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Original Article

# Addressing Challenges Towards Online Learning Framework

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**Abstract.** This paper investigated the extent of online platform support mechanisms and solutions for managing students' learning capabilities and relationships, and the extent to which well-being moderates students' experiences of these mechanisms and solutions. The study employed a descriptive–correlational research design using an expert-validated and reliability-tested questionnaire. A total of 353 students, selected through proportional stratified random sampling, participated in the study. Data were analyzed using descriptive and inferential statistics. Findings showed that platform support mechanisms were available to a moderate extent but did not meet the benchmark for high or adequate support. Despite this limitation, platform support mechanisms were statistically significant predictors of the effectiveness of platform-based solutions. By contrast, platform solutions were highly rated and demonstrated a significant enhancement in students' digital learning capabilities, engagement, and autonomy. Correlation and regression analyses revealed a moderate but statistically significant positive relationship between platform support mechanisms and platform solution effectiveness, indicating that support is an enabling factor for solution effectiveness. The moderation analyses also showed that student well-being significantly moderates the relationships between the platform's support mechanisms and the online learning experience, as well as between platform solutions and the online learning experience. The more emotionally and mentally well students were, the greater their capacity to employ support mechanisms, use solutions, and maintain engagement in an online learning environment. The findings emphasize that successful online learning should not be based solely on the availability of functioning platforms and organized solutions. However, they should also be supported by the long-term consideration of students' emotional and mental health. The study proposes a Student-Centered Online Learning Framework that integrates platform support, digital literacy development, solution readiness, well-being integration, and institutional sustainability to promote inclusive, resilient, and sustainable online education.

***Keywords:*** *Online platforms; Learning challenges; Online learning.*

The disruptions facing educational institutions worldwide today are more diverse and complex, extending far beyond communicable diseases. Although online learning, as an alternative instructional method, has become feasible with digital technologies, schools now face several challenges. Swift shifts to alternative learning models have become necessary, leading to security issues, extreme weather conditions, and natural disasters, which are significant drivers of school closures (Crompton et al., 2021). Between 2011 and 2019, the United States experienced 21,000 long-term, unplanned school disruptions, putting more than 13 million students at risk of missing school. In such cases, natural disasters have been a leading cause (47), adverse weather has been

an additional factor (35), and other reasons have accounted for the remainder (Jahan et al., 2022).

Earthquakes pose a significant risk to educational continuity, particularly in seismically active areas. The 2010 Chile earthquake demonstrated that school disruptions from seismic events were both short- and long-term, and that learning losses were even more severe in municipalities with inexperienced political leadership (Alcaino & Argote, 2024). More recently, the 2023 Kahramanmaras earthquakes in Turkey prompted educational institutions to adopt distance learning as a crisis response, raising questions about the effectiveness of online learning during emergencies due to reduced student motivation and limited access (Karakas, 2025). The interdisciplinary nature of modern-day educational crises is exemplified by school heads in the Philippines, who have developed multi-layered emergency management skills necessary to sustain teaching and learning operations during typhoons, floods, earthquakes, and other health emergencies (Angwas, 2025).

Typhoons and tropical cyclones pose long-term threats to students' learning and school operations, causing severe disruptions. Studies on the effects of extreme weather conditions indicate that tropical cyclones, floods, and wildfires often trigger school closures, directly disrupting the learning process. It has been demonstrated that a single school closure day results in the loss of one day of learning (Venegas Marin et al., 2024). In October and November 2020, eight typhoons struck the Philippines, resulting in massive flooding, power outages, property damage, and the loss of numerous lives. These extreme conditions significantly affected undergraduate and graduate student engagement in learning, demonstrating that environmental crises can substantially hinder even established online learning systems (Lagmay & Rodrigo, 2022). In response to such disasters, schools have adopted Alternative Delivery Modes, using modular printing as a primary learning method, given the challenges in accessibility and connectivity that necessitate differentiated learning approaches (Acang et al., 2024).

Abnormal weather conditions, such as extreme heat and high humidity, are a new, although growing, danger to educational activity. In Arizona elementary schools during the summer of 2023, almost all schools (93%) changed their regular outdoor recess due to extreme heat exposure, and the mean duration of recess disruption was 3.5 weeks (Paulos & Wilson, 2023). In addition to recess interruptions, high temperatures have a direct negative impact on student cognitive processing and learning. It has been demonstrated that there is a substantial negative correlation between heat exposure and learning: the more days students are exposed to extreme heat, the less they learn (Venegas Marin et al., 2024). Thermal stress can be significantly worse than in schools located in equatorial and tropical regions. Some schools have recorded temperatures of 37 °C, with maximum values of 41 °C, which constitute extreme heat stress and require alternative scheduling and teaching delivery (Canizares & Romero-Alvarez, 2025).

Security risks, such as bomb threats and armed attacks on institutions, also contribute to educational disruption. An official report on a bomb threat incident at Central Ridge High School explains that, even when the incident is identified as a hoax, it can cause significant emotional distress, necessitating highly elaborate crisis-response measures and effective communication plans with staff, families, and counseling services (Classen, 2025). In even more extreme settings, such as the northwest of Nigeria, education and educational institutions are subjected to armed assaults and kidnappings, which cause the development of an atmosphere of fear and uncertainty permeating the whole country, leading to the mass closure of schools and significant losses in enrollment among students (Kanu et al., 2024). These security issues illustrate how non-health-related threats can prompt schools to adopt alternative learning modalities.

Although an extensive body of literature already exists to elucidate the problems of infrastructure and the digital divide, as well as the lack of digital literacy among students and its impact on their well-being on online learning platforms, a critical research gap remains. The current literature primarily focuses on support systems for online learning and on student outcomes in single-platform settings or limited geographic areas, often under pandemic conditions. The systems by which student well-being moderates the efficacy of support systems in various crisis scenarios, especially those related to natural catastrophes, extreme weather, and threats that extend beyond pandemic situations, are systematically understudied. Moreover, although Google Classroom and Zoom have become the dominant tools for providing emergency education, there is insufficient research on how different configurations of their support systems affect student learning outcomes when these tools are used during non-pandemic crises. The relationship between platform-based support systems and students' learning capacity has not been investigated in the context of the current disruptions in education. The paper will fill this research gap by exploring the extent and forms of the system of support that is provided by Google Classroom and Zoom,

questioning how these platforms can help students develop their learning capacities in different settings of crisis, and evaluating critically the application of student well-being to moderate the experiences of the students using the two platforms. The study aimed to provide evidence-based recommendations for developing robust, equitable, and online learning frameworks that effectively address learners' learning and well-being across the full range of educational challenges schools encounter in modern settings.

## Methodology

### Research Design

This study employed a quantitative research design, employing both descriptive and inferential approaches, specifically correlational and moderation analyses. The descriptive part aimed to assess the extent and adequacy of support systems in distance education, particularly in the use of online tools such as Google Classroom and Zoom. It also assessed the perceived effectiveness of solutions applied to online learning issues. The data have been summarized and interpreted using descriptive statistics, such as the mean and standard deviation.

### Participants and Sampling Technique

The respondents were the included students from Cavite State University – Silang Campus for the 2nd semester of the Academic Year 2024–2025. The student respondents were selected from the currently registered students in the eight on-campus academic programs. The Raosoft sample size calculator was used at a 95% confidence level with a 5% margin of error, yielding a sample size of 353 students. The research employed proportional stratified random sampling, in which every subgroup of the population was adequately represented, and all students had an equal probability of selection, proportional to their number in the total population.

### Research Instrument

The instrument utilized in this study was a researcher-made structured questionnaire. The instrument was designed to align with the research objectives, underwent expert validation, and was pilot-tested to ensure clarity, reliability, and internal consistency. It comprises three major parts: platform challenges, solutions, and well-being. All questionnaire items were rated using a five-point Likert scale, with responses ranging from 1 to 5. The descriptive interpretations of the scale are as follows: 4.50–5.00 is interpreted as “Very High Extent,” 3.50–4.49 as “High Extent,” 2.50–3.49 as “Moderate Extent,” 1.50–2.49 as “Low Extent,” and 1.00–1.49 as “Very Low Extent.”

The content validity of the research instrument was established using the Content Validity Index (CVI) in accordance with the systematic procedure recommended by Yusoff (2019). Each item was rated by a panel of three professionals with experience in educational management, research, and information technology on relevance, readability, and suitability on a five-point scale. The item-level Content Validity Index (I-CVI) values were calculated by dividing the number of experts who rated an item as relevant (scores 3-5) by the total number of experts. The Scale-level Content Validity Index (S-CVI/Ave) was used to achieve the mean of all the I-CVI values. All items had an I-CVI of 1.00, and the S-CVI/Ave was also 1.00, indicating excellent content validity. After expert validation, the instrument was piloted on a small sample of respondents (n = 40) representative of the study's target population. The pilot test results were assessed using Cronbach’s alpha (α) to evaluate internal consistency and reliability. The analysis yielded a Cronbach's alpha of 0.878, which exceeds the recommended minimum of 0.70, indicating good internal consistency.

### Data Gathering Procedure

The survey questionnaire was administered online to facilitate distribution and data collection. It was disseminated to the selected participants through formal communication channels. The purpose of the study was clearly stated, and participants could choose to participate voluntarily. During data collection, monitoring, and response retrieval, they were fully applied to ensure that the response was accurate and complete. The process resulted in a 100% retrieval rate. The collected data were coded in a spreadsheet and subsequently analyzed statistically.

### Data Analysis Procedure

Before conducting parametric statistical analyses, the assumptions of normality were examined at the scale level. The test of normality was conducted in two parts: statistical and visual. This involved checking the values of skewness and kurtosis, as well as the Shapiro-Wilk test, and visual analysis of standard Q-Q plots. Although the Shapiro-Wilk test yielded statistically significant results for the variables, this was expected due to the large

sample size (n = 353). Notably, the skewness and kurtosis of all composite variables were within acceptable limits (approximately ±1), indicating that normality was approximately met.

Additionally, the examination of the Q-Q plots revealed that the data items were predominantly distributed along the diagonal reference line, with minor deviations at the ends of the distribution. Such departures are characteristic of Likert-scale data and do not imply such severe norm violation. Given the strength of parametric tests in large samples, the data were deemed suitable for such tests.

To analyze the extent of support systems (online platforms, including Google Classroom and Zoom), descriptive statistics (mean and standard deviation) were used to summarize students' responses and identify trends. A one-sample t-test was used to compare perceived platform support with a hypothesized population mean of 3.5. To assess the effectiveness of solutions to the online learning problem, specifically for online platforms (Google Classroom and Zoom), descriptive statistics (mean and standard deviation) were used. A one-sample t-test was conducted to determine whether students' responses regarding these solutions differed significantly from the hypothesized value of 3.5. A multiple linear regression analysis was performed to assess the extent to which support processes are associated with solution effectiveness. This statistical test evaluated the presence and magnitude of the predictive effect of online platform support on students' reported success in applying solutions to online learning challenges. A multiple linear regression analysis with interaction terms was used to investigate the moderating effect of well-being on students' experiences. This analysis aimed to determine whether well-being significantly affected the strength of the relationship between platform support mechanisms and students' experiences, as well as the effectiveness of platform solutions in managing online learning. Moreover, the analysis of differences in the well-being levels (low, moderate, high) and platforms (Google Classroom and Zoom) and their interaction effects was also tested using two-way Analysis of Variance (ANOVA) to give a more detailed picture of well-being-based influence on the type of online learning experience the students have.

**Ethical Considerations**

This research paper was compiled strictly in accordance with the ethical principles of research and the requirements of Republic Act No. 10173, or the Data Privacy Act of 2012. All participants were informed of and invited to participate in the study. Participants' privacy was protected because no personally identifiable information was collected. The research was revised and approved by the Philippine Christian University (PCU) prior to implementation to ensure compliance with institutional, ethical, and legal standards.

## Results and Discussion

**Extent of Online Platform Support Mechanisms in Online Learning**

Table 1 summarizes the extent of online platform support mechanisms for Google Classroom and Zoom using descriptive statistics and a one-sample t-test. The platform support was rated at a moderate level (Overall composite $M = 3.10$, $SD = 1.25$). The one-sample t-test assessed whether students' mean ratings differ from 3.50, which in this study represents the minimum threshold for a "high" level of support on the 5-point Likert scale (i.e., the cutpoint separating "moderate" from "high" support based on the study's scale interpretation). The results indicate that the mean ratings for all indicators and composite scores were significantly lower than 3.50 ($p < .001$). This means the observed ratings are not only descriptively "moderate," but also statistically below the expected adequacy threshold for high support. For Google Classroom, support from family members in logging in/navigating ($M = 3.12$, $SD = 1.27$) and in submitting assignments/checking feedback ($M = 3.07$, $SD = 1.28$) remained moderate. Likewise, Zoom-related support for joining classes ($M = 3.11$, $SD = 1.24$) and using interactive features, such as screen sharing, chat, and breakout rooms ($M = 3.10$, $SD = 1.25$), was also rated as moderate. These findings suggest that students' home support mechanisms are present but not consistently strong enough to be considered "high" or fully adequate for independent use of the platform. The pattern of negative t-values reflects a gap between current support levels and the targeted benchmark, implying that learners may continue to rely on intermittent assistance for basic and interactive tasks. This supports the need for more structured capacity-building (e.g., guided orientation, tutorials, and continuous technical support) to reduce dependence on informal help and improve confidence and engagement in online learning. Ample t-test on Online Platform Support Mechanism (Google Classroom and Zoom Composite).

**Table 1.** *The Extent of Platform Support in Online Learning in Terms of Google Classroom and Zoom*

| Indicators | Mean | SD | Interpretation | t | p | Significance |
|---|---|---|---|---|---|---|
| **Google Classroom** | | | | | | |
| A family member or someone at home can help me log in to and navigate Google Classroom. | 3.12 | 1.27 | Moderate Extent | -5.65 | <.001 | Significant |
| When I struggle to submit assignments or check feedback in Google Classroom, someone at home can assist me. | 3.07 | 1.28 | Moderate Extent | -6.30 | <.001 | Significant |
| **Composite Score** | **3.09** | **1.24** | **Moderate Extent** | **-6.16** | **<.001** | **Significant** |
| **Zoom** | | | | | | |
| Someone at home assists me with joining Zoom classes if I encounter difficulties (e.g., wrong link, login issues). | 3.11 | 1.24 | Moderate Extent | -5.59 | <.001 | Significant |
| My family helps me understand or use features like screen sharing, chat, or breakout rooms in Zoom. | 3.10 | 1.25 | Moderate Extent | -5.98 | <.001 | Significant |
| **Composite Score** | **3.10** | **1.22** | **Moderate Extent** | **-6.07** | **<.001** | **Significant** |
| **Overall Composite Score** | **3.10** | **1.25** | **Moderate Extent** | **-5.96** | **<.001** | **Significant** |

***n*** *= 353,* ***df*** *= 352*

According to Zuniga-Tonio (2021), there was greater participation and academic performance in courses delivered via Google Classroom. Students who underwent systematic orientation and received practical instructions were more confident and motivated to complete learning tasks. These results emphasize the importance of guided training and tutorials as key components of successful digital learning implementation, which can address technological challenges faced by students and promote more equitable access to online learning. Several studies discover that the success of platforms like Google Classroom relies heavily on instructor and student training and institutional support, when teachers implement guided approaches (e.g., posting assignments clearly, keeping comment threads open, integrating Classroom with messaging tools), submission behaviour, and access to feedback when they do (Khan et al., 2020). Islam et al. (2020) found that online classes were inaccessible and could not fully serve the needs of many Bangladeshi students during the pandemic. The researchers reported that online classes failed to address their needs, and a significant number of students were out of reach due to internet and infrastructure barriers. Similarly, students residing in less developed areas may rely on informal assistance due to inadequate formal education in digital environments (Barrot et al., 2021).

Moreover, Serhan (2020) examined Zoom as a synchronous learning platform that facilitates real-time interaction. Multiple studies highlight that, despite the availability of platforms such as Google Classroom, these platforms are underutilized in low-access environments due to weak connectivity, limited device access, and inflexible features. To illustrate, a study (Jaca, 2022) found that most students utilized Google Classroom during the pandemic. However, most students report intermittent internet access and varying internet speeds, which means that Google Classroom has enabled them to complete their schoolwork at their convenience, even though they are sometimes interrupted during live class time. A different study provides a clear report: "One of the challenges of online learning is internet connection. Google Classroom does not have any offline access feature" (Muslem et al., 2024, p. 79). Another study demonstrated that the shift to online learning, particularly when using platforms such as Zoom, has introduced new challenges, commonly known as Zoom fatigue, that can adversely affect student engagement and satisfaction. A study in the Philippines reported moderate to high levels of videoconferencing fatigue, and qualitative results indicated that students frequently experienced eye strain and fatigue after prolonged screen time (Dacillo et al., 2022).

Table 2 presents the results of a one-sample t-test conducted to determine whether the students' mean rating of the online platform support mechanism (Google Classroom and Zoom composite) differs significantly from the benchmark value of 3.50. In this study, 3.50 represents the minimum cutoff for a high/adequate level of support on the 5-point Likert scale, serving as an operational benchmark for assessing whether perceived support meets a desirable threshold. The analysis yielded $t(352) = -6.390$, $p < .001$, indicating that the observed mean is significantly lower than 3.50. Therefore, the null hypothesis ($H_{01}$: $\mu = 3.50$) is rejected, suggesting that students' perceived support for using Google Classroom and Zoom does not meet the expected adequacy threshold. Although the descriptive interpretation reflects a moderate extent of support, the t-test result indicates that this "moderate" support is reliably below the benchmark for high/adequate support. In practice, this may limit the development of independent digital learning capabilities, as students may continue to require assistance with navigating platform features, completing platform-based tasks, and managing online learning requirements. This condition can contribute to uneven participation, reduced confidence in using platform tools, and inconsistent engagement in online learning activities.

**Table 2.** *One-Sample t-test on Online Platform Support Mechanism (Google Classroom and Zoom Composite)*

| Variables | Statistic | df | p | Interpretation | Decision |
|---|---|---|---|---|---|
| Online Platform Support Mechanism in Terms of Google Classroom and Zoom | -6.39 | 352 | <.001 | Significant | Reject the Null Hypothesis |

**Note**. Test Value = 3.5; $H_0$: $\mu = 3.5$; $H_1$: $\mu \neq 3.5$.

The findings of this research align with the existing literature, which indicates that digital under-readiness persists among students, particularly in low- and middle-income communities. Adedoyin and Soykan (2020) state that several students do not use online platforms effectively due to limited orientation, insufficient training, and limited practice, resulting in low self-efficacy and dependence on external help. Several studies indicate that merely having online learning technologies may not guarantee effective interaction. Evidence-based research on platform literacy suggests that students possess a simplistic form of functional literacy, limited to basic platform functionality, appropriate submission options, and straightforward troubleshooting. This limitation negatively affects active engagement and the learning experience (Ha & Kim, 2023; Gutierrez-Angel et al., 2022). Such incompetence often impedes effective interaction and reduces the potential benefits of online studies.

Additionally, Scheel et al. (2021) noted that two core components of digital learning capability are perceived ease of use and perceived usefulness. A lack of confidence or skills in using platforms and related tools will adversely affect students' motivation and performance. Even when students are supported by a family that provides no guidance or training, they can still struggle. This fact underscores the need to introduce targeted mechanisms, such as guided education, user-friendly manuals, and technology literacy classes, at the family level to foster digital learning skills. Digital competence will not only facilitate interaction between students and platforms but also reduce cognitive load and enhance independent learning (Al-Fraihat et al., 2020).

**Extent of Online Platform Solutions Offered in Managing Students' Learning Capability**

Table 3 presents the descriptive statistics and one-sample t-test results examining the extent to which online platform solutions are offered to address students' learning challenges in Google Classroom and Zoom. The overall composite $M = 3.91$ ($SD = 0.92$) indicates that students largely perceived the platform-based solutions. A one-sample t-test was conducted to assess whether the observed mean ratings differed significantly from the benchmark value of 3.50, which represents the minimum cutoff for a high or adequate level of platform solutions, as defined by the study's scale interpretation. The results show that the mean ratings for all indicators and composite scores were significantly higher than the benchmark value of 3.50 ($p < .001$). This indicates that the perceived effectiveness of platform-based solutions is not only descriptively high but also statistically above the adequacy threshold, suggesting that these interventions exceed the minimum level required to support students' online learning capability.

**Table 3.** *The Extent of Platform Solutions Offered to Address Challenges in Terms of Google Classroom*

| Indicators | Mean | SD | Interpretation | t | p | Significance |
|---|---|---|---|---|---|---|
| **Google Classroom** | | | | | | |
| Tutorials or guides on Google Classroom helped me navigate and use it more effectively. | 3.92 | 0.97 | High Extent | 8.14 | <.001 | Significant |
| After receiving help or training, I experienced fewer difficulties in using Google Classroom. | 3.83 | 0.98 | High Extent | 6.33 | <.001 | Significant |
| **Composite Score** | **3.87** | **0.92** | **High Extent** | **7.64** | **<.001** | **Significant** |
| **Zoom** | | | | | | |
| Training or experience using Zoom features made online classes more manageable and interactive. | 3.98 | 0.88 | High Extent | 10.13 | <.001 | Significant |
| Whenever I faced issues in Zoom, I could apply what I learned from support resources to fix them. | 3.91 | 0.90 | High Extent | 8.65 | <.001 | Significant |
| **Composite Score** | **3.94** | **0.86** | **High Extent** | **9.68** | **<.001** | **Significant** |
| **Overall Composite Score** | **3.91** | **0.92** | **High Extent** | **8.43** | **<.001** | **Significant** |

***n*** *= 353,* ***df*** *= 352*

For Google Classroom, students reported that tutorials or user guides helped them navigate and use the platform more effectively ($M = 3.92$, $SD = 0.97$), while training and guided assistance reduced difficulties in completing platform-related tasks ($M = 3.83$, $SD = 0.98$). Similarly, Zoom-related solutions were rated highly, particularly training on interactive features that made online classes more manageable and engaging ($M = 3.98$, $SD = 0.88$) and the application of learned support strategies to resolve technical issues ($M = 3.91$, $SD = 0.90$). The statistically significant positive differences indicate that structured platform solutions—such as organized tutorials, guided practice, and continuous training—are effective in enhancing students' digital learning capability. Unlike the

support mechanisms discussed in earlier sections, which were found to be below the adequacy threshold, these solution-oriented interventions appear sufficient to promote greater autonomy, confidence, and competence in using online learning platforms.

These results are consistent with other studies demonstrating the effectiveness of facilitated learning in web-based learning systems. According to Al-Maroof and Al-Emran (2021), students' satisfaction and perceived ease of use with Google Classroom increased significantly after receiving training and tutorials on the platform. Similarly, Rapanta et al. (2020) also emphasized the importance of delivering adequate instructional support and realistic training to enhance digital competence and have a substantial impact on learners. Prasetyo et al. (2021) also noted that the training interventions reduce cognitive load and increase students' confidence in their ability to cope with online spaces. In the Philippine context, Zuniga-Tonio (2021) found a positive shift in participation and academic performance among students enrolled in courses delivered via Google Classroom. The students were oriented and provided with practical instructions, and they demonstrated increased confidence and motivation to complete the learning activities. Such findings suggest that guided training and tutorials are crucial to effective digital learning, as they address technology-related challenges that learners may still encounter and help make online learning more equitable. These findings confirm that online training and tutorials are crucial for addressing the digital learning challenges faced by students. Likewise, the results from Zoom studies suggest that systematically conducted training can significantly enhance students' ability to cope with synchronous classes. Serhan (2020) reported that a lack of training leads to low student engagement and satisfaction in synchronous Zoom classes, and that instructional support could be more effective in improving the online learning process.

Table 4 presents the results of a one-sample t-test conducted to determine whether students' perceived effectiveness of online platform solutions for managing learning capability in Google Classroom and Zoom differs significantly from the benchmark value of 3.50. In this study, the value 3.50 represents the minimum cutoff for a high or adequate level of platform solutions, based on the adopted Likert scale interpretation. The analysis yielded $t(352) = 9.228$, $p < .001$, indicating that the observed mean rating is significantly higher than the benchmark value. Thus, the null hypothesis ($H_{02}$: $\mu = 3.50$) is rejected, suggesting that students perceive the solutions offered for using Google Classroom and Zoom as effectively supporting their learning capability. The statistically significant positive difference indicates that platform-based solutions, such as structured tutorials, guided training, and applied support strategies, go beyond mere adequacy and meaningfully enhance students' ability to manage online learning tasks. This finding indicates that when appropriate solutions are provided, students are better equipped to navigate platform functions independently, address technical challenges, and sustain engagement in online learning environments.

**Table 4.** *One-Sample t-test on the Effectiveness of Online Platform Solutions in Managing Learning Capability*

| Variables | Statistic | df | p | Interpretation | Decision |
|---|---|---|---|---|---|
| Online Platform Solutions in Terms of Google Classroom and Zoom | 9.22 | 352 | <.001 | Significant | Reject the Null Hypothesis |

**Note**. $H_a$ $\mu \neq 3.5$

Other empirical studies based on the Technology Acceptance Model also indicate that perceived usefulness and intention to use platforms increase when institutions support high-quality systems, practical manuals, and technical orientation (Alqahtani & Rajkhan, 2022; Buchan et al., 2024). Digital self-efficacy, more engagement, and better completion or performance outcomes (e.g. articles on orientation courses enhancing engagement; studies that relate digital tool use to self-efficacy and outcome) are reported when students are given specific orientation on the use of digital learning platforms (e.g., introductory courses or walkthroughs of the learning system) (Getenet et al., 2024; Joshi et al., 2025). As pointed out by Khalil et al. (2020), synchronous online learning, which uses platforms such as Zoom, has proven effective for delivering theoretical content. However, its effectiveness was also determined by the faculty's sufficient preparation and the institution's readiness. Students valued the accessibility and flexibility of real-time sessions; however, significant issues included technical problems and limited face-to-face interaction. In addition, the importance of Zoom-based solutions is consistent with the findings of Zhang et al. (2022), who found that digital fluency with videoconferencing tools made virtual classrooms more interactive and engaging. Students who were assisted in using Zoom features, such as breakout rooms, chat, and screen sharing, were more likely to be active participants and to be in control of their learning. Similarly, Islam et al. (2020) observed that interventions aimed at supporting Google Classroom positively

influenced submission rates, understanding of due dates, and access to teacher feedback, and identified which interventions helped overcome initial difficulties in using the platform.

**Relationship Between Support Mechanisms and Solutions in Managing Online Learning Capability**

Table 5 presents the results of a multiple linear regression analysis examining the relationship between platform support mechanisms and the effectiveness of platform solutions in managing online learning capability. The model yielded a Pearson correlation coefficient (*r*) of 0.398, indicating a moderate positive correlation between platform support mechanisms and the effectiveness of platform solutions. This indicates that the more support there is, the more the perceived effectiveness of platform-based solutions. The coefficient of determination ($R^2$ = 0.159) indicates that platform support mechanisms can explain approximately 15.9% of the variance in the effectiveness of platform solutions. The adjusted *R*-squared value of 0.156 indicates that the model remains stable despite the inclusion of additional predictors. It was established that the regression model differed significantly, $F(1, 351) = 66.185$, $p < .001$, indicating that support mechanisms on the platform are crucial in determining the quality of platform solutions for managing online learning capacity. In practice, this means that when students receive more specific direction, technical support, and guidance on using Google Classroom and Zoom, they are more likely to consider platform-based solutions, such as tutorials, training, and applied support strategies, which are effective in overcoming issues related to online learning. Although the explained variance (15.9%) may not be very high, it remains substantial in educational research, where multiple interacting factors likely affect learning outcomes. The other unknown variance indicates that additional variables, including students' digital literacy, technology availability, instructional design, and personal motivation, also contribute to the success of platform solutions.

**Table 5.** *Multiple Linear Regression Results on the Extent of the Relationship Between Platform Support and Platform Solutions in Managing Online Learning Capabilities*

| Model | R | $R^2$ | Adjusted $R^2$ | SD | F | df | p | Decision |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.39 | 0.15 | 0.15 | 0.76 | 66.18 | 1 | <.001 | Reject the Null Hypothesis |

**Note**: Dependent Variable = Solution Mean; Predictors = Technical Support Mean, Online Platform Mean

The model was identified as statistically significant ($F$ (1, 351) = 66.185, $p < .001$), indicating that support mechanisms, such as guidance when using Google Classroom or Zoom and assistance in applying platform-based interventions, are essential factors in predicting students' ability to manage the challenges of online learning. The explained variance (15.9%) is not statistically significant; however, the significance test indicates that support mechanisms are an important predictor of the efficacy of platform-based solutions. Recognizing this fact underscores the need for systematic, frequent encouragement to enable students to use existing digital tools effectively. This means that with sufficient guidance on how to navigate and utilize the platform's features, learners can be better equipped to apply the supports to real-world solutions, thereby keeping them more engaged and taken more seriously. Its findings are consistent with those of other authors who have highlighted the importance of platform support in online learning environments. Al-Fraihat et al. (2020) explain that system quality, user support, and perceived usefulness are significant predictors of system success, which, in turn, directly affects student satisfaction and learning. Similarly, Getenet et al. (2021) demonstrated that digital proficiency and perceived ease of use are strong predictors of learners' effective use of online solutions, underscoring the role of support in ensuring solution effectiveness. Furthermore, Rapanta et al. (2020) noted that when institutions provide systematic training and guidance on online tools, students are better equipped to address problems independently and are more engaged in the learning process. On the other hand, insufficient support on the platform may lead to decreased interest and ineffective solutions (Adedoyin & Soykan, 2020).

**Relationships Between PSupport Mechanisms and the Effectiveness of Solutions**

Table 6 presents the regression coefficients examining the relationship between platform support mechanisms and the effectiveness of platform solutions in managing online learning capability. In this model, platform support mechanisms are the predictor variables, and the effectiveness of platform solutions is the dependent variable. The regression results indicate that the constant is statistically significant ($B = 3.035$, $p < .001$), suggesting that students report a baseline level of solution effectiveness even in the absence of perceived platform support. This implies that factors beyond platform support, such as prior experience, individual digital skills, or instructional design, may contribute to students' perceived ability to apply platform-based solutions. More importantly, platform support mechanisms emerged as a statistically significant predictor of solution effectiveness ($B = 0.283$, $SE = 0.035$, $t = 8.135$, $p < .001$). The unstandardized coefficient indicates that for every one-unit increase in perceived platform support, the average increase in the effectiveness with which students apply platform-based solutions is 0.283

units. The standardized beta coefficient ($b$ = 0.398) reflects a moderate positive relationship between platform support mechanisms and solution effectiveness. Given that the model involves a single predictor, this standardized beta corresponds directly to Pearson's correlation coefficient ($r$ = 0.398), indicating that higher levels of platform support are moderately associated with greater effectiveness of platform solutions. The statistically significant and moderately strong positive relationship demonstrates that platform support mechanisms, such as assistance with logging in, navigating Google Classroom, or utilizing Zoom features, play a significant role in enhancing students' ability to implement solutions in online learning environments. Consequently, the null hypothesis ($H_{03}$) is rejected.

**Table 6.** *Regression Coefficients on the Relationship Between Platform Support Mechanisms and the Effectiveness of Platform Solutions*

| Predictor | B | SE | β (Beta) | t | p | Decision | Interpretation |
|---|---|---|---|---|---|---|---|
| (Constant) | 3.035 | 0.115 | — | 26.350 | < .001 | Significant | Reject the Null Hypothesis |
| Support Mean | 0.283 | 0.035 | 0.398 | 8.135 | < .001 | Significant | Reject the Null Hypothesis |

*Dependent Variable = Platform Solutions Mean; Predictor = Platform Support Mechanisms Mean. B = Unstandardized Coefficient; SE = Standard Error; β = Standardized Coefficient (equivalent to Pearson's r for a single predictor)*

This finding aligns with the existing literature, which has highlighted the importance of support mechanisms in improving students' learning outcomes. As determined by Al-Fraidat et al. (2020), learner support is a key determinant of an e-learning system's success, positively affecting user satisfaction and perceived effectiveness of the solutions. Similarly, Zhao et al. (2021) noted that platform support preconditions user confidence and autonomy, which, in turn, enhance students' problem-solving skills on digital platforms. Additionally, Rapanta et al. (2020) noted that institutional training, guides, and tutorials are designed to support students in using technological resources more efficiently when seeking solutions to academic issues. Without appropriate support, students are less likely to use the provided tools, thereby reducing the effectiveness of digital learning strategies (Adedoyin & Soykan, 2020).

**Extent to Which Well-Being Moderates Students' Experience of Support Mechanisms and Solutions**

Table 7 presents descriptive statistics and one-sample t-test results examining students' emotional and mental well-being, as well as the influence of these factors on their experiences with support mechanisms and platform solutions in an online learning environment. In this analysis, a benchmark value of 3.50 was used, representing the minimum cutoff for a high level of well-being based on the study's Likert-scale interpretation. The results show that students reported high levels of well-being, with mean scores ranging from 3.82 to 4.20 across individual indicators and an overall composite mean of 3.97 ($SD$ = 0.86). The one-sample t-test results indicate that all mean ratings were significantly higher than the benchmark value of 3.50 ($p$ < .001). This finding suggests that students' perceived emotional and mental well-being consistently exceeds a minimum threshold for high well-being. Regarding emotional well-being, students strongly concurred that they can more effectively handle the online learning problems when they feel well ($M$ = 4.20, $SD$ = 0.84) and that their abilities to focus, solve problems, and take advantage of available solutions are directly related to their emotional condition (composite $M$ = 3.97, $SD$ = 0.86). These findings suggest that emotional balance helps students make effective use of support systems and learning techniques.

In contrast, emotional distress can restrict their ability to exploit available solutions to the problem. Similarly, results on mental well-being indicate strong consensus that good mental and physical health enhances motivation, persistence, and the effective use of online learning strategies (composite $M$ = 4.09, $SD$ = 0.81). Students indicated that support, self-care measures, and psychological resilience can be utilized to mitigate the adverse effects of online learning challenges and facilitate the more stable implementation of platform-based interventions - a notable finding that is elucidated. The statistically significant findings indicate that the role of emotional and mental well-being in enabling students is crucial in determining the effectiveness of platform support mechanisms and solutions. Although the analysis does not directly test moderation through interaction effects, the results indicate that higher well-being enhances students' effective use of available support systems and interventions in an online learning context.

**Table 7.** *The Extent of Well-Being Among Student Participants*

| Emotional Well-Being | Mean | SD | Extent | t | p | Significance |
|---|---|---|---|---|---|---|
| I am able to handle online learning challenges better when I feel emotionally well. | 4.20 | 0.84 | High Extent | 15.56 | <.001 | Significant |
| When I feel stressed or anxious, even small technical or academic problems in online learning feel overwhelming. | 3.83 | 0.90 | High Extent | 6.81 | <.001 | Significant |
| My ability to focus and solve problems related to online learning depends on my emotional state. | 3.95 | 0.93 | High Extent | 9.17 | <.001 | Significant |
| Even when solutions are available, I struggle to take advantage of them if I feel emotionally unwell. | 3.82 | 0.89 | High Extent | 6.75 | <.001 | Significant |
| The impact of online learning solutions like tutorials or home support is stronger when I feel confident and emotionally balanced. | 4.06 | 0.75 | High Extent | 13.99 | <.001 | Significant |
| **Composite Mean** | **3.97** | **0.86** | **High Extent** | **10.45** | **<.001** | **Significant** |
| **Mental Well-Being** | | | | | | |
| I am more likely to benefit from technical or academic support when I am in a good mental state. | 4.07 | 0.83 | High Extent | 12.81 | <.001 | Significant |
| Maintaining good physical and mental health helps me stay motivated despite the difficulties of online learning. | 4.15 | 0.77 | High Extent | 16.01 | <.001 | Significant |
| My motivation to follow online learning strategies or use tools improves when I feel mentally healthy. | 4.08 | 0.77 | High Extent | 14.03 | <.001 | Significant |
| Support for my well-being (e.g., encouragement from family, breaks, self-care) helps reduce the negative effects of online learning difficulties. | 4.02 | 0.86 | High Extent | 11.3 | <.001 | Significant |
| Emotional and mental well-being helps me apply the solutions to online learning problems more consistently and successfully. | 4.11 | 0.80 | High Extent | 14.36 | <.001 | Significant |
| **Composite Mean** | **4.09** | **0.81** | **High Extent** | **13.70** | **<.001** | **Significant** |
| **Overall Composite Mean** | **3.97** | **0.86** | **High Extent** | **10.45** | **<.001** | **Significant** |

A strong connection exists between emotional and mental well-being, academic engagement, and academic success in virtual learning environments. According to Besser et al. (2022), students who are more emotionally regulated and self-efficacious tend to achieve better outcomes and greater flexibility in online education. The articles state that the better students' mental well-being, the more adaptive coping strategies they can employ, particularly problem-solving, which can alleviate academic stress and facilitate learning (Barbayannis et al., 2022; Cordova et al., 2023). Alternatively, interventions that improve problem-solving skills also enhance students' mental health, indicating a positive relationship between problem-solving skills and mental well-being. The most recent statistics suggest that students' emotional and mental health is a crucial factor in determining engagement with instruction and feedback. The feedback processes are highly intertwined with emotions. Regulated positive emotions facilitate learners' ability to interpret and respond to feedback. Simultaneously, dysregulated and negative emotional responses lead to reduced feedback uptake, thereby impairing attention and problem-solving (Ajjawi et al., 2022).

Additionally, Peters et al. (2018) note that well-being is not only a personal attribute but also a key mediator in the practical application of technical and academic solutions. Such a statement is supported by the fact that responses to statements about motivation, consistency, and solution utilization are overwhelmingly positive. The findings align with Social Cognitive Theory proposed by Bandura (1986), which posits that behavior, individual factors, and the environment exert reciprocal influence, thereby shaping learning. In this context, well-being is a personal factor that directly influences students' learning behaviors and their responses to external support.

Table 8 presents the results of an analysis of variance (ANOVA) conducted to examine the moderating role of students' well-being in the relationship between platform support mechanisms and students' online learning experience. In this analysis, students were grouped by their level of well-being, and differences in the online learning experience across these groups were examined in relation to platform support mechanisms. The ANOVA results reveal a statistically significant effect, $F(2, 350) = 17.463$, $p < .001$. This suggests that students' online learning experiences vary significantly across levels of well-being, thereby rejecting the null hypothesis (H0). The

finding suggests that well-being significantly moderates the relationship between platform support mechanisms and students' experience of online learning. The significant result indicates that the effectiveness of platform support mechanisms varies for all students, depending on their emotional and mental well-being. Students with higher levels of well-being are more likely to perceive platform support positively, utilize tools such as Google Classroom and Zoom effectively, and apply available solutions more efficiently when encountering online learning challenges. In contrast, students with lower levels of emotional or mental well-being may struggle to fully benefit from available support mechanisms, even when such support is accessible and functional.

**Table 8.** *ANOVA Results on the Moderating Role of Well-Being in the Relationship Between Platform Support Mechanisms and Students' Online Learning Experience*

| Source of Variation | Sum of Squares | df | Mean Square | F | p | Decision |
|---|---|---|---|---|---|---|
| Between Groups | 44.36 | 2 | 22.18 | 17.46 | <.001 | Reject $H_{04}$ |
| Within Groups | 444.54 | 350 | 1.27 | | | |
| **Total** | **488.90** | **352** | | | | |

The findings align with those of Besser et al. (2022), who emphasized the role of students' emotional state as a central factor in determining their capability to participate in digital learning settings through meaningful engagement. Likewise, Hasan and Bao (2020) state that stress and emotional load adversely affect students' ability to adapt to technological tools, at times reducing their perception of the usefulness of platform functions. In the Philippine context, the research highlights the impact of mental health and emotional issues, as well as concerns about infrastructure and readiness, on the efficiency of digital learning resources. As an example, Lim et al. (2022) show that Philippine students who transitioned to online studies and were isolated are more likely to experience depression, anxiety, and stress, and attribute this finding to interaction problems or challenges with online education. Fabito et al. (2020) conducted another study, emphasizing that significant barriers to online learning included limited internet connectivity for participation and the lack of preparedness among students and faculty to take fully online classes. Collectively, these findings are consistent with the notion that supportive digital resources (platforms, tools) cannot fully realize their potential when connectivity, readiness, and emotional/mental stress converge. In line with this, current research on the concept of technostress and online instructional design indicates that well-developed instructor- and institutional-level supports (clear guidance, proactive scaffolding, timely technical assistance) have significant potential to reduce the adverse effects of stress or poorer well-being on learning outcomes. That is, once learners reach a practical minimum of emotional preparedness, strategically planned technical and instructional aids are likely to provide consistent advantages across students, which explains the finding that there is no significant difference in outcomes between moderate- and high-well-being organizations when such aids are present. This intermediary/compensatory effect has been observed in studies comparing synchronous/asynchronous formats, as well as research exploring technostress, instructor support, and perceived learning quality (Saleem et al., 2024).

Table 9 presents the results of an analysis of variance (ANOVA) conducted to examine the moderating role of students' well-being in the relationship between platform solutions and students' online learning experiences. In this analysis, students were grouped by their level of well-being, and differences in the online learning experience were examined in relation to the effectiveness of platform solutions. The ANOVA results show a statistically significant effect, $F$ (2, 350) = 68.191, $p$ < .001. This result indicates that students' online learning experiences differ significantly across levels of well-being, thereby rejecting the null hypothesis ($H_{05}$). The finding suggests that well-being significantly moderates the relationship between the effectiveness of platform solutions and students' experience of online learning. The significant result implies that the impact of platform solutions—such as tutorials, training, and guided interventions — is not uniform across all students but varies with their emotional and mental well-being. Students with higher levels of well-being are more likely to benefit from platform solutions, apply them effectively, and experience more positive engagement and satisfaction in online learning. Conversely, students with lower levels of well-being may struggle to fully utilize available solutions, even when these solutions are well-designed and accessible.

**Table 9.** *ANOVA Results on the Moderating Role of Well-Being in the Relationship Between Platform Support Mechanisms and Students' Experience*

| Source of Variation | Sum of Squares | df | Mean Square | F | p | Decision |
|---|---|---|---|---|---|---|
| Between Groups | 69.03 | 2 | 34.51 | 68.19 | <.001 | Reject $H_{05}$ |
| Within Groups | 177.15 | 350 | 0.50 | | | |
| **Total** | **246.18** | **352** | | | | |

Highly well-being students are far ahead of their low- and moderate-well-being counterparts in reaping the benefits of online learning. This is corroborated by previous results, which show that psychological well-being enhances motivation, persistence, and technology adoption in digital learning practices (Besser et al., 2022; Hasan & Bao, 2020). Lastly, it has been shown that students experiencing higher stress levels, emotional distress, or fatigue are less likely to use the provided online learning solutions, even when both connectivity and platforms are available. Indicatively, studies on videoconferencing fatigue reveal that participants not only experience a decline in satisfaction but also suffer a loss of depth of engagement. According to a recent meta-analysis, videoconference fatigue is a co-occurring condition with anxiety and burnout, as well as an adverse effect on motivation (Beyea et al., 2025). Hehir et al. (2021) also found that the following elements are essential to the development of digital resources: emotional and psychological factors (e.g., usability, teacher interaction, immediacy). These results emphasize that solutions such as tutorials, platform training, and support mechanisms are effective; however, their impact depends on students' mental and emotional states. Well-being is an agent that facilitates learners in optimizing the potential of these solutions. This aligns with the Social Cognitive Theory proposed by Bandura, which emphasizes the interplay between personal (well-being), behavioral (solution use), and environmental (learning platforms) factors (Bandura, 1986).

**Online Learning Framework**

It is essential to note that the Student-Centered Online Learning Framework was developed to address the issues identified in the research, specifically gaps in platform support, limited digital literacy, reliance on informal support, and the importance of student well-being. It is an amalgamation of five key areas of responsibility (KRAs): **(1)** Improving Platform Support, **(2)** Improving Digital Literacy, **(3)** Coherence in Experiencing Solutions **(4)** Improving Student Well-Being, **(5)** Institutionalizing Sustainability.

According to this model, emotional strength and technical skills are twofold in improving the efficiency of online learning. Student autonomy in the use of technologies, including Google Classroom and Zoom, will be developed through training sessions, online boot camps, and a troubleshooting manual. Additionally, peer mentoring and a help desk will reduce the need for informal in-home support. In the meantime, motivation and focus are also supported by various well-being interventions, including regular check-ins, mindfulness practices, and peer support groups. The framework facilitates ongoing improvement and alignment of institutional and national education policies by linking activities to quantifiable performance indicators and incorporating monitoring systems. It later presents a holistic, sustainable, and systematic approach to enhancing the online learning process and ensuring greater inclusivity, adaptability, and resilience.

**Table 10.** *Synthesis of the Proposed Online Learning Framework*

| Key Area | Primary Focus | Core Strategies |
|---|---|---|
| Platform Support | Improve students' independent use of online platforms. | Platform-Specific Trainings, Video Tutorials, Onboarding Orientations |
| Digital Literacy | Reduce reliance on family or peers for technical support. | Digital Literacy Boot Camps, Peer Mentoring, Help Desk Support |
| Access to Solutions | Ensure continuity despite technical or connectivity issues. | Backup Internet Options, Home Study Space Guidance, Troubleshooting Materials |
| Student Well-Being | Enhance emotional and mental capacity to use learning solutions effectively. | Well-Being Check-Ins, Mindfulness Workshops, Peer Support Groups |
| Sustainability & Monitoring | Institutionalize continuous improvement of online learning. | Feedback Forums, Regular Surveys, Policy Alignment |

## Conclusion

This study examined the extent, effectiveness, and interrelationships of platform support mechanisms and platform solutions in online learning using Google Classroom and Zoom. It investigated the moderating role of student well-being across diverse disruption contexts. The findings in this regard indicate that platform support mechanisms, such as assistance with login, navigation features, and task completion, were moderate but not at the high or adequate support benchmark. Despite the existence of such support, it was insufficient to enable full autonomy in using the platform, thereby necessitating informal support. By contrast, platform-based solutions such as tutorials, guided training, and structured learning interventions were perceived as highly effective and above the adequacy threshold. These solution-based interventions significantly increased students' digital learning potential, confidence, and autonomy in completing online learning tasks. The regression and correlation results also revealed a moderate yet statistically significant positive association between platform support mechanisms and the effectiveness of the platform solution. This observation confirms that support mechanisms

play a role in enabling conditions that reinforce the effect of solutions, but only partially explain the variation in solution effectiveness. The moderation tests demonstrated that student well-being is a highly important moderating factor in online learning. Emotional and mental well-being both shaped how students perceived support mechanisms and solutions and significantly influenced the strength of the associations between (a) platform support mechanisms and the online learning experience, and (b) platform solutions and the online learning experience. Learners who experienced greater well-being tended to have a more positive perception of support, implement effective solutions, and maintain engagement. Conversely, poorer students found it challenging to utilize the available resources, despite their functionality. These results emphasize well-being as a crucial contextual variable that both influences and constrains the effectiveness of technical and instructional interventions in online learning.

The results enable the advancement of a Student-Centered Online Learning Framework that aligns with five essential dimensions: supporting the development of digital literacy, enhancing platform support, developing solutions, promoting well-being, and ensuring institutional sustainability. The model emphasizes that, for online learning to be effective, it requires not only platforms but also the strategic alignment of technical support, structured solutions, and ongoing attention to students' emotional and mental health. According to the findings, the research proposes that learning institutions should incorporate platform training and guided tutorials into their orientation programs for students and faculty, increase emphasis on digital literacy programs to encourage student autonomy, and make well-being support an integral part of their online learning infrastructure. Policy-makers are urged to address equity by investing in infrastructure, subsidizing connectivity, and enhancing capacity-building. Families and guardians might complement it with guided routines and activities at home. In future studies, researchers are advised to continue testing and developing the proposed framework across various educational settings and disruption scenarios, and to investigate longitudinal and interaction-oriented models that capture the dynamic nature of the relationships among technology, well-being, and learning outcomes.

## Contributions of Authors

A single author conducted this study. The author was solely responsible for the conceptualization, data collection, analysis, interpretation of results, and manuscript preparation. The author assumes full responsibility for the accuracy, integrity, and completion of the work.


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## Conflict of Interest

The author declares no conflicts of interest related to this study.


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