

# Digital Literacy, Technological Facility Provision, and Learning Motivation as Determinants of Social Studies Engagement and Society 5.0 Readiness Among Indonesian Madrasah Students

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**Abstract.** This study examines how the availability of technology-based instructional facilities and students' digital literacy competencies shape Social Studies (Ilmu Pengetahuan Sosial/IPS) learning engagement and preparedness for the Society 5.0 paradigm, while concurrently exploring the moderating and mediating functions of learning motivation within these relationships. A quantitative, cross-sectional survey design was adopted, drawing a stratified proportional random sample of 111 junior secondary students from MTs Darunnajah Trenggalek, Indonesia, for the 2024/2025 academic year. Data collection employed a closed-response Likert instrument comprising 144 items across five theoretical constructs, and analysis was conducted through Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0 with 5,000 bootstrap resamples. Findings confirm that both technology-based facility provision and digital literacy competency exert statistically significant positive influences on IPS learning engagement and Society 5.0 preparedness. Digital literacy emerged as the strongest direct predictor of student readiness ( $\beta = 0.288$ ,  $p = 0.001$ ), whereas facility availability demonstrated the greatest impact on intrinsic learning motivation ( $\beta = 0.412$ ,  $p < 0.001$ ). Learning motivation functioned as a meaningful moderator across all four predictor-to-outcome pathways and additionally served as a partial mediator between facility provision and student readiness ( $\beta = 0.185$ ,  $T = 3.450$ ,  $p = 0.001$ ). The composite  $R^2$  values for the endogenous constructs ranged from 0.585 to 0.658, reflecting adequate model explanatory power. These results collectively underscore that deliberate investment in digital infrastructure and literacy cultivation, reinforced by systematic nurturing of motivational dispositions, constitutes an evidence-based pathway for enhancing the quality and future-readiness of Social Studies education in Indonesian Islamic secondary school contexts.

**Keywords:** Digital Literacy, Technology-Based Learning Facilities, IPS Learning Engagement, Society 5.0 Readiness, Learning Motivation

## 1 Introduction

The accelerating trajectory of digital transformation in the twenty-first century has fundamentally reconfigured how individuals acquire knowledge, communicate, and participate in social life across all levels of education. The conceptual emergence of Society 5.0 — a human-centred societal framework initially articulated through Japan's 5th Science and Technology Basic Plan (Cabinet Office, Government of Japan, 2016) — marks a critical juncture in which the convergence of artificial intelligence, big data analytics, the Internet of Things, and cyber-physical systems is envisioned as a mechanism for resolving complex societal challenges and enhancing individual quality of life. Unlike earlier industrial paradigm shifts that prioritised economic efficiency, Society 5.0 centralises human flourishing as the orienting purpose of technological integration.

Within the educational sphere, this paradigmatic transition necessitates the cultivation of learners equipped not merely with declarative knowledge but with a sophisticated constellation of twenty-first-century competencies — including critical reasoning, collaborative problem-solving, digital literacy, and adaptive capacity in the face of rapid global change (Fukuyama, 2018; Nastiti & Abdu, 2020). In the Indonesian context, this imperative has been operationalised through the Kurikulum Merdeka reform initiative, which foregrounds digital technology integration and the development of future-oriented competencies as foundational prerequisites for producing human capital capable of navigating Society 5.0 demands (Gunawan, 2023; Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2023). For Social Studies (Ilmu Pengetahuan Sosial/IPS) education, this transformation carries particular significance: the subject's mandate to cultivate

critical comprehension of social, economic, and cultural phenomena increasingly requires engagement with digitally mediated information environments. Yet empirical conditions in many Indonesian junior secondary institutions — particularly madrasah tsanawiyah (Islamic junior secondary schools) situated in rural and semi-urban localities — frequently diverge from policy aspirations.

The provision of technology-based instructional facilities constitutes one of the most influential structural determinants of learning quality. Scholarship affirms that adequate ICT infrastructure — encompassing hardware devices, internet connectivity, multimedia systems, and digital software — functions as cognitive scaffolding that enables active, student-centred knowledge construction (Piaget, 1972; Rusman, 2018). Cross-national research by Ghavifekr & Rosdy (2015) documented that consistent access to and use of digital learning tools substantially elevated student participation frequencies and learning outcomes. In IPS-specific contexts, Haryati (2021) reported improvements of up to 32% in student learning activeness when technology-based media were systematically integrated into instruction. However, Ministry of Religious Affairs data (Kementerian Agama RI, 2023) indicate that a substantial proportion of Indonesian madrasah institutions continue to operate with constrained ICT infrastructure, limited internet access, and insufficient digital learning platforms. At the study site — MTs Darunnajah Trenggalek — internal inventory records confirmed that only three of eight classrooms (37.5%) possessed functional projectors, while internet access remained confined to the teachers' room and computer laboratory.

Alongside infrastructural constraints, deficiencies in digital literacy competency constitute an equally consequential barrier to meaningful learning engagement. Digital literacy — broadly understood as the integrated capacity to access, critically evaluate, and ethically utilise digital information and technologies for purposeful ends (Gilster, 1997; Ng, 2012) — has been widely recognised as a foundational competency for twenty-first-century learners. Preliminary diagnostic surveys conducted with 40 students at MTs Darunnajah Trenggalek revealed that 68% reported limited familiarity with digital media for IPS-related learning tasks, while 62% encountered difficulties in independently sourcing and evaluating online educational content. National survey findings from the Ministry of Education and Culture (Kementerian Pendidikan dan Kebudayaan, 2021) corroborate these results, highlighting that digital literacy gaps are especially pronounced among learners in rural and Islamic secondary school contexts.

Beyond structural and competency-related variables, the psychological dimension of learning motivation has emerged as a pivotal moderating and mediating force that determines the extent to which available resources and competencies are translated into active engagement and future readiness. Self-Determination (Deci & Ryan, 1985) holds that intrinsically motivated learners — whose engagement is driven by personal interest and perceived task value rather than external compulsion — demonstrate deeper cognitive processing, sustained effort, and greater willingness to explore challenging content. Empirical evidence from Nuraini (2021) and Firmansyah (2020) corroborates this theoretical position, indicating that motivation significantly amplifies the positive effects of technology access on learning engagement and academic outcomes. Observations at the study site suggested the presence of a motivational gap that warranted systematic empirical investigation within an integrated structural model.

Prior scholarship on ICT-based IPS learning has predominantly examined technology–outcome relationships or digital literacy–achievement linkages in isolation (Haryati, 2021; Rahmawati & Dwijayanti, 2023), while Society 5.0 readiness research has largely focused on macro-institutional or tertiary education levels (Nastiti & Abdu, 2020; Wibawanto, 2021). No extant study has simultaneously modelled technology facility availability, digital literacy, learning motivation, IPS learning engagement, and Society 5.0 readiness within a single PLS-SEM framework at the madrasah tsanawiyah level. This theoretical and methodological gap constitutes the primary justification for the present investigation. Accordingly, this study aims to examine and analyse the causal and moderating relationships among these five constructs among students of MTs Darunnajah Trenggalek, with the goal of generating both theoretical insights and evidence-based practical recommendations for educators and policymakers.

## 2 Literature Review

### 2.1 Technology-Based Instructional Facilities and Learning Engagement

Constructivist epistemology, as advanced by Piaget (1972), holds that meaningful learning is achieved through active interaction between the learner and cognitively stimulating environments. In contemporary educational practice, ICT infrastructure — comprising hardware, connectivity, multimedia peripherals, and digital software — serves as the primary technological scaffold through which this active knowledge construction is realised. Rusman (2018) affirms that adequate ICT provision fosters student-centred, problem-based, and collaborative learning orientations, directly facilitating higher-order engagement. In IPS-specific investigations, Haryati (2021) and Sari & Pratama (2022) consistently documented significant improvements in student participation, questioning behaviour, and digital content production when technology-based media were

systematically employed. Rindrayani et al. (2025) further established that technology infrastructure availability exerted a statistically significant effect on student learning motivation ( $\beta = 0.38$ ,  $p < 0.01$ ), positioning ICT provision as both a direct and motivationally mediated predictor of engagement.

The Technology Acceptance Model (Davis, 1989) provides a complementary theoretical lens, positing that perceived ease of use — facilitated by physical facility availability — promotes long-term technology adoption, a prerequisite for Society 5.0 readiness. When learners consistently interact with accessible digital tools, they develop dispositional confidence and technical self-efficacy that extend beyond discrete learning episodes, contributing to sustained adaptive capacity in technologically enriched environments.

## 2.2 Digital Literacy as a Competency for IPS Learning and Society 5.0

Ng (2012) conceptualised digital literacy along three intersecting dimensions: technical proficiency with digital devices and platforms; cognitive competence in information retrieval, evaluation, and management; and socio-emotional capability encompassing digital collaboration and ethical conduct. This tripartite framework positions digital literacy not merely as a technical skill but as a holistic intellectual and social competency. Yulianti (2022) found a strong positive association between digital literacy and Social Studies learning activeness ( $r = 0.67$ ,  $p < 0.01$ ), with digitally proficient students demonstrating higher frequencies of independent reference-seeking, peer discussion engagement, and creative digital output. Rahmawati & Dwijayanti (2023) similarly reported that secondary students' digital literacy scores significantly predicted academic achievement and critical thinking capacity ( $\beta = 0.52$ ,  $p < 0.001$ ).

In relation to Society 5.0 preparedness, Wati (2023) established through SEM that digital literacy significantly predicts critical thinking capacity ( $b = 0.61$ ,  $p < 0.01$ ), while Pramudita (2021) found digital literacy to account for 41% of variance in students' digital transformation readiness ( $R^2 = 0.41$ ). Amri & Safitri (2025) further underscore that Society 5.0-era IPS learning demands not only technical proficiency but also constructive intellectual engagement with digitally mediated social phenomena, affirming that student readiness is simultaneously a cognitive, technical, and ethical construct.

## 2.3 Learning Motivation as Moderator and Mediator

Self-Determination Theory (Deci & Ryan, 1985) distinguishes between intrinsic motivation — characterised by autonomous engagement driven by inherent interest — and extrinsic motivation, identifying the former as the more potent and durable regulatory form. Intrinsically motivated learners are more likely to seek additional resources, persist through academic challenges, and engage in deeper cognitive processing. Uno (2016) argues that motivational dispositions directly shape students' readiness to exploit available learning resources and media, establishing motivation as a psychological amplifier of structural and competency-based inputs.

Empirical support for the moderating role of motivation is provided by Nuraini (2021), who demonstrated that the interaction between digital technology use and learning motivation produced significantly greater learning activeness than either variable independently ( $b = 0.45$ ,  $p < 0.05$ ). Firmansyah (2020) similarly confirmed that motivation functions as a strengthening moderator between technology-based learning models and academic outcomes ( $\Delta R^2 = 0.12$ ,  $p < 0.05$ ). The theoretical integration of constructivism (Piaget, 1972), Self-Determination Theory (Deci & Ryan, 1985), and the Technology Acceptance Model (Davis, 1989), frames the present study's conceptual architecture, positioning ICT availability and digital literacy as structural inputs, learning motivation as the psychological amplifier, and IPS engagement and Society 5.0 readiness as dual outcome constructs.

## 3 Research Method

### 3.1 Research Design and Participants

This study employed a quantitative associative-explanatory design to test causal and moderating relationships among five theoretical constructs: technology-based learning facility availability ( $X_1$ ), digital literacy ( $X_2$ ), IPS learning engagement ( $Y_1$ ), Society 5.0 preparedness ( $Y_2$ ), and learning motivation ( $Z$ ). A cross-sectional survey approach was adopted, with data collected at a single time point without experimental manipulation of independent variables (Creswell & Creswell, 2018; Sugiyono, 2020).

The study population comprised 204 students enrolled across Grades VII, VIII, and IX of the regular programme at MTs Darunnajah Trenggalek during the 2024/2025 academic year. Sample size was determined using Slovin's (1960) formula with an 8% margin of error, yielding a required sample of 111 participants ( $n = 204 / [1 + 204(0.08^2)] \approx 111$ ). Stratified proportional random sampling was employed, with strata defined by grade level and participants selected by random number within each stratum, ensuring proportional representation across the entire junior secondary programme.

### 3.2 Instrumentation and Data Collection

Data were collected using a structured, closed-ended Likert-scale questionnaire encompassing 144 items distributed across the five research constructs:  $X_1$  (24 items, 8 indicators),  $X_2$  (32 items, 8 indicators),  $Z$  (24 items, 8 indicators),  $Y_1$  (32 items, 8 indicators), and  $Y_2$  (32 items, 8 indicators), each rated on a five-point scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The instrument was developed from validated theoretical frameworks (Deci & Ryan, 1985; Nastiti & Abdu, 2020; Ng, 2012; Rusman, 2018) and adapted to reflect the specific pedagogical and infrastructural realities of IPS instruction in an Indonesian madrasah setting.

### 3.3 Analytical Approach

Analysis was conducted using variance-based Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 (Ringle et al., 2022) proceeding sequentially through outer model and inner model evaluations. Convergent validity was assessed via outer loading factors ( $\geq 0.70$ ) and Average Variance Extracted ( $AVE \geq 0.50$ ); discriminant validity was confirmed using the Fornell-Larcker criterion; and construct reliability was evaluated through Composite Reliability ( $CR \geq 0.70$ ) and Cronbach's Alpha (Hair et al., 2019). Inner model evaluation encompassed coefficients of determination ( $R^2$ ), effect sizes ( $f^2$ ), and bootstrapped path coefficients ( $T > 1.96$ ;  $p < 0.05$ ) across 5,000 resamples. Moderation effects were estimated using the product-indicator approach in SmartPLS, and mediation was assessed through specific indirect effects bootstrapping following Baron & Kenny (1986) and Hayes (2018).

## 4 Results and Discussion

### 4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for all five research constructs across the 111 respondents. The Technology-Based Learning Facilities variable ( $X_1$ ) recorded a mean of 105.4 (SD = 12.50) on a 24–120 theoretical range, reflecting students' generally adequate perceptions of school ICT infrastructure. Digital Literacy ( $X_2$ ) yielded the highest mean score ( $M = 124.5$ ,  $SD = 16.20$ ) on a 32–160 range, indicating relatively strong digital competency. IPS Learning Engagement ( $Y_1$ ) produced a mean of 118.1 (SD = 15.40), while Society 5.0 Preparedness ( $Y_2$ ) recorded a mean of 112.3 with the largest standard deviation (19.50), reflecting notable heterogeneity in readiness levels across the student cohort. Learning Motivation ( $Z$ ) produced a mean of 94.8 (SD = 13.10) on a 24–120 scale, indicating a generally elevated motivational orientation among respondents.

**Table 1.** Descriptive Statistics of Research Variables (Source: SmartPLS 4.0 Output, 2026)

Variable	Mean	SD	Min	Max	N
Tech. Learning Facilities ( $X_1$ )	105.4	12.50	75	120	111
Digital Literacy ( $X_2$ )	124.5	16.20	78	156	111
IPS Learning Engagement ( $Y_1$ )	118.1	15.40	85	155	111
Society 5.0 Preparedness ( $Y_2$ )	112.3	19.50	76	156	111
Learning Motivation ( $Z$ )	94.8	13.10	55	119	111

### 4.2 Measurement Model Evaluation

Table 2 presents the internal consistency reliability results. All constructs exhibited Cronbach's Alpha and Composite Reliability values considerably exceeding the 0.70 threshold recommended by Hair et al. (2019), with Learning Motivation demonstrating the strongest internal consistency ( $\alpha = 0.952$ ;  $CR = 0.958$ ). These outcomes confirm that the measurement instruments possess robust reliability across all theoretical constructs.

**Table 2.** Internal Consistency Reliability Results

Construct	Cronbach's $\alpha$	Composite Reliability	Result
Tech. Learning Facilities ( $X_1$ )	0.912	0.925	Reliable
Digital Literacy ( $X_2$ )	0.935	0.941	Reliable
IPS Learning Engagement ( $Y_1$ )	0.928	0.933	Reliable
Society 5.0 Preparedness ( $Y_2$ )	0.945	0.950	Reliable
Learning Motivation ( $Z$ )	0.952	0.958	Reliable

Convergent validity assessment, presented in Table 3, confirmed that all AVE values exceeded the 0.50 threshold, establishing that each construct captures more than half the variance in its associated indicators. Outer loading factors ranged above 0.70 across all items. Discriminant validity was confirmed via the Fornell-Larcker criterion: the square root of each construct's AVE ( $X_1$ : 0.763;  $X_2$ : 0.784;  $Y_1$ : 0.773;  $Y_2$ : 0.803;  $Z$ : 0.823) surpassed its highest correlation with any other construct, while interaction terms recorded square root AVE values of 1.000.

**Table 3.** Convergent Validity Results (AVE and Loading Factor)

Construct	AVE	Loading Factor Range	Valid?
Tech. Learning Facilities ( $X_1$ )	0.582	0.708 – 0.811	Yes
Digital Literacy ( $X_2$ )	0.615	0.715 – 0.822	Yes
Learning Motivation ( $Z$ )	0.678	0.795 – 0.866	Yes
IPS Learning Engagement ( $Y_1$ )	0.598	0.715 – 0.825	Yes
Society 5.0 Preparedness ( $Y_2$ )	0.645	0.715 – 0.840	Yes

### 4.3 Structural Model and Coefficients of Determination

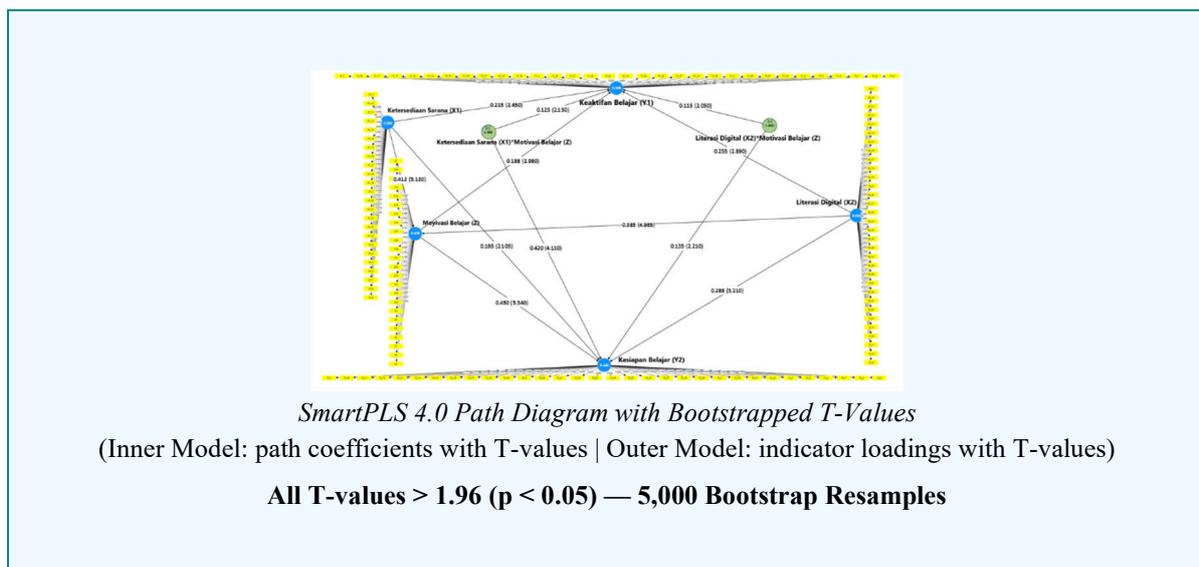
Table 4 reports the coefficient of determination values for the three endogenous constructs.  $R^2$  values of 0.585 (Learning Motivation), 0.612 (IPS Learning Engagement), and 0.658 (Society 5.0 Preparedness) collectively fall within Chin (1998)'moderate' classification. The  $R^2$  of 0.658 for Society 5.0 Preparedness approaches the 'substantial' threshold of 0.67, indicating that the structural model possesses adequate explanatory power. Adjusted  $R^2$  values confirm that model stability is maintained after accounting for predictor count.

**Table 4.** Coefficient of Determination ( $R^2$ )

Endogenous Construct	$R^2$	$R^2$ Adjusted	Category
Learning Motivation ( $Z$ )	0.585	0.581	Moderate
IPS Learning Engagement ( $Y_1$ )	0.612	0.608	Moderate
Society 5.0 Preparedness ( $Y_2$ )	0.658	0.654	Moderate-Strong

### 4.4 Structural Path Diagram (T-Value Inner and Outer Model)

Figure 1 presents the complete structural path diagram generated by SmartPLS 4.0, displaying the bootstrapped T-values on all inner model (path) and outer model (indicator loading) relationships. All paths connecting the predictor constructs to the endogenous constructs display T-values exceeding the critical threshold of 1.96, visually confirming the statistical significance of all hypothesised relationships. The interaction terms ( $Z \times X_1$  and  $Z \times X_2$ ) similarly display significant T-values, providing visual evidence of the moderating role of Learning Motivation across predictor-to-outcome pathways.



**Figure 1.** T-Value Inner and Outer Model (Source: SmartPLS 4.0 Output, 2026)

#### 4.5 Hypothesis Testing: Direct Effects

Table 5 presents the bootstrapped path coefficients for all eight direct hypothesised relationships. All paths achieved statistical significance at the  $p < 0.05$  threshold.

**Table 5.** Direct Effect Results (Path Coefficients via PLS Bootstrapping)

Hypothesised Path	$\beta$	M	SD	T	p	Decision
$X_1 \rightarrow Z$	0.412	0.415	0.080	5.120	0.000	Supported
$X_2 \rightarrow Z$	0.385	0.382	0.077	4.985	0.000	Supported
$X_1 \rightarrow Y_1$	0.215	0.218	0.088	2.450	0.015	Supported
$X_2 \rightarrow Y_1$	0.255	0.252	0.088	2.890	0.004	Supported
$Z \rightarrow Y_1$	0.420	0.422	0.102	4.110	0.000	Supported
$X_1 \rightarrow Y_2$	0.195	0.192	0.093	2.105	0.036	Supported
$X_2 \rightarrow Y_2$	0.288	0.290	0.090	3.210	0.001	Supported
$Z \rightarrow Y_2$	0.450	0.448	0.084	5.340	0.000	Supported

Among the direct effects, the relationship between Technology-Based Learning Facilities and Learning Motivation ( $\beta = 0.412$ ,  $T = 5.120$ ,  $p < 0.001$ ) emerged as the strongest, affirming that a technologically enriched instructional environment stimulates students' intrinsic motivational drive. This finding is theoretically grounded in Self-Determination Theory Deci & Ryan (1985) successful engagement with digital tools reinforces learners' sense of competence, thereby strengthening autonomous motivation. Digital Literacy demonstrated the strongest direct effect on Society 5.0 Preparedness ( $\beta = 0.288$ ,  $T = 3.210$ ,  $p = 0.001$ ), positioning literacy-oriented competencies — critical evaluation, ethical digital navigation, and creative production — as the primary drivers of holistic future readiness. Technology-based facilities also exerted a significant direct effect on IPS Learning Engagement ( $\beta = 0.215$ ,  $p = 0.015$ ), consistent with constructivist propositions that accessible digital scaffolding promotes active knowledge construction (Ana & Astutik, 2025; Piaget, 1972).

#### 4.6 Moderating Effects of Learning Motivation

Table 6 presents the moderation analysis outcomes. All four interaction terms produced statistically significant path coefficients, uniformly confirming that Learning Motivation functions as a positive strengthening moderator in all predictor-to-outcome relationships.

**Table 6.** Moderating Effect Results (Product-Indicator Approach, SmartPLS 4.0)

Interaction Path	$\beta$	M	SD	T	P	Decision
$Z \times X_1 \rightarrow Y_1$	0.125	0.122	0.058	2.150	0.032	Supported
$Z \times X_1 \rightarrow Y_2$	0.188	0.185	0.063	2.980	0.003	Supported
$Z \times X_2 \rightarrow Y_1$	0.115	0.118	0.056	2.050	0.041	Supported
$Z \times X_2 \rightarrow Y_2$	0.135	0.132	0.061	2.210	0.028	Supported

The interaction path  $Z \times X_1 \rightarrow Y_2$  produced the largest moderation coefficient ( $\beta = 0.188$ ,  $T = 2.980$ ,  $p = 0.003$ ), indicating that learning motivation most powerfully amplifies the relationship between facility availability and student preparedness for Society 5.0. This finding carries important practical implications: investments in physical ICT infrastructure will yield substantially greater gains in future readiness when systematically coupled with strategies to cultivate students' intrinsic motivational engagement. Even the smallest interaction effect —  $Z \times X_2 \rightarrow Y_1$  ( $\beta = 0.115$ ,  $p = 0.041$ ) — nevertheless confirms that digital literacy's contribution to learning engagement is meaningfully amplified under conditions of high motivation, suggesting that competency and psychological readiness are mutually reinforcing rather than independently sufficient. These findings align with Self-Determination Theory's proposition that motivation functions as the psychological fuel converting available competencies and resources into enacted learning behaviours (Deci & Ryan, 1985; Nuraini, 2021).

#### 4.7 Mediating Effect of Learning Motivation

Table 7 reports the specific indirect effect result, testing whether Learning Motivation mediates the relationship between Technology-Based Learning Facilities and Society 5.0 Preparedness.

**Table 7.** Mediation Effect Results (Specific Indirect Effects, Bootstrap)

Indirect Path	B	M	SD	T	p	Decision
$X_1 \rightarrow Z \rightarrow Y_2$	0.185	0.186	0.054	3.450	0.001	Partial Mediation

The indirect path  $X_1 \rightarrow Z \rightarrow Y_2$  produced a statistically significant coefficient of 0.185 ( $T = 3.450, p = 0.001$ ). Since the direct effect of  $X_1 \rightarrow Y_2$  also remained significant ( $\beta = 0.195, p = 0.036$ ), Learning Motivation functions as a partial mediator according to Baron & Kenny (1986) criteria. This dual-pathway mechanism illuminates the multi-layered manner in which technological facility provision shapes student readiness: a direct environmental facilitation pathway through which consistent engagement with digital tools builds technical capacity, and an indirect motivational pathway through which the stimulating, interactive atmosphere generated by ICT-rich environments ignites students' intrinsic drive to pursue and deepen readiness-relevant competencies. The simultaneous operation of both pathways suggests that institutional investments in physical ICT infrastructure carry both immediate and psychologically-mediated benefits for student preparedness in the Society 5.0 era.

#### 4.8 Summary of Hypothesis Testing

**Table 8.** Comprehensive Summary of Hypothesis Testing Results

H	Path	$\beta$	T	p	Type	Decision
H <sub>1</sub>	$X_1 \rightarrow Y_1$	0.215	2.450	0.015	Direct	Supported
H <sub>2</sub>	$X_1 \rightarrow Y_2$	0.195	2.105	0.036	Direct	Supported
H <sub>3</sub>	$X_2 \rightarrow Y_1$	0.255	2.890	0.004	Direct	Supported
H <sub>4</sub>	$X_2 \rightarrow Y_2$	0.288	3.210	0.001	Direct	Supported
H <sub>5</sub>	$X_1 \rightarrow Z$	0.412	5.120	0.000	Direct	Supported
H <sub>6</sub>	$Z \times X_1 \rightarrow Y_1$	0.125	2.150	0.032	Moderation	Supported
H <sub>7</sub>	$Z \times X_1 \rightarrow Y_2$	0.188	2.980	0.003	Moderation	Supported
H <sub>8</sub>	$Z \times X_2 \rightarrow Y_1$	0.115	2.050	0.041	Moderation	Supported
H <sub>9</sub>	$Z \times X_2 \rightarrow Y_2$	0.135	2.210	0.028	Moderation	Supported
H <sub>10</sub>	$X_1 \rightarrow Z \rightarrow Y_2$	0.185	3.450	0.001	Mediation	Supported

### 5 Conclusion

This investigation examined how technology-based instructional facility availability and digital literacy competency shape Social Studies learning engagement and Society 5.0 preparedness among 111 junior secondary students at MTs Darunnajah Trenggalek, with learning motivation functioning as both moderating and mediating variable. Utilising PLS-SEM with 5,000 bootstrap resamples, the study produced empirical confirmation of all ten hypothesised relationships. Technology-based learning facilities and digital literacy each exerted statistically significant positive influences on both IPS learning engagement and Society 5.0 preparedness. Among direct pathways, digital literacy emerged as the strongest predictor of student readiness ( $\beta = 0.288, p = 0.001$ ), affirming that readiness for a human-centred digital society is driven more by learners' critical, ethical, and creative competency with technology than by mere physical device availability. Technology-based learning facilities demonstrated the most substantial effect on learning motivation ( $\beta = 0.412, p < 0.001$ ), establishing that a well-resourced instructional environment functions as a primary antecedent of intrinsic motivational drive.

Learning motivation was confirmed as a significant positive moderator across all four predictor-to-outcome relationships, with interaction effects uniformly significant and consistently amplifying the influences of both predictor variables on the two outcome constructs. The most powerful moderation effect was observed on the path from facility availability to student preparedness ( $\beta = 0.188, p = 0.003$ ), underscoring that ICT infrastructure investments achieve substantially greater returns when paired with deliberate motivational cultivation strategies. Furthermore, learning motivation was found to partially mediate the relationship between facility provision and student readiness ( $\beta = 0.185, T = 3.450, p = 0.001$ ), revealing that physical infrastructure shapes preparedness through both a direct environmental facilitation mechanism and an indirect motivationally-mediated pathway.

Collectively, these findings advance an integrated understanding of how structural, competency-based, and psychological variables interact to shape educational outcomes in Society 5.0-oriented learning contexts. From a practical standpoint, they imply that madrasah administrators, IPS educators, and educational policymakers

should pursue simultaneous rather than sequential investment in ICT infrastructure, digital literacy programming, and motivational enhancement interventions. Single-dimensional approaches — such as facility upgrading without accompanying literacy or motivation support — are likely to yield sub-optimal outcomes. The study's limitations include its single-site cross-sectional design, exclusive reliance on self-reported data, and the unexplained variance (34.2%–41.5%) in the endogenous constructs. Future research should adopt multi-site longitudinal or experimental designs, incorporate observational and archival data triangulation, and explore additional boundary conditions such as teacher digital competency, school leadership support, and socioeconomic background as supplementary constructs or moderators.

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