JOURNAL OF INTERDISCIPLINARY PERSPECTIVES

ISSN Print: 2984-8288, ISSN Online: 2984-8385
Vol. 3 No. 10, pp. 156-163, October 2025

Examining Digital Competence among Filipino Public School Teachers: Generational Gaps, Institutional Support and ICT Perceptions

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Date received: July 29, 2025
Date revised: August 19, 2025
Date accepted: September 5, 2025

Originality: 88%
Grammarly Score: 99%
Similarity: 12%

Recommended citation:
Wong, A., Sy, F. I., & Wong, J. (2025). Examining digital competence among Filipino public school teachers: Generational gaps, institutional support, and ICT perceptions. *Journal of Interdisciplinary Perspectives*, *3*(10), 156-163. https://doi.org/10.69569/jip.2025.617

Abstract. This study examines the digital competence of public elementary school teachers in the Romblon District, Philippines, with a focus on generational differences, support for capacity building, and attitudes toward technology use in education. Addressing the growing need for teacher readiness in digital classrooms, the study used a descriptive-correlational research design with 296 participants. Teachers were grouped as digital natives (born after 1980) and digital immigrants (born before 1980). Findings showed that digital natives demonstrated higher levels of digital competence compared to digital immigrants. Teachers who reported greater access to training, technology resources, and peer collaboration also had stronger digital skills. Additionally, a positive attitude toward ICT integration was linked to higher competence. These results suggest that institutional support and teacher mindset play essential roles in developing digital proficiency. The study recommends targeted training programs based on generational needs, equal access to digital resources, and stronger peer learning communities. These strategies can help bridge gaps in digital competence and enhance the overall integration of technology in teaching. The findings contribute to ongoing efforts to improve teacher preparedness for digital education in both local and global contexts
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Keywords: Digital competence; Generational differences; ICT in education; Teacher training; Technology attitudes.

1.0 Introduction

The global digital transformation of education systems has created urgent demands for teachers to develop comprehensive digital competencies (Fraillon et al., 2019). Defined by the European Commission's DigComp framework, digital competence encompasses information literacy, communication, content creation, safety, and problem-solving skills essential for 21st-century teaching (Vuorikari et al., 2022). Research underscores that teachers with strong digital competencies are more effective in creating student-centered learning experiences (Instefjord & Munthe, 2017). However, disparities persist, particularly among older educators and those in resource-constrained settings (Hatlevik & Christophersen, 2013). These disparities are exacerbated in developing contexts like the Philippines, where infrastructure gaps often hinder even technologically proficient teachers (Almerino et al., 2020).

In the Philippine public education system, the shift toward digitalization presents both opportunities and challenges, especially for elementary teachers in geographically isolated and disadvantaged areas (Soriano et al.,

2021). While initiatives like the MATATAG Curriculum prioritize technology integration (DepEd, 2023), implementation barriers—such as intermittent electricity and unreliable internet—remain pervasive (Acosta & Acosta, 2021; Bernardo et al., 2022). Compounding these challenges are multigrade teaching assignments and large class sizes, which demand unique adaptations of digital pedagogies (Rodriguez & Macayan, 2020). Studies highlight Filipino teachers' resourcefulness (*diskarte*) in navigating these constraints through community-based support systems and localized solutions (David et al., 2021; Ortega-Dela Cruz, 2023). However, such organic coping mechanisms reveal systemic gaps in institutional support, calling for policy interventions aligned with UNESCO's (2021) emphasis on equitable digital capacity building.

This study is anchored in two theoretical frameworks that illuminate the complexities of digital competence development. Prensky's (2001) digital native/immigrant paradigm offers a generational lens, though critics argue it requires adaptation in developing contexts where resource access mediates technological fluency (Bennett & Maton, 2010; Helsper & Eynon, 2010). Bandura's (1986) social cognitive theory further enriches this analysis by framing digital self-efficacy as a dynamic interplay of environmental, personal, and behavioral factors—a perspective validated in studies of teacher motivation and technology adoption (Chai et al., 2019; Scherer et al., 2019). The Technology Acceptance Model (TAM) reinforces this, identifying perceived usefulness and ease of use as critical to ICT integration (Davis, 1989), particularly when supported by institutional training and peer learning communities (Trust et al., 2016; Tondeur et al., 2017).

Despite growing literature on digital competence, significant gaps persist. Most studies focus on well-resourced urban schools (Howard et al., 2018), neglecting rural and island contexts like the Romblon District. Additionally, research often isolates generational or environmental factors, overlooking their synergistic effects (Tondeur et al., 2017). This study addresses these gaps by examining how generational characteristics, institutional support, and teacher attitudes intersect in an understudied Philippine setting. Its timing is pivotal, coinciding with post-pandemic recovery efforts and MATATAG Curriculum reforms (DepEd, 2023). By investigating localized barriers and adaptive strategies, the findings will inform context-sensitive professional development programs while contributing to global discourse on digital equity in education.

2.0 Methodology

2.1 Research Design

This study utilized a descriptive-correlational research design to investigate the relationships between digital competence, capacity-building support, and attitudes toward information and communication technology (ICT) among elementary school teachers in the Romblon District. The descriptive component facilitated an in-depth examination of teachers' digital competence levels and their attitudes toward ICT. At the same time, the correlational aspect explored potential associations between these variables and perceived capacity-building support. Quantitative methods were employed to analyze these relationships systematically. A survey approach was adopted as the primary data collection strategy. This method allowed for the efficient gathering of responses from a large and diverse sample, enabling a structured analysis of digital competence domains, capacity-building perceptions, and ICT-related attitudes. The cross-sectional nature of the survey ensured that data were collected at a single point in time, providing a comprehensive snapshot of teachers' current digital competencies, institutional support mechanisms, and challenges in ICT integration.

2.2 Participants

The study included 296 public elementary school teachers from kindergarten to Grade 6 across 29 schools in the Romblon District. While the total population of teachers in the district was 321, only 296 participated due to factors such as leave, refusal to respond, or travel duties during data collection. This sample represented a broad spectrum of educators across different grade levels and subject areas, ensuring a diverse and representative analysis of digital competence, capacity-building perceptions, and ICT attitudes within the public elementary education sector.

2.3 Research Instrument

Data was collected using a structured questionnaire designed to assess teachers' digital competence, capacity-building factors, and attitudes toward ICT utilization. The instrument was divided into four sections:

Generational Classification

Respondents were categorized based on birth year to distinguish between digital immigrants (born before 1980)

and digital natives (born after 1980). This classification served as a key variable in analyzing differences in digital competence and ICT-related practices. The section for Digital Competence Domains evaluated teachers' digital competence across five dimensions: Digital Pedagogy, Technology Integration, Digital Communication and Collaboration, Digital Citizenship, and Professional Development. The section Capacity-Building Factors assessed institutional support and resource availability, including Access to technology (devices, software, internet connectivity, and technical support). Training and professional development opportunities. Availability of financial and educational resources for digital learning, Peer collaboration, and knowledge-sharing mechanisms. Finally, the section Attitudes Toward ICT Utilization measured teachers' perceptions of ICT integration, including comfort levels, perceived value, and willingness to incorporate technology into instructional practices.

Responses were recorded on a 4-point Likert scale (1 = Disagree, 2 = Fairly Agree, 3 = Agree, 4 = Strongly Agree). To ensure instrument validity and reliability, Pilot Testing, Reliability Analysis, and Expert Validation were employed. The instrument demonstrated strong internal consistency across all sections. The digital competence subscales yielded Cronbach's alpha values ranging from 0.818 to 0.950, with an overall reliability of 0.969. Similarly, the capacity-building perception scale showed high reliability ($\alpha = 0.947$), and the attitude toward ICT utilization scale achieved excellent consistency ($\alpha = 0.902$). These results confirm the instrument's robustness in measuring the intended constructs.

2.4 Data Analysis Procedures

Data was processed and analyzed using SPSS (Statistical Package for the Social Sciences). Descriptive statistics (frequencies, percentages) summarized respondent profiles and overall trends in digital competence, capacity-building perceptions, and ICT attitudes. Inferential analyses included: The Kruskal-Wallis H test was used to examine differences in digital competence levels between generational groups. Correlation analysis was performed to assess relationships between digital competence, capacity-building factors, ICT attitudes, and generational classification.

2.5 Ethical Considerations

The study adhered to ethical research standards, ensuring informed consent, voluntary participation, and confidentiality. Personal identifiers were anonymized, and data were securely stored in password-protected files. The questionnaire was designed to minimize discomfort, and participants were provided with contact details for any concerns. Institutional and professional ethical guidelines were strictly followed.

3.0 Results and Discussion

3.1 Generational Classification of Participants

Table 1 presents the generational distribution of respondents (N=296), with 42.2% (n=125) classified as Digital Immigrants (born before 1980) and 57.8% (n=171) as Digital Natives (born after 1980). This predominance of Digital Natives suggests a technologically adept teaching workforce in Romblon District, potentially facilitating ICT integration in classrooms (Prensky, 2001). However, the substantial minority of Digital Immigrants reflects the enduring value of experienced educators, creating opportunities for intergenerational knowledge exchange between technological fluency and pedagogical expertise (Helsper & Eynon, 2010).

Table 1. *Generational Classification of Respondents (N=296)*

Generational Group	Frequency	%
Digital Immigrants (Born before 1980)	125	42.2
Digital Natives (Born after 1980)	171	57.8

3.2 Digital Competence in Education

The data presented in Table 2 demonstrate a strong self-perception of digital competence among respondents across all five measured dimensions. The consistent median score of 3.0 (on a 4-point scale) with minimal variation (IQR=1.0) indicates a generally high level of confidence in digital skills application within educational settings. This uniformity suggests successful institutional efforts in establishing baseline digital competencies, though the compressed distribution may also reflect potential limitations in self-assessment instruments to capture nuanced skill differentials.

Notable peaks in strong agreement appear in Digital Citizenship (34.5%). Professional Development (43.9%), revealing two significant trends: first, a robust institutional emphasis on ethical technology use, likely driven by policy mandates regarding digital safety and responsible online behavior; second, an established culture of continuous learning, where educators actively pursue digital upskilling opportunities. These findings align with contemporary educational priorities that position digital ethics and lifelong learning as foundational competencies in technology-integrated pedagogy.

Table 2. *Level of Digital Competence in Education*

Dimension	Responses	Frequency	%	Median	IQR	Interpretation
Digital Pedagogy	Strongly Disagree	0	0.00	3.0	1.00	High
	Disagree	32	10.8			
	Agree	170	57.4			
	Strongly Agree	94	31.8			
Technology Integration	Strongly Disagree	3	1.00	3.0	1.00	High
	Disagree	40	13.5			
	Agree	166	56.1			
	Strongly Agree	87	29.4			
Digital Communication and Collaboration	Strongly Disagree	0	0.00	3.0	1.00	High
	Disagree	23	7.80			
	Agree	165	55.7			
	Strongly Agree	108	36.5			
Digital Citizenship	Strongly Disagree	0	0.00	3.0	1.00	High
	Disagree	10	3.40			
	Agree	184	62.2			
	Strongly Agree	102	34.5			
Professional Development	Strongly Disagree	0	0.00	3.0	1.00	High
	Disagree	15	5.10			
	Agree	151	51.0			
	Strongly Agree	130	43.9			

However, the persistence of disagreement clusters (10.8-14.5%) in Technology Integration and Digital Pedagogy dimensions signals specific competency gaps that warrant attention. These areas, which involve the practical application of digital tools to enhance teaching and learning processes, may require more hands-on, classroom-centered training approaches compared to the theoretical foundations emphasized in Digital Citizenship. The variation across dimensions suggests that while conceptual understanding of digital education principles is strong, implementation competencies may develop unevenly depending on access to practical training and technological infrastructure.

The overall high competence levels likely reflect systemic investments in teacher digital capacity building, including revised teacher education standards and widespread adoption of digital learning platforms. However, the residual skill disparities highlight the need for differentiated professional development that addresses both technical proficiency and pedagogical integration strategies. This pattern underscores the multidimensional nature of digital competence, where theoretical knowledge, practical skills, and ethical considerations develop at varying paces depending on institutional support structures and individual teaching contexts.

3.3 Capacity Building for Digital Competence

Table 3 reveals consistently positive perceptions of institutional capacity-building support across four key dimensions, with all metrics showing median scores of 3.0 ("Agree"). Three dimensions – Access to Technology, Training/Professional Development, and Resource Availability – demonstrate exceptional consensus (IQR=0.00), while Peer Collaboration shows slightly more variability (IQR=1.0). Between 79.7%-85.8% of respondents affirmed institutional support, suggesting successful implementation of digital readiness initiatives.

This pattern indicates systemic efforts to create enabling conditions for digital education through combined infrastructure investment and professional development. The strong performance in peer collaboration (80.4% agreement) highlights the emergence of organic support networks that complement formal training structures. However, residual disagreement (2.7%-17.6%) points to persistent inequities in resource distribution and training access that require targeted intervention. The findings collectively portray an education system transitioning effectively toward digital transformation, though continued refinement of support mechanisms remains necessary to ensure universal digital readiness. The results particularly emphasize the value of peer learning systems in sustaining digital competence development beyond formal training programs.

Table 3. *Perception of Capacity Building for Digital Competence*

Dimension	Responses	Frequency	%	Median	IQR	Interpretation
Access to Technology	Strongly Disagree	4	1.40	3.0	0.00	High
	Disagree	38	12.8			
	Agree	190	64.2			
	Strongly Agree	64	21.6			
Training and Professional Development	Strongly Disagree	3	1.00	3.0	0.00	High
	Disagree	51	17.2			
	Agree	171	57.8			
	Strongly Agree	71	24.0			
Resource Availability	Strongly Disagree	8	2.70	3.0	0.00	High
	Disagree	52	17.6			
	Agree	186	62.8			
	Strongly Agree	50	16.9			
Peer Collaboration and Support	Strongly Disagree	0	0.00	3.0	1.00	High
	Disagree	8	2.70			
	Agree	52	17.6			
	Strongly Agree	186	62.8			

3.4 Attitudes toward ICT Usage in Education

Table 4 demonstrates overwhelmingly positive attitudes toward ICT integration among respondents, with 97% expressing agreement (54.1%) or strong agreement (42.9%). The median score of 3.0 and IQR of 1.00 confirm this strong consensus, while minimal disagreement (3.0%) suggests near-universal recognition of ICT's educational value. This favorable disposition likely reflects successful institutional efforts in digital capacity-building, where training and support systems have effectively translated into psychological readiness for technology adoption. The findings suggest that Romblon District educators have moved beyond basic acceptance of ICT to genuine appreciation of its pedagogical benefits, creating fertile ground for advanced digital integration initiatives. The negligible resistance (0% strong disagreement) indicates exceptional receptiveness to educational technology, presenting valuable opportunities for implementing more sophisticated digital teaching strategies. This attitudinal foundation proves particularly significant as it represents the crucial human factor that often determines the success or failure of technological innovations in education.

Table 4. *Level of Attitudes Toward ICT Usage in Education*

Dimension	Responses	Frequency	%	Median	IQR	Interpretation
Attitude toward ICT Usage	Strongly Disagree	0	0.00	3.0	1.00	High
	Disagree	9	3.00			
	Agree	160	54.1			
	Strongly Agree	127	42.9			

3.5 Difference in Digital Competence Based on Generational Classification

Table 5 (Mann-Whitney U test results) reveals statistically significant differences ($p < .05$) in digital competence between Digital Natives and Digital Immigrants across all five dimensions. Digital Natives consistently demonstrated higher mean ranks, with the most significant gap observed in Digital Pedagogy and Technology Integration. These findings confirm that generational background influences digital competence, likely due to Digital Natives' early and sustained exposure to technology. The uniform significance across dimensions suggests that while Digital Immigrants may possess pedagogical expertise, they face systemic challenges in adapting to digital teaching environments. This generational gap highlights the need for differentiated professional development—leveraging Digital Natives' technological fluency while providing Digital Immigrants with structured, application-focused training to bridge competence disparities.

Table 5. *Difference in Digital Competence based on Generational Classification*

Dimensions	Groups	N	Mean Rank	Mann Whitney	Sig. (2-tailed)
Digital Pedagogy	Digital Immigrants	125	124.32	7665.50	<.001
	Digital Natives	171	166.17		
Technology Integration	Digital Immigrants	125	122.89	7486.50	<.001
	Digital Natives	171	167.22		
Digital Comm. & Collaboration	Digital Immigrants	125	123.79	7599.00	<.001
	Digital Natives	171	166.56		
Digital Citizenship	Digital Immigrants	125	127.55	8068.50	<.001
	Digital Natives	171	163.82		
Professional Development	Digital Immigrants	125	132.28	8660.50	.002
	Digital Natives	171	160.35		

The results emphasize that equitable digital transformation requires institutional strategies that address generational differences without marginalizing experienced educators. A balanced approach—combining peer mentoring, just-in-time training, and age-inclusive program design—could optimize the strengths of both cohorts while mitigating disparities in technology adoption.

The findings of this study provide valuable insights into the digital competence of public elementary school teachers in Romblon District, their perceptions of capacity-building support, and their attitudes toward ICT utilization. The results highlight generational differences in digital competence, aligning with prior research on technology integration in education (Ertmer & Ottenbreit-Leftwich, 2013; Tondeur et al., 2017). A key finding was the significant difference in digital competence between digital immigrants (born before 1980) and digital natives (born after 1980). Digital natives exhibited higher competence across all dimensions—digital pedagogy, technology integration, communication, digital citizenship, and professional development—as evidenced by the Mann-Whitney U test results (*p* < .001). This aligns with Prensky's (2001) assertion that digital natives, having grown up with technology, possess greater familiarity and adaptability in digital environments. However, the moderate positive correlations (*r* = .183–.287, *p* < .01) suggest that generational classification alone does not fully explain digital competence, reinforcing the role of institutional support and training (Hämäläinen et al., 2021).

3.6 Correlation between Digital Competence and Perceived Capacity Building

The correlation analysis (see Table 6) reveals statistically significant ($p < .001$) positive relationships between all dimensions of digital competence and perceived capacity-building support. The strongest associations emerged between professional development initiatives and both Digital Communication & Collaboration ($r = .546$) and Professional Development competence ($r = .564$), indicating that structured training programs and peer support systems most effectively enhance educators' digital capabilities. These results demonstrate that digital competence develops not in isolation, but through a synergistic ecosystem combining four critical elements. The consistent strength of these correlations across all competence domains suggests that comprehensive capacity-building approaches yield the most significant improvements in digital readiness. Particularly noteworthy is how peer collaboration demonstrates nearly equal predictive power as formal training, highlighting the importance of organic, teacher-driven learning networks alongside structured professional development. The results ultimately affirm that institutional commitment to multidimensional support systems represents the most reliable pathway to achieving widespread digital competence among educators. These findings support the argument that institutional support is critical in enhancing teachers' digital skills (Howard et al., 2018). Notably, access to technology and structured professional development were the strongest predictors of competence, reinforcing the need for systemic investments in infrastructure and teacher training (Fraillon et al., 2019).

Table 6. *Correlation between Digital Competence and Perceived Capacity-building*

Dependent Variable (Digital Competence)		**Independent Variable** (Perceived Capacity Building)			
		Access to Technology	**Training & Professional Development**	**Resource Availability**	**Peer Collaboration & Support**
Digital Pedagogy	r	.442**	.457**	.450**	.441**
	p	<.001	<.001	<.001	<.001
Technology Integration	r	.520**	.545**	.475**	.500**
	p	<.001	<.001	<.001	<.001
Digital Communication & Collaboration	r	.540**	.546**	.505**	.500**
	p	<.001	<.001	<.001	<.001
Digital Citizenship	r	.535**	.440**	.417**	.474**
	p	<.001	<.001	<.001	<.001
Professional Development	r	.506**	.520**	.419**	.564**
	p	<.001	<.001	<.001	<.001

** *Correlation is significant at p < .001 (two-tailed).*

3.7 Correlation between Digital Competence and Attitudes toward ICT Utilization

Table 7 demonstrates significant positive correlations between teachers' ICT attitudes and all digital competence dimensions ($r = .415$-$.579$, $p < .001$). The strongest relationships emerged in Digital Citizenship ($r = .579$) and Professional Development ($r = .572$), revealing that educators with favorable ICT attitudes exhibit greater competence in ethical technology use and continuous digital upskilling. These results underscore that effective

technology integration requires addressing both cognitive (skills) and affective (attitudes) components. The findings ultimately suggest that cultivating digital competence requires a dual focus on developing both technical capabilities and positive technological mindsets among educators. Teachers who view ICT as valuable are more likely to engage in skill development, consistent with Scherer et al.'s (2019) findings on motivation and technology adoption. However, the presence of some resistance (3% disagreed with ICT usage) indicates that addressing attitudinal barriers remains crucial for widespread ICT integration (Inan & Lowther, 2010).

Table 7. *Correlation between Digital Competence and Attitudes toward ICT Utilization*

Dependent Variable (Digital Competence)	**Independent Variable** (Attitude toward ICT Utilization)	
	r	**p**
Digital Pedagogy	.415**	<.001
Technology Integration	.493**	<.001
Digital Communication & Collaboration	.492**	<.001
Digital Citizenship	.579**	<.001
Professional Development	.572**	<.001

** *Correlation is significant at p < .001 (two-tailed).*

3.8 Correlation between Digital Competence and Generational Classification

The correlation analysis between digital competence and generational classification (see Table 8) reveals consistent but modest positive relationships across all dimensions of digital proficiency. While statistically significant, the relatively small effect sizes (ranging from r = .183 to r = .287) indicate that generational status alone accounts for only a portion of the variation in teachers' digital capabilities. The strongest association emerges in Technology Integration (r = .287), suggesting Digital Natives' primary advantage lies in practical implementation skills rather than theoretical knowledge of digital pedagogy. Conversely, the weakest correlation appears in Professional Development (r = .183), implying that structured training systems can effectively compensate for generational differences when properly designed and implemented.

These findings carry important implications for educational practice and policy. While confirming that younger educators generally demonstrate higher digital competence, the modest effect sizes caution against overemphasizing generational stereotypes in professional development planning. The results suggest that institutional support systems and training quality may play equal or greater roles than innate generational characteristics in shaping digital proficiency. This underscores the potential of strategic, needs-based approaches to teacher development that leverage Digital Natives' technological fluency through peer mentoring while providing targeted implementation support for Digital Immigrants. Rather than viewing generational differences as fixed barriers, educational leaders should recognize them as manageable factors that can be addressed through equitable, differentiated professional learning opportunities. Ultimately, these findings advocate for moving beyond deterministic assumptions about age-related digital competence to focus instead on creating support systems that capitalize on each generation's unique strengths while addressing their specific developmental needs. The study underscores the need for targeted professional development programs, particularly for digital immigrants, to bridge competence gaps. Schools should prioritize peer collaboration networks and sustained technical support, as these were strongly linked to higher competence. Policymakers must ensure equitable access to digital resources, aligning with UNESCO's (2021) call for inclusive digital education strategies. While this study provides robust quantitative data, its cross-sectional design limits causal inferences. Future research could employ longitudinal methods to track competence development over time. Additionally, qualitative inquiries into contextual challenges (e.g., infrastructure limitations) would enrich understanding.

Table 8. *Correlation between digital competence and generational classification*

Dependent Variable (Digital Competence)	**Independent Variable** (Generational Classification)	
	r	**p**
Digital Pedagogy	.274**	<.001
Technology Integration	.287**	<.001
Digital Communication & Collaboration	.280**	<.001
Digital Citizenship	.247**	<.001
Professional Development	.183*	<.001

* *Correlation is significant at p < .01 (two-tailed);*
** *Correlation is significant at p < .001 (two-tailed). **

4.0 Conclusion

This study highlights key factors influencing digital competence among elementary teachers, revealing meaningful differences between generational groups. While younger teachers demonstrated greater familiarity with technology, the findings emphasize that structured training and institutional support play pivotal roles in enhancing digital skills for all educators. The positive relationship between teachers' attitudes and their competence further underscores the importance of fostering a culture that values technology integration in education. To address these insights, schools and policymakers should prioritize equitable access to resources, ongoing professional development, and peer collaboration initiatives. By combining targeted support with efforts to cultivate positive attitudes toward technology, educational institutions can empower teachers to thrive in digital learning environments. These steps are essential for bridging competence gaps and ensuring effective technology integration across all levels of education.

5.0 Contributions of Authors

All authors contributed equally to this study

6.0 Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

7.0 Conflict of Interests

The authors declare no conflict of interest concerning the publication of this paper.

8.0 Acknowledgment

The authors acknowledge the support of Romblon State University and all teachers who participated in this study.

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