

Integration of Student-Centered vs Teacher Centered Approaches and Digital Media in Character Education Learning for Prospective Teachers in Punjab India

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ABSTRACT

Background. The growing global and national attention to character education, reinforced by India's National Education Policy (NEP) 2020 call for learner-centered pedagogy, has outpaced empirical evidence on which teaching approaches are most effective in cultivating character among prospective teachers.

Purpose. This study examined the comparative effectiveness of digitally supported student-centered and teacher-centered instructional approaches on character education outcomes among prospective teachers in Punjab, India.

Method. A quasi-experimental, mixed-methods design was employed involving 123 prospective teachers across four intact classes, assigned to student-centered ($n = 63$) and teacher-centered ($n = 60$) conditions. ANCOVA and MANCOVA tested effects on character formation across three dimensions-moral knowing, moral feeling, and moral action-complemented by semi-structured interviews.

Novelty. Unlike prior studies reporting composite character scores, this study disaggregated character formation into theoretically distinct dimensions and explicitly engaged an unresolved methodological debate regarding cognitive-versus-behavioral measurement bias in character education research.

Results. The student-centered group showed significantly greater gains in overall character outcomes, $F(1, 120) = 88.02$, $p < .001$, partial $\eta^2 = .421$, with the strongest effect observed for moral knowing ($\eta^2 = .402$).

Conclusion. Digitally supported student-centered instruction shows promise for character formation in teacher education, though findings warrant cautious interpretation pending randomized, longitudinal replication with behavioral outcome measures.

KEYWORDS : Character Education; Student-Centered Learning; Teacher-Centered Learning; Digital Media; Prospective Teachers

Citation: Kaur, P., M, N., & Ramos, N. (2026). Integration of Student Centered vs Teacher Centered Approaches and Digital Media in Character Education Learning for Prospective Teachers in Punjab India. *Journal Of Paddisengeng Technology*, 2(3), 183 - 196. <https://doi.org/10.65224/jopate.v2i3.298>

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Received: August 3, 2026

Accepted: September 12, 2026

Published: September 30, 2026



INTRODUCTION

Growing concern over the erosion of moral and ethical values amid rapid social and technological change has renewed global attention toward character education as a core aim of schooling rather than a peripheral component of academic instruction (Gandhi & Shah, 2026). This shift carries direct implications for teacher education, as teachers are widely regarded as the primary agents through whom character values are transmitted, modeled, and reinforced within the classroom. In India, this concern is reflected at the policy level:

the National Education Policy (NEP) 2020 explicitly calls for teacher education programs to shift from rote, teacher-centered instruction toward learner-centered and collaborative pedagogy, while embedding constitutional collaborative pedagogy, while embedding constitutional and civic values into teacher preparation (Rangarajan et al., 2025; Sharma et al., 2023). However, how prospective teachers are prepared to enact this shift-and whether student-centered approaches yield stronger character-education outcomes than conventional teacher-centered instruction, particularly when supported by digital media-remains insufficiently examined in the empirical literature.

Teacher education landscapes across India's states exhibit substantial variability concerning curriculum implementation, resource accessibility, and pedagogical cultures. This necessitates region-specific investigations to fully grasp how national policies are actualized in classroom practices. Punjab, with its well-established network of both government and private teacher training colleges, provides a relevant context for examining this translation (David, 2026; Kayode et al., 2026). Previous research on prospective teachers in Punjab has predominantly focused on their perceptions of program structure and professional attitudes, rather than on the specific pedagogical approaches employed to cultivate character and values during their training (Dhaneria et al., 2026; Gupta et al., 2026; Krishna & Agrawal, 2026; Sharma et al., 2026). This gap raises a critical question: are future educators in this context being prepared through student-centered, digitally supported instruction, or do teacher-centered and conventional methods continue to dominate the character education components of their training, despite NEP 2020's explicit advocacy for the former.

The fundamental distinction between student-centered and teacher-centered pedagogical approaches is rooted in constructivist learning theory Vygotsky (1978) in (Erwin et al., 2026; Hausfather, 1996). This theory posits that knowledge and values are actively built by learners through their engagement, social interaction, and structured experiences, rather than being passively received directly from an instructor. When applied to character education, this perspective implies that student-centered methodologies-where aspiring educators actively engage in discussions, reflection, and collaborative ethical reasoning-are likely to promote a more profound internalization of character values compared to teacher-centered instruction, which predominantly involves the direct delivery of information.

Furthermore, the incorporation of digital media as a second independent variable is underpinned by the Technological Pedagogical Content Knowledge (TPACK) framework (Mavenge et al., 2026; Ong & Annamalai, 2024; Sullivan et al., 2024). This framework defines effective teaching as the convergence of technological, pedagogical, and content expertise, rather than simply treating technology as an auxiliary instrument. From this viewpoint, digital media is hypothesized to enhance character education not merely through the provision of content via an alternative medium, but by facilitating interactive, reflective, and socially mediated learning experiences that align with constructivist tenets (Harrison & Laco, 2022; Li & Zhang, 2025; Rosyida et al., 2025).

The connection between these two variables is further elucidated by social cognitive theory (Bandura, 1986), which asserts that character and values are predominantly acquired through processes of observation and modeling (Krishnamoorthy et al., 2025; Tong & Ren, 2025). Consequently, student-centered, digitally enhanced instruction could offer aspiring teachers more extensive opportunities to observe, practice, and exemplify the character values they are anticipated to cultivate in their future pupils.

Although there is increasing global and national focus on character education and a robust theoretical justification for integrating student-centered pedagogy with digitally-mediated

instruction, empirical investigations specifically examining this combined approach are scarce, particularly within the domain of teacher education (Al-Khresheh et al., 2025; Darmana et al., 2026; Haghi et al., 2026; Ramdana et al., 2026). Prior research involving prospective teachers in Punjab has predominantly explored their attitudes towards program frameworks and professional attributes, rather than evaluating the comparative efficacy of various instructional methodologies in fostering character-related competencies.

Furthermore, while frameworks such as TPACK and constructivist theory provide substantial conceptual foundations for anticipating that student-centered, digitally-enhanced instruction would surpass traditional teacher-centered methods in cultivating character, this hypothesis has seldom been subjected to empirical scrutiny. Crucially, such scrutiny has rarely involved research designs that rigorously isolate the pedagogical approach as an independent variable, simultaneously ensuring the systematic integration of digital media, rather than merely treating technology as an incidental or unmanaged element of classroom activities.

This research void carries significant implications: in the absence of empirical data demonstrating which instructional strategy more effectively nurtures character values among future educators, teacher education institutions in India face the peril of implementing the pedagogical reforms outlined in NEP 2020 based purely on policy aspirations, rather than on empirically validated instructional efficacy (Singh & Kaur, 2024). The current investigation aims to bridge this identified gap by empirically evaluating and comparing the impact of student-centered and teacher-centered instructional methodologies, both integrated with digital media, on character education outcomes among prospective teachers in Punjab, India.

To address this research gap, the present study employed a quasi-experimental explanatory sequential mixed-methods design to compare digitally supported student-centered and teacher-centered instructional approaches in character education among pre-service teachers in Punjab, India. Both instructional conditions addressed comparable character-education content and incorporated digital media, while differing primarily in the organization of learning activities and the degree of learner participation. This design enabled the study to examine the contribution of pedagogical approach under broadly comparable digitally supported learning conditions rather than treating technology itself as an independent experimental factor.

The intervention was guided by a set of theory-informed instructional design principles derived from constructivist learning, TPACK, and social cognitive perspectives. These principles included the alignment of learning objectives, character-education content, digital resources, learning activities, and assessment; purposeful integration of digital media with pedagogical strategies; opportunities for interaction, reflection, observation, modeling, and practice; and systematic monitoring of implementation fidelity across instructional groups. In the student-centered condition, these principles were operationalized through collaborative discussion, reflective activities, problem-oriented tasks, and active learner participation, whereas the teacher-centered condition emphasized instructor-led explanation and structured delivery while using comparable digital resources.

This instructional design is consistent with the broader direction of Education 4.0 in India and the National Education Policy (NEP) 2020, which emphasize the purposeful use of digital infrastructure and learner-centered pedagogy in educational reform (Muralidharan et al., 2022). By combining quantitative estimates of instructional effects with qualitative accounts of prospective teachers' learning experiences, the study seeks not to propose a fully validated instructional model, but to generate evidence-informed principles for designing digitally supported character education in teacher preparation. Such evidence may inform curriculum development and pedagogical

decision-making in teacher education institutions while providing a basis for further testing across different institutional and regional contexts.

Building upon this theoretical foundation, the current investigation aims to empirically assess the efficacy of integrating student-centered and teacher-centered pedagogical strategies with digital media in the character education of pre-service teachers in Punjab, India. More specifically, this study endeavors to: (1) ascertain differences in character education outcomes between pre-service teachers educated through a digitally augmented student-centered approach and those instructed via a digitally augmented teacher-centered approach; (2) identify which particular dimensions of character development are most amenable to each instructional methodology; and (3) explore the lived experiences of pre-service teachers concerning each approach through qualitative inquiry, thereby contextualizing and elucidating the quantitative findings. Through the attainment of these aims, this research seeks to generate empirical evidence capable of guiding teacher education institutions in Punjab-and, by extrapolation, other Indian states implementing the pedagogical innovations of NEP 2020-in structuring curricula that more proficiently foster character values within the forthcoming cohort of educators.

RESEARCH METHODOLOGY

Research Design

The study employed a quasi-experimental, non-equivalent groups design embedded within an explanatory sequential mixed-methods framework. A quasi-experimental approach was selected because individual random assignment was not feasible within the existing institutional class structure, a common constraint in classroom-based educational research (Lau, 2020). Four pre-existing intact classes participated in the study and were organized into two instructional conditions: a digitally supported student-centered condition and a digitally supported teacher-centered comparison condition. Because digital media were incorporated in both conditions, the principal contrast concerned the pedagogical organization of learning rather than the presence or absence of technology. This arrangement was intended to maintain broadly comparable digitally supported learning conditions while examining whether different instructional approaches were associated with differences in character education outcomes.

The mixed-methods dimension adhered to an explanatory sequential design, commencing with the collection of quantitative pre-test and post-test measures pertaining to character education outcomes. This initial phase was subsequently followed by qualitative interviews conducted with a subset of participants, intended to elucidate and provide contextual depth to the quantitative results (Creswell & Plano Clark, 2023). This specific design was selected given that character formation cannot be comprehensively captured solely through numerical scores. Qualitative data offered critical insights into the differential experiences of prospective teachers across the distinct instructional approaches, thereby complementing the pursuit of causal inference initiated by the quasi-experimental segment. While the non-equivalent group design enables robust comparisons of pre- and post-intervention variations, the resultant findings are interpreted as indicators of instructional impact rather than conclusive causal evidence, primarily attributable to the lack of random participant allocation.

Given the absence of individual random assignment, the study does not treat the observed between-group differences as definitive causal effects. Instead, the findings are interpreted as evidence of comparative instructional effects within the specific institutional context, after accounting for baseline differences through the planned statistical analyses. This cautious

interpretation is particularly important because participants remained nested within intact classes throughout the intervention.

Research Subjects

Participants were drawn from four pre-existing intact classes: Class A ($n = 28$; 13 male and 15 female), Class B ($n = 29$; 15 male and 14 female), Class C ($n = 31$; 15 male and 16 female), and Class D ($n = 35$; 15 male and 20 female). Overall, the sample comprised 58 male (47.2%) and 65 female (52.8%) pre-service teachers. Participants ranged in age from 21 to 27 years, with a mean age of 23.4 years ($SD = 1.6$). All participants were enrolled in the second year of the B.Ed. program. Approximately 78.9% reported previous experience using digital learning platforms, including learning management systems, video-conferencing applications, and online collaborative tools. Most participants came from mixed urban and rural backgrounds, reflecting the diverse demographic composition of teacher education students in the region.

Because institutional regulations did not permit the random reassignment of individual students across established classes, allocation occurred at the intact-class level. Classes A and D were assigned to the digitally supported student-centered condition ($n = 63$; 28 male and 35 female), whereas Classes B and C were assigned to the digitally supported teacher-centered comparison condition ($n = 60$; 30 male and 30 female). No participants were transferred between classes for research purposes. Class allocation was determined in consultation with program administrators and was based on existing teaching schedules, class availability, and efforts to maintain broadly comparable class sizes across the two instructional conditions.

Prior to the intervention, comparability between the two instructional conditions was assessed using available demographic and academic characteristics, including class size, gender composition, age, academic level, previous experience with digital learning, and pre-test scores. Because participants were not individually randomized, baseline equivalence was not assumed. Pre-test scores were therefore incorporated as covariates in the subsequent ANCOVA and MANCOVA analyses to statistically adjust for initial differences between the two instructional conditions..

Table 1. Characteristics of Research Subjects by Instructional Group

Characteristic	Student-Centered Condition	Teacher-Centered Condition	Total
Classes	A and D	B and C	A–D
n	63	60	123
Male, n (%)	28 (44.4%)	30 (50.0%)	58 (47.2%)
Female, n (%)	35 (55.6%)	30 (50.0%)	65 (52.8%)
Age, M (SD)	23.3 (1.5)	23.5 (1.7)	23.4 (1.6)
Age range	21–27	21–27	21–27
Program	B.Ed.	B.Ed.	B.Ed.
Academic level	Second year	Second year	Second year
Prior digital-learning experience, n (%)	50 (79.4%)	47 (78.3%)	97 (78.9%)

Research Instruments

The investigation utilized a quartet of research tools: (1) a Character Education Assessment, administered as both a pre-test and a post-test; (2) a Perception Questionnaire concerning Instructional Approach and Digital Media; (3) a Classroom Implementation Observation Sheet; and (4) a Semi-Structured Interview Guide. Comprehensive details of these instruments are provided in Appendices A through D.

Appendix A. Character Education Assessment. Its primary objective was to evaluate the progression of prospective teachers' character development both prior to and following the intervention. The assessment dimensions were rooted in (Berkowitz, 2022) tripartite framework of character, encompassing moral knowing (defined as the comprehension of ethical principles and reasoning abilities), moral feeling (pertaining to attitudes, empathy, and dedication to moral principles), and moral action (manifested through the behavioral application of character values in practical tasks). Evaluation across these three dimensions was facilitated by a performance-based rubric.

Appendix B. Perception Questionnaire on Instructional Approach and Digital Media. This instrument aimed to ascertain prospective teachers' perspectives regarding the instructional methodology and digital resources employed within their respective groups. Participants' responses were captured on a five-point Likert scale, spanning from 1 (Strongly Disagree) to 5 (Strongly Agree) (Maor & Fraser, 2005). The questionnaire explored four distinct sub-dimensions: perceived utility, level of engagement, instructional clarity, and overall satisfaction.

Appendix C. Classroom Implementation Observation Sheet. Its function was to systematically record the fidelity with which the instructional design was executed across both study groups. Observers evaluated each component using a four-point scale, where 1 indicated "Not Implemented" and 4 signified "Well Implemented." The evaluated aspects included the lucidity of learning objectives, the integration of digital media, congruence with the designated instructional paradigm (either student-centered or teacher-centered), and the degree of student involvement (Barendsen & Henze, 2019).

Appendix D. Semi-Structured Interview Guide. The objective of this guide was to gather comprehensive qualitative data concerning prospective teachers' experiences with character development within the context of each instructional approach (Oplatka, 2018). This qualitative information served to both complement and provide contextual depth to the quantitative results derived from the Character Education Assessment.

Prior to the main investigation, all instruments employed in this study underwent a comprehensive validation process involving Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) with two independent samples, in accordance with established construct-validation methodologies (Tabachnick et al., 2019). This process yielded satisfactory outcomes, demonstrating robust factor structures, acceptable model-fit indices, strong convergent validity, and high reliability across all instruments, as detailed in Table 2.

Table 2. Results of Construct Validity Testing for the Research Instruments

Instrument	EFA Results	CFA Results
Character Education Assessment	KMO = 0.87; three factors were identified: moral knowing, moral feeling, and moral action; factor loadings > 0.65	CFI = 0.93; RMSEA = 0.059; SRMR = 0.034; standardized factor loadings > 0.70; AVE > 0.50
Perception Questionnaire on Instructional Approach and Digital Media	KMO = 0.84; four factors were identified: usefulness, engagement, clarity, and satisfaction; factor loadings > 0.60	CFI = 0.92; RMSEA = 0.062; SRMR = 0.037; standardized factor loadings > 0.70; AVE > 0.50
Classroom Implementation Observation Sheet	KMO = 0.89; two factors were identified: instructional-approach fidelity and student participation; factor loadings > 0.70	CFI = 0.94; RMSEA = 0.051; SRMR = 0.029; standardized factor loadings > 0.75; AVE > 0.55

Data Analysis

Before hypothesis testing, standard ANCOVA/MANCOVA assumptions were checked, including normality (Shapiro–Wilk), homogeneity of variance (Levene’s test) and covariance matrix (Box’s M), linearity, multicollinearity, and homogeneity of regression slopes (Tabachnick, Fidell, & Ullman, 2019), with a significance threshold of 0.05 (0.001 for Box’s M). ANCOVA was used to test the effect of instructional approaches on overall character education outcomes, with pre-test scores as a covariate. MANCOVA, using Pillai’s Trace, tested simultaneous effects across all three character dimensions-moral knowledge, moral feelings, and moral actions-followed by Bonferroni-adjusted univariate tests where the multivariate effect was significant ($\alpha = 0.05$). Qualitative data from observations and interviews were analyzed thematically and integrated with quantitative findings through a combined view.

Research Procedures

The data collection procedure unfolded across three sequential phases: preparation, treatment, and final data acquisition. The initial preparation phase involved obtaining institutional approval, coordinating with faculty, conducting a pilot test of the instruments with participants not included in the main sample, and administering a pre-test to both experimental groups (Presser et al., 2004; Shadish et al., 2002). Within the intervention phase, Classes A and D were exposed to student-centered pedagogical approaches augmented by digital resources, while Classes B and C underwent teacher-centered instruction utilizing identical digital media.

To ascertain the fidelity of implementation and ensure consistency across the different groups, systematic classroom observations were performed (Carroll et al., 2007). During the concluding stage, both participant cohorts completed a post-test and a perception questionnaire. Concurrently, a subset of prospective teachers engaged in semi-structured interviews, designed to elucidate and enrich the understanding of the quantitative results (Creswell & Plano Clark, 2018). A comprehensive overview of the entire methodology is provided in figure 1.

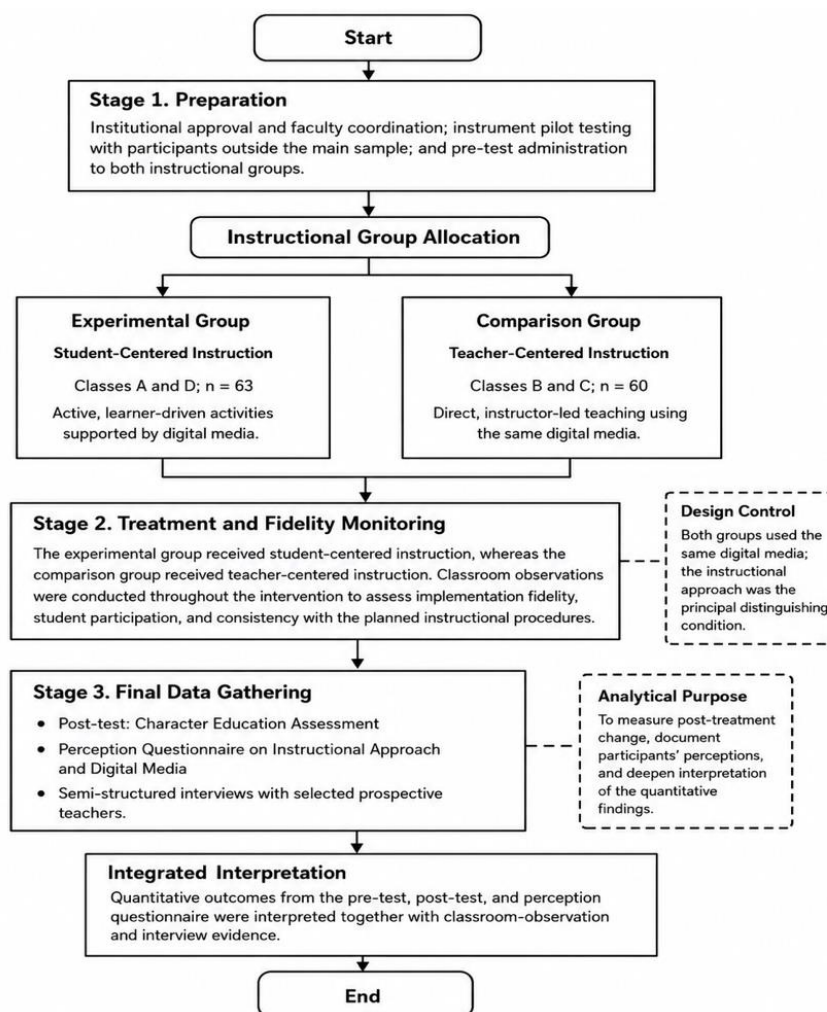


Figure 1. Sequential Framework of Instructional Treatment and Research Data Collection

RESULT AND DISCUSSION

Descriptive statistical analysis was conducted to illustrate changes in character education outcomes across the student-centered and teacher-centered groups. Before the intervention, the student-centered group achieved an average pre-test score of 48.3 (SD = 9.7), while the teacher-centered group achieved 49.1 (SD = 10.4). The initial mean difference of 0.8 points indicates that the two groups were relatively equivalent descriptively prior to treatment.

After the intervention, the student-centered group's average post-test score increased to 71.6 (SD = 6.9), while the teacher-centered group's score reached 59.8 (SD = 8.5). The student-centered group thus showed a mean gain of 23.3 points, compared to a gain of 10.7 points in the teacher-centered group—a between-group gain difference of 12.6 points.

Table 3. Descriptive Statistics of Character Education Outcomes by Instructional Group

Instructional Group	<i>n</i>	Pre-test, <i>M</i> (<i>SD</i>)	Post-test, <i>M</i> (<i>SD</i>)	Mean Gain
Student-Centered Instruction	63	48.3 (9.7)	71.6 (6.9)	23.3
Teacher-Centered Instruction	60	49.1 (10.4)	59.8 (8.5)	10.7
Between-Group Difference	-	-0.8	11.8	12.6

Table 4. Descriptive Statistics of Character Education Outcomes by Dimension

Character Dimension	SC Pre-test, <i>M</i> (<i>SD</i>)	SC Post-test, <i>M</i> (<i>SD</i>)	SC Mean Gain	TC Pre-test, <i>M</i> (<i>SD</i>)	TC Post-test, <i>M</i> (<i>SD</i>)	TC Mean Gain
Moral Knowing	50.2 (9.1)	73.8 (7.2)	23.6	51.0 (9.6)	62.1 (8.0)	11.1

Character Dimension	SC Pre-test, <i>M</i> (<i>SD</i>)	SC Post-test, <i>M</i> (<i>SD</i>)	SC Mean Gain	TC Pre-test, <i>M</i> (<i>SD</i>)	TC Post-test, <i>M</i> (<i>SD</i>)	TC Mean Gain
Moral Feeling	46.9 (10.5)	69.4 (7.6)	22.5	47.6 (10.9)	58.0 (8.7)	10.4
Moral Action	47.8 (10.0)	71.5 (7.4)	23.7	48.7 (10.2)	59.3 (9.0)	10.6

Assumption testing indicated that the data met the requirements for ANCOVA and MANCOVA. Univariate normality was supported for the composite outcome and all three dimensions (Shapiro–Wilk, all $p > .05$); Levene’s test indicated homogeneity of variance; Box’s M test indicated homogeneous variance–covariance matrices ($M = 9.87$, $\chi^2(6) = 9.63$, $p = .141$); Mahalanobis distance revealed no influential multivariate outliers (maximum = 14.92, critical χ^2 at $p < .001$ for three dependent variables ≈ 16.27); and the group $\times$ covariate interaction was non-significant, $F(1, 119) = 1.42$, $p = .236$, supporting homogeneity of regression slopes.

Table 5. ANCOVA Results for Overall Character Education Outcomes

Source	SS	df	MS	<i>F</i>	<i>p</i>	Partial η^2
Pre-test	2,894.6	1	2,894.6	71.42	< .001	.371
Instructional Approach	3,567.8	1	3,567.8	88.02	< .001	.421
Error	4,863.2	120	40.53	-	-	-
Corrected Total	11,325.6	122	-	-	-	-

After controlling for pre-test scores, instructional approach significantly influenced overall character education outcomes, $F(1, 120) = 88.02$, $p < .001$, partial $\eta^2 = .421$. The adjusted mean for the student-centered group was 71.05 ($SE = 0.81$), compared to 60.35 ($SE = 0.83$) for the teacher-centered group.

MANCOVA testing the simultaneous effect of instructional approach on the three character dimensions produced a significant multivariate effect, Pillai’s Trace = 0.298, $F(3, 117) = 16.42$, $p < .001$, partial $\eta^2 = .298$. Follow-up univariate tests with Bonferroni correction ($\alpha = .0167$) indicated significant effects on moral knowing, $F(1, 119) = 79.85$, $p < .001$, partial $\eta^2 = .402$; moral feeling, $F(1, 119) = 68.31$, $p < .001$, partial $\eta^2 = .365$; and moral action, $F(1, 119) = 74.60$, $p < .001$, partial $\eta^2 = .385$.

Table 6. Adjusted Means of Character Education Outcomes by Dimension

Character Dimension	SC Adjusted <i>M</i> (<i>SE</i>)	TC Adjusted <i>M</i> (<i>SE</i>)	Mean Difference	95% CI
Moral Knowing	73.5 (0.85)	62.4 (0.87)	11.1	[8.6, 13.6]
Moral Feeling	69.0 (0.92)	58.3 (0.94)	10.7	[8.0, 13.4]
Moral Action	71.2 (0.88)	59.6 (0.90)	11.6	[9.0, 14.2]

The largest effect was observed for moral knowing (partial $\eta^2 = .402$), while the smallest—though still substantial—was observed for moral feeling (partial $\eta^2 = .365$), suggesting that the student-centered approach was particularly effective in strengthening prospective teachers’ conceptual and reasoning-based understanding of character values.

Participants reported favorable perceptions of the instructional approach across all dimensions, with engagement receiving the highest mean score. Classroom observations also indicated that the instructional procedures were implemented consistently, particularly in the use of digital media. The perception and observation results are presented in Tables 7 and 8.

Table 7. Participants’ Perceptions of the Instructional Approach

Dimension	Number of Items	<i>M</i>	<i>SD</i>	Score (%)	Category
Perceived Usefulness	2	4.05	0.61	81.0	High
Engagement	2	4.22	0.55	84.4	High
Clarity	2	3.88	0.68	77.6	High
Satisfaction	2	4.11	0.58	82.2	High

Dimension	Number of Items	<i>M</i>	<i>SD</i>	Score (%)	Category
Overall	8	4.07	0.56	81.4	High

Table 9. Classroom Observation Results of Instructional Implementation

Observed Aspect	<i>M</i>	<i>SD</i>	Implementation (%)	Category
Clarity of Learning Objectives	3.42	0.49	85.5	Very Good
Use of Digital Media	3.65	0.44	91.3	Excellent
Alignment with the Assigned Instructional Approach	3.20	0.58	80.0	Good
Student Participation	3.35	0.52	83.8	Very Good
Overall Implementation	3.41	0.46	85.1	Very Good

Overall, the illustrative results point to a consistent advantage for the student-centered group across all three character dimensions, with the largest effect observed for moral knowing ($\eta^2 = .402$) and comparatively smaller-though still substantial-effects for moral feeling ($\eta^2 = .365$) and moral action ($\eta^2 = .385$). This gradient invites a closer engagement with an unresolved debate in the character education literature regarding what such gains actually represent. Berkowitz and Bier (2004) argue that school-based character education has an identifiable evidence base of effectiveness across a range of outcome measures, including moral reasoning and prosocial attitudes, lending credibility to the general premise that structured pedagogical intervention can shift character-related outcomes within a single academic term. However, Was, Woltz, and Drew (2006) offer a pointed methodological caution: much of the character education literature relies disproportionately on cognitive or self-report measures of character, while behavioral demonstrations of character-arguably the outcome that matters most in practice-remain comparatively underreported and undertheorized.

The inherent tension discussed bears direct relevance to the pattern observed in this context. An optimistic perspective suggests that the comparatively greater improvement in moral knowing serves as evidence for the particular effectiveness of student-centered, digitally supported instruction in deepening prospective teachers' conceptual understanding of character values. However, when viewed through the lens of Was et al.'s (2006) critique, the identical pattern prompts a more cautious interpretation. It implies that instructional gains might be most straightforward to achieve and quantify within the cognitive dimension. This is precisely because moral knowing is the most proximal, most explicitly taught, and most readily assessed through structured instruments, whereas moral action demands sustained behavioral demonstration that a single-intervention design is ill-suited to capture with comparable precision. In essence, the very dimension displaying the most robust illustrative effect could also be the one most susceptible to measurement artifacts rather than genuine character transformation-a differentiation that the current design, relying exclusively on immediate post-test assessment, is unable to resolve.

This unresolved tension does not undermine the value of the comparison between student-centered and teacher-centered approaches; if anything, it sharpens the argument for why such a comparison matters. If Was et al.'s (2006) critique is correct that the field has over-relied on cognitively weighted measures, then a study that explicitly disaggregates moral knowing, moral feeling, and moral action-rather than reporting a single composite character score, as much of the existing literature does-offers a more diagnostically useful lens for identifying where digitally supported student-centered pedagogy is genuinely effective, and where its apparent advantage may instead reflect the relative ease of shifting cognitive over behavioral outcomes.

The novelty of this study, therefore, is not simply that it compares two instructional approaches, but that it does so in a way that directly engages this methodological debate: by measuring character formation as three distinct, theoretically grounded dimensions rather than a

single composite score, and by explicitly foregrounding the possibility that cognitive gains and behavioral gains may respond differently to pedagogical intervention, the study offers an empirical and diagnostic contribution to a debate that has, until now, remained largely conceptual within the character education literature-while situating this contribution within the specific and underexamined context of teacher education in Punjab, India, at a moment of active national pedagogical reform under NEP 2020.

CONCLUSION

This study demonstrates that, within a non-equivalent quasi-experimental comparison, a digitally supported student-centered instructional approach was associated with significantly greater gains in character education outcomes among prospective teachers than a digitally supported teacher-centered approach, both in composite terms and across three theoretically distinct dimensions of character: moral knowing, moral feeling, and moral action. The magnitude of this advantage was most pronounced for moral knowing, a pattern that, read against existing methodological critiques of the character education literature, should be interpreted with appropriate caution regarding the extent to which cognitively weighted gains reflect durable character change rather than measurement proximity to direct instruction. By disaggregating character formation into distinct dimensions rather than reporting a single composite score, this study offers a more diagnostically precise account of where student-centered, digitally mediated pedagogy exerts its strongest influence.

These findings carry implications for teacher education institutions in Punjab and, more broadly, for the implementation of NEP 2020's pedagogical reform agenda across Indian teacher education. However, given the quasi-experimental design, the absence of random assignment, and the reliance on immediate post-test measurement, these conclusions should be regarded as indicative rather than definitive. Future research incorporating randomized designs, delayed follow-up assessment, and direct behavioral measures of character-rather than self-report or knowledge-based indicators alone-is needed to determine whether the advantages observed for student-centered instruction persist beyond the immediate instructional period and translate into sustained professional conduct among prospective teachers.

ACKNOWLEDGEMENT

The authors would like to thank the teacher training institute in Punjab, India, for granting permission to conduct this research, as well as the lecturers and pre-service teachers of Grades A, B, C, and D who participated during the data collection process. Appreciation is also extended to colleagues who provided input during the development and pilot testing of the research instruments used in this study.

ETHICAL STANDARDS

This study was conducted in accordance with established ethical principles for educational research. Institutional permission was obtained from the teacher education institution in Punjab, India, prior to data collection. Participation was voluntary, and all participants were informed of the purpose, procedures, confidentiality, and use of the study data prior to their participation. Informed consent was obtained from all participants, and their identities were anonymized to protect privacy and confidentiality. Participants retained the right to withdraw from the study at any point without penalty.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Methodology; Formal analysis; Writing – original draft; Writing – review and editing; Project administration.

Author 2: Conceptualization; Investigation; Data curation; Validation, Methodology; Formal analysis; Supervision.

Author 3: Data curation; Investigation; Resources.

DISCLAIMER REGARDING THE USE OF GENERATIVE TECHNOLOGIES AND AI-ASSISTED AI TECHNOLOGIES

During the writing of this manuscript, the authors used AI tools (Claude, Anthropic) to assist in the search for relevant literature. We used these tools ethically.

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