INTERNATIONAL ACADEMIC RESEARCH JOURNAL
ISSN :2289-8441
International Academic Research Journal of Social Science
Journal homepage: www.iarjournal.com

Do Digital Natives Teach Better with Technology? Evidence from TPACK, Gender Differences, and Teaching Experience

Mohamed Imran[1] and Al-Amin Mydin[2]
[1]Universiti Sains Malaysia, [2]Universiti Sains Malaysia

Corresponding email: mohamed.imran@student.usm.my, alamin@usm.my

Article Information

Keywords
Digital Nativity
TPACK
Higher Education
Gender Differences
Teaching Experience

Abstract

This study investigates whether digital natives teach more effectively with technology by examining the influence of digital nativity on lecturers' Technological Pedagogical Content Knowledge (TPACK) in higher education institutions in the Maldives. A quantitative, cross-sectional research design was employed, with data collected from 300 lecturers at Maldives National University and the Islamic University of Maldives using a structured questionnaire. Digital nativity was measured using the Digital Nativity Assessment Scale (DNAS), while TPACK was assessed using the instrument developed by Schmidt et al. (2009). Data were analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM), including moderation analysis.

The results revealed that digital nativity has a significant positive effect on TPACK, indicating that lecturers who are more digitally inclined demonstrate higher levels of technology integration in teaching. Gender was also found to significantly influence TPACK, while teaching experience showed no significant effect. Furthermore, neither gender nor teaching experience moderated the relationship between digital nativity and TPACK. These findings highlight the importance of digital competencies over traditional teaching experience in enhancing technology integration. The study provides valuable insights for higher education institutions and policymakers in promoting effective digital teaching practices.

INTRODUCTION

The rapid advancement of Information and Communication Technology (ICT) has fundamentally reshaped the global educational landscape, a shift that is particularly pronounced in small island developing states (SIDS) like the Maldives. In the Maldivian higher education sector, the integration of digital tools is a necessity to bridge geographical barriers across its small islands. As the nation pushes toward a digital transformation agenda, the role of university lecturers has moved from traditional knowledge dispensers to facilitators of technology-enhanced learning environments.

Central to this transformation is the Technological Pedagogical Content Knowledge (TPACK) framework, which defines the complex interplay between a lecturers' understanding of technology, pedagogy, and their specific academic discipline. In the Maldives, lecturers are increasingly required to demonstrate high levels of TPACK to

meet the 21st-century competency demands of a diverse and geographically dispersed student body. However, the effectiveness of this integration often hinges on individual characteristics such as digital nativity (the inherent comfort and familiarity with digital environments) and professional demographics like gender and years of teaching experience.

This research aims to investigate the factors that influence TPACK proficiency among Maldivian higher education lecturers, specifically focusing on the impact of digital nativity. While the government has invested heavily in digital infrastructure, including the Maldives 2.0 Digital Transformation Summit initiatives, there is a critical need to understand how these systemic changes align with the actual competencies and predispositions of the faculty. By examining the moderating effects of gender and experience, this study seeks to provide a comprehensive profile of digital readiness in the Maldivian academic workforce.

BACKGROUND

The evolution of higher education in the Maldives has been characterised by a drive for increased accessibility and quality. The Higher Education Master Plan has long emphasised the importance of professional development (PD) as a cornerstone of institutional excellence. Despite these goals, research by Aminath and Waseela (2022) indicates that even when educators hold high perceptions of their own TPACK, this does not always translate into meaningful classroom integration. This gap highlights a significant challenge in the Maldivian context, where technological hardware is often more available than the specialised pedagogical skills required to use it effectively.

Furthermore, the "digital divide" in the Maldives is not merely a matter of access to devices but also includes disparities in digital literacy and technical support. According to the UNESCO review of the National ICT in Education Master Plan, lecturers face unique hurdles, such as inconsistent internet speeds, poor ICT infrastructure and a lack of context-situated training. These institutional barriers are often compounded by the varied digital backgrounds of the lecturers themselves, where younger "digital natives" may feel more empowered to innovate, while experienced lecturers rely on their deep pedagogical expertise but may experience "digital stress."

Gender also plays a nuanced role in the Maldivian higher education landscape. Data from the UNDP (2025) reveals that fewer women pursue studies or careers in ICT-related fields in the Maldives, which may influence their self-perceived technological competency as lecturers. When these gender dynamics intersect with levels of digital nativity and teaching experience, the resulting TPACK profiles become highly complex. Understanding these intersections is vital for developing targeted professional development programs that can support all faculty members in contributing to the nation's ambitious digital learning ecosystem.

Research Objectives

1. To examine the effect of digital nativity on teachers' TPACK.
2. To investigate the influence of gender on teachers' TPACK.
3. To determine whether teaching experience significantly predicts TPACK.
4. To assess the moderating effect of teaching experience on the relationship between digital nativity and TPACK.
5. To evaluate the moderating effect of gender on the relationship between digital nativity and TPACK.

Research Questions

1. Does digital nativity significantly influence teachers' TPACK?
2. Does gender significantly affect teachers' TPACK?
3. Does teaching experience significantly predict teachers' TPACK?
4. Does teaching experience moderate the relationship between digital nativity and TPACK?
5. Does gender moderate the relationship between digital nativity and TPACK?

LITERATURE REVIEW

The Technological Pedagogical Content Knowledge (TPACK) framework by Mishra and Koehler (2006) has become a pivotal lens for assessing how higher education faculty integrate digital tools into specialized academic contexts. Unlike primary or secondary settings, university lecturers must navigate high levels of disciplinary complexity while managing diverse digital instructional demands. This review synthesises current scholarship regarding the influence of digital nativity, gender, and experience on the TPACK proficiency of university lecturers.

Does digital nativity significantly influence lecturers' TPACK?

Digital Nativity (DN) is frequently cited as a primary driver of technological fluency among academic staff. Research by Huang et al. (2021) suggests that university faculty who exhibit "digital native" traits regardless of their chronological age tend to perceive technology as more useful and easier to integrate into their specialised

curricula. This suggests that "digital nativity" in academia is less about a generation gap and more about a psychological and behavioral tendency toward technical innovation and adoption.

Furthermore, Yurdakul (2018) and Milutinović (2024) have demonstrated that digital proficiency significantly predicts overall TPACK competency. Lecturers with higher digital nativeness are more likely to view technology as a seamless extension of their pedagogical toolkit rather than an external burden. However, as noted in the Journal of Educational Computing Research, while digital nativity strengthens the "Technological Knowledge" (TK) domain, it does not automatically guarantee high proficiency in the complex intersections of pedagogical and content knowledge required for advanced university-level instruction.

Does gender significantly affect lecturers' TPACK?
Gender disparities in TPACK self-efficacy among lecturers often reflect broader societal trends in technical confidence. According to a large-scale meta-analysis by Scherer et al. (2026), male educators often report higher self-efficacy in technology-oriented domains like TK and TPK. These findings are echoed in studies of university contexts, such as the work by Tan and Zainal (2020), which found that male lecturers were more likely to use Learning Management Systems (LMS) for active content creation and interactive engagement compared to their female counterparts.

Conversely, female lecturers often demonstrate a stronger inclination towards pedagogical adaptation and complex delivery modes. Ukaegbu and Zaid (2025) observed that while male lecturers may actively utilise interactive digital tools, female lecturers often focus on the administrative and structural integrity of online platforms, potentially indicating a more cautious but thorough approach to digital integration. Importantly, Scherer and Siddiq (2026) emphasise that these differences are often more related to self-perceived confidence than actual performance metrics, suggesting that institutional support should focus on bridging the "confidence gap" rather than technical ability alone.

Does teaching experience significantly predict lecturers' TPACK?
The relationship between years of service and TPACK proficiency in higher education is non-linear and often contradictory. While some studies including Antony et al. (2019) have found that extensive experience can significantly influence a lecturer's ability to master all seven TPACK components, others suggest a "ceiling effect." For instance, Haviz et al. (2020) found no direct correlation between teaching experience and TPACK perceptions among specialised mathematics and science lecturers, suggesting that disciplinary expertise might outweigh mere seniority.

Furthermore, veteran lecturers often possess deep Pedagogical Content Knowledge (PCK) which serves as a robust anchor for technology integration. However, they may simultaneously face "digital stress" or resistance to rapidly evolving software. Recent research published in MDPI Education Sciences (2024) indicates that while teaching experience may not always increase digital competence, it significantly helps in mitigating the stress associated with abrupt digital shifts, such as the transition to remote teaching during global crises.

Does teaching experience moderate the relationship between digital nativity and TPACK?
Teaching experience serves as a vital moderator by bridging the gap between raw technical skill and professional pedagogical application. Younger, more "digitally native" lecturers may possess high TK but lack the classroom management and content delivery experience of their seniors. Research by Huang et al. (2021) posits that experienced professors can "acquire" digital native traits through continuous professional development, effectively moderating the traditional generational advantage of younger staff.

Moreover, the moderating effect of experience ensures that technical proficiency is grounded in disciplinary rigor. In the university setting, Valle et al. (2024) found that experience allows lecturers to better evaluate which digital tools actually enhance learning outcomes, preventing the "technology for technology's sake" trap that less experienced digital natives might fall into. This moderation effectively balances technical enthusiasm with pedagogical maturity.

Does gender moderate the relationship between digital nativity and TPACK?
Gender also acts as a moderating variable, particularly in how lecturers perceive their own competence in the face of digital advancement. Nature (2025) reports that the influence of digital nativity on TPACK can vary significantly by gender. For example, male lecturers with lower technological self-efficacy may rely more heavily on their core TPACK knowledge, whereas female lecturers with high self-efficacy tend to achieve much higher overall teaching effectiveness.

Institutional and cultural factors further moderate this relationship. As observed in research from Scherer et al. (2026) the moderating effect of gender on TPACK development is highly sensitive to country-level gender

equality and economic growth. In environments with strong feminist pedagogical support, the traditional "male advantage" in digital nativity tends to disappear, leading to a more equitable distribution of TPACK competency across the faculty.

METHODOLOGY

Research Design

This study employed a quantitative research approach using a cross-sectional design to investigate the influence of digital nativity on lecturers' Technological Pedagogical Content Knowledge (TPACK), along with the roles of gender and teaching experience. A quantitative approach was deemed appropriate as it allows for the measurement of relationships among variables using statistical techniques, enabling generalisable findings across the study population. The cross-sectional design involves collecting data at a single point in time, making it suitable for examining existing conditions and associations without manipulating variables.

Cross-sectional studies are widely used in educational research due to their efficiency and ability to capture a snapshot of perceptions and behaviors within a defined population. According to Creswell (2014), such designs are particularly useful when the objective is to describe trends and test relationships among variables. This approach aligns well with the current study's aim of analysing predictive and moderating relationships using structural equation modelling.

Population and Sample

The target population of this study consisted of lecturers working in higher education institutions in the Maldives, specifically those employed at Maldives National University and the Islamic University of Maldives. These institutions were selected as they represent key public higher education providers in the country, offering diverse academic programs and employing a substantial number of academic staff. A total of 300 lecturers participated in the study, including 154 males and 146 females, providing a balanced representation of gender. The sample size was determined using the widely accepted sample size determination table developed by Krejcie and Morgan (1970), which provides guidance for selecting adequate sample sizes based on population size. This ensured that the sample was sufficiently large to support statistical analysis and enhance the reliability of the findings.

Sampling Technique

The study utilised a stratified convenience sampling technique. In this approach, the population was first divided into strata based on the institutions (Maldives National University and Islamic University of Maldives). Stratification ensured that both universities were adequately represented in the sample, which is important for improving the generalisability of the findings within the Maldivian higher education context. Within each stratum, convenience sampling was applied to select participants who were readily accessible and willing to participate. While convenience sampling may limit the generalisability of findings to some extent, combining it with stratification helps to reduce sampling bias and improve representation. According to Etikan et al. (2016), convenience sampling is commonly used in educational research where access to participants is constrained but still allows for meaningful insights when applied carefully.

Instrumentation

Data were collected using a structured questionnaire comprising closed-ended items, which allows for standardised responses and facilitates quantitative analysis. The questionnaire included two main constructs: digital nativity and TPACK. Digital nativity was measured using the Digital Nativity Assessment Scale (DNAS) developed by Teo (2013), which captures key dimensions such as growing up with technology, multitasking, reliance on graphics, and preference for instant gratification. TPACK was measured using the instrument developed by Schmidt et al. (2009), which assesses teachers' knowledge across technological, pedagogical, and content domains.

Instrument Reliability

Both instruments have been widely validated and used in prior studies, ensuring reliability and validity. The use of established scales enhances the credibility of the findings and allows for comparison with previous research. These tools cotent validity has been checked by local experts and ammendments such as rephrasing of statements to better align them to the local context has been made. With the respective ammendments a pilot test with 29 academic staff has been conducted. Cronbach Alpha Reliability Scores for Reliability for DN and TPACK questionnare are as follows.

TABLE 1
CRONBACH ALPHA RELIABILITY SCORES FOR RELIABILITY (DIGITAL NATIVITY)

#	Hypothesis	Cronbach Alpha (Based on Original Tool)	Cronbach Alpha (Based on Modified Tool)
1	Grew up with technology (GrowT)	.89	.95
2	Comfortable with multitasking (MultiT)	.91	.94
3	Reliant on graphics for communication (GraphicsC)	.87	.92
4	Thrive on instant gratifications and rewards (InstantGR)	.87	.92

TABLE 2
CRONBACH ALPHA RELIABILITY SCORES FOR RELIABILITY (TPACK)

#	Hypothesis	Cronbach Alpha (Based on Original Tool)	Cronbach Alpha (Based on Modified Tool)
1	Content Knowledge (CK)	.85	.94
2	Pedagogical Knowledge (PK)	.84	.90
3	Technological Knowledge (TK)	.82	.87
4	Pedagogical Content Knowledge (PCK)	.85	.93
5	Technological Content Knowledge (TCK)	.80	.88
6	Technological Pedagogical Knowledge (TPK)	.86	.86
7	Technological Pedagogical Content Knowledge (TPACK)	.92	.89

Data Collection Procedure

Data were collected an online survey administered through Google Forms, which enabled efficient distribution and response collection. The questionnaire link was shared with academic staff through institutional communication channels, allowing participants to complete the survey at their convenience. The use of online surveys is particularly advantageous in higher education contexts as it increases accessibility and response rates. Participation in the study was voluntary, and respondents were informed about the purpose of the research before completing the questionnaire. Online data collection methods are increasingly popular due to their cost-effectiveness and ability to reach geographically dispersed participants. According to Wright (2005), web-based surveys provide flexibility and can yield high-quality data when designed appropriately.

Data Screening

Prior to conducting the statistical analyses, the collected data were screened for missing values, outliers, normality, and multicollinearity to ensure the suitability of the data for further analysis. Prior to hypothesis testing, data screening procedures comprising normality assessment, Confirmatory Factor Analysis (CFA), model fit evaluation, convergent validity, discriminant validity, and construct reliability and validity assessments were conducted. The results are summarised in the following table.

TABLE 3
RESULTS OF DATA SCREENING

#	Test	Measurements	Results
1	Normality Test	Skewness & Kurtosis	98% items' value falls between the range of -2 and +2
2	Confirmatory Factor Analysis (CFA)	Outer Loading (Standardised)	89.5% Acceptable
3	Model Fit	Chi-square P value ChiSqr/df RMSEA AGFI PGFI SRMR	22338.79 0.00 4.60 0.11 0.31 0.32 0.07
4	Convergent Validity	Factor Loading	89.5% items acceptable
5	Discriminant Validity	Heterotrait-monotrait Ratio (HTMT)	DN 0.127 TPACK 0.287
6		Fornell-Larcker	DN 0.836 > 0.698 (AVE)

			TPACK 0.765 > 0.585 (AVE)
7	Construct Reliability and Validity	Cronbach's alpha,	0.980 (DN), 0.981 (TPACK)
8		Composite reliability (rho_c)	0.980 (DN) 0.982 (TPACK)
9		Average Variance Extracted (AVE)	0.698 (DN) 0.585 TPACK

Data Analysis

The collected data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), including moderation analysis. PLS-SEM is a variance-based structural equation modelling technique that is particularly suitable for exploratory research, complex models, and studies focusing on prediction. It allows for the simultaneous analysis of multiple relationships between variables, making it appropriate for examining both direct and moderating effects in this study. The choice of PLS-SEM is supported by its ability to handle smaller sample sizes and non-normal data distributions. Moderation analysis was conducted to assess whether gender and teaching experience influence the strength of the relationship between digital nativity and TPACK. A significance level of $p < .05$ was used to determine statistical significance. Hair et al. (2019) recommend PLS-SEM for studies involving latent constructs and predictive modelling in social sciences.

Ethical Considerations

Ethical considerations were carefully addressed throughout the research process. Participants were provided with clear information regarding the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained prior to data collection, ensuring that participants understood their rights, including the right to withdraw at any time without any consequences. Confidentiality and anonymity were strictly maintained. No personally identifiable information was collected, and responses were used solely for academic purposes. Ensuring ethical compliance is essential in educational research to protect participants and maintain the integrity of the study. According to the American Educational Research Association (AERA, 2011), researchers must uphold principles of respect, beneficence, and justice in all research involving human participants.

RESULTS AND DISCUSSION

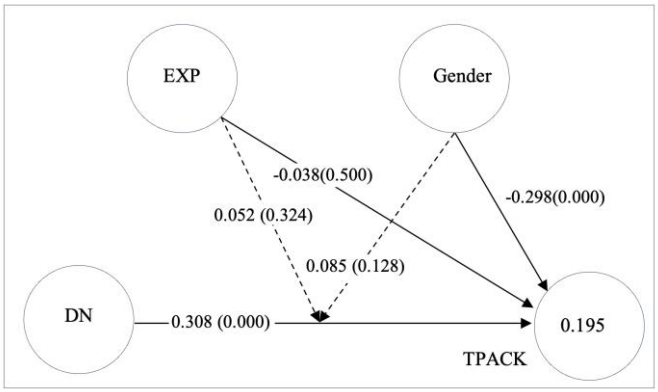
Results

The structural model was assessed using Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine the hypothesised relationships among digital nativity (DN), teaching experience, gender, and TPACK. The significance of path coefficients was evaluated at a threshold of $p < .05$. The results of the structural model are summarized in Table 1 and Figure 1 below.

TABLE 4
PATH COEFFICIENTS AND HYPOTHESIS TESTING

#	Hypothesis	β (Beta)	p-value	Result
H1	DN → TPACK	0.308	0.000	Supported
H2	Experience → TPACK	-0.038	0.500	Not Supported
H3	Gender → TPACK	-0.298	0.000	Supported
H4	DN × Experience → TPACK	0.052	0.324	Not Supported
H5	DN × Gender → TPACK	0.085	0.128	Not Supported

FIGURE 1
STRUCTURAL MODEL



The results indicate that digital nativity has a statistically significant positive effect on TPACK (β = 0.308, p < .001), supporting H1. This suggests that lecturers with higher levels of digital nativity are more likely to possess stronger technological pedagogical content knowledge. The effect size indicates a moderate contribution of digital nativity in predicting TPACK. In contrast, teaching experience does not significantly predict TPACK (β = -0.038, p = .500), leading to the rejection of H2. This finding implies that years of teaching experience alone do not necessarily enhance lecturers' ability to integrate technology effectively into their teaching practices. The analysis further reveals that gender has a significant effect on TPACK (β = -0.298, p < .001), supporting H3. This indicates that there are statistically significant differences in TPACK based on gender. It is indicated that female teachers reported lower TPACK levels compared to male teachers. Regarding moderating effects, neither teaching experience (p = .324) nor gender (p = .128) significantly moderates the relationship between digital nativity and TPACK. Therefore, H4 and H5 are not supported. These findings suggest that the impact of digital nativity on TPACK is consistent regardless of lecturers' experience levels or gender.

The structural model evaluation revealed that the predictors accounted for approximately 19.5% of the variance in TPACK (R^2 = .195). Specifically, digital nativity (DN) exerted a significant positive direct effect on TPACK (β = .308), (p < .001). Conversely, gender had a significant negative direct effect (β = -.298), (p < .001). Experience (EXP) did not significantly predict TPACK (β = -.038), (p = .500). Furthermore, the hypothesized moderating effects on the relationship between DN and TPACK were not supported, as neither the interaction of EXP * DN (β = .052), (p = .324) nor Gender * DN (β = .085), (p = .128) reached statistical significance.

DISCUSSION

The findings of this study provide strong empirical support for the role of digital nativity as a key predictor of TPACK among lecturers in higher education institutions in the Maldives. The significant positive relationship between digital nativity and TPACK is consistent with the theoretical perspective introduced by Marc Prensky, who argued that individuals who grow up in digital environments develop distinct cognitive styles and technological competencies. The result also aligns with empirical work by Timothy Teo, who demonstrated that digital nativity is closely associated with individuals' ability to effectively engage with technology in educational settings.

This finding is further supported by studies such as Ng (2012), which found that digitally competent individuals are better able to integrate technology into learning environments. Similarly, research on TPACK by Mishra and Koehler (2006) emphasises that technological knowledge is a critical component of effective teaching in the digital age. The current study extends this body of knowledge by demonstrating that digital nativity significantly enhances TPACK within the context of Maldivian higher education, a setting that has received limited empirical attention.

In contrast, the finding that teaching experience does not significantly predict TPACK challenges traditional assumptions in education that experience naturally leads to improved teaching competence. This result is consistent with prior studies (e.g., Chai et al., 2013), which found that experience alone does not guarantee effective technology integration. Instead, the findings suggest that adaptability and familiarity with digital technologies are more important than the length of teaching service. This is particularly relevant in rapidly evolving digital environments, where newer technologies may not have been part of more experienced lecturers' initial training.

The significant effect of gender on TPACK is also noteworthy. This finding aligns with previous research indicating gender differences in technology use, attitudes, and confidence (e.g., Teo, 2008). The findings indicated tha females score significantly lower than males on TPACK. While some studies have found males to report higher levels of technological confidence, others suggest that such differences are diminishing over time. The present study contributes to this ongoing debate by providing evidence of gender-based differences within the Maldivian higher education context.

Despite the significant main effect of gender, the lack of a moderating effect suggests that digital nativity influences TPACK similarly across male and female lecturers. This finding is important, as it indicates that digital nativity is a robust predictor of TPACK regardless of gender, reinforcing its central role in technology integration. Similarly, the absence of a moderating effect of teaching experience suggests that the relationship between digital nativity and TPACK is stable across different levels of experience. This implies that even less experienced lecturers with high digital nativity can demonstrate strong TPACK, while more experienced lecturers without strong digital exposure may not necessarily exhibit high levels of TPACK. This finding is consistent with the growing emphasis on continuous professional development in digital skills rather than reliance on experience alone.

Overall, the findings of this study contribute to the literature by highlighting that digital nativity is a more critical factor than teaching experience in predicting TPACK, while also emphasising the role of gender differences. In the context of higher education in the Maldives, these results underscore the need for institutions to focus on developing digital competencies among lecturers through targeted training and support initiatives.

CONCLUSION AND IMPLICATIONS

Conclusion

This study set out to examine whether digital natives teach better with technology by investigating the influence of digital nativity on TPACK, along with the roles of gender and teaching experience among lecturers in higher education institutions in the Maldives. The findings clearly demonstrate that digital nativity is a significant and positive predictor of TPACK, indicating that lecturers who are more accustomed to and comfortable with digital technologies are better equipped to integrate technology into their teaching practices.

In contrast, teaching experience was found to have no significant effect on TPACK, nor did it moderate the relationship between digital nativity and TPACK. This suggests that traditional indicators of teaching expertise, such as years of experience, may no longer be sufficient in explaining technology integration competencies in modern educational environments. Additionally, while gender showed a significant direct effect on TPACK, it did not act as a moderating variable, indicating that the influence of digital nativity on TPACK is consistent across genders. Overall, the study concludes that digital nativity plays a more critical role than teaching experience in shaping lecturers' technological pedagogical competencies, highlighting a shift in the determinants of effective teaching in the digital era.

Theoretical Implications

This study contributes to the existing body of knowledge on TPACK by reinforcing the importance of digital nativity as a foundational construct in understanding technology integration in education. While the TPACK framework developed by Mishra and Koehler (2006) emphasises the interplay between technology, pedagogy, and content knowledge, the current findings extend this framework by highlighting the role of individual digital dispositions such as digital nativity. Furthermore, the study provides empirical support for the conceptual arguments of Marc Prensky, suggesting that individuals who grow up in digital environments possess inherent advantages in technology use. By demonstrating that digital nativity significantly predicts TPACK, this study bridges the gap between theoretical discussions of digital natives and practical teaching competencies. The non-significant role of teaching experience also contributes to ongoing debates in educational research, suggesting that experience-based models of teacher development may need to be reconsidered in light of rapid technological advancement.

Theoretical Implications

The findings of this study have important implications for higher education institutions in the Maldives. First, universities should prioritise developing digital competencies among lecturers, as digital nativity has been shown to significantly enhance TPACK. This can be achieved through targeted professional development programs focusing on digital tools, instructional technologies, and innovative teaching strategies. Second, the lack of influence of teaching experience suggests that training programs should not be differentiated solely based on years of service, but rather on lecturers' digital proficiency levels. Institutions should provide continuous learning opportunities that enable all lecturers regardless of experience to adapt to evolving technological demands. Third, the significant gender differences observed in TPACK indicate the need for inclusive and equitable professional development initiatives. Universities should ensure that both male and female lecturers have equal access to resources, training, and support systems that enhance their technological capabilities.

At the policy level, the findings suggest that national higher education strategies in the Maldives should emphasize digital transformation in teaching and learning. Policymakers should consider integrating digital competency frameworks into teacher standards and evaluation systems. Additionally, investment in digital infrastructure, training programs, and institutional support systems is essential to foster effective technology integration. Policies should also encourage collaboration between institutions to share best practices and resources for enhancing TPACK among academic staff.

Limitations and Future Research

Despite its contributions, this study has few limitations. First, the use of a cross-sectional design limits the ability to draw causal inferences. Future studies could adopt longitudinal designs to examine how digital nativity and TPACK evolve over time. Second, the study relied on self-reported data, which may be subject to response bias. Future research could incorporate observational or performance-based measures of TPACK to provide a more comprehensive assessment. Third, the study was limited to two higher education institutions in the Maldives. Future research could expand the sample to include additional institutions or conduct comparative studies across

different countries to enhance generalisability. Finally, future studies could explore additional variables such as institutional support, access to technology, and attitudes toward technology, which may further explain variations in TPACK.

REFERENCES

Aminath, W., & Waseela, A. (2022). Teachers' TPACK and technology integration in teaching and learning: A case study in the Maldives. https://saruna.mnu.edu.mv/items/14ed288a-6983-431e-8110-94a5fd1c842e

American Educational Research Association. (2011). Code of ethics. https://www.aera.net/About-AERA/AERA-Rules-Policies/Professional-Ethics

Antony, M. K., Paidi, Subali, B., Pradana, S. P., Hapsari, N., & Astuti, F. E. C. (2019). Teacher's TPACK profile: The effect of teacher qualification and teaching experience. Journal of Physics: Conference Series, 1397(1), 012054. https://doi.org/10.1088/1742-6596/1397/1/012054

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of technological pedagogical content knowledge. Educational Technology & Society, 16(2), 31–51.

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. Computers & Education, 59(2), 661–686. https://doi.org/10.1016/j.compedu.2012.03.004

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). SAGE Publications.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. American Journal of Theoretical and Applied Statistics, 5(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Eysenbach, G. (2005). The law of attrition. Journal of Medical Internet Research, 7(1), e11. https://doi.org/10.2196/jmir.7.1.e11

Frontiers in Education. (2024). Modeling the relationship of the TPACK framework with cyber wellness, school climate, and digital nativity of basic education teachers. Frontiers in Education, 9. https://doi.org/10.3389/feduc.2024.1397888

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.). SAGE Publications.

Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. Springer. https://doi.org/10.1007/978-3-030-80519-7

Haviz, M., Maris, I. M., & Herlina, E. (2020). Relationships between teaching experience and teaching ability with TPACK: Perceptions of mathematics and science lecturers. Journal of Science Learning, 3(2), 88–96. https://doi.org/10.17509/jsl.v3i2.22225

Huang, R., et al. (2021). Digital nativity, computer self-efficacy, and technology adoption: A study among university faculties in China. Frontiers in Psychology. https://doi.org/10.3389/fpsyg.2021.723093

Kabakci Yurdakul, I. (2018). Modeling the relationship between pre-service teachers' TPACK and digital nativity. Journal of Educational Computing Research, 55(7), 964–988. https://doi.org/10.1177/0735633117735615

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610. https://doi.org/10.1177/001316447003000308

Ministry of Education Maldives. (2024). ICT in education master plan 2. https://www.moe.gov.mv/storage/files/resources/ICT_Master_Plan_2.pdf

Ministry of Higher Education Maldives. (2021). Correlation between lecturers' professional development activities and their competencies in Maldives' higher education institutes. https://www.researchgate.net/publication/354990015

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Mondal, S., & Mondal, A. (2024). Artificial intelligence in higher education: Investigating the potential of ChatGPT and Google Gemini as pedagogical assistants. Frontiers in Education, 9. https://doi.org/10.3389/feduc.2024.1397888

Ng, W. (2012). Can we teach digital natives digital literacy? Computers & Education, 59(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Papastergiou, M. (2009). Exploring the potential of computer and video games for health and physical education: A literature review. Computers & Education, 53(3), 603–622. https://doi.org/10.1016/j.compedu.2009.04.001

Prensky, M. (2001). Digital natives, digital immigrants. On the Horizon, 9(5), 1–6. https://doi.org/10.1108/10748120110424816

Ringle, C. M., Wende, S., and Becker, J.-M. 2024. "SmartPLS 4." Bönningstedt: SmartPLS, https://www.smartpls.com.

Scherer, R., et al. (2026). Unraveling gender disparities in teachers' technological pedagogical and content knowledge (TPACK): A multilevel meta-analysis. International Journal of Educational Research. https://doi.org/10.1016/j.ijer.2026.102200

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK). Computers & Education, 52(2), 123–149. https://doi.org/10.1016/j.compedu.2008.06.014

Tan, L., & Zainal, A. (2025). Gender differences in lecturers' competency and use of learning management systems. Education Sciences, 15(12), 1595. https://doi.org/10.3390/educsci15121595

Teo, T. (2008). Pre-service teachers' attitudes towards computer use. Australasian Journal of Educational Technology, 24(4), 413–424. https://doi.org/10.14742/ajet.1201

Teo, T. (2013). An initial development and validation of a Digital Natives Assessment Scale (DNAS). Computers & Education, 67, 51–57. https://doi.org/10.1016/j.compedu.2013.02.012

UNDP. (2025). Policy note: Digital in the Maldives. https://www.undp.org/sites/g/files/zskgke326/files/2025-06/policynote20thmay.pdf

UNESCO. (2024). UNESCO partners with Maldives to review its national ICT in Education Master Plan for digital transformation and lifelong learning. https://www.unesco.org/en/articles/unesco-partners-maldives-review-its-national-ict-education-master-plan-digital-transformation-and

Ushasree, P. M., & Szablewski, M. (2016). An investigation into the role of capping on second harmonic generation. Optics and Photonics Journal, 6(5), 101–111. https://doi.org/10.4236/opj.2016.65013

Wright, K. B. (2005). Researching Internet-based populations. Journal of Medical Internet Research, 7(3), e34. https://doi.org/10.2196/jmir.7.3.e34