for the Digital Competence Framework for Citizens as seen in Table 2.

Table 2. The Digital Competence Framework for Citizens (Carretero et al., 2016)

Competence areas	Competences
1. Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
2. Communication and collaboration	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3. Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licenses 3.4 Programming
4. Safety	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
5. Problem solving	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps

Vietnam does not set itself apart from the general flow of the digital age and the decisive transformation of the industrial revolution 4.0. On June 3, 2020, the Prime Minister issued Decision 749/QĐ-TTg approving the Transformation Program to 2025, with a vision to 2030” in which the following points are clearly defined:

- (1) Awareness plays a decisive role in digital transformation.
- (2) People are at the heart of digital transformation.
- (3) Institutions and technology are the drivers of digital transformation.
- (4) Developing a digital platform is a breakthrough solution to promote faster digital transformation, reduce costs, and increase efficiency.
- (5) Ensuring network safety and security is the key to successful and sustainable digital transformation and is an integral part of digital transformation.
- (6) The participation of the whole system itself, synchronous action at all levels, and the participation of the whole people are factors that ensure the success of the digital transformation.

With the identification of “people at the center of digital transformation,” the task

of equipping people in general and the productive workforce in particular with a system of skills and abilities to participate effectively and efficiently in the national digital transformation is considered a top priority task. The concept of digital literacy - digital skills is more deeply concerned by Vietnamese educators, and digital literacy frameworks for Vietnamese people and Vietnamese students are gradually being researched. Several works can be named, that are Digital literacy framework for Vietnamese students (Hanoi National University) (Hung et al., 2021); Digital literacy framework for primary school students in Vietnam (Vinh et al., 2021).

In the National Digital Transformation Manual issued by the Ministry of Information and Communications, the concept of Digital Literacy and digital skills is not clearly explained, but the requirements for building and developing digital literacy and digital skills for the workforce. The number of employees is precise (Ministry of Information and Communications, 2021)

The Vietnam National Educational Curriculum 2018 sets out the requirements to form and develop for students the following core competencies: (1) General competencies are formed and developed through all subjects and educational activities: autonomy and self-study competence, communication and cooperation competence, problem-solving and creativity competence, and (2) Domain-specific competencies are formed and developed mainly through certain subjects and educational activities: language competence, numeracy, scientific competence, ICT competence, technological competence, aesthetic competence, and physical competence (Ministry of Education and Training, 2018).

The comprehension of digital literacy referred to through ICT competence is shown as follows:

The content of Informatics subject develops three blended knowledge strands: General digital education (DL), Information and Communication Technology (ICT), and Computer Science (CS). In the Basic Education Stage: Informatics helps students form and develop the ability to use digital tools, familiarize themselves with and use the Internet; initially form and develop problem-solving thinking with the support of computers and computer systems; understand and follow the basic principles of information exchange and sharing (Ministry of Education and Training, 2018).

At the primary school level, students mainly learn to use simple software to support learning and use computer equipment following the principles of keeping healthy. At the same time, the student initially formed a problem-solving mindset and problem with computer support (Ministry of Education and Training, 2018).

At the lower secondary level, students learn how to use and exploit common software to create digital products for learning and life; practice creative problem discovery and problem solving with the help of tools and automation systems of digital technology; Learn how to organize, store, manage, search and retrieve digital data, and evaluate and select information (Ministry of Education and Training, 2018).

At the career-oriented education stage, the orientation of Applied Informatics is to meet the needs of using computers as a tool of digital technology in life, study and

work, bringing adaptation and service development capabilities to digital society. Computer Science orientation meets the initial purpose of understanding the operating principles of computer systems, developing computational thinking, and the ability to explore and discover information systems and develop applications on computer systems.

Although digital literacy is not officially mentioned in the content, the Vietnam National Educational Curriculum 2018 includes the requirements to achieve digital literacy as a learner's core competency. When posing the need to develop digital literacy for learners, we find it necessary to consider the following aspects. First, the behavioural indicators could change when developing learners' competencies in the digital context. For example, self-learning behaviours will be expanded in terms of methods, information sources, and connections. Digital transformation does not change the nature of self-study. However, it makes learners more accessible to information sources. It places higher demands on self-study when the pace of development through Information grows exponentially, and there is no physics school – no teacher can teach it all. Self-study skills are interwoven with the digital transformation context. In this respect, it can be seen that digital skills are tools to help learners achieve core competency goals in the new educational context that includes digital transformation.

According to the above analysis, core competencies play a premise for learners to access and achieve digital literacy because human nature is still non-digital entities, original instincts. Humans are not immediately prepared for the digital environment. The digital environment is a contributor to the enrichment of human life, not an essential condition for survival or success. A person who only communicates in digital space and forgets about direct communication with others and society will gradually become lost and separate from society. Thus, digital literacy is a consequence of core competencies in this relationship.

It can be concluded that digital literacy and core competencies have intersections and interconnections. Both have an interaction in which core competencies are the conditions for having digital literacy, and digital literacy impacts promoting core competencies formed and developed. In the context of the industrial revolution 4.0, digital capability is a condition for people to develop and succeed and increase their influence. Since then, the development of digital literacy for learners needs to be set as a goal parallel to the core competencies. Certain priority strategies are required for this literacy in the digital context to optimize the benefits of digital transformation and quickly master and successfully implement digital transformation. In each specific context, it is necessary to determine the appropriate method - a form of teaching organization to achieve the set objectives.

2.2. Blended teaching

The term blended learning was used at the end of the 20th century when there was a need to combine face-to-face teaching with online teaching via the internet. The Information technology infrastructure has achieved specific development steps (transmission lines, hardware devices, software applications). The concept of

blended learning is gradually developed. From 2006 to now, B-learning has been understood as a combination of face-to-face teaching and teaching on technology-mediated platforms. Bonk and Graham define B-learning as a combination of face-to-face and computer-based instruction (Bonk & Graham, 2006). Horn and Staker defines B-learning as a formal educational program in which students learn partially online, with control over time, place, route, and progress. There is at least one part of classroom instruction, and each student’s learning styles must be linked together to create unity. The way students learn courses and subjects is connected to providing an integrated learning experience (Horn & Staker, 2014).

Most intuitively, it can be seen that the blended learning teaching model requires learners to use information technology infrastructures to participate in learning as a mandatory requirement. Information (in other words, digital literacy) is a prerequisite skill to participate in this teaching model successfully. Analyse the deep causes of the birth of this form of teaching, stemming from the need to increase the amount of information exchanged and transmitted in the teaching process, reduce time, and increase flexibility in location and learners’ time, encouraging learners to learn on their own. B-teaching model is suitable for the requirements the 21st-century skills in general and under the requirements of learners’ quality and competence to be achieved in Vietnam National Educational Curriculum 2018.

Since 2020, the Covid-19 pandemic has caused severe consequences, affecting all aspects of social life, including education. An education with weak resistance and poor adaptability is confused in selecting tools and choosing the teaching organization model. Teachers are confused again when getting used to online teaching and returning to direct teaching. Covid-19 is like a reagent, allowing us to find weaknesses to overcome as a catalyst so that we can go faster on the path of digitization of education when all habits must be changed. The complicated evolution of the pandemic and other contextual factors, in general, are unpredictable. Education must equip itself with better resistance and adaptability to changes, combined with teaching and learning, with the flexibility to switch between spaces, not limited in time can be considered a solution to this requirement.

According to Harvey Singh, there are three levels of blended teaching organization, shown in Table 3.

Table 3. Levels of blended teaching (Singh, 2003)

Level 1	Level 2	Level 3
Teachers still consider face-to-face teaching a priority, with online learning materials for students.	Teachers must design online lessons and use them with traditional face-to-face teaching.	In addition to teaching a combination of online and face-to-face, teachers must have a plan to test, evaluate and manage online classes for the whole course.

Level 1	Level 2	Level 3
Students use technology and the Internet to search for subject-related materials to perform learning tasks.	Students perform online learning tasks that teachers provide. Discussions for lessons are conducted via email, forum, or directly in the classroom.	Students perform learning tasks and participate in online assessment activities. Discuss and exchange information via email, forum, or directly in the classroom.

To deploy the blended teaching model at level 3, it is necessary to have a learning management system (LMS) with a digitized and differentiated database (which may be provided with the LMS, or the teacher have to upload it by themselves).

When conducting an integrated teaching organization, based on the characteristics of the organizational space, Staker & Horn’s six models based on the specific characteristics of each school and each locality, shown in Table 4.

Table 4. Models of blended teaching and learning (Horn & Staker, 2014)

Models	Characteristic	Applying
Face-to-face Driver	Teachers lead the learning process in class with the support of technology devices.	This model works best for diverse classrooms in which students are functioning at various levels of ability and mastery.
Rotation	As a station-based learning model, students alternate between stations on a set schedule – either online or face-to-face with a teacher.	Flexible learning environment suitable for elementary and junior high schools. Teachers can provide more support based on student needs.
Flex	Learners mainly learn online. The teacher is the one who guides, advises, and answers questions during face-to-face meetings with learners.	Maximize learners' independence, teamwork, and interaction, which is quite common in schools.
Online Lab	Allows learners to study online for the course in dedicated computer labs. The entire learning process is managed directly by the course supervisors.	This model helps to reduce the requirements for facilities (schools, classrooms) and resources (minimize the number of teachers).
Self – Blend	Allows learners to take online courses outside the mainstream curriculum based on individual needs.	Suitable for university-level learners with diverse learning needs: improve professional qualifications and practice personal skills.

Online Driver	Learners participate in the learning process through an online management platform. Interactions with teachers are also done online.	Suitable for learners who need flexibility in daily activity schedule, suitable for undergraduate or graduate levels.
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3. Methodology

We use the analysis and synthesis of theory, analysis, and synthesis of experience combined with observation and experiment in our research. We use literature review process and synthesis to understand the concepts of digital literacy, the blended learning model based on domestic and international documents that we have access to. Research from the International studies is selected from journals with high ranking (Q1, Q2), high impact index and a number of citations. Based on this theoretical study, we propose a blended learning model suitable for the Vietnamese context. Based on our experiments and observations in high school, we apply the method of analysis and synthesis of experience to verify and adjust the proposed model.

4. Results

4.1. Classification of schools according to information technology infrastructure and teaching organization

From our implementation experience and practical observations in Vietnam, we classify schools in Vietnam into four groups (based on the stages of equipping them with facilities and necessary skills). It is assumed that teachers’ information technology level is the same and reaches the minimum level according to Circular 20/2018/TT-BGDĐT issued on August 22, 2018. In schools where teachers do not have access to information technology and are equipped with computers, students who are not equipped with computers or devices to access the network will not be mentioned in these subjects.

Table 5. Classifying types of school in Vietnam

Type	Characteristics
0	<ul style="list-style-type: none"> • The school does not have an information technology infrastructure system (computers, transmission lines). • Students do not have the equipment and skills to access the internet and online learning systems.
1	<ul style="list-style-type: none"> • Gradual transition from entirely face-to-face teaching to becoming familiar with online teaching. • The school does not have a computer room or computer network access device for students in a regular, adequate and stable school space for each student. • Students may use computers, or other digital devices, to access the online learning system at home.

2	<ul style="list-style-type: none"> • Partially converted from face-to-face teaching to a combination of online teaching. • The school has a computer room or computer network access device for students in the regular, complete, and stable school space. Students are allowed to use computers during school hours. • Students may use computers, or other digital devices, to access the online learning system at home.
3	<ul style="list-style-type: none"> • The school has transformed digitally. Teachers and students have digital skills and are proficient in online teaching. • The school has a computer room or computer network access device for students in the regular, complete, and stable school space. Students are allowed to use computers during school hours. • Students may use computers, or other digital devices, to access the online learning system at home.

4.2. Proposing an application model

Based on the above classification of schools, we choose the AEGlobal education ecosystem (an online learning management system with teaching materials for subjects (questions and interactive slides for self-study) and propose the corresponding teaching and learning organization scenarios. Note that, for Type 0, special effects are needed. We do not include this study but will do it in another study.

4.2.1. Type 1 Schools

Deployment goals

For teachers:

Teachers can choose several teaching phases suitable to the classroom conditions to carry out online.

Teachers create personalized learning programs in the education ecosystem.

Teachers can use resources on the system to compile digital learning materials on the education ecosystem (worksheets, lecture slides, videos, ...).

Teachers can track student activities' results in the education ecosystem. At the same time, based on the results of the educational ecosystem and assessment during direct learning, teachers select appropriate materials to supplement and replace content in the curriculum.

For students:

Students can perform some learning phases in the education ecosystem (for example, working with worksheets, reading documents, doing exercises on interactive slides, ...)

Students can track their learning results after working with documents on the system (for example, results of worksheets, results of interactive slides, exam results, ...)

Students can use the system's features to enhance exchanges and discuss learning tasks with teachers and friends before and after school.

Table 6. Teaching process before and after applying B-learning in Type 1 schools

	Before using B-learning	After using B-learning
Before class	Teachers prepare lesson plans, including scenarios of activities, detailed explanations, questions, and tasks ..., and prepare word documents and PowerPoint presentations.	<ul style="list-style-type: none"> • Digitize pre-school tasks on the system: <ul style="list-style-type: none"> - Compose interactive self-study slides and add them to the classroom. - Prepare worksheets before class and add them to the class: Check previous lessons and new lesson knowledge at the level of awareness and understanding. - Upload files students need to read need to prepare in advance. • Remind students to perform tasks before class on the system. • Analyse the results of students' learning tasks, prepare lesson plans for activities in the live class: answer questions, common problems, new knowledge, focus if necessary, and do exercises.
In class	Teaching according to the lesson plan using PowerPoint tables and screens.	<ul style="list-style-type: none"> • Summarize and announce the results of the student's work before class. • Announcement of learning tasks/ activities. • Teaching according to the designed lesson plan; can use the system's slides to explain, video resources, and exercises of the system that students have done to illustrate. • Remind homework: Access and do homework on the system.
After class	Mark homework and give feedback to parents through channels such as chat via Zalo app, electronic contact book, and phone calls.	<ul style="list-style-type: none"> • Remind homework: Access and do homework on the system. • View, grade, correct students' work on the system, discuss and respond to student discussions.

4.2.2. Type 2 Schools

Deployment goals

For teachers:

Teachers organize most learning activities in the educational ecosystem, making the most of the school’s equipment and infrastructure resources.

Teachers design suitable learning programs for each individual in the education ecosystem (differentiation of competence).

Teachers can use resources on the system to compile digital learning materials on the education ecosystem (worksheets, lecture slides, videos, ...)

Teachers can track student activities’ results in the education ecosystem. At the same time, based on the results of the educational ecosystem and assessment during direct learning, teachers select appropriate materials to supplement and replace content in the curriculum.

For students:

Students proficiently use the features of the education ecosystem to perform learning phases in the education ecosystem (for example, working with worksheets, reading documents, and doing exercises on corresponding slides). works, ...)

Students can track their learning results after working with documents on the system (for example, results of worksheets, results of interactive slides, exam results, ...)

Students can use the system’s features to enhance exchanges and discuss learning tasks with teachers and friends before, during, and after school.

Table 7. Teaching process before and after applying B-learning in Type 2 schools

	Before using B-learning	After using B-learning
Before class	Teachers prepare lesson plans, including scenarios of activities, detailed explanations, questions, and tasks ...), word documents, and PowerPoint presentations.	<ul style="list-style-type: none"> • Digitize pre-school tasks on the system - Compose interactive self-study slides and add them to the classroom - Prepare worksheets before class and add them to the class: Check previous lessons, and new lesson knowledge at the level of awareness and understanding - Upload files students need to read need to prepare in advance • Remind students to perform tasks before class on the system • Analyse the results of students' learning tasks; prepare lesson plans for activities in the live class: answer questions, common problems, new knowledge, focus if needed; work in the classroom but practice exercises on the system.

In class	Teaching according to the lesson plan using PowerPoint tables and screens.	<ul style="list-style-type: none"> • Summarize and announce the results of the student's work before class. • Announcement of learning tasks/activities. • Teaching according to the designed lesson plan; can use the system's slides to explain, video resources, and exercises of the system that students have done to illustrate. • Remind homework: Access and do homework on the system.
After class	Grade homework and give feedback to parents through channels such as Zalo app, electronic contact book, and phone calls.	<ul style="list-style-type: none"> • Remind homework: Access and do homework on the system. • View, grade, and correct students' work on the system, discuss, and respond to student discussions.

4.2.3. Type 3 Schools

Deployment goals

For teachers:

Teachers organize all learning activities in the education ecosystem, making the most of equipment and infrastructure resources of individuals, students' families, and schools.

Teachers design suitable learning programs for each individual in the education ecosystem (differentiation of capacity)

Teachers can use resources on the system to compile digital learning materials on the education ecosystem (worksheets, lecture slides, videos, ...)

Teachers can track student activities' results in the education ecosystem. At the same time, based on the results of the educational ecosystem and assessment during direct learning, teachers select appropriate materials to supplement and replace content in the curriculum.

For students:

Students proficiently use the features of the education ecosystem to perform learning phases in the education ecosystem (for example, working with worksheets, reading documents, and doing exercises on corresponding slides).

Students can track their learning results after working with documents on the system (for example, results of worksheets, results of interactive slides, exam results, ...)

Students can use the system’s features to enhance exchanges and discuss learning tasks with teachers and friends before, during, and after school.

Table 8. Teaching process before and after applying B-learning in Type 3 schools

	Before using B-learning	After using B-learning
Before class	Teachers prepare lesson plans (including scenarios of activities, detailed explanations, questions, and tasks ...), prepare word documents, power point presentations, activities on interactive pages, and forms across platforms.	<ul style="list-style-type: none"> • Digitize pre-school tasks on the system - Compose interactive self-study slides and add them to the classroom - Prepare worksheets before class and add them to the class: Check previous lessons, and new lesson knowledge at the level of awareness and understanding - Upload files students need to read need to prepare in advance • Remind students to perform tasks before class on the system • Analyse the results of students' learning tasks; prepare lesson plans for activities in virtual classrooms: answer questions, common problems, new knowledge, focus if needed; work in the classroom but work on the system: practice exercises.
In class	Lecture in the virtual classroom according to the lesson plan.	<p>Lecture in the virtual classroom according to the process:</p> <ul style="list-style-type: none"> • Summarize and announce the results of the student's work before class. • Announcement of learning tasks/activities. • Teaching according to the designed lesson plan; can use the system's slides to explain, video resources, and exercises of the system that students have done to illustrate. • Remind homework: Access and do homework on the system.
After class	Mark the above homework through photos, forms, and feedback to parents through channels such as Zalo app, electronic contact book, and phone calls.	<ul style="list-style-type: none"> • Remind homework: Access and do homework on the system. • View, grade, and correct students' work on the system, discuss, and respond to student discussions.

4.4. Discussion

From January 2022 to March 2022, we conducted a trial using the AEGlobal education ecosystem to deploy B-learning for students in grades 1 and 6, with a range of 3 subjects from two schools (Secondary School and High School). Luong The Vinh High School in Hanoi, Fansipan High School in Thanh Hoa). The first step has obtained a lot of positive results. Test deployment model:

Step 1: Training on blended teaching methods and exploiting the educational ecosystem to deploy blended teaching.

Step 2: Practice skills with the system after training.

Step 3: Teachers practice teaching under expert supervision

Step 4: Teachers are free to use the system for their teaching.

Other steps include providing an account, contacting the school, answering technical questions, and instructing students. However, essential steps for successful testing are not included in the above model because we want to focus on teacher-related processes. After three months, the results are found as follows:

Table 9. The result of implementing B-learning at school

Criteria	Survey results	Interview result
The need to implement B-learning methods in the current pandemic situation and the context of digital transformation.	100% necessary	Combined teaching methods are necessary and valuable because: - Flexibility in all levels of teaching organization; - Support students to learn effectively on their own; - Take advantage of the advantages of both face-to-face and online teaching.
The usefulness of the training program.	5/5 on average	The program is practical and timely, offers solutions to solve teachers' difficulties in the context of the pandemic, and organizes online teaching.
Students want to continue participating in the following training programs on B-learning and using the AEGlobal education ecosystem.	100% of students want to continue participating	Continue to learn to fully exploit the features of the ecosystem to support the teaching process.

It can be seen that 100% of the students understood the Blended Learning model and applied it to the teaching hours. 100% of teachers' teaching hours are assessed at a Satisfactory level (score from 80/100). The assessment results of the expert's

teaching hours are presented in Appendix 3, attached to this report. All periods in school follow the process of blended learning. Teachers initially have the skills to use the system. The practical training and experience for the group of teachers through each lesson has helped the teachers to progress gradually through the lessons. From there, teachers know how to exploit the system to implement teaching intentions actively and effectively; Students work on the system quickly.

It is also found that the presence of trainers/experts during the three months of training and practice is essential to ensure a successful trial. Teachers have many tasks, and if they are not reminded and motivated, they will forget the task. The critical role of a digital data warehouse in the digital transformation of teaching and learning activities is crucial in helping improve teacher performance and assessing learners' competence in real-time.

There is no legal corridor for large-scale deployment of the model. The trial size is small and not statistically significant, leading to conclusions consistent with the theory. However, we need to conduct more large-scale tests to quantify and compare the effect with the traditional teaching model.

5. Conclusion

The proposed blended learning model is suitable and can be flexibly switched between online and face-to-face teaching in private schools. Practice the proposed Blended learning model to achieve the goal of developing subject-specific competencies and learners' digital literacy. Building a digital teaching material repository plays an essential and pivotal role in the practice of the blended teaching model in particular, the digital transformation of teaching and learning activities in general, and monitoring and evaluating student performance in real-time.

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