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PRINT: ISSN 0975-1122 ONLINE: ISSN 2456-6322
Int J Edu Sci, 55(1): 32-39 (2026)
DOI: 10.31901/24566322.2026/55.1.1517

Online Learning Readiness Among Lower Secondary Students in a Mountainous Border Context: Evidence from Pu Nhi Commune, Thanh Hoa Province, Vietnam

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KEYWORDS Digital Access. Educational Technology. Learner Autonomy. Motivation. Self-efficacy. Technology Acceptance

ABSTRACT Digital transformation is increasingly shaping secondary education, yet students' readiness to participate effectively in technology-supported learning may vary across geographically disadvantaged contexts. This study examines online learning readiness among lower secondary students in Pu Nhi Commune. A quantitative cross-sectional survey of 250 students showed a moderate level of online learning readiness (M=3.42, SD=0.61; β=.31; p<.001; R^2=.486). Multiple regression analysis indicated that digital self-efficacy, self-regulated learning (β=.27, p<.001), perceived usefulness of digital learning (β=.16, p=.008), access to digital learning resources (β=.12, p=.041), and motivation for digital learning (β=.18, p=.004) were significant positive predictors of online learning readiness. The five factors explained 48.6 percent of the variance in online learning readiness. The findings suggest supporting students' digital capabilities and improving access to learning resources.

INTRODUCTION

Digital transformation is increasingly influencing secondary education, requiring students to develop not only access to digital technologies but also the confidence, self-regulation, motivation, and perceived usefulness necessary for effective technology-supported learning. Online learning readiness has consequently become an important area of educational research. Previous research with secondary students has identified technology readiness, learner control, online communication self-efficacy, self-directed learning, and motivation as important dimensions of readiness for online learning (Vo et al. 2024).

Recent research has further extended attention to online learning readiness among school-age learners. Studies involving junior high school students have examined readiness through dimensions such as self-directed learning, motivation, computer/Internet self-efficacy, learner control, and online communication self-efficacy (Dwiyanti et al. 2020). More recent research has also developed and validated readiness instruments specifically for high school students (Belawati et al. 2023) and younger school-age learners (Chou et al. 2026). However, these studies provide evidence of heterogeneity regarding the identified components. The study by Vo et al. (2024) identified five components among Vietnamese secondary school students, whereas Chou et al. (2026) identified four components among Taiwanese elementary school students, including family support and technical support. These discrepancies highlight the need to consider the application of readiness measurement tools in relation to age and educational context, assuming that the same measurement structure is suitable for all groups of students is inadequate.

Students' readiness is also closely associated with individual learning characteristics. Self-efficacy can influence students' engagement with digital learning tasks, while self-regulated learning enables learners to plan, monitor, and regulate their learning activities. Research synthesising 163 stud-

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ies has confirmed the importance of self-regulated learning in online and blended environments and highlighted the need for further evidence involving children and adolescents (Xu et al. 2023). However, research has focused less on motivational and emotional processes, prioritising cognitive and metacognitive processes instead (Toomla et al. 2026). Therefore, it is necessary to examine self-regulation in conjunction with learning motivation. Furthermore, manifestations of learning processes or academic achievement should not be viewed as direct evidence of how these factors relate to online learning readiness.

Students' perceptions of the usefulness of digital learning may also influence their acceptance and engagement with technology-supported education. Studies applying the Technology Acceptance Model have consistently examined perceived usefulness as an important factor associated with students' acceptance of online learning technologies (Davis 1989; Han and Sa 2022). In addition, motivation and readiness are closely connected in technology-mediated learning environments, suggesting that students' willingness and motivation to engage with digital learning should be considered when examining readiness (Jiang et al. 2024). Research by Singh and Ishrat (2025) in the Indian context demonstrated a link between social support, confidence in computer and Internet proficiency, and learning satisfaction among high school students. However, learning satisfaction is not synonymous with readiness for online learning, and findings from urban settings cannot be broadly applied to explain student readiness in other areas, such as rural or mountainous regions.

This issue is particularly relevant in mountainous and border areas where educational resources and digital infrastructure may remain constrained. In the 2025-2026 school year, Pu Nhi Boarding Lower Secondary School in Thanh Hoa Province had 443 students in 12 classes, including 433 ethnic minority students (97.74%). The school had implemented digital learning materials, electronic educational records, and connected lessons, although computer facilities and digital teaching equipment remained insufficiently synchronised.

Thus, existing studies provide a basis for simultaneously considering learner characteristics and access to resources. However, it should be noted that these studies have not established whether the associations with online learning readiness are applicable to the school context examined in the present study. Therefore, this study examines online learning readiness among lower secondary students in Pu Nhi Commune, Thanh Hoa Province, Vietnam. It investigates five potential predictors, namely, digital self-efficacy, self-regulated learning, perceived usefulness of digital learning, access to digital learning resources, and motivation for digital learning. The study specifically seeks to determine the level of online learning readiness and identify the factors that significantly predict students' readiness for technology-supported learning.

This study aims to assess the online learning readiness of lower secondary school students in Pu Nhi Commune and to examine the relationship between this readiness and several factors, namely, confidence in digital technology proficiency, self-regulated learning capabilities, perceived usefulness of digital learning, access to digital learning resources, and motivation for digital learning.

Research Questions

RQ1: What is the level of online learning readiness among lower secondary students in Pu Nhi Commune?

RQ2: What are the relationships between the five proposed factors and students' online learning readiness?

RQ3: Which factors significantly predict online learning readiness among lower secondary students?

Literature Review and Hypothesis Development

Online Learning Readiness

Online learning readiness refers to students' preparedness to participate effectively in technology-supported learning. Hung et al. (2010) conceptualised online learning readiness as a multidimensional construct involving self-directed learning, motivation, computer/Internet self-efficacy, learner control, and online communication self-efficacy. More recently, Vo et al. (2024) validated the Online Learning Readiness Scale among 296 secondary students in Vietnam and confirmed five components of readiness, including technology readiness, learner control, online communication self-efficacy, self-directed learning, and motivation.

For students in geographically disadvantaged contexts, readiness may depend not only on technological conditions but also on individual capabilities and perceptions of digital learning. Accordingly, the present study examines online learning readiness as an outcome associated with five individual and contextual factors, that is, digital self-efficacy, self-regulated learning, perceived usefulness, access to digital learning resources, and motivation.

Digital Self-Efficacy and Online Learning Readiness

Digital self-efficacy refers to students' confidence in their ability to use digital technologies to accomplish learning-related tasks. Previous reviews have also highlighted the relevance of self-efficacy to learners' performance and engagement in online learning environments (Yokoyama 2019). Hung et al. (2010) identified computer/Internet self-efficacy as an important dimension of online learning readiness. Recent evidence among secondary school students also indicates that social support can contribute to computer and Internet self-efficacy in online education (Singh and Ishrat 2025). Students who feel confident in using digital technologies may therefore be better prepared to participate in technology-supported learning activities. Accordingly, the following hypothesis is proposed: *H1: Digital self-efficacy has a positive effect on online learning readiness*.

Self-Regulated Learning and Online Learning Readiness

Self-regulated learning involves learners' ability to plan, monitor, and regulate their learning processes. This capability is especially important in online environments, where students often need greater responsibility for organising their learning activities. Earlier systematic evidence identified time management, metacognition, effort regulation, and critical thinking as important self-regulated learning strategies in online learning environments (Broadbent and Poon 2015). A scoping review of 163 studies subsequently found substantial evidence concerning the importance of self-regulated learning in online and blended learning and emphasised the need for further research among children and adolescents (Xu et al. 2023). Recent systematic research focusing specifically on K-12 digital learning likewise identifies self-regulation as an important area of digital learning research (Toomla et al. 2026). Systematic evidence from K-12 online education further indicates that technology access, students' developmental needs, and self-regulated learning skills are important contextual conditions for successful online learning (Johnson et al. 2023). Thus, students who can regulate their learning independently are expected to be better prepared for technology-supported learning, and the following hypothesis is proposed: *H2: Self-regulated learning has a positive effect on online learning readiness*.

Perceived Usefulness of Digital Learning and Online Learning Readiness

Perceived usefulness refers to the extent to which students believe that using digital technologies can improve their learning. The Technology Acceptance Model identifies perceived usefulness as a fundamental determinant of users' acceptance of information technology (Davis 1989). In educational settings, students who perceive digital learning as useful may be more willing to engage with technology and develop greater preparedness for online learning.

Therefore, perceived usefulness is expected to be positively associated with online learning readiness, and the following hypothesis is proposed: *H3: Perceived usefulness of digital learning has a positive effect on online learning readiness*.

Access to Digital Learning Resources and Online Learning Readiness

Access to digital learning resources includes students' availability of appropriate devices, Internet connectivity, and digital materials required for learning. Digital access is not evenly distributed across students and schools, with socioeconomic and contextual differences affecting students' digital skills and access to learning technologies (van de Werfhorst et al. 2022). Evidence from online learning contexts has similarly demonstrated that differences in students' access to digital resources can contribute to unequal learning experiences (Guo and Wan 2022). Research on e-learning readiness has also identified technology access as an important component of students'

readiness for digital learning. Accordingly, students with greater access to digital learning resources are expected to demonstrate higher online learning readiness, and the hypothesis proposed is: *H4: Access to digital learning resources has a positive effect on online learning readiness*.

Motivation for Digital Learning and Online Learning Readiness

Motivation provides an important basis for students' willingness to initiate and sustain learning activities. In online environments, motivation has been associated with persistence, engagement, and learning-related outcomes. Chen and Jang (2010), drawing on the Self-Determination Theory, demonstrated the relevance of motivation in online learning, while more recent research has continued to identify motivation as an important factor in technology-supported secondary education. Students who are more motivated to engage in digital learning are therefore expected to demonstrate greater readiness for technology-supported learning, and the hypothesis proposed is: *H5: Motivation for digital learning has a positive effect on online learning readiness*.

Research Framework

Based on the reviewed literature, this study proposes that digital self-efficacy, self-regulated learning, perceived usefulness of digital learning, access to digital learning resources, and motivation for digital learning are positively associated with online learning readiness among lower secondary students.

METHODOLOGY

Research Design and Participants

This study employed a quantitative cross-sectional survey design to examine factors associated with online learning readiness among lower secondary school students at Pu Nhi Boarding Lower Secondary School, Pu Nhi Commune, Thanh Hoa Province, Vietnam, during the 2025-2026 school year. The school had a total enrolment of 443 students across 12 classes. Of these, 433 students (97.74%) belonged to ethnic minority groups, while 308 students (69.53%) were eligible for boarding support.

A convenience sampling method was employed to recruit 250 students from the school. The sample size was determined by the number of students who could be accessed and the practical conditions for conducting the survey within the school setting. The 250 participants represented approximately 56.4 percent of the school's total enrollment. However, because convenience sampling was used, this proportion should not be interpreted as evidence that the sample was statistically representative of the entire student population.

Participation was voluntary, and the respondents were informed that the information collected would be used for academic research purposes.

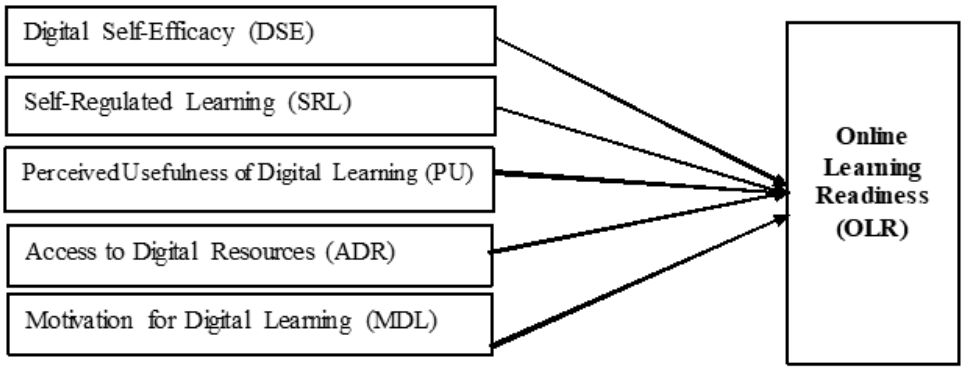


Fig. 1. Proposed research framework
Source: Synthesis of the author

The survey examined students' digital self-efficacy, self-regulated learning, perceived usefulness of digital learning, access to digital learning resources, motivation for digital learning, and overall online learning readiness. The analysis was based on responses from the 250 participating students.

Research Instrument

Data were collected using a structured questionnaire consisting of two parts. The first part collected basic demographic information, while the second part measured six constructs, namely, Digital Self-Efficacy (DSE), Self-Regulated Learning (SRL), Perceived Usefulness of Digital Learning (PU), Access to Digital Learning Resources (ADR), Motivation for Digital Learning (MDL), and Online Learning Readiness (OLR).

All constructs were measured using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The measurement items were adapted from previous studies on online learning readiness, self-efficacy, self-regulated learning, technology acceptance, and learning motivation and adjusted to the lower secondary school context.

To minimise conceptual overlap between the predictors and the dependent variable, online learning readiness was operationalised as students' overall preparedness and confidence to participate in technology-supported learning, while digital self-efficacy, self-regulated learning, and motivation were measured as separate explanatory constructs.

Data Analysis

The data were analysed using descriptive statistics, Cronbach's alpha, and multiple linear regression. Means and standard deviations were used to describe the study variables, while Cronbach's alpha was used to assess the internal consistency of the measurement scales. Multiple linear regression was employed to examine the associations between the five independent variables and online learning readiness.

The regression model was specified as follows:

$$OLR = \beta_0 + \beta_1 DSE + \beta_2 SRL + \beta_3 PU + \beta_4 ADR + \beta_5 MDL + \varepsilon$$

Where, OLR represents Online Learning Readiness, DSE represents Digital Self-Efficacy, SRL represents Self-Regulated Learning, PU represents Perceived Usefulness of Digital Learning, ADR represents Access to Digital Learning Resources, MDL represents Motivation for Digital Learning, and å represents the error term. Statistical significance was evaluated at $p < .05$.

RESULTS

Descriptive Statistics and Reliability

The descriptive statistics and reliability results for the study variables are presented in Table 1. The mean scores ranged from 3.21 to 3.68, indicating generally moderate to relatively positive perceptions of digital learning among the students. Online learning readiness had a mean of 3.42 (SD = 0.61). All measurement scales demonstrated acceptable internal consistency, with Cronbach's alpha values ranging from .82 to .89.

Students rated the accessibility of resources the lowest, with the greatest degree of dispersion, while rating the usefulness of digital learning the highest. Thus, although students acknowledge the benefits of learning, actual conditions do not yet allow them to access the corresponding support resources. However, this remains a descriptive observation; the differences between the mean scores have not been statistically tested.

Table 1: Descriptive statistics and reliability of the variables

Variable	*Mean*	*SD*	*Cronbach's α*
Digital Self-Efficacy (DSE)	3.54	0.67	.87
Self-Regulated Learning (SRL)	3.47	0.63	.85
Perceived Usefulness (PU)	3.68	0.59	.88
Access to Digital Learning Resources (ADR)	3.21	0.78	.82
Motivation for Digital Learning (MDL)	3.56	0.65	.86
Online Learning Readiness (OLR)	3.42	0.61	.89

Note: SD = standard deviation; α = Cronbach's alpha
Source: Survey data of the study

Multiple Regression Analysis

Multiple linear regression was conducted to examine the five proposed predictors of online learning readiness. The regression model was statistically significant, $F(5, 244) = 46.17$, $p < .001$, and explained 48.6 percent of the variance in online learning readiness ($R^2 = .486$; Adjusted $R^2 = .475$). The remaining variation in online learning readiness was not explained by the five variables in the model.

As shown in Table 2, all five predictors had statistically significant positive effects on online learning readiness. Digital self-efficacy had the strongest effect ($\beta = .31$, $p < .001$), followed by self-regulated learning ($\beta = .27$, $p < .001$). Motivation for digital learning ($\beta = .18$, $p = .004$), perceived usefulness of digital learning ($\beta = .16$, $p = .008$), and access to digital learning resources ($\beta = .12$, $p = .041$) also showed significant positive effects.

Students demonstrated the highest standardised coefficient for confidence in their digital technology proficiency and ability to self-regulate their learning. Meanwhile, confidence regarding access to resources showed the lowest coefficient, though it remained statistically significant. This ranking does not establish causality or intervention priorities, even though it reflects the magnitude of the relationships within the sample.

Summary of Hypothesis Testing

The results supported all five hypotheses. Digital self-efficacy and self-regulated learning were the two strongest predictors of online learning readiness. The findings also confirmed significant positive relationships between perceived usefulness, access to digital learning resources, motivation for digital learning, and students' readiness for technology-supported learning. Hence, overall, all five proposed hypotheses (H1–H5) were supported.

DISCUSSION

The findings show that students reported a moderate level of online learning readiness ($M = 3.42$, $SD = 0.61$), with the five predictors jointly explaining 48.6 percent of its variance ($R^2 = .486$). This supports the view that online learning readiness is multidimensional and influenced by both learner characteristics and learning conditions (Hung et al. 2010; Vo et al. 2024).

Digital self-efficacy was the strongest predictor ($\beta = .31$, $p < .001$), supporting H1. This indicates that students' confidence in using digital technologies is closely associated with their readiness for technology-supported learning. Self-regulated learning was the second strongest predictor ($\beta = .27$, $p < .001$), supporting H2, consistent with evidence that self-regulation is important in online and blended learning (Xu et al. 2023).

Toomla et al. (2026) warn against technology taking over the learner's regulatory role, while Singh and Ishrat (2025) examine technological confidence in relation to social support. These findings suggest that the development of individual competence must be accompanied by pedagogical support. However, the study conducted at Pu Nhi did not examine this support mechanism.

Perceived usefulness significantly predicted readiness ($\beta = .16$, $p = .008$), supporting H3. This finding is consistent with the Technology Acceptance Model, which identifies perceived usefulness as an important determinant of technology acceptance (Davis 1989). Access to digital learning resources was also positively associated with readiness ($\beta = .12$, $p = .041$), supporting H4, indi-

Table 2: Multiple regression results

Predictor	*β*	*p-value*	*Hypothesis*
Digital Self-Efficacy (DSE)	.31	<.001	H1 Supported
Self-Regulated Learning (SRL)	.27	<.001	H2 Supported
Perceived Usefulness (PU)	.16	.008	H3 Supported
Access to Digital Learning Resources (ADR)	.12	.041	H4 Supported
Motivation for Digital Learning (MDL)	.18	.004	H5 Supported

$R^2 = .486$; Adjusted $R^2 = .475$; $F(5, 244) = 46.17$, $p < .001$
Note: α = Standardised regression coefficient
Source: Survey data of the study

cating that access to devices, connectivity, and digital materials remains relevant to students' readiness.

Low scores regarding access to digital resources are insufficient to prioritise interventions. Conversely, a perception of technology as useful does not constitute evidence of actual learning effectiveness.

Motivation for digital learning was positively associated with readiness ($\alpha = .18$, $p = .004$), supporting H5. This finding is consistent with previous research emphasising motivation in online learning (Chen and Jang 2010) and with Vo et al. (2024), who identified motivation as a component of online learning readiness among secondary students in Vietnam.

Overall, all five hypotheses were supported. The results suggest that strengthening students' digital self-efficacy and self-regulated learning, together with improving access to digital resources and students' perceptions and motivation, may be relevant to online learning readiness in the Pu Nhi context.

The scale specifically designed for primary school students by Chou et al. (2026) emphasises the need for age-appropriate assessment. The findings from Pu Nhi presented in this study must be interpreted within the context of a single school and a cross-sectional design. Consequently, the observed associations do not establish causality, nor are they representative of students in other settings.

CONCLUSION

The study examined online learning readiness among lower secondary students in Pu Nhi Commune, Vietnam. The findings indicate that students' readiness for technology-supported learning is associated with digital self-efficacy, self-regulated learning, perceived usefulness of digital learning, access to digital learning resources, and motivation for digital learning. All five proposed factors were supported in the research model. Confidence in digital technology proficiency and the ability to self-regulate learning exhibit the strongest positive association, based on the magnitude of the standardised coefficient. The study highlights the importance of developing students' digital capabilities and independent learning skills while improving access to digital learning resources. The findings provide empirical evidence for understanding online learning readiness in a mountainous border-school context. Future studies could extend this research to larger samples and other educational settings to further examine the factors influencing students' readiness for digital learning.

RECOMMENDATIONS

Based on the findings, several recommendations are proposed to improve students' readiness for technology-supported learning. Schools should strengthen students' digital self-efficacy through regular practical activities that allow students to use digital tools, learning platforms, and online resources in their learning. Teachers should promote self-regulated learning by encouraging students to set learning goals, manage their study time, monitor their progress, and complete digital learning tasks independently. Schools should improve access to digital learning resources, particularly computers, Internet connectivity, and appropriate digital learning materials, to provide students with greater opportunities to participate in technology-supported learning. Teachers should demonstrate the practical usefulness of digital learning by integrating relevant digital resources and activities into lessons and helping students understand how technology can support their learning. Schools and teachers should strengthen students' motivation for digital learning through engaging, practical, and age-appropriate technology-supported learning activities.

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Paper received for publication in September, 2026
Paper accepted for publication in October, 2026