

PREFACE TO THE EDITION

It is with great pleasure that we present the latest issue of the **International Journal of Teacher Education Research Studies (IJTERS)**, a scholarly platform dedicated to advancing research, innovation, and reflective practice in teacher education and educational development. This issue brings together a collection of insightful articles that address some of the most pressing concerns and emerging opportunities in contemporary educational environments. Collectively, these contributions highlight the evolving role of educators, institutions, and educational policies in fostering meaningful learning experiences and sustainable academic growth.

The opening article examines the critical issue of student mental health and well-being in higher education. Through a comprehensive review of contemporary literature, the study explores the complex interplay of psychological, social, institutional, and environmental factors influencing student well-being. The article offers valuable perspectives on creating supportive educational ecosystems that prioritize mental health as a cornerstone of student success.

The second contribution presents an innovative framework for integrating activity outcomes into Outcome-Based Education (OBE) assessment systems. By proposing a structured approach to incorporating extracurricular and extension activities into learning outcome evaluations, alongside the development of an automated Excel-based computational tool, the study offers practical solutions for educators seeking more holistic and inclusive assessment practices.

Technology continues to reshape educational landscapes across the globe, and the third article provides a timely review of technology integration in higher education. Drawing upon established theoretical models and recent developments in educational technology, the study examines the opportunities and challenges associated with digital learning environments, artificial intelligence, mobile learning, and collaborative technologies. The findings underscore the importance of aligning technological innovation with sound pedagogical principles and institutional readiness.

Assessment remains central to effective teaching and learning. The fourth article contributes to this discourse through an empirical investigation comparing formative and summative assessment practices in secondary education. The study demonstrates the positive impact of formative assessment on academic achievement, student motivation, self-efficacy, engagement, and reduced test anxiety. Its findings offer important implications for educators, policymakers, and curriculum designers seeking to enhance student learning outcomes.

The final article focuses on teacher professional development and its influence on instructional effectiveness and student achievement. By comparing high-intensity and low-intensity professional development models, the research provides compelling evidence that sustained, collaborative, and job-embedded professional learning experiences significantly contribute to improved teaching practices and educational outcomes. This study reinforces the vital role of continuous professional growth in strengthening educational quality.

Together, the articles featured in this issue reflect the dynamic and multifaceted nature of contemporary education. They demonstrate a shared commitment to evidence-based practice, innovation, inclusivity, and educational excellence. The insights presented herein offer valuable guidance for teacher educators, researchers, practitioners, institutional leaders, and policymakers striving to address the challenges and opportunities of twenty-first-century education.

We extend our sincere appreciation to all authors for their scholarly contributions, to the reviewers for their rigorous evaluations, and to the editorial team for their dedication in maintaining the quality and integrity of the journal. We trust that readers will find this issue both intellectually stimulating and practically relevant, inspiring further research and transformative educational practice.

Dr. Premachandran P
Chief editor

CONTENTS

SL. NO	TITLE	AUTHOR	PAGE NO
1	Student Mental Health and Well-Being in Higher Education	Jeeva Chacko	37-42
2	Integrating Activity Outcome into an Outcome Based Assessment framework and development of an excel computational tool: a Sotl approach	Joby Cyriac & Sunil Job K. A	43-49
3	Technology Integration in Higher Education: A Theoretical and Literature Review	Sundaravally	50-54
4	Formative Versus Summative Assessment Practices and Their Effects on Student Achievement, Self-Efficacy, and Motivation in Secondary Schools	Anitha N V	55-59
5	The Impact of High-Intensity Teacher Professional Development on Instructional Effectiveness and Student Achievement in Secondary Schools	Vincent	60-65



INTERNATIONAL JOURNAL OF TEACHER EDUCATION RESEARCH STUDIES (IJTERS)

(Open Access, Double-Blind Peer Reviewed Journal)

ISSN Online: 3049-1614



Student Mental Health and Well-Being in Higher Education

Jeeva Chacko

Principal, St. Mary's Arts and Science College, Cherupanathady, India.

Article information

Received: 5th March 2026

Received in revised form: 11th April 2026

Accepted: 13th May 2026

Available online: 18th June 2026

Volume: 3

Issue: 2

DOI: <https://doi.org/10.63090/IJTERS/3049.1614.0033>

Abstract

Student mental health and well-being have emerged as among the most urgent concerns confronting higher education institutions in the twenty-first century. Escalating rates of anxiety, depression, and psychological distress among university students have prompted calls for systemic, evidence-informed institutional responses. This theoretical and literature review synthesizes peer-reviewed research published between 2005 and 2025 to examine the multidimensional determinants of student mental health, the theoretical frameworks that inform institutional responses, and the evidence base for campus-based mental health interventions. Drawing on key frameworks including the biopsychosocial model, Self-Determination Theory (SDT), and Bronfenbrenner's ecological systems theory, the review critically evaluates the interplay of individual, relational, institutional, and societal factors that shape student psychological well-being. Key themes addressed include the prevalence and nature of mental health challenges among university students, the role of academic stress, social connectedness, financial hardship, and identity-related stressors, as well as the efficacy of counseling services, early intervention programs, and whole-university approaches to mental health promotion. The review concludes that isolated, clinically oriented responses are insufficient and that sustainable improvements in student well-being require coordinated, prevention-oriented, and structurally attentive institutional strategies.

Keywords: - Student Mental Health, Well-Being, Higher Education, Self-Determination Theory, Biopsychosocial Model, Ecological Systems Theory, Campus Counseling, Psychological Distress, Academic Stress.

I. INTRODUCTION

Higher education institutions have long been regarded as sites of intellectual growth, social development, and personal transformation. Yet over the past two decades, a mounting body of research has documented a parallel and deeply troubling trend: a significant and sustained deterioration in the mental health and psychological well-being of university students worldwide. Surveys conducted across North America, Europe, Australia, and Asia consistently report that substantial proportions of students experience clinically significant symptoms of anxiety, depression, and psychological distress during their time at university (Auerbach et al., 2018; Eisenberg et al., 2011). The World Health Organization's World Mental Health International College Student Initiative, which surveyed over 14,000 students across eight countries, found that approximately one in three first-year students met diagnostic criteria for at least one common mental health disorder (Auerbach et al., 2018).

These figures represent not merely a statistical concern but a profound human and institutional challenge. Mental health difficulties are among the strongest predictors of academic underperformance, withdrawal, and failure to complete degrees (Eisenberg et al., 2009; Storrie et al., 2010). They also carry enduring consequences for individuals' occupational functioning, relationship quality, and long-term health trajectories (Kessler et al., 2005). For institutions committed to student success and social equity, the imperative to understand and address the determinants of student mental health is therefore both ethical and strategic.

Despite growing institutional awareness and investment in campus counseling and mental health services, the evidence suggests that demand for support consistently outpaces available provision (Gallagher, 2014; Mowbray et al., 2006). This gap has intensified calls for a shift away from purely clinical, reactive models toward broader, prevention-oriented approaches that

address the environmental, relational, and structural conditions shaping student well-being (Keyes et al., 2012; Stallman, 2010). Central to this shift is the need for theoretically grounded frameworks that illuminate the complex, multilevel determinants of mental health in the university context.

This literature review is structured around five major sections. The first examines the prevalence and nature of mental health challenges among university students. The second reviews the principal theoretical frameworks informing the field. The third explores key determinants of student mental health, including academic stress, social connectedness, financial hardship, and identity-related factors. The fourth evaluates the evidence base for campus-based interventions. The fifth synthesizes key findings and proposes directions for future research and institutional practice.

II. PREVALENCE AND NATURE OF STUDENT MENTAL HEALTH CHALLENGES

2.1. Anxiety and Depression

Anxiety and depression are the most frequently reported mental health conditions among university students. Eisenberg et al. (2011) analyzed data from over 14,000 students at 26 U.S. universities and found that approximately 17% of students met screening criteria for depression and 10% for anxiety disorders, with considerably higher rates among students who had sought prior treatment. A comprehensive meta-analysis by Ibrahim et al. (2013), pooling data from 24 studies across 13 countries, reported a pooled prevalence of depression among university students of approximately 31%, substantially higher than age-matched population estimates in many national contexts.

The COVID-19 pandemic markedly exacerbated these trends. Studies conducted during the pandemic consistently documented sharp increases in symptoms of anxiety, depression, and loneliness among students as a consequence of social isolation, financial insecurity, disruption to academic routines, and uncertainty about the future (Hamza et al., 2020; Son et al., 2020). Hamza et al. (2020), surveying over 2,000 Canadian undergraduates during the early months of the pandemic, found that more than half reported moderate to severe symptoms of depression and anxiety, representing a dramatic increase from pre-pandemic baseline surveys.

2.2. Psychological Distress and Suicidality

Beyond diagnosable disorders, a broad spectrum of psychological distress, encompassing stress, burnout, emotional exhaustion, and impaired well-being, affects large segments of the student population (Stallman, 2010). Kessler et al. (2005) highlighted that the transition to adulthood, which coincides for many individuals with the university years, represents a peak period for the onset of mental health disorders, underscoring the particular developmental vulnerability of this population.

Suicidality represents the most acute manifestation of student mental health crisis. Mortier et al. (2018), analyzing data from the WHO World Mental Health International College Student Initiative, found that 20.3% of first-year students reported lifetime suicidal ideation and 9.4% reported lifetime suicide attempts. These figures are particularly striking given that the college years represent the life stage during which mental health conditions most commonly emerge, and they underscore the moral urgency of institutional prevention and response frameworks.

III. THEORETICAL FRAMEWORKS

3.1. The Biopsychosocial Model

Originally proposed by Engel (1977) as a challenge to the reductive biomedical model of illness, the biopsychosocial model posits that health and well-being are determined by the dynamic interaction of biological, psychological, and social factors. Applied to student mental health, this framework directs attention beyond individual psychopathology toward the broader social and institutional conditions in which students are embedded. Biological vulnerabilities such as genetic predispositions to anxiety or depression interact with psychological factors such as perfectionism, rumination, and self-efficacy, and with social factors such as peer relationships, institutional climate, and socioeconomic circumstances to produce mental health outcomes (Stallman, 2010).

The biopsychosocial model has been influential in shifting university mental health policy and practice away from purely clinical, illness-oriented frameworks toward more comprehensive approaches that acknowledge the institutional and social co-determinants of student distress (Keyes et al., 2012). It provides the conceptual foundation for whole-university approaches to mental health promotion, which seek to modify the environmental and cultural conditions of campus life rather than simply treating individual students who present in distress.

3.2. Self-Determination Theory (SDT)

Self-Determination Theory, developed by Deci and Ryan (2000), offers a motivational framework with significant implications for understanding student well-being. SDT proposes that psychological well-being is contingent on the satisfaction of three basic psychological needs: autonomy (the experience of volition and self-endorsement in one's actions), competence (the experience of effectiveness and mastery), and relatedness (the experience of meaningful connection with others). When these needs are satisfied within the academic environment, students are more likely to experience intrinsic motivation, engagement, and positive well-being; when they are frustrated, distress, disengagement, and ill-being are the likely consequences.

A substantial body of empirical research has applied SDT to the higher education context, consistently finding that need satisfaction mediates the relationship between institutional practices and student well-being outcomes. Niemiec and Ryan (2009) reviewed SDT-based research in educational settings and concluded that autonomy-supportive teaching practices, which provide students with meaningful choice, rationale for academic tasks, and acknowledgment of their perspectives, are positively associated with intrinsic motivation, academic engagement, and psychological well-being. Conversely, controlling

instructional environments that undermine student autonomy are associated with increased anxiety, diminished self-esteem, and reduced vitality.

3.3. Bronfenbrenner's Ecological Systems Theory

Bronfenbrenner's (1979) ecological systems theory provides a multilevel framework for conceptualizing the nested environmental contexts that shape human development and well-being. The theory identifies a series of concentric systems, from the microsystem (immediate settings such as family, peers, and classrooms) through the mesosystem (interactions among microsystems), exosystem (broader social structures), and macrosystem (cultural values, policies, and ideologies), to the chronosystem (the dimension of time and historical change).

Applied to student mental health, ecological systems theory draws attention to the multiple levels at which interventions can and should operate. At the microsystem level, the quality of student-faculty relationships, peer social networks, and residential community environments all constitute significant influences on well-being (Hurtado et al., 2012). At the mesosystem level, the coherence and coordination among academic departments, student services, and counseling provisions shapes the quality of institutional support available to students in distress. At the macrosystem level, broader cultural attitudes toward mental health help-seeking, stigma, and the commodification of higher education shape the contexts in which student distress is experienced and expressed (Wynaden et al., 2014).

IV. KEY DETERMINANTS OF STUDENT MENTAL HEALTH

4.1. Academic Stress and Performance Pressure

Academic stress is among the most consistently documented antecedents of psychological distress among university students. The demands of coursework, examination pressure, time management challenges, and uncertainty about academic performance create chronic stressors that tax students' coping resources and contribute to anxiety, depression, and burnout (Beiter et al., 2015; Robotham & Julian, 2006). Beiter et al. (2015), surveying undergraduate students at a U.S. university, identified academic performance as the single greatest source of student stress, endorsed by over 68% of respondents.

The rise of perfectionism as a culturally sanctioned orientation toward academic achievement has received particular scholarly attention. Curran and Hill (2019) conducted a meta-analysis of perfectionism trends among college students across three decades and found significant increases in all three dimensions of perfectionism, particularly socially prescribed perfectionism, that is, the perception that others hold unrealistically high standards for one's performance. Socially prescribed perfectionism was the dimension most strongly associated with depression, anxiety, and suicidal ideation, suggesting that the broader cultural environment of competitive higher education may itself be a significant contributor to student psychological distress.

4.2. Social Connectedness and Belonging

A robust evidence base supports the conclusion that social connectedness, encompassing the quality of peer relationships, sense of belonging, and integration into campus community, is a protective factor of central importance for student mental health. Strayhorn (2012) conceptualized belonging as a fundamental human need that, when met within the university environment, promotes academic motivation, persistence, and well-being. Conversely, loneliness and social isolation have been identified as among the strongest predictors of depression and anxiety in student populations (Segrin & Passalacqua, 2010).

The transition to university is a particularly vulnerable period for social connectedness, as students navigate the disruption of existing social networks and the challenge of forming new relationships in an unfamiliar environment. First-generation college students, international students, and students from underrepresented minority backgrounds frequently report lower levels of campus belonging and higher levels of social isolation, reflecting the ways in which institutional cultures and social structures can differentially distribute the protective benefits of community membership (Hurtado et al., 2012).

4.3. Financial Hardship

Financial stress represents a significant and often underappreciated determinant of student mental health. The rising cost of higher education, compounded by student loan debt, housing insecurity, food insecurity, and the need to engage in paid employment alongside full-time study, creates material conditions that substantially elevate psychological risk (Eisenberg et al., 2009; Richardson et al., 2017). Richardson et al. (2017), in a systematic review of financial difficulties and student mental health, found consistent associations between financial stress and poor mental health outcomes, with effects that persisted even after controlling for pre-existing mental health conditions.

Students from low-income backgrounds bear a disproportionate mental health burden associated with financial hardship. These students must simultaneously navigate the academic demands of higher education and the material precarity of insufficient financial resources, often without access to the social capital and family support that buffer more advantaged students against stress. The intersection of financial hardship with other marginalized social positions, including being a first-generation student, a student of color, or a student with caring responsibilities, compounds this burden considerably (Strayhorn, 2012).

4.4. Identity, Diversity, and Marginalization

A growing strand of research has examined the mental health implications of identity and social marginalization within university contexts. Students who belong to groups historically underrepresented or marginalized in higher education, including racial and ethnic minority students, LGBTQ+ students, students with disabilities, and international students, frequently report elevated rates of psychological distress associated with experiences of discrimination, microaggressions,

cultural alienation, and the psychological burden of navigating institutional environments not designed with their experiences in mind (Holley & Steeley, 2017; Wynaden et al., 2014).

Minority stress theory, originally developed by Meyer (2003) to account for the excess burden of psychological distress experienced by sexual minorities, has been extended to a range of marginalized student populations. The theory identifies chronic stressors specific to minority status, including prejudice events, expectations of rejection, internalized stigma, and identity concealment, as proximal causes of mental health disparities. For universities genuinely committed to equity and inclusion, addressing the structural and cultural conditions that generate minority stress is therefore a matter of both moral obligation and mental health strategy.

V. CAMPUS-BASED MENTAL HEALTH INTERVENTIONS

5.1. Counseling and Clinical Services

Campus counseling centers represent the most established institutional response to student mental health need. However, the demand for counseling services consistently and substantially exceeds available provision at most institutions, resulting in long waiting times, session limits, and the triage of only the most acute presentations (Gallagher, 2014). These structural constraints mean that counseling services, while essential, cannot on their own constitute an adequate institutional response to the breadth and depth of student mental health need.

Stepped-care models have been proposed as a more resource-efficient approach to organizing campus mental health provision. In a stepped-care framework, students are matched to the lowest intensity of support that is likely to be effective for their level of need, with pathways for escalation to more intensive interventions if initial provision proves insufficient (Keyes et al., 2012). This approach integrates self-help resources, peer support programs, brief psychological interventions, and specialist clinical services into a coherent continuum of care, potentially extending institutional reach while optimizing the use of specialist resources.

5.2. Whole-University Approaches

Increasingly influential in the international literature is the concept of the whole-university approach to mental health, sometimes framed as the mentally healthy university model. This approach, drawing on public health principles and ecological systems theory, frames student mental health as a shared institutional responsibility rather than the exclusive domain of specialist clinical services. It calls for coordinated action across the full range of university functions, including curriculum design, campus culture, student services, academic policies, and community partnerships, to create environments that actively promote student well-being rather than simply responding to distress (Thorley, 2017).

Evidence for the effectiveness of whole-university approaches is accumulating, though the field is still developing robust evaluation methodologies suited to complex, multilevel interventions. Stallman (2010) argued that the dominant clinical orientation of campus mental health services reflects a fundamental category error: treating what is, in significant part, a public health and institutional design problem as though it were a clinical one. Reframing student mental health in population and ecological terms, she contended, is a prerequisite for developing responses commensurate with the scale of the challenge.

5.3. Peer Support and Digital Interventions

Peer support programs, in which trained student volunteers provide non-clinical mental health support to fellow students, have grown considerably in scope and sophistication in recent years. These programs capitalize on the well-documented influence of peer relationships on student well-being and help-seeking behavior, and they represent a cost-effective mechanism for extending institutional reach beyond formal clinical services (Byrom, 2018). Evidence suggests that peer supporters can effectively reduce stigma, facilitate early help-seeking, and provide meaningful emotional support, provided that they receive adequate training, supervision, and institutional backing.

Digital mental health interventions, including web-based and mobile application platforms for psychological self-help, mindfulness, and cognitive-behavioral skill building, have attracted growing research attention as scalable complements to face-to-face provision. Davies et al. (2014) conducted a meta-analysis of internet-delivered cognitive-behavioral therapy (iCBT) for depression and anxiety and found effect sizes comparable to those of face-to-face delivery, particularly when guided by a therapist or coach. The appeal of digital interventions for student populations is considerable, given their accessibility, anonymity, flexibility around study schedules, and potential to reduce the stigma associated with help-seeking.

VI. DISCUSSION

The literature reviewed in the preceding sections reveals a field grappling with a challenge of considerable complexity and urgency. Student mental health is not a monolithic or static phenomenon but a dynamic outcome shaped by the interplay of individual vulnerabilities, relational contexts, institutional structures, and broader sociocultural forces. The theoretical frameworks reviewed here, particularly the biopsychosocial model, Self-Determination Theory, and ecological systems theory, collectively underscore that any adequate institutional response must be multilevel, prevention-oriented, and structurally attentive.

A central tension emerging from the literature is the gap between the scale of student mental health need and the predominantly clinical, individually oriented frameworks through which that need is most commonly addressed. As Stallman (2010) and others have persuasively argued, the framing of student distress primarily as individual psychopathology requiring clinical treatment tends to individualize what are in significant part structural problems, locating the source of distress in the student rather than in the conditions of their institutional experience. The growing evidence base for whole-university approaches represents an important corrective to this tendency, though substantial methodological and implementation challenges remain.

The equity dimensions of student mental health are particularly salient and deserve explicit institutional attention. The evidence consistently shows that mental health burden is not uniformly distributed across student populations but is disproportionately concentrated among students who occupy marginalized social positions. Financial hardship, minority stress, and the absence of culturally responsive institutional support each contribute to differential mental health outcomes that mirror and reproduce broader social inequalities (Meyer, 2003; Strayhorn, 2012). Institutions that frame mental health promotion as separate from equity and inclusion agendas risk missing the structural determinants of the disparities they observe.

Finally, the evidence highlights the important role of the relational dimensions of campus life in shaping student well-being. The quality of student-faculty relationships, peer social networks, and sense of institutional belonging emerge consistently across theoretical frameworks and empirical studies as significant protective factors. These relational dimensions are not incidental to institutional functioning but are constitutive of the educational environment itself, suggesting that the promotion of student mental health is not separable from the quality of teaching, community life, and institutional culture more broadly.

VII. CONCLUSION

This literature review has synthesized theoretical and empirical research on student mental health and well-being in higher education, examining the prevalence and nature of psychological distress, the theoretical frameworks that inform understanding and intervention, the key determinants of student mental health, and the evidence base for campus-based interventions. The review finds broad convergence in the literature around several conclusions: that rates of student psychological distress are high and have increased over recent decades; that mental health is determined by multiple interacting factors at individual, relational, and structural levels; that current institutional responses are insufficient in scale and scope; and that sustainable progress requires a fundamental reorientation from reactive, clinical provision toward proactive, whole-university approaches.

For institutional leaders and policymakers, the evidence reviewed here supports significant investment in coordinated, prevention-oriented mental health strategies that engage the full range of university functions. For researchers, the field would benefit from more robust longitudinal designs, participatory methodologies that center student voices, and evaluation frameworks capable of capturing the complex, multilevel effects of whole-university interventions. For faculty and student-facing staff, the literature underscores the importance of creating relational, autonomy-supportive academic environments and developing the awareness and skills to recognize and respond to student distress.

Ultimately, the mental health of university students is not a peripheral concern or a specialist clinical problem but a central indicator of the quality and humanity of higher education institutions. Meeting the challenge of student mental health in the twenty-first century will require the sustained commitment of institutions that understand well-being not as an add-on to their educational mission but as its indispensable foundation.

REFERENCES

- Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., & Kessler, R. C. (2018). WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology*, 127(7), 623–638. <https://doi.org/10.1037/abn0000362>
- Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & Sammut, S. (2015). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *Journal of Affective Disorders*, 173, 90–96.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.
- Byrom, N. (2018). An evaluation of a peer support intervention for student mental health. *Journal of Mental Health*, 27(3), 240–246. <https://doi.org/10.1080/09638237.2018.1437605>
- Curran, T., & Hill, A. P. (2019). Perfectionism is increasing over time: A meta-analysis of birth cohort differences from 1989 to 2016. *Psychological Bulletin*, 145(4), 410–429. <https://doi.org/10.1037/bul0000138>
- Davies, E. B., Morris, R., & Glazebrook, C. (2014). Computer-delivered and web-based interventions to improve depression, anxiety, and psychological well-being of university students: A systematic review and meta-analysis. *Journal of Medical Internet Research*, 16(5), Article e130. <https://doi.org/10.2196/jmir.3142>
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- Eisenberg, D., Golberstein, E., & Hunt, J. B. (2009). Mental health and academic success in college. *The B.E. Journal of Economic Analysis & Policy*, 9(1), 1–37. <https://doi.org/10.2202/1935-1682.2191>
- Eisenberg, D., Hunt, J., & Speer, N. (2011). Mental health in American colleges and universities: Variation across student subgroups and across campuses. *Journal of Nervous and Mental Disease*, 199(2), 60–67.
- Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science*, 196(4286), 129–136. <https://doi.org/10.1126/science.847460>
- Gallagher, R. P. (2014). *National survey of college counseling centers 2014*. International Association of Counseling Services.
- Hamza, C. A., Ewing, L., Heath, N. L., & Goldstein, A. L. (2020). When social isolation is nothing new: A longitudinal study on psychological distress during COVID-19 among university students with and without preexisting mental health concerns. *Canadian Psychology*, 62(1), 20–30. <https://doi.org/10.1037/cap0000255>
- Holley, L. C., & Steeley, S. L. (2017). Microaggressions and the mental health of minority students. In A. W. Blume (Ed.), *Social issues in living color: Challenges and solutions from the perspective of ethnic minority psychology* (Vol. 2, pp. 1–26). Praeger.
- Hurtado, S., Alvarez, C. L., Guillermo-Wann, C., Cuellar, M., & Arellano, L. (2012). A model for diverse learning environments: The scholarship on creating and assessing conditions for student success. *Higher Education: Handbook of Theory and Research*, 27, 41–122. https://doi.org/10.1007/978-94-007-2950-6_2
- Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research*, 47(3), 391–400.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62(6), 593–602. <https://doi.org/10.1001/archpsyc.62.6.593>

- Keyes, C. L. M., Eisenberg, D., Perry, G. S., Dube, S. R., Kroenke, K., & Dhingra, S. S. (2012). The relationship of level of positive mental health with current mental disorders in predicting suicidal behavior and academic impairment in college students. *Journal of American College Health*, 60(2), 126–133. <https://doi.org/10.1080/07448481.2011.608393>
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, 129(5), 674–697. <https://doi.org/10.1037/0033-2909.129.5.674>
- Mortier, P., Cuijpers, P., Kiekens, G., Auerbach, R. P., Demyttenaere, K., Green, J. G., & Bruffaerts, R. (2018). The prevalence of suicidal thoughts and behaviours among college students: A meta-analysis. *Psychological Medicine*, 48(4), 554–565. <https://doi.org/10.1017/S0033291717002215>
- Mowbray, C. T., Megivern, D., Mandiberg, J. M., Strauss, S., Stein, C. H., Collins, K., & Lett, R. (2006). Campus mental health services: Recommendations for change. *American Journal of Orthopsychiatry*, 76(2), 226–237. <https://doi.org/10.1037/0002-9432.76.2.226>
- Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), 133–144.
- Richardson, T., Elliott, P., & Roberts, R. (2017). The relationship between personal unsecured debt and mental and physical health: A systematic review and meta-analysis. *Clinical Psychology Review*, 33(8), 1148–1162.
- Robotham, D., & Julian, C. (2006). Stress and the higher education student: A critical review of the literature. *Journal of Further and Higher Education*, 30(2), 107–117. <https://doi.org/10.1080/03098770600617513>
- Segrin, C., & Passalacqua, S. A. (2010). Functions of loneliness, social support, health behaviors, and stress in association with poor health. *Health Communication*, 25(4), 312–322. <https://doi.org/10.1080/10410231003773334>
- Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research*, 22(9), Article e21279. <https://doi.org/10.2196/21279>
- Stallman, H. M. (2010). Psychological distress in university students: A comparison with general population data. *Australian Psychologist*, 45(4), 249–257. <https://doi.org/10.1080/00050067.2010.482109>
- Storrie, K., Ahern, K., & Tuckett, A. (2010). A systematic review: Students with mental health problems: A growing problem. *International Journal of Nursing Practice*, 16(1), 1–6.
- Strayhorn, T. L. (2012). *College students' sense of belonging: A key to educational success for all students*. Routledge.
- Thorley, C. (2017). *Not by degrees: Improving student mental health in the UK's universities*. Institute for Public Policy Research.
- Wynaden, D., Wichmann, H., & Murray, S. (2014). A synopsis of the mental health concerns of university students: Results of a text-based online survey from one Australian university. *Higher Education Research & Development*, 33(1), 168–181.



INTERNATIONAL JOURNAL OF TEACHER EDUCATION RESEARCH STUDIES (IJTERS)

(Open Access, Double-Blind Peer Reviewed Journal)

ISSN Online: 3049-1614



Integrating Activity Outcome into an Outcome Based Assessment Framework and Development of an Excel Computational Tool: A SoTL Approach

Sunil Job K. A¹, Joby Cyriac²

¹ Associate Professor, Marian College Kuttikkanam, Autonomous, Kerala, India

² Assistant Professor, Marian College Kuttikkanam, Autonomous, Kerala, India

Article information

Received: 3rd June 2026

Received in revised form: 5th June 2026

Accepted: 10th June 2026

Available online: 18th June 2026

Volume: 3

Issue: 2

DOI: <https://doi.org/10.63090/IJTERS/3049.1614.0034>

Abstract

Assessment of students with respect to the learning outcome is of vital importance for ensuring the level of attainment of learner in terms of Course level outcomes and Program level outcome in the context of Outcome Based Education. For an inclusive assessment of these outcomes, it is essential that the activity outcome related to various clubs, forums and other extension activities should be effectively integrated with the assessment process. These multifarious activities create a real platform for experiential learning. Hence combining all the activities related to Sports, Arts and Extension will be indispensable for an overall development of learner, enhancing student engagement and scaling the attainment of desired learning outcome. Integration of the Activity Outcome with the Program level outcome posed a number of challenges due to the higher level of flexibility and autonomy of the learner in selecting the pathway of learning. In this paper we have attempted to suggest a framework where we could generate a program matrix based on students' choice of options with respect to the curricular and extracurricular activities from a program level grid, and standardization of the assessments with respect to the predetermined threshold number of indicators to ensure the level of attainment of the outcomes. An excel based automated tool is also developed using the computation algorithm and its efficiency is tested using a Scholarship of teaching and learning (SoTL) approach by validating its practicability and usability among the peer instructors. The results of the analysis of the responses from the stakeholders / peer instructors seems to be very encouraging. Very high positive means with respect to effectiveness, usage and satisfaction level among the peer evaluators indicate stakeholders' confirmation of the assessment strategy and effectiveness of the developed tool.

Keywords: - Scholarship of Teaching and Learning (SoTL), Program Outcomes POs, Program Specific Outcomes PSOs, Activity Outcome AOs, Component Activity Outcome CAO, Outcome Mapping, Mapping Threshold.

I. INTRODUCTION

The evolving scenario of higher education have witnessed a drastic change in its approach and practices. The paradigm shifts from traditional objective based to outcome based have Posed a number of challenges among the stakeholders in the higher education sector. One major challenge in the implementation of outcome-based education is the assessment of the attainment of outcome when the students are given flexibility in the selection of diverse courses and activities. Moreover, as per the latest curriculum revision the students are given autonomy to select multidisciplinary course of study in various pathways according to their choice. In this context a standardized program matrix for the estimation of the Program Outcome is not possible. Furthermore, diversification of curriculum and inclusion of multiple activities and experiential learning opportunities is considered as valuable avenues for fostering all-round development and porting the learning experiences to higher order thinking skills. Hence for a successful implementation of Outcome Based Education it is important to develop a framework that could accommodate various activity outcomes and the flexibility of the student's choice in computation of the level of attainment of Program outcomes.

Besides it has become imperative to have a tool by which we could lessen the effort of documentation and calibration of the activity outcomes and integrating it with the direct assessment for the estimation of Program Outcomes.

This study seeks to identify a feasible approach for computation of the attainment of activity outcome and to integrate it with direct assessment in the OBE process. A SoTL based approach is considered as a better way to develop a model and to ensure its practicability and effectiveness in estimation of outcomes within the framework of outcome-based education.

To ensure a scholarly and comprehensive study on Outcome-Based Education (OBE) within the higher education institution (HEI) context, various scholarly works and journals have been consulted, both from Indian and global perspective. For a complete understanding of the possibilities the following resources are utilized.

Singh and Sachdeva's (2019) examination of Outcome-Based Education implementation and perspectives in the Indian context, focusing on assessment practices tailored to OBE frameworks.

Pai and Adiga's (2017) primer on Outcome-Based Education practices within India, offering insights into curriculum design, assessment methods, and their alignment with industry requirements, particularly focusing on assessing activity outcomes.

Chandrasekhar and Ramaswamy's (2016) examination of Outcome-Based Education implementation and assessment strategies, particularly emphasizing the assessment of activity outcomes and their integration with direct assessment methods within Indian educational settings.

Nair and Paul's (2015) handbook on Outcome-Based Education assessment strategies, which discusses various techniques aligned with OBE principles, including assessing activity outcomes and integrating them with direct assessment methods.

Additionally, globally notable works such as:

Biggs and Tang (2011), who advocate for constructive alignment in teaching, emphasizing the alignment of intended learning outcomes, teaching activities, and assessment tasks, thus highlighting the importance of assessing activity outcomes within an OBE framework.

Boud and Falchikov's (2006) review on aligning assessment with long-term learning goals, providing strategies for assessing activity outcomes and integrating them with direct assessment methods to foster deep learning and meaningful student engagement within an OBE framework.

Wiggins and McTighe's (2005) seminal work on Understanding by Design (UbD), stressing the significance of designing curriculum and assessments based on desired learning outcomes, thus offering insights into aligning assessments with activity outcomes and integrating them within the OBE framework.

Knight and Yorke's (2003) exploration of the nexus between assessment, learning, and employability, underscoring the importance of assessing activity outcomes within an OBE framework and integrating them with direct assessment methods to enhance student employability skills.

1.1. Research Questions

The purpose of this SoTL study is to develop a framework of integrating multifarious activities related to curricular and extracurricular in the computation of Program Outcomes. The study focuses to direct the instructors in the following aspects

- How can activity outcomes be effectively integrated into the existing OBE framework for comprehensive program outcome computation?
- How do different types of activity outcomes (e.g., club participation, arts engagement, sports involvement, extension activities) contribute to the attainment of program-level outcomes?
- What strategies and best practices can be implemented to facilitate the integration of activity outcomes into the assessment framework of OBE for program outcome computation?
- Development of an automated tool in excel for the documentation and calculation of Activity Outcome with automated reports on Attainments of Outcomes
- Opinion from the stakeholders (teachers) regarding the assessment strategy and the excel based automated tool adopted in computation of Activity Outcomes and their views regarding the integration of the activity outcome with the assessment of POs and PSOs.

II. PROPOSED FRAMEWORK FOR ACTIVITY OUTCOME ASSESSMENT

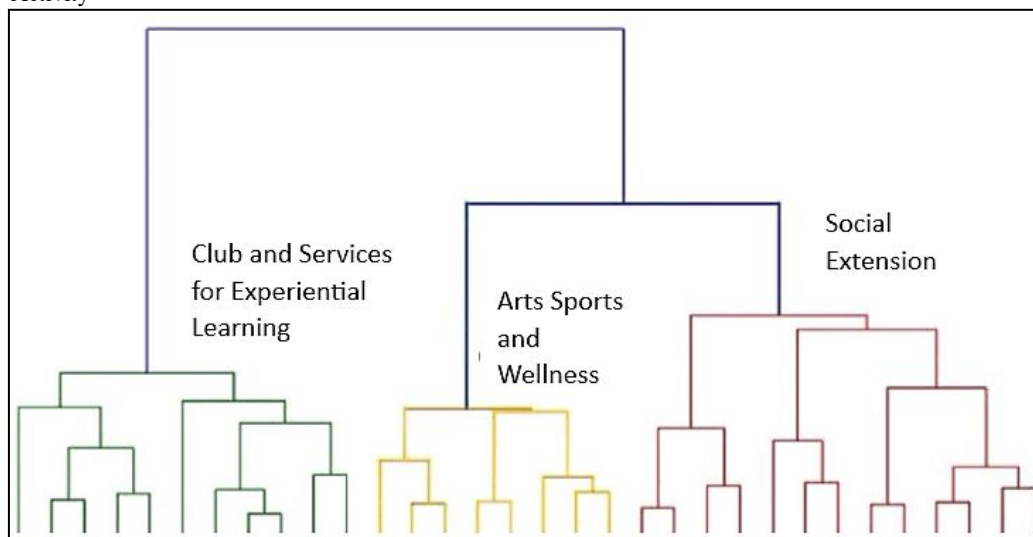
2.1. Key Principles of the Framework

- Assessments applicable to all type of curricular and extra-curricular activities
- Data to be tracked from continuous monitoring and documentation with respect to all activities considered for assessment
- Assessment rubric to evaluate and score students' performance in terms of level of participation is done.

2.2. Activity Clustering

In order to bring diversity in the participating activities by the students, it will be good practice to Bin the club related (Clustering) or other cocurricular and extracurricular activities into various Bins that have some common characteristics and ensure students participation from every Bins. A suggestive way of binning the activities as detailed below can be done using a dendrogram as given below. Here the 3 Bins or activity Cluster could be paired in terms of Competency enhancement, fitness and well being and social extension

Fig 1: Dendrogram for clustering of various activities into Clubs, Art & Sports and Social Extension related Activity



2.3. Activity Outcome mapping to POs and PSOs

The various activity outcomes related to Club and Services, Arts – Sports and wellness and Social Extension activities should be mapped with the respective POs and PSOs in a binary scale of whether it addresses or not. The mapping matrix could be designed as in Table 1.

Table 1: Matrix of Mapping of AO1 and its component Activity Outcomes to respective POs and PSOs

AO ₁	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PSO ₁	PSO ₂	PSO ₃
AO1.1	1			1			1			1	
AO1.2	1	1					1				
AO1.3		1		1					1		
AO1.4	1								1		
AO1.5		1		1						1	
AO ₁	1	1		1			1		1	1	

Here AO1.1, AO1.2.....AO1.5 are outcome related to the various activity conducted by the Clubs/forums. The cells with 1 indicate that the Activity (the outcome corresponding to the specific activity) is related to the respective POs and PSOs. On consolidation of the mapping of the component activities (outcomes) to an overarching parent outcome AO₁, we shall consider that AO₁ as equally addressing the PO₁, PO₂, PO₄, PO₇, PSO₁ and PSO₂. This consolidation of the number of activity outcome to a parent Activity outcome related to the club or forum could reduce the complexity of calculation and representation of the Activity Outcome.

2.4. Assessment Rubrics

For standardization of the assessment of various activities and to have a uniform assessment pattern we can adopt the following rubrics to score the performance and involvement of the participants in related activities. This rubric could be altered as per the norms and policies of the institution

Table 2: Assessment Rubrics indicating the various level of performance and involvement of students related to various activity and the corresponding scores they gain.

Level of participation	Description	Score
Level 0	Non-Participation and non-involvement	0
Level 1	Participation in the events	1.5
Level 2	Organizing of the event	2
Level 3	Winning of any events at college level	2.5
Level 4	Winning at intercollege level and above	3

2.5. Computation of Activity Outcomes

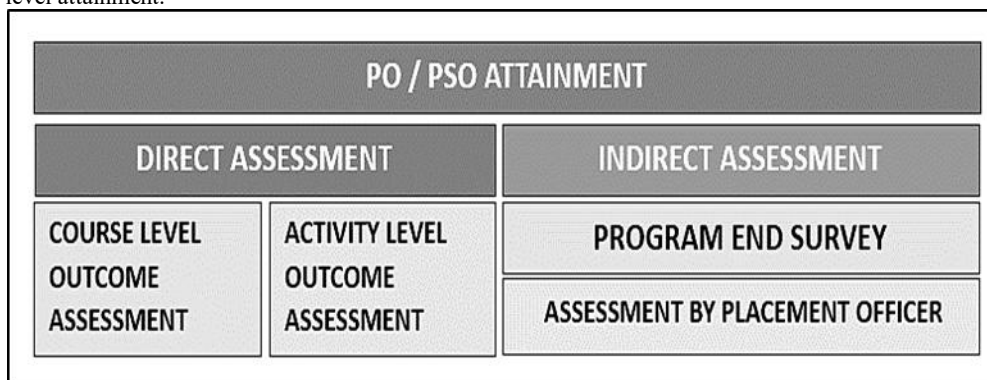
AO attainment will be calculated at the end a year (2 semester). A minimum number of Activities related to any club/sports/social extension may be fixed say (5 Activities). The performance of the student with respect to each activity is assessed using the standardized rubrics and documented.

- Attainment of AO1 with respect to a student = Average of the attainment of the student with respect to various activities (activity 1 to activity 5) could be considered as a measure of the level of attainment of that Activity Outcome.

2.6. Integration of Activity outcomes to POs and PSOs

The attainment scores of the AO₁ could be transferred to all the POs that the component outcomes of AO1 addresses with an equal weightage. In table 1, AO₁ is addressing PO₁, PO₂, PO₄, PO₇, PSO₁ and PSO₂. In this case the attainment score of AO₁ can be equally distributed to all these Program Outcomes. For the final estimation of the POs and PSOs in order bring a standardization to the calculation process a threshold (a minimum number of scores needed to make the POs and PSOs mature for estimation of the final Program Outcomes) may be pre-defined.

Fig 2: Schematic representation of the assessment process that led to the computation of the POs/PSOs level attainment.



- Attainment Score of POs (Direct Assessment) = Average of (Top scoring, threshold number of COs/AOs that are connected to the corresponding POs/PSOs)

3. DEVELOPMENT OF EXCEL BASED COMPUTATIONAL TOOL

An excel based prototype calculation engine based on the framework detailed in this paper is developed to facilitate the attainment calculation of Activity Outcome. This model offers an easy-to-use interface and an authentic computation system for calculation of the activity outcome attainment and distributing the AO component to the various POs to which the activity is related.

3.1. Data entry

The model has separate interfaces to document student data, Activity Outcomes and its component outcomes, binary mapping of the component outcomes to the respective POs and the mark entry page to document the level of involvement of students in various activity as per the rubrics.

3.2. Algorithms

The model uses the appropriate algorithms and statistical technique as detailed in this paper for computation of Activity Outcomes scores. The model provides flexibility to customize the calculation procedure in accordance with the requirement of various assessment practices.

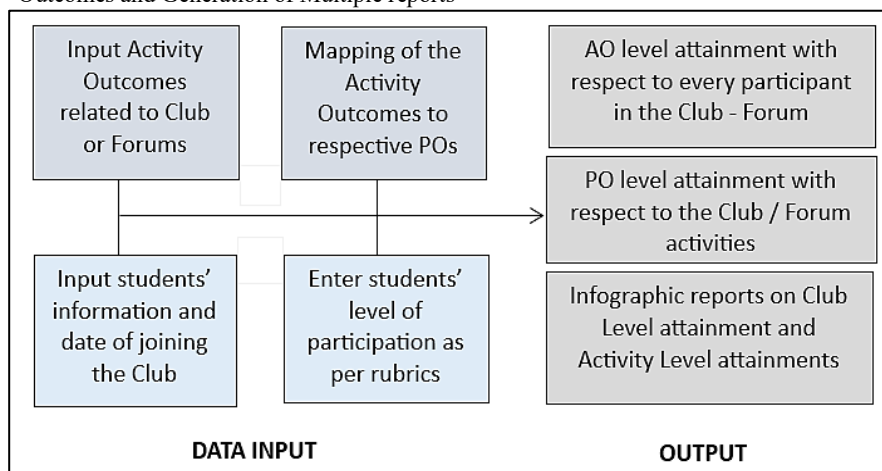
3.3. Analytics

The model calibrates the attainment of the students and generates report to showcase the attainment of the class with respect to various Activity Outcome. The mapping of the activity outcomes to the respective POs in a binary format is integrated with this model, hence we get a student wise distribution of the attainment scores with respect to the various POs to which the Activity Outcome is related. This helps the user to integrate the Activity outcome attainment with the other Course level attainment in calculation of the final attainment score of POs and PSOs. Moreover, we have reports on club wise performance with respect to each activity and the average performance level in each activity and distribution of the students with respect high, moderate and low level of performance and involvement in the activity.

3.4. Customization

The model could be customised to various scale in par with the requirement of the stakeholders and assessment scenario. The calculation algorithms and the nature of the reports can also be customised to the specific requirement of the user.

Fig 3: Process flow of the Excell based automated model for estimation of Activity Outcomes and Generation of Multiple reports



IV. STAKEHOLDER VALIDATION THROUGH SoTL APPROACH

The mean score of the response for each statement based on the Likert scale from the group of 63 club conveners who used the tool for the computation of AO is collected. The category of response is scored with a weightage of 1 to 5 from negative to positive and the summary of the analysis is given in the table 3

Table 3: The mean score of the opinion of the stakeholders towards the various statement towards the usage of the Excel tool for computation of Activity Outcomes.

Statements from Questionnaire	Mean
To what extent did you find the features of the Excel-based tool helpful in facilitating the assessment process?	4.14
How effectively did the Excel-based tool generate reports and visualizations to interpret assessment data and identify trends?	4.27
To what extent do you believe that the Excel-based assessment tool aligns with the objectives and outcomes of the assessments?	4.1
How confident are you in the validity of the assessment data generated by the Excel-based tool?	4.24
How confident are you in the reliability of the assessment data generated by the Excel-based tool?	4.32
How would you rate the overall usefulness and value of the Excel-based assessment tool in assisting you with student assessment and analysis?	4.32
Overall, how satisfied are you with the Excel-based assessment tool?	4.22
How user-friendly did you find the Excel-based assessment tool for entering student assessment data and conducting analysis?	4.37
How clear and comprehensive were the instructions and guidance provided with the Excel-based tool for conducting assessments?	4.21
How likely are you to recommend the Excel-based assessment tool to other teachers or colleagues for use in their assessment practices?	4.38

Analysing the responses of the various club conveners it is found that the average score of all responses is much higher than the neutral response score of 3. This indicates that there is a very high level of positive response towards the model among conveners of various clubs and activities.

Further on clustering these Statements in terms of Effectiveness, Satisfaction and Usability, the mean score of the observation is given in table 4.

Table 4: The mean score of the opinion of the stakeholders when aggregated in terms of various criteria namely Effectiveness, Satisfaction and Usage

Sl. No	Criteria	Mean
1	Effectiveness	4.17
2	Usage	4.32
3	Satisfaction	4.28

On analysis of the responses with respect to various category – Effectiveness, Usage and Satisfaction it is observed that the average score of response of the stakeholders with respect to the category Effectiveness, Usage and Satisfaction are 4.17, 4.32 and 4.28 respectively and is much higher than the neutral response score of 3. This indicates that the opinion of the opinion of the stakeholders towards the automated tool with respect to the foresaid criteria are fairly high.

Furthermore, the correlation coefficient of each pair of items within each category is calculated to ascertain the internal consistency and validity of the responses within the category.

Table 5: Correlation Coefficient of the statement related of (Efficiency)

Items	1	4	9
1. How user-friendly	1		
4. How clear and comprehensive	0.891	1	
9. How likely to recommend	0.954	0.885	1

Table 6: Correlation Coefficient of the statement related of (Usage)

Items	3	6	7
3. How effective reports	1		
6. Confidence in validity	0.901	1	
7. Confidence in reliability	0.956	0.896	1

Table 7: Correlation Coefficient of the statement related of (Satisfaction)

Items	2	5	8	10
2. How helpful features	1			
5. Alignment with objectives	0.981	1		
8. Overall usefulness	0.957	0.965	1	
10. Overall satisfaction	0.881	0.938	0.889	1

In all of the above table 5, table 6 and table 7 The correlation coefficient with respect to pair of items within each category is much high indicating that all the items within the category are consistent and the response of the conveners are valid.

V. RELIABILITY ANALYSIS OF THE QUESTIONNAIRE

Cronbach's alpha for each category namely usage, efficiency and satisfaction are computed by calculating the variance of each item within the category and the total variance across all items and by applying the Cronbach's alpha formula.

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum_{i=1}^k \sigma_i^2}{\sigma_x^2} \right)$$

The calculated value of Cronbach alpha for ensuring the reliability of the questionnaire is given is table 8

Table 8: Cronbach alpha for the usage, efficiency and satisfaction

Subcategory	N	Items	Cronbach's alpha
Efficiency	63	3	0.942
Usage	63	3	0.917
Satisfaction	63	4	0.871

It is found that for the Category Efficiency and Usage the Cronbach's alpha value is much high above 0.9 which is a very excellent value which indicating that the tool is highly reliable in estimate of Efficiency and Usage. Also, that the Cronbach's value for Satisfaction is 0.871 which also fair value showing a high level of consistency for the criteria satisfaction.

VI. DISCUSSION

The primary focus of this study is to suggest a framework for assessment of activity outcomes and integration of diversified activity outcome into the computation of Program Outcomes. The main challenge in this regard is that due to flexibility in selection of the various club related activity a standardized program matrix for a program cannot be prepared. In this study we have suggested a program grid that accommodate all set of activities and courses irrespective of open or elective to be listed in the program grid. For the computation of PO level attainment of each student a dynamic student level program matrix should be generated (as per the pathway adopted by the student in his course of study). For standardization of the computation of POs and PSOs a threshold that is a benchmark that declares a minimum number of activities or course outcomes that is necessary for the calculation of program level outcomes. By the tenure of his study the student should ensure that his program matrix (as per his selected pathway) meet the minimum essential requirement as per the threshold fixed for each program level outcomes.

Comprehensiveness of the assessment and inclusiveness of all the Activity Outcome component into the computation of POs and PSOs, it is suggested that the major outcome related to the club or forums may be further subdivided into component outcomes and map these component outcomes to the overarching program outcomes in a binary scale (whether it address or not) of 1 or 0. Further we could combine all the component outcomes mapping to a single line mapping which showcase the mapping of the parent Activity Outcome to the respective POs

A club can organize any number of activities, for each activity the level of participation of each student of the club should be assessed in line with the standardized rubric to gauge the performance and participation of the students. The rubric can be prepared a per the norms and standards identified by the college. The average score of performance of the students

across various activities is considered as the AO level attainment and it will be equally distributed to all POs and PSOs that the Parent AO addresses. For facilitating the documentation and calculation of the outcome we have developed a excel based tool customized in line with the algorithm for computation of Activity Outcome.

For validation of the process and the developed tool, stakeholders' opinion is collected through peer review and by administering a questionnaire focusing on efficiency, usage and satisfaction of the system. The high positive mean scores for each questionnaire item and very high average scores across effectiveness, usage, and satisfaction indicate strong stakeholder endorsement towards the assessment framework and the developed tool.

The high correlation coefficients and Cronbach's alpha values within the subcategories of effectiveness, usage, and satisfaction demonstrate the internal consistency and reliability of the questionnaire.

In conclusion, this study offers a significant contribution to the assessment of Outcomes in an OBE scenario. The rigidity of the traditional framework by considering a standardized program matrix can be replaced by much more practical and flexible assessment procedure by developing a program grid and dynamic student-centred program matrix according to the selected pathway of study. Moreover, an evidence-based approach (SoTL) was adopted to gauge the practicability and efficiency of the suggested framework and the developed tool in providing a workable solution in the outcome-based assessment process.

REFERENCES

- Boud, D., & Falchikov, N. (2006). Aligning assessment with long-term learning. *Assessment & Evaluation in Higher Education*, 31(4), 399–413.
- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university: What the student does*. McGraw-Hill Education (UK).
- Chandrasekhar, N. B., & Ramaswamy, A. (2016). *Outcome-based education: Implementation and assessment strategies*. I. K. International Publishing House Pvt. Ltd.
- Knight, P. T., & Yorke, M. (2003). *Assessment, learning and employability*. McGraw-Hill Education (UK).
- Nair, B. V., & Paul, R. (2015). *A handbook for outcome-based education assessment strategies*. I. K. International Publishing House Pvt. Ltd.
- Pai, M. S., & Adiga, A. (2017). *Outcome based education: A primer*. Tata McGraw-Hill Education.
- Singh, J., & Sachdeva, J. K. (2019). *Outcome-based education: Implementation and perspectives in Indian context*. Springer.
- Wiggins, G., & McTighe, J. (2005). *Understanding by design*. Association for Supervision and Curriculum Development. (ASCD).



INTERNATIONAL JOURNAL OF TEACHER EDUCATION RESEARCH STUDIES (IJTERS)

(Open Access, Double-Blind Peer Reviewed Journal)

ISSN Online: 3049-1614



Technology Integration in Higher Education: A Theoretical and Literature Review

Sundaravally

Assistant Professor, Department of Education, Manonmaniam Sundaranar University, Abhishekapatti, Tirunelveli, Tamil Nadu, India.

Article information

Received: 6th March 2026

Received in revised form: 13th April 2026

Accepted: 17th May 2026

Available online: 18th June 2026

Volume: 3

Issue: 2

DOI: <https://doi.org/10.5281/zenodo.20792352>

Abstract

The rapid proliferation of digital technologies has fundamentally transformed the landscape of higher education, compelling institutions to re-examine pedagogical approaches, institutional frameworks, and student engagement strategies. This theoretical and literature review examines the multidimensional nature of technology integration in higher education settings, synthesizing empirical and theoretical literature published between 2010 and 2025. Drawing on foundational frameworks including the Technological Pedagogical Content Knowledge (TPACK) model, the Technology Acceptance Model (TAM), and the Community of Inquiry (CoI) framework, this paper critically evaluates how digital tools including Learning Management Systems (LMS), Artificial Intelligence (AI)-driven platforms, mobile learning, and collaborative technologies influence teaching effectiveness, student outcomes, and institutional change. The review further identifies persistent barriers to effective technology integration such as digital equity, faculty readiness, and pedagogical alignment, while proposing evidence-based recommendations for policy and practice. Findings suggest that successful technology integration is contingent not merely on access to tools but on a systemic alignment of pedagogy, professional development, and institutional culture. The paper concludes with a forward-looking agenda for research and practice in educational technology within higher education.

Keywords: - Technology Integration, Higher Education, TPACK, Technology Acceptance Model, Learning Management Systems, Digital Pedagogy, Faculty Development, Artificial Intelligence in Education.

I. INTRODUCTION

The intersection of technology and education has been a subject of sustained scholarly inquiry for several decades, yet the pace of digital transformation experienced over the past fifteen years has elevated this conversation to one of the most pressing issues in contemporary higher education. Institutions of higher learning worldwide are grappling with the dual imperatives of preparing graduates for a rapidly evolving digital economy while simultaneously leveraging technology to enhance the quality, accessibility, and equity of education (Selwyn, 2017). The COVID-19 pandemic further accelerated this trajectory, compelling even the most tradition-bound institutions to adopt remote and hybrid instructional modalities virtually overnight (Hodges et al., 2020).

Technology integration in higher education encompasses a broad spectrum of practices and tools, from the deployment of Learning Management Systems (LMS) such as Canvas and Blackboard, to sophisticated applications of Artificial Intelligence (AI), augmented reality, and adaptive learning platforms. However, the mere presence of technology within educational settings does not automatically yield improved learning outcomes. A substantial body of literature underscores the critical importance of pedagogical intentionality, the deliberate and theoretically grounded use of technology to support specific learning objectives (Mishra & Koehler, 2006; Garrison et al., 2010).

The theoretical underpinnings of technology integration are varied and robust. Foundational frameworks such as the Technological Pedagogical Content Knowledge (TPACK) model (Mishra & Koehler, 2006), the Technology Acceptance Model (TAM) (Davis, 1989), and the Community of Inquiry (CoI) framework (Garrison et al., 2010) have each contributed

distinctive lenses through which educators and researchers can understand and evaluate the complex dynamics of technology use in teaching and learning. These frameworks, individually and in combination, have generated a rich empirical literature that continues to evolve in response to emerging technological paradigms.

Despite the promise that technology holds, significant challenges remain. Issues of digital equity and access, faculty resistance and inadequate professional development, the risk of pedagogical misalignment, and institutional inertia represent formidable obstacles to meaningful and sustained technology integration (Ertmer & Ottenbreit-Leftwich, 2010; Warschauer & Matuchniak, 2010). These challenges are not merely technical but are deeply sociocultural and organizational in nature, requiring systemic responses that transcend the procurement of devices or software.

This literature review is organized around four major thematic areas:

- Theoretical frameworks guiding technology integration
- Key technologies and their applications in higher education
- Barriers and enablers of effective technology integration
- Future directions for research and practice.

The review draws on peer-reviewed journal articles, book chapters, and seminal theoretical works published predominantly between 2010 and 2025, with selected foundational sources from earlier periods where warranted.

II. THEORETICAL FRAMEWORKS FOR TECHNOLOGY INTEGRATION

2.1. Technological Pedagogical Content Knowledge (TPACK)

Perhaps the most widely cited framework in educational technology research, TPACK was introduced by Mishra and Koehler (2006) as an extension of Shulman's (1986) Pedagogical Content Knowledge (PCK) model. TPACK posits that effective technology integration requires teachers to develop three interlocking forms of knowledge: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). The intersections of these domains, particularly the Technological Pedagogical Content Knowledge at the core, represent the nuanced understanding that educators must cultivate to use technology meaningfully in subject-specific instruction.

In the context of higher education, TPACK has been applied to faculty development programs, curriculum design, and instructional evaluation. Voogt et al. (2013) conducted a systematic review of TPACK-based studies and found that faculty who received targeted professional development grounded in TPACK demonstrated significantly higher levels of technology integration quality compared to those who received only technical training. Similarly, Koh et al. (2014) identified that lecturers with higher TPACK scores produced more student-centered learning environments when using technology, underscoring the framework's explanatory and predictive value.

2.2. Technology Acceptance Model (TAM)

Originally developed by Davis (1989) in the context of information systems, TAM has become a foundational framework for understanding why individuals adopt or resist new technologies. The model identifies two key determinants of technology adoption: perceived usefulness (the degree to which a technology is believed to enhance performance) and perceived ease of use (the degree to which using a technology is free of effort). These perceptions, in turn, influence users' behavioral intentions and actual technology use.

TAM has been extensively applied in higher education research to study the adoption of LMS platforms, mobile learning applications, and online course tools. Scherer et al. (2019) conducted a meta-analysis of 114 TAM-based studies in higher education and found that perceived usefulness was consistently the stronger predictor of adoption intentions, though perceived ease of use remained significant, particularly for novice users. Subsequent extensions of TAM, including TAM2 (Venkatesh & Davis, 2000) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), have incorporated additional constructs such as social influence and facilitating conditions, further enriching the model's applicability to complex educational environments.

2.3. Community of Inquiry (CoI) Framework

The Community of Inquiry framework, developed by Garrison et al. (2010), provides a comprehensive model for understanding the nature of online and blended learning experiences in higher education. The framework posits that meaningful educational experiences emerge from the interaction of three interdependent presences: cognitive presence (the extent to which learners can construct meaning through sustained communication), social presence (the ability to project one's self socially and emotionally in a community of inquiry), and teaching presence (the design, facilitation, and direction of cognitive and social processes).

The CoI framework has been particularly influential in the design and evaluation of online and blended courses in higher education. Arbaugh et al. (2008) validated the CoI survey instrument across multiple disciplines and found strong reliability and construct validity, confirming the framework's applicability across diverse academic contexts. More recently, the framework has been extended to account for emerging technologies such as AI-facilitated discussions and virtual reality environments (Cleveland-Innes & Campbell, 2012), suggesting its continued relevance in an era of rapid technological change.

III. KEY TECHNOLOGIES AND THEIR APPLICATIONS IN HIGHER EDUCATION

3.1. Learning Management Systems (LMS)

Learning Management Systems represent the most pervasive form of educational technology in higher education today. Platforms such as Blackboard, Canvas, Moodle, and D2L Brightspace serve as centralized hubs for course content delivery,

communication, assessment, and analytics. Dahlstrom and Bichsel (2014) reported that over 99% of higher education institutions in the United States had adopted an LMS, and similar patterns have been documented globally (Brown et al., 2015).

The educational impact of LMS adoption, however, is contingent on how these systems are used. Research consistently distinguishes between digitizing the classroom, that is, simply uploading static content, and genuinely transforming pedagogy through interactive features such as discussion forums, collaborative tools, formative quizzes, and learner analytics (Newhouse, 2014). Coates et al. (2005) found that students in courses with high LMS engagement reported greater satisfaction and deeper learning compared to those in courses where LMS use was minimal or superficial. The role of instructor design choices is therefore paramount: LMS tools are pedagogically neutral; their impact depends on the intentionality of their deployment.

3.2. Artificial Intelligence in Higher Education

The integration of Artificial Intelligence (AI) into higher education represents one of the most significant and complex technological developments of the current era. AI applications in education, ranging from intelligent tutoring systems and adaptive learning platforms to natural language processing-based feedback tools and large language models (LLMs), hold immense promise for personalizing learning, automating administrative tasks, and generating data-driven insights about student progress (Zawacki-Richter et al., 2019).

Zawacki-Richter et al. (2019) conducted a systematic review of AI applications in higher education and identified four primary domains: profiling and prediction of student performance, intelligent tutoring, virtual facilitators, and systematic reviews themselves. Their findings indicate that while AI tools have demonstrated efficacy in personalized feedback and early-warning systems for at-risk students, ethical concerns around data privacy, algorithmic bias, and academic integrity remain inadequately addressed in both research and institutional policy. The emergence of generative AI tools such as large language models has further intensified debates about authorship, critical thinking, and the fundamental purposes of higher education (Kasneci et al., 2023).

3.3. Mobile Learning (m-Learning)

The ubiquity of smartphones and tablet devices has given rise to mobile learning (m-learning) as a distinct and growing domain within educational technology. M-learning refers to the use of mobile devices to facilitate learning experiences that are portable, personalized, and often contextually embedded in real-world environments (Crompton, 2013). In higher education, m-learning applications span a wide range, from course-specific apps and mobile-optimized LMS interfaces to augmented reality field tools and collaborative annotation platforms.

Crompton and Burke (2018) conducted a systematic review of m-learning in higher education and found that its most significant impacts were observed in science, technology, engineering, and mathematics (STEM) fields, where mobile devices facilitated data collection, simulations, and real-time collaboration. However, the authors cautioned that effective m-learning requires careful pedagogical scaffolding and that uninstructed mobile use in classrooms frequently results in distraction rather than engagement. The challenge, then, is not the technology itself but the cultivation of digital literacies and structured learning designs that harness the unique affordances of mobile devices.

3.4. Collaborative and Interactive Technologies

Beyond individual tools, a significant strand of literature focuses on how collaborative and interactive technologies, including video conferencing platforms (e.g., Zoom, Microsoft Teams), synchronous polling tools (e.g., Poll Everywhere, Mentimeter), and shared digital workspaces (e.g., Google Workspace, Padlet), reshape the social dimensions of learning in higher education. These tools are particularly relevant to active learning pedagogies such as flipped classrooms, problem-based learning, and collaborative inquiry.

Freeman et al. (2014) conducted a meta-analysis of 225 studies comparing active learning to traditional lecturing in undergraduate STEM courses and found that active learning approaches, many of which were technology-mediated, produced significantly higher achievement gains and reduced failure rates. The role of technology in these contexts is not merely to transmit information but to create collaborative structures that facilitate peer interaction, formative feedback, and the co-construction of knowledge, hallmarks of constructivist pedagogy (Vygotsky, 1978).

IV. BARRIERS AND ENABLERS OF EFFECTIVE TECHNOLOGY INTEGRATION

4.1. Faculty Readiness and Professional Development

A recurring theme in the literature is the critical role of faculty readiness in determining the quality of technology integration. Ertmer and Ottenbreit-Leftwich (2010) distinguished between first-order barriers (external factors such as access, time, and institutional support) and second-order barriers (internal factors such as beliefs, attitudes, and subject culture). Their analysis argued that second-order barriers are considerably more resistant to change and represent the most significant impediment to transformative technology use.

Professional development programs that address both technical skills and pedagogical beliefs have been shown to be more effective than those that focus solely on tool competency (Prestridge, 2012). Garrison and Kanuka (2004) further emphasized that faculty development must be grounded in reflective practice and supported by institutional cultures that value innovation and tolerate experimentation. The absence of such cultures represents a systemic barrier that no amount of technical training can fully overcome.

4.2. Digital Equity and Access

While technology holds the potential to democratize access to higher education, it also risks exacerbating existing

inequalities if not deployed with explicit attention to equity. The digital divide, that is, the gap between those with meaningful access to digital technologies and those without, operates along multiple dimensions, including economic resources, geographic location, disability status, and prior educational experience (Warschauer & Matuchniak, 2010).

The pandemic starkly illuminated these inequities, as millions of students globally struggled to participate in emergency remote teaching due to inadequate devices, unreliable internet connectivity, or domestic environments unsuited to online study (Hodges et al., 2020). Selwyn (2017) argued that any meaningful account of technology in education must grapple with these structural inequalities, cautioning against techno-utopian narratives that frame digital tools as inherently emancipatory without addressing the social conditions of their use.

4.3. Pedagogical Alignment and Instructional Design

A persistent finding in the literature is that technology integration fails to produce meaningful learning gains when it is not aligned with sound instructional design principles. The concept of technology for technology's sake, referring to the adoption of tools primarily because they are novel or institutionally mandated rather than because they address specific pedagogical needs, represents a particularly pernicious form of misalignment (Newhouse, 2014).

Effective instructional design in technology-enhanced environments requires adherence to established principles such as Gagne's (1985) conditions of learning, Merrill's (2002) first principles of instruction, and constructivist alignment (Biggs & Tang, 2011). These frameworks collectively emphasize that technologies should be selected and deployed in service of clearly articulated learning outcomes and that assessment, instruction, and technology use should be coherently aligned within a broader curricular architecture.

V. DISCUSSION

Synthesizing the literature reviewed in the preceding sections, several overarching themes emerge that carry significant implications for both theory and practice in higher education. First, the evidence consistently supports the view that technology integration is a complex, multidimensional phenomenon that cannot be reduced to the mere adoption of digital tools. As Mishra and Koehler (2006) compellingly argued, meaningful technology integration requires the simultaneous development of content, pedagogical, and technological knowledge, a demanding and context-sensitive endeavor that resists simple prescriptions.

Second, the literature underscores the irreducible importance of human agency in technology-enhanced learning environments. Technologies such as AI-driven adaptive systems and intelligent tutoring tools offer powerful capabilities for personalization and feedback, but their effectiveness is mediated by faculty design choices, institutional policies, and student dispositions toward technology (Zawacki-Richter et al., 2019; Kasneci et al., 2023). The CoI framework's emphasis on teaching presence (Garrison et al., 2010) is particularly relevant here: even in highly automated learning environments, the educator's role in shaping the cognitive and social conditions of learning remains indispensable.

Third, the equity dimensions of technology integration demand sustained scholarly and institutional attention. The digital divide is not a problem that dissolves with the passage of time or the proliferation of devices; rather, it is reproduced and reconfigured by each new wave of technological change (Warschauer & Matuchniak, 2010; Selwyn, 2017). Institutions that aspire to use technology to expand educational opportunity must therefore invest not only in infrastructure and devices but in the broader social and economic conditions that determine who can meaningfully benefit from digital education.

Finally, the literature points to the need for institutional cultures that support ongoing experimentation, reflective practice, and collaboration among faculty, instructional designers, and technologists. The most successful technology integration initiatives documented in the literature share a common feature: they are embedded in communities of professional practice in which knowledge about technology is shared, critiqued, and refined over time (Garrison & Kanuka, 2004; Prestridge, 2012).

VI. CONCLUSION

This literature review has examined the theoretical foundations and empirical landscape of technology integration in higher education, with particular attention to the dominant frameworks, key technologies, and persistent barriers that characterize this field. The review finds that while the evidence for the benefits of well-designed technology integration is substantial, these benefits are neither automatic nor universal. They are contingent upon a complex interplay of technological affordances, pedagogical intentionality, faculty expertise, institutional support, and equitable access.

For practitioners, the implications are clear: technology should be selected and deployed in deliberate service of specific learning objectives, guided by established theoretical frameworks, and supported by robust professional development and institutional infrastructure. For researchers, the field would benefit from greater methodological diversity, longitudinal designs, and sustained attention to the equity dimensions of technology use, dimensions that are frequently acknowledged but insufficiently foregrounded in the existing literature.

As higher education continues to navigate the opportunities and disruptions of the digital age, the challenge is not to determine whether to integrate technology but how to do so in ways that are pedagogically sound, equitably accessible, and genuinely transformative for all students. Meeting that challenge will require the sustained collaboration of researchers, educators, policymakers, and institutional leaders, a community of inquiry in the fullest sense of the term.

REFERENCES

- Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education*, 11(3–4), 133–136.
- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university* (4th ed.). Open University Press.

- Brown, M., Dehoney, J., & Millichap, N. (2015). *The next generation digital learning environment: A report on research*. EDUCAUSE Learning Initiative.
- Cleveland-Innes, M., & Campbell, P. (2012). Emotional presence, learning, and the online learning environment. *The International Review of Research in Open and Distributed Learning*, 13(4), 269–292. <https://doi.org/10.19173/irrodl.v13i4.1234>
- Coates, H., James, R., & Baldwin, G. (2005). A critical examination of the effects of learning management systems on university teaching and learning. *Tertiary Education and Management*, 11(1), 19–36. <https://doi.org/10.1080/13583883.2005.9967137>
- Crompton, H. (2013). A historical overview of mobile learning: Toward learner-centered education. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 3–14). Routledge.
- Crompton, H., & Burke, D. (2018). The use of mobile learning in higher education: A systematic review. *Computers & Education*, 123, 53–64.
- Dahlstrom, E., & Bichsel, J. (2014). *ECAR study of students and information technology*. EDUCAUSE Center for Analysis and Research.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255–284. <https://doi.org/10.1080/15391523.2010.10782551>
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410–8415. <https://doi.org/10.1073/pnas.1319030111>
- Gagné, R. M. (1985). *The conditions of learning and theory of instruction* (4th ed.). Holt, Rinehart and Winston.
- Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. *The Internet and Higher Education*, 13(1–2), 5–9.
- Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95–105.
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*. <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning>
- Kasneci, E., Sessler, K., Kuchemann, S., Bannert, M., Dementieva, D., Fischer, F., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, Article 102274.
- Koh, J. H. L., Chai, C. S., & Tsai, C.-C. (2014). Demographic factors, TPACK constructs, and teachers' perceptions of constructivist-oriented TPACK. *Journal of Educational Technology & Society*, 17(1), 185–196.
- Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, 50(3), 43–59. <https://doi.org/10.1007/BF02505024>
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054.
- Newhouse, C. P. (2014). A framework to articulate the value of project-based learning to employers of graduates. *Journal of Education and Work*, 27(3), 335–352.
- Prestridge, S. (2012). The beliefs behind the teacher that influences their ICT practices. *Computers & Education*, 58(1), 449–458.
- Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, 128, 13–35.
- Selwyn, N. (2017). *Education and technology: Key issues and debates* (2nd ed.). Bloomsbury Academic.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. <https://doi.org/10.1287/mnsc.46.2.186.11926>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
- Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge: A review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109–121. <https://doi.org/10.1111/j.1365-2729.2012.00487.x>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education*, 34(1), 179–225.
- Zawacki-Richter, O., Marin, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, 16, Article 39. <https://doi.org/10.1186/s41239-019-0171-0>



Formative Versus Summative Assessment Practices and Their Effects on Student Achievement, Self-Efficacy, and Motivation in Secondary Schools

Anitha N V

Retired HM, G. L P S Karikkinmedu, Kerala, India.

Article information

Received: 8th March 2026

Received in revised form: 10th April 2026

Accepted: 12th May 2026

Available online: 18th June 2026

Volume: 3

Issue: 2

DOI: <https://doi.org/10.5281/zenodo.20794036>

Abstract

This quantitative study examined the differential effects of formative and summative assessment practices on secondary school students' academic achievement, academic self-efficacy, test anxiety, student engagement, and intrinsic motivation. Using a quasi-experimental, nonequivalent comparison group design, data were collected from 364 students (Grade 9-12) enrolled in eight secondary schools across two school districts in a mid-sized metropolitan region. Students were assigned to one of two conditions: classrooms employing predominantly formative assessment strategies ($n = 186$) or classrooms employing predominantly summative assessment strategies ($n = 178$). A one-semester intervention period was followed by collection of outcome data through standardized achievement tests, validated self-report scales, and administrative records. Multivariate analysis of variance (MANOVA) revealed statistically significant differences across all five outcome variables, with students in formative assessment classrooms demonstrating higher academic achievement ($M = 74.82$ vs. 68.37 , $d = 0.65$), higher self-efficacy ($d = 0.62$), lower test anxiety ($d = 0.93$), greater engagement ($d = 0.62$), and higher intrinsic motivation ($d = 0.71$) compared to their peers in summative assessment classrooms. Moderation analyses indicated that the benefits of formative assessment were particularly pronounced for students from low-income backgrounds. Findings have significant implications for assessment policy, teacher professional development, and instructional design in secondary education contexts.

Keywords: - Formative Assessment, Summative Assessment, Academic Achievement, Self-Efficacy, Test Anxiety, Student Engagement, Intrinsic Motivation, Quasi-Experimental

I. INTRODUCTION

Assessment is widely recognized as one of the most powerful levers available to educators for shaping student learning, motivation, and achievement. The question of how assessment is designed and deployed, and for what purposes, lies at the heart of enduring debates in educational policy and practice. Two broad paradigms have dominated secondary school assessment discourse: formative assessment, which is embedded in ongoing instruction and designed to provide feedback that guides learning; and summative assessment, which is administered at the conclusion of instructional units to evaluate and certify student achievement (Black & Wiliam, 1998; Harlen, 2005).

The distinction between these two assessment paradigms is not merely technical but reflects fundamentally different assumptions about the purposes of assessment, the nature of learning, and the role of feedback in educational processes. Proponents of formative assessment argue that its emphasis on ongoing feedback, student self-regulation, and instructional adaptation produces superior learning outcomes and more positive motivational profiles compared to predominantly summative approaches (Black & Wiliam, 1998; Hattie & Timperley, 2007). Critics of summative-heavy assessment cultures contend that high-stakes testing environments elevate test anxiety, undermine intrinsic motivation, and create conditions more conducive to performance-avoidance goal orientations than to genuine intellectual engagement (Harlen & Deakin Crick, 2003; Ryan & Brown, 2005).

Despite a robust theoretical literature and a substantial body of small-scale qualitative and mixed-methods research supporting the benefits of formative assessment, large-scale quantitative studies comparing the two paradigms in secondary school contexts remain relatively scarce. The majority of existing quantitative research has been conducted at the primary

school level or in higher education, leaving a significant empirical gap at the secondary level, where assessment pressures are acutely felt and where assessment practices have the most direct bearing on students' academic trajectories and postsecondary opportunities (Kingston & Nash, 2011; Wiliam, 2011).

The present study addresses this gap by examining the differential effects of formative and summative assessment practices on five key outcome variables among secondary school students: academic achievement, academic self-efficacy, test anxiety, student engagement, and intrinsic motivation. The study employs a quasi-experimental, nonequivalent comparison group design across eight secondary schools in two school districts, with a one-semester intervention period.

1.1. Research Questions and Hypotheses

The study was guided by the following research questions:

- RQ1: Are there statistically significant differences in academic achievement between secondary school students in formative assessment classrooms and those in summative assessment classrooms?
- RQ2: Are there statistically significant differences in academic self-efficacy, test anxiety, student engagement, and intrinsic motivation between the two groups?
- RQ3: Does socioeconomic status moderate the relationship between assessment condition and student outcomes?

Based on the extant literature, it was hypothesized that students in formative assessment classrooms would demonstrate significantly higher academic achievement, self-efficacy, engagement, and intrinsic motivation, and significantly lower test anxiety, compared to students in summative assessment classrooms (H1). It was further hypothesized that the benefits of formative assessment would be more pronounced for students from low-income backgrounds (H2), consistent with findings suggesting that formative feedback disproportionately benefits students with fewer external academic support resources (Wiliam, 2011).

II. LITERATURE REVIEW

2.1. Formative Assessment: Theoretical Foundations and Evidence

Formative assessment, also described as assessment for learning, encompasses a range of practices through which evidence of student learning is elicited, interpreted, and used by teachers and students to make instructional and learning decisions (Black & Wiliam, 1998; Wiliam, 2011). The seminal meta-analysis by Black and Wiliam (1998), reviewing over 250 studies, reported effect sizes of between 0.4 and 0.7 standard deviations for formative assessment interventions on student achievement, among the largest effects documented for any educational intervention at the time. These findings catalyzed a global policy movement toward embedding formative assessment practices within classroom instruction.

Hattie and Timperley's (2007) influential model of feedback provides a theoretical framework for understanding how formative assessment produces its effects. The model distinguishes four levels at which feedback operates: task, process, self-regulation, and self. Feedback directed at the task and process levels, which characterizes effective formative assessment, is associated with enhanced learning, while feedback directed at the self level (praise or criticism of the learner as a person) is typically ineffective or counterproductive. Consistent with Self-Determination Theory (Deci & Ryan, 2000), feedback that supports students' sense of competence and autonomy, both hallmarks of well-implemented formative assessment, is predicted to enhance intrinsic motivation and engagement.

2.2. Summative Assessment and Its Consequences

Summative assessment, or assessment of learning, is designed to evaluate student achievement at defined endpoints and to certify, grade, or rank performance. In secondary school contexts, summative assessments typically include end-of-unit examinations, standardized tests, and high-stakes national or regional assessments that determine progression and postsecondary access (Harlen, 2005). While summative assessments serve essential accountability and certification functions, research indicates that environments dominated by high-stakes summative assessment are associated with elevated test anxiety (Putwain, 2007), performance-avoidance goal orientations (Ryan & Brown, 2005), surface rather than deep learning approaches (Birenbaum, 2003), and reduced intrinsic motivation (Harlen & Deakin Crick, 2003).

Putwain (2007) conducted a systematic review of test anxiety in secondary school students and found that prevalence rates ranged from 10% to 40% across studies, with substantial negative effects on examination performance, well-being, and long-term academic self-concept. The mechanisms through which high-stakes summative assessment elevates test anxiety include the attribution of significant consequences to performance, the infrequency of assessment opportunities (limiting recovery from poor performance), and the competitive ranking of students, all of which are antithetical to the psychologically safe environments that support intrinsic motivation and deep learning (Ryan & Brown, 2005).

2.3. Assessment and Equity

A consistent finding in the assessment literature is that the consequences of assessment practices are not uniformly distributed across student populations. Students from economically disadvantaged backgrounds are disproportionately harmed by high-stakes summative assessment cultures, both because they are less likely to have access to private tutoring and test preparation resources and because the consequences of underperformance, including exclusion from academic tracks and postsecondary pathways, are more severe for students with limited alternative routes to advancement (Sadler, 2010; Stobart, 2008). Wiliam (2011) argued that formative assessment is inherently more equitable than summative assessment because it provides all students with actionable information about how to improve, rather than simply certifying current performance levels.

III. METHOD

3.1. Research Design

The study employed a quasi-experimental, nonequivalent comparison group design (Campbell & Stanley, 1963), in which intact classrooms were assigned to formative or summative assessment conditions. Random assignment of individual students was not feasible given the intact nature of school class groupings; however, schools were matched on key demographic and academic performance indicators prior to condition assignment to maximize comparability between groups. Institutional ethics approval was obtained from the university's Human Research Ethics Committee, and informed consent was secured from school principals, teachers, parents, and students prior to data collection.

3.2. Participants

Participants were 364 secondary school students (Grade 9-12) enrolled in eight schools across two school districts in a mid-sized metropolitan region. Schools were selected through purposive sampling based on willingness to participate and comparability on district-reported demographic and achievement indicators. Students in four schools were assigned to the formative assessment condition ($n = 186$; 52.7% female, 44.1% male, 3.2% non-binary or other), and students in the remaining four schools formed the summative assessment comparison group ($n = 178$; 52.8% female, 43.8% male, 3.4% non-binary or other). Table 1 presents full demographic characteristics of the sample.

Table 1. Participant Demographic Characteristics by Assessment Condition

Variable	Formative Group (n = 186)	Summative Group (n = 178)	Total (N = 364)
Grade Level			
Grade 9	47 (25.3%)	44 (24.7%)	91 (25.0%)
Grade 10	48 (25.8%)	46 (25.8%)	94 (25.8%)
Grade 11	46 (24.7%)	45 (25.3%)	91 (25.0%)
Grade 12	45 (24.2%)	43 (24.2%)	88 (24.2%)
Gender			
Female	98 (52.7%)	94 (52.8%)	192 (52.7%)
Male	82 (44.1%)	78 (43.8%)	160 (44.0%)
Non-binary/Other	6 (3.2%)	6 (3.4%)	12 (3.3%)
Socioeconomic Status			
Low income	58 (31.2%)	55 (30.9%)	113 (31.0%)
Middle income	89 (47.8%)	86 (48.3%)	175 (48.1%)
High income	39 (21.0%)	37 (20.8%)	76 (20.9%)

Note. SES categories are based on eligibility for free or reduced-price school lunch programs (low income) and parental self-report (middle and high income).

3.3. Intervention

The intervention period spanned one full academic semester (18 weeks). Teachers in the formative assessment condition received four full days of professional development training in formative assessment strategies prior to the intervention, followed by fortnightly coaching sessions throughout the semester. Formative assessment practices implemented included: daily exit tickets and learning checks; peer and self-assessment activities using co-constructed success criteria; frequent low-stakes quizzes with individualized written feedback; and student-led conferences on learning progress. Teachers in the summative assessment condition continued their existing assessment practices, which consisted primarily of end-of-unit examinations, mid-semester tests, and a final semester examination, with minimal formative feedback between assessments. To ensure fidelity, all formative assessment classrooms were observed on three occasions by trained observers using a validated observation checklist (Leahy et al., 2005).

3.4. Measures

Academic achievement was measured using a standardized end-of-semester achievement test developed collaboratively by district curriculum officers and independently validated against national curriculum standards. Scores ranged from 0 to 100. Academic self-efficacy was assessed using the Academic Self-Efficacy Scale (Bandura, 1997), a 10-item Likert-format instrument (1 = not at all confident, 5 = completely confident) with well-established reliability ($\alpha = .87$ to $.92$ across previous studies). Test anxiety was measured using the Revised Test Anxiety Scale (Benson & El-Zahhar, 1994), a 20-item scale assessing cognitive, affective, and behavioral dimensions of test anxiety ($\alpha = .90$ to $.95$). Student engagement was assessed using the Student Engagement Instrument (Appleton et al., 2006), capturing cognitive and affective engagement dimensions ($\alpha = .88$). Intrinsic motivation was measured using the Intrinsic Motivation Inventory academic subscale (Ryan & Deci, 2000), assessing interest, enjoyment, and perceived choice in academic activities ($\alpha = .86$).

3.5. Data Analysis

Data were analyzed using IBM SPSS Statistics version 28. Preliminary analyses included examination of distributional assumptions, missing data patterns (less than 2% of data were missing, addressed through multiple imputation), and equivalence of groups on pre-intervention covariates using independent samples t-tests and chi-square tests. The primary analysis was a one-way Multivariate Analysis of Variance (MANOVA) with assessment condition as the independent variable and the five outcome measures as dependent variables. Wilks' lambda was used as the multivariate test statistic. Statistically significant multivariate effects were followed by univariate ANOVAs with Bonferroni correction for multiple comparisons.

Effect sizes were estimated using partial eta-squared and Cohen's d. Moderation analyses examining the role of socioeconomic status were conducted using hierarchical multiple regression with assessment condition by SES interaction terms.

IV. RESULTS

4.1. Preliminary Analyses

Pre-intervention equivalence checks confirmed that the formative and summative assessment groups did not differ significantly on baseline academic performance records ($t(362) = 1.14, p = .255$), SES distribution ($\chi^2(2) = 0.04, p = .980$), or gender composition ($\chi^2(2) = 0.02, p = .990$). Box's M test indicated that the assumption of equality of covariance matrices was satisfied ($M = 24.17, p = .163$). Mardia's tests confirmed multivariate normality was not severely violated. No significant outliers were identified using Mahalanobis distance.

4.2. Multivariate and Univariate Results

The one-way MANOVA revealed a statistically significant multivariate effect of assessment condition on the combined set of outcome variables, Wilks' lambda = .74, $F(5, 358) = 25.43, p < .001$, partial eta-squared = .26, indicating that assessment condition accounted for approximately 26% of the variance in the multivariate outcome space. Table 2 presents descriptive statistics and between-group effect sizes for each outcome variable, and Table 3 presents univariate ANOVA results.

Table 2. Descriptive Statistics and Effect Sizes by Assessment Condition

Variable	Formative Group M (SD)	Summative Group M (SD)	Cohen's d
Academic Achievement	74.82 (9.14)	68.37 (10.63)	0.65
Academic Self-Efficacy	3.91 (0.72)	3.44 (0.81)	0.62
Test Anxiety	2.31 (0.84)	3.12 (0.91)	0.93
Student Engagement	4.02 (0.68)	3.58 (0.74)	0.62
Intrinsic Motivation	3.87 (0.77)	3.29 (0.88)	0.71

Note. M = mean; SD = standard deviation. Academic achievement scores are percentage-based (0-100). All other variables are on a 1-5 Likert scale. Cohen's d values represent the standardized mean difference (formative minus summative, with direction reversed for test anxiety).

Table 3. Univariate ANOVA Results for All Outcome Variables

Dependent Variable	F (1, 362)	p	eta-p2	95% CI	Effect Size
Academic Achievement	41.73	< .001	.103	[0.06, 0.15]	Medium
Academic Self-Efficacy	37.84	< .001	.095	[0.05, 0.14]	Medium
Test Anxiety	68.29	< .001	.159	[0.10, 0.22]	Large
Student Engagement	35.11	< .001	.088	[0.05, 0.13]	Medium
Intrinsic Motivation	47.56	< .001	.116	[0.07, 0.16]	Medium

Note. eta-p2 = partial eta-squared. Effect size benchmarks follow Cohen (1988): small = .01, medium = .06, large = .14. All p values are Bonferroni-corrected. CI = confidence interval for partial eta-squared.

Follow-up univariate ANOVAs confirmed statistically significant differences between conditions on all five outcome variables after Bonferroni correction. The largest effect was observed for test anxiety (partial eta-squared = .159, large effect), indicating that students in formative assessment classrooms reported substantially lower test anxiety than their summative group peers. Medium effects were observed for academic achievement, self-efficacy, engagement, and intrinsic motivation, all favoring the formative assessment condition.

4.3. Moderation by Socioeconomic Status

Hierarchical regression analyses examined whether SES moderated the relationship between assessment condition and each outcome variable. For academic achievement, the Assessment Condition x SES interaction was statistically significant ($\beta = .18, t(360) = 3.42, p < .001$, R-squared change = .03), indicating that the achievement advantage associated with formative assessment was significantly more pronounced for low-income students ($d = 0.81$) than for middle-income ($d = 0.63$) or high-income students ($d = 0.51$). A similar pattern was observed for self-efficacy and intrinsic motivation, with significant Assessment Condition x SES interactions in each case (all $p < .01$). The interaction was not statistically significant for test anxiety or student engagement, suggesting that the anxiety-reducing and engagement-promoting effects of formative assessment were relatively uniform across SES groups.

V. DISCUSSION

The findings of this study provide substantial quantitative support for the proposition that formative assessment practices produce superior educational outcomes across multiple dimensions compared to predominantly summative assessment approaches in secondary school contexts. Students in formative assessment classrooms demonstrated higher academic achievement, greater self-efficacy, lower test anxiety, higher engagement, and stronger intrinsic motivation than their peers in summative assessment classrooms, with effect sizes ranging from medium to large. These findings are broadly consistent with the foundational meta-analytic evidence of Black and Wiliam (1998) and with the theoretical predictions of Self-Determination Theory (Deci & Ryan, 2000) and feedback research (Hattie & Timperley, 2007).

The particularly large effect size observed for test anxiety ($d = 0.93$) deserves special attention. This finding suggests that the shift from a predominantly summative to a predominantly formative assessment environment produces a substantial

reduction in the psychological burden of academic assessment for secondary school students, consistent with Putwain's (2007) analysis of the mechanisms through which high-stakes summative environments elevate anxiety. Given the well-documented negative consequences of test anxiety for both academic performance and student well-being, this finding has considerable practical significance for secondary school assessment policy.

The moderation analyses provide compelling evidence that the benefits of formative assessment are not uniformly distributed but are particularly pronounced for students from low-income backgrounds, at least with respect to academic achievement, self-efficacy, and intrinsic motivation. This finding aligns with Wiliam's (2011) equity argument and extends it with quantitative evidence: formative assessment appears to function as an equalizing force in secondary education, providing students who lack access to private tutoring and supplementary academic support with the ongoing, actionable feedback that more advantaged students may obtain through private means.

Several limitations of the present study warrant acknowledgment. First, the quasi-experimental design, while appropriate given the constraints of school-based research, does not permit causal inference with the confidence of a fully randomized controlled trial. Although groups were well-matched on observed pre-intervention characteristics, unobserved confounds cannot be ruled out. Second, the intervention was delivered over a single semester, and it is possible that longer implementation periods would yield larger or more differentiated effects. Third, the study was conducted in a single metropolitan region, and replication across diverse geographic, cultural, and institutional contexts will be necessary to establish the generalizability of findings.

VI. CONCLUSION

This quantitative study contributes to the evidence base on assessment practices in secondary education by demonstrating, through a large-sample quasi-experimental design, that formative assessment classrooms produce significantly better outcomes than predominantly summative classrooms across achievement, motivational, and affective dimensions. The findings support continued policy investment in formative assessment professional development for secondary teachers and underscore the equity implications of assessment design, with particular urgency for schools serving economically disadvantaged student populations.

For school leaders and policymakers, the evidence suggests that structural reforms reducing the dominance of high-stakes summative assessment in secondary education may yield significant dividends not only in achievement but in student motivation and psychological well-being. For researchers, future studies employing randomized controlled designs, longer intervention periods, and more diverse samples will be essential to further refine understanding of the conditions under which formative assessment produces its most powerful effects and for which student populations its benefits are greatest.

REFERENCES

- Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology, 44*(5), 427–445.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Benson, J., & El-Zahhar, N. (1994). Further refinement and validation of the Revised Test Anxiety Scale. *Structural Equation Modeling, 1*(3), 203–221. <https://doi.org/10.1080/10705519409539975>
- Birenbaum, M. (2003). New insights into learning and teaching and their implications for assessment. In M. Segers, F. Dochy, & E. Cascallar (Eds.), *Optimising new modes of assessment* (pp. 13–36). Springer.
- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*(1), 7–74. <https://doi.org/10.1080/0969595980050102>
- Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research*. Rand McNally.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- Harlen, W. (2005). Teachers' summative practices and assessment for learning: Tensions and synergies. *Curriculum Journal, 16*(2), 207–223. <https://doi.org/10.1080/09585170500136093>
- Harlen, W., & Deakin Crick, R. (2003). Testing and motivation for learning. *Assessment in Education: Principles, Policy & Practice, 10*(2), 169–207. <https://doi.org/10.1080/0969594032000121270>
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112.
- Kingston, N., & Nash, B. (2011). Formative assessment: A meta-analysis and a call for research. *Educational Measurement: Issues and Practice, 30*(4), 28–37. <https://doi.org/10.1111/j.1745-3992.2011.00220.x>
- Leahy, S., Lyon, C., Thompson, M., & Wiliam, D. (2005). Classroom assessment: Minute by minute, day by day. *Educational Leadership, 63*(3), 18–24.
- Putwain, D. W. (2007). Researching academic stress and anxiety in students: Some methodological considerations. *British Educational Research Journal, 33*(2), 207–219. <https://doi.org/10.1080/01411920701208258>
- Ryan, A. M., & Brown, J. L. (2005). Assessment for learning, for keeps: Understanding formative assessment in secondary school contexts. *Theory Into Practice, 44*(1), 5–14.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*(1), 54–67.
- Sadler, D. R. (2010). Beyond feedback: Developing student capability in complex appraisal. *Assessment & Evaluation in Higher Education, 35*(5), 535–550. <https://doi.org/10.1080/02602930903541015>
- Stobart, G. (2008). *Testing times: The uses and abuses of assessment*. Routledge.
- Wiliam, D. (2011). *Embedded formative assessment*. Solution Tree Press.



INTERNATIONAL JOURNAL OF TEACHER EDUCATION RESEARCH STUDIES (IJTERS)

(Open Access, Double-Blind Peer Reviewed Journal)

ISSN Online: 3049-1614



The Impact of High-Intensity Teacher Professional Development on Instructional Effectiveness and Student Achievement in Secondary Schools

Vincent

Assistant Professor of English, Lakshmi College of Education, Gandhigram, Dindigul, Tamil Nadu, India.

Article information

Received: 7th March 2026

Received in revised form: 14th April 2026

Accepted: 16th May 2026

Available online: 18th June 2026

Volume: 3

Issue: 2

DOI: <https://doi.org/10.63090/IJTERS/3049.1614.0037>

Abstract

Teacher professional development (PD) is widely regarded as a cornerstone of school improvement, yet significant variability in PD quality and intensity in secondary education settings raises pressing questions about which forms of PD most effectively enhance instructional practice and student outcomes. This quantitative study investigated the differential effects of high-intensity and low-intensity teacher PD programs on six key outcomes: instructional effectiveness, pedagogical content knowledge, teacher self-efficacy, classroom management quality, reflective practice, and student academic achievement gains. Using a quasi-experimental, nonequivalent comparison group design, data were collected from 410 secondary school teachers ($N = 410$) across 24 schools in three school districts following a full academic year of differentiated PD provision. High-intensity PD involved sustained, job-embedded, collaborative learning communities with coaching support (mean contact hours = 64.3), while low-intensity PD consisted of episodic workshops without follow-up (mean contact hours = 12.7). Independent samples t -tests and hierarchical multiple regression analyses revealed that high-intensity PD participants significantly outperformed their low-intensity counterparts on all six outcomes, with effect sizes ranging from medium ($d = 0.54$) to large ($d = 0.93$). Moderation analyses indicated that the benefits of high-intensity PD were amplified for early-career teachers and teachers in high-disadvantage school contexts. Findings underscore the critical importance of PD design features, particularly intensity, collaboration, and job-embeddedness, for generating meaningful and sustained improvements in secondary teaching quality.

Keywords: - Teacher Professional Development, Instructional Effectiveness, Pedagogical Content Knowledge, Teacher Self-Efficacy, Secondary Education, Student Achievement, Job-Embedded Learning, Professional Learning Communities

I. INTRODUCTION

Teacher quality is consistently identified as the most influential school-level factor affecting student learning and achievement (Darling-Hammond, 2000; Hattie, 2009). Within the broad enterprise of improving teacher quality, professional development (PD) represents the primary institutional mechanism through which practicing teachers acquire, refine, and extend the knowledge, skills, and dispositions that underpin effective instruction. Yet decades of research have produced a sobering verdict on the prevailing model of teacher PD in many secondary school systems: episodic, workshop-based, one-size-fits-all programs delivered in isolation from classroom practice are largely ineffective in producing meaningful or sustained improvements in teaching quality or student outcomes (Desimone, 2009; Guskey, 2002; Yoon et al., 2007).

In contrast, an emerging consensus in the research literature points to a set of design features associated with high-quality, high-impact PD: sustained duration, active learning opportunities, content focus, collaboration, and coherence with school improvement priorities (Desimone, 2009; Timperley et al., 2007). PD programs embodying these features, variously described as job-embedded PD, professional learning communities, instructional coaching, and inquiry cycles, have demonstrated significantly stronger effects on teaching practice and student learning than conventional workshop-based approaches (Darling-Hammond et al., 2017; Timperley et al., 2007).

Despite this growing evidence base, the vast majority of secondary school teachers continue to receive PD that falls well short of the intensity and design quality identified as effective. Darling-Hammond et al. (2017) found that only 30% of

U.S. teachers participated in PD that could be characterized as sustained and intensive, while the majority experienced PD programs lasting fewer than two days. This gap between research evidence and prevalent practice creates a significant and consequential inequity: teachers in schools with greater resources to invest in sustained PD infrastructure are likely to develop more effective instructional repertoires, widening the already substantial quality gap between schools serving advantaged and disadvantaged student populations (Ingvarson et al., 2005).

The present study contributes to this literature by comparing the effects of high-intensity and low-intensity PD programs on secondary school teacher outcomes and student achievement gains across a sample of 410 teachers in 24 schools. The study addresses three research questions and employs hierarchical regression to examine moderating effects of teaching experience and school socioeconomic context on PD effectiveness.

1.1. Research Questions and Hypotheses

The study was guided by the following research questions:

- RQ1: Are there statistically significant differences in instructional effectiveness, pedagogical content knowledge, teacher self-efficacy, classroom management quality, and reflective practice between teachers who participated in high-intensity PD and those who participated in low-intensity PD?
- RQ2: Are there statistically significant differences in student academic achievement gains between classrooms led by high-intensity PD participants compared to those led by low-intensity PD participants?
- RQ3: Do teaching experience and school socioeconomic context moderate the relationship between PD intensity and teacher and student outcomes?

Based on the extant literature, it was hypothesized that high-intensity PD participants would demonstrate significantly superior outcomes on all six measures compared to low-intensity PD participants (H1). It was further hypothesized that the benefits of high-intensity PD would be more pronounced for early-career teachers, who have less established instructional repertoires and therefore more developmental headroom (H2a), and for teachers in high-disadvantage schools, where the gap between current practice and high-quality instruction is typically largest (H2b).

II. LITERATURE REVIEW

2.1. Defining Effective Teacher Professional Development

Desimone (2009) proposed an influential conceptual framework identifying five core features of effective PD: content focus (centering PD on subject matter and student learning of specific content); active learning (engaging teachers as learners through observation, analysis, and practice); coherence (alignment with school goals, state standards, and teachers' prior knowledge); duration (sustained engagement over time, with a minimum threshold commonly cited at 50 or more hours); and collective participation (involving groups of teachers from the same school, grade, or subject). This framework has been widely adopted by researchers and policymakers and has generated substantial supporting empirical evidence (Darling-Hammond et al., 2017; Garet et al., 2001).

Garet et al. (2001) conducted one of the earliest large-scale quantitative studies of PD design features, surveying over 1,000 mathematics and science teachers. Their findings confirmed that reform-type activities characterized by sustained duration, collective participation, and active learning were significantly more likely to produce changes in teachers' knowledge, skills, and classroom practice compared to traditional workshop formats. Duration emerged as a particularly critical variable: teachers who participated in more hours of PD showed significantly greater gains in knowledge and reported more changes in instructional practice.

2.2. Professional Learning Communities and Instructional Coaching

Two models of job-embedded PD have attracted particularly strong research support in the secondary school context: professional learning communities (PLCs) and instructional coaching. PLCs involve structured, ongoing collaborative inquiry among teachers centered on student learning evidence, shared goals, and collective accountability for outcomes (Stoll et al., 2006). A meta-analysis by Vescio et al. (2008), reviewing 11 studies of PLC effects on teaching practice and student learning, found consistent positive effects, with particularly strong evidence for improvements in student achievement when PLCs were sustained over multiple years and embedded in a culture of shared accountability.

Instructional coaching, in which trained coaches work alongside teachers in their classrooms to model, observe, and provide feedback on practice, has similarly accumulated a growing evidence base. Knight (2007) synthesized research on coaching and identified it as among the highest-impact PD formats available, citing its combination of individualization, sustained engagement, and job-embeddedness. Kraft et al. (2018) conducted a meta-analysis of 60 randomized and quasi-experimental studies of instructional coaching and found a mean effect size of 0.49 standard deviations on instructional practice and 0.18 on student achievement, with larger effects associated with higher-intensity coaching programs.

2.3. Self-Efficacy and Pedagogical Content Knowledge as Mediators

Two teacher-level constructs occupy a central place in theoretical accounts of how PD influences instructional practice and student outcomes: teacher self-efficacy and pedagogical content knowledge (PCK). Bandura's (1997) social cognitive theory identifies self-efficacy beliefs, that is, teachers' confidence in their capacity to achieve specific instructional goals, as a critical mediator of effort, persistence, and instructional ambition. Teachers with high self-efficacy are more likely to adopt challenging instructional approaches, persist in the face of setbacks, and respond adaptively to student learning difficulties (Tschannen-Moran & Hoy, 2001). PD that provides teachers with supported practice, expert modeling, and evidence of impact

on student learning is theorized to enhance self-efficacy through the mechanisms of mastery experience, vicarious learning, and social persuasion identified by Bandura (1997).

PCK, originally conceptualized by Shulman (1986) and subsequently elaborated within the TPACK framework (Mishra & Koehler, 2006), encompasses the specialized knowledge that enables teachers to represent subject matter in pedagogically powerful and student-accessible ways. High-quality PD, particularly content-focused PD that engages teachers in deep disciplinary inquiry alongside pedagogical reflection, has been consistently associated with growth in PCK and with improvements in student understanding of complex disciplinary concepts (Garet et al., 2001; Timperley et al., 2007).

2.4. PD Effectiveness for Early-Career and Disadvantaged-Context Teachers

The research literature suggests that the effects of PD may not be uniform across teacher subgroups. Early-career teachers, who are navigating the transition from pre-service preparation to independent classroom practice, face a distinctive set of developmental challenges, including classroom management, curriculum pacing, and the integration of theoretical knowledge with practical judgment (Ingvarson et al., 2005). High-intensity PD that provides mentoring, collaborative inquiry, and structured reflection has been theorized to be particularly beneficial during this formative career stage, accelerating the development of the practical knowledge and self-efficacy that stabilize early practice (Timperley et al., 2007).

Teachers in high-disadvantage school contexts face a qualitatively different challenge: they must develop instructional repertoires responsive to the complex learning needs of students who frequently arrive in classrooms with significant prior knowledge gaps, language needs, and social-emotional support requirements. Yoon et al. (2007), in a systematic review of evidence on PD and student achievement, found that intensive PD programs produced larger achievement gains for students in higher-disadvantage settings, suggesting that sustained investment in teacher quality may be a particularly high-leverage equity strategy in schools serving economically disadvantaged communities.

III. METHOD

3.1. Research Design

The study employed a quasi-experimental, nonequivalent comparison group design in which teachers were assigned to high-intensity or low-intensity PD conditions at the school level. Schools were allocated to conditions based on district-level PD investment decisions rather than random assignment; however, schools were matched in pairs across the two conditions on district, school size, student socioeconomic composition, and prior-year student achievement to maximize pre-intervention comparability. Ethical approval was obtained from the university Human Research Ethics Board, and informed consent was secured from all participating teachers, school administrators, and the parents of students whose achievement data were included in analyses.

3.2. Participants

The sample comprised 410 secondary school teachers (Grades 9-12) drawn from 24 schools across three school districts in a large metropolitan region. Twelve schools were assigned to the high-intensity PD condition ($n = 212$ teachers), and twelve to the low-intensity PD comparison condition ($n = 198$ teachers). Teacher demographic and professional characteristics for both groups are presented in Table 1. Pre-intervention equivalence checks confirmed no statistically significant differences between groups on teaching experience, gender, subject area, or school SES context.

Table 1. Participant Demographic and Professional Characteristics by PD Condition

Characteristic	High-Intensity PD ($n = 212$)	Low-Intensity PD ($n = 198$)	Total ($N = 410$)
Gender			
Female	141 (66.5%)	132 (66.7%)	273 (66.6%)
Male	67 (31.6%)	63 (31.8%)	130 (31.7%)
Non-binary/Other	4 (1.9%)	3 (1.5%)	7 (1.7%)
Teaching Experience			
1-5 years	62 (29.2%)	58 (29.3%)	120 (29.3%)
6-15 years	89 (42.0%)	84 (42.4%)	173 (42.2%)
16+ years	61 (28.8%)	56 (28.3%)	117 (28.5%)
Subject Area			
STEM	88 (41.5%)	82 (41.4%)	170 (41.5%)
Humanities/Social Science	75 (35.4%)	70 (35.4%)	145 (35.4%)
Arts/Other	49 (23.1%)	46 (23.2%)	95 (23.1%)
School SES Context			
High-disadvantage	71 (33.5%)	67 (33.8%)	138 (33.7%)
Mid-disadvantage	87 (41.0%)	81 (40.9%)	168 (41.0%)
Low-disadvantage	54 (25.5%)	50 (25.3%)	104 (25.4%)

Note. PD = professional development. School SES context is based on the percentage of students qualifying for the national free school meals program: high-disadvantage ($> 40\%$), mid-disadvantage ($20\text{--}40\%$), low-disadvantage ($< 20\%$).

3.3. Professional Development Programs

High-intensity PD was operationalized as a structured program combining three interrelated components delivered across the full academic year:

- Bi-weekly professional learning community (PLC) meetings (90 minutes each, 32 sessions total), structured around collaborative analysis of student work, shared lesson planning, and inquiry into student learning challenges;

- Fortnightly instructional coaching cycles involving pre-observation conferences, classroom observation, and post-observation feedback sessions; and
- Four full-day content-focused workshops delivered in the first, eighth, fourteenth, and eighteenth weeks.

Mean total PD contact hours for the high-intensity condition was 64.3 hours (SD = 4.7). Teachers in the low-intensity comparison condition participated in four half-day workshops (one per school term) on general teaching strategies, with no follow-up coaching or collaborative structures. Mean total PD contact hours was 12.7 hours (SD = 1.9).

3.4. Measures

Instructional effectiveness was measured using the Classroom Assessment Scoring System Secondary (CLASS-S; Pianta et al., 2012), a validated observational instrument assessing emotional support, classroom organization, and instructional support. Three trained observers rated each participating teacher on two occasions, with inter-rater reliability confirmed (ICC = .84). Pedagogical content knowledge was assessed using subject-specific PCK tests developed and validated by the research team in collaboration with district curriculum officers ($\alpha = .86$). Teacher self-efficacy was measured using the Teachers' Sense of Efficacy Scale (Tschannen-Moran & Hoy, 2001), a 24-item scale assessing efficacy for instructional strategies, student engagement, and classroom management ($\alpha = .93$). Classroom management quality was assessed via the CLASS-S classroom organization subscale. Reflective practice was measured using the Reflective Teaching Scale (Larrivee, 2008), a 40-item self-report instrument with strong psychometric properties ($\alpha = .91$). Student academic achievement gains were computed as the difference between end-of-year and beginning-of-year standardized achievement scores, averaged across all students taught by each participating teacher.

3.5. Data Analysis

Preliminary analyses examined group equivalence on pre-intervention covariates and verified distributional assumptions. Primary analyses addressed RQ1 and RQ2 using independent samples t-tests with Bonferroni correction for multiple comparisons, accompanied by Cohen's d effect size estimates. RQ3 was addressed through hierarchical multiple regression analyses in which control variables (teaching experience, subject area, school SES context) were entered in Step 1, PD condition in Step 2, and the PD Condition x Teaching Experience and PD Condition x School SES interaction terms in Step 3. All analyses were conducted using IBM SPSS Statistics version 28. The alpha threshold was set at .05; Bonferroni-corrected thresholds are reported for multiple comparison analyses.

IV. RESULTS

4.1. Preliminary Analyses

Independent samples t-tests and chi-square analyses confirmed that the two PD groups did not differ significantly on any pre-intervention teacher characteristic, including years of teaching experience ($t(408) = 0.41, p = .681$), prior self-efficacy scores ($t(408) = 0.83, p = .408$), gender distribution ($\chi^2(2) = 0.07, p = .966$), subject area ($\chi^2(2) = 0.01, p = .995$), or school SES context ($\chi^2(2) = 0.02, p = .990$). Student achievement scores at baseline also did not differ significantly between the classes of high-intensity and low-intensity PD teachers ($t(408) = 1.12, p = .263$). Levene's tests confirmed homogeneity of variance for all primary outcome variables.

4.2. Primary Analyses: PD Intensity and Teacher and Student Outcomes

Table 2 presents descriptive statistics, t-test results, and Cohen's d effect sizes for all six outcome variables. High-intensity PD participants demonstrated statistically significantly higher scores than low-intensity participants on every outcome after Bonferroni correction (all $p < .001$). Effect sizes ranged from medium (classroom management quality, $d = 0.54$) to large (reflective practice, $d = 0.93$; instructional effectiveness, $d = 0.85$; pedagogical content knowledge, $d = 0.82$). Student academic achievement gains were also significantly higher in classrooms of high-intensity PD teachers ($M = 72.91$ vs. $66.44, d = 0.70$).

Table 2. Descriptive Statistics, t-Test Results, and Effect Sizes by PD Condition

Outcome Variable	High-Intensity M (SD)	Low-Intensity M (SD)	t (408)	Cohen's d
Instructional Effectiveness	4.21 (0.61)	3.64 (0.74)	8.77***	0.85
Pedagogical Content Knowledge	4.08 (0.66)	3.52 (0.71)	8.34***	0.82
Teacher Self-Efficacy	4.14 (0.58)	3.71 (0.69)	6.93***	0.68
Classroom Management Quality	4.03 (0.63)	3.67 (0.72)	5.48***	0.54
Reflective Practice	4.17 (0.59)	3.58 (0.68)	9.44***	0.93
Student Achievement Gains	72.91 (8.83)	66.44 (9.71)	7.14***	0.70

Note. All t-tests used Bonferroni-corrected $\alpha = .008$ for six simultaneous comparisons. Student achievement gain scores are expressed as standardized percentage-point gains (0-100 scale). All other variables are rated on a 1-5 scale. *** $p < .001$.

4.3. Hierarchical Regression: Moderation Analyses

Table 3 presents results from the hierarchical regression analysis predicting instructional effectiveness (the primary outcome). The pattern of results was broadly consistent across outcome variables. In Step 1, the control block accounted for 8% of variance in instructional effectiveness ($R^2 = .08, F(3, 406) = 11.72, p < .001$), with teaching experience ($\beta = .18, p = .001$) and school SES context ($\beta = .12, p = .028$) emerging as significant predictors. Subject area was not a significant predictor ($\beta = .07, p = .204$). Adding PD condition in Step 2 produced a significant increment in explained variance ($\Delta R^2 = .08, F(1, 406) = 11.72, p < .001$).

R-squared = .17, $p < .001$), with PD intensity emerging as the strongest predictor in the model ($\beta = .41$, $p < .001$). The final step, adding the interaction terms, produced a further significant increment ($\Delta R\text{-squared} = .04$, $p < .01$).

Table 3. Hierarchical Regression Predicting Instructional Effectiveness

Predictor	B	SE B	beta	p
Step 1: Control Variables				
Teaching Experience	0.31	0.09	.18	.001
Subject Area (STEM ref.)	0.14	0.11	.07	.204
School SES Context	0.22	0.10	.12	.028
Step 2: PD Condition				
PD Intensity (High = 1)	0.57	0.07	.41	< .001
Step 3: Interaction				
PD Intensity x Teaching Exp.	0.19	0.08	.14	.017
PD Intensity x School SES	0.23	0.09	.16	.010
R-squared (Step 1)	.08			
Delta R-squared (Step 2)	.17***			
Delta R-squared (Step 3)	.04**			

Note. PD = professional development. Exp. = experience. B = unstandardized regression coefficient. SE B = standard error of B. beta = standardized regression coefficient. ** $p < .01$. *** $p < .001$.

Decomposition of the significant interaction effects revealed that the instructional effectiveness advantage of high-intensity PD was largest for early-career teachers (1-5 years; $d = 1.04$) compared to mid-career (6-15 years; $d = 0.81$) and experienced teachers (16+ years; $d = 0.63$). Similarly, the PD Intensity x School SES interaction indicated that teachers in high-disadvantage school contexts benefited most from high-intensity PD ($d = 1.01$) relative to mid-disadvantage ($d = 0.83$) and low-disadvantage contexts ($d = 0.72$). These patterns were replicated for pedagogical content knowledge, teacher self-efficacy, and student achievement gain outcomes.

V. DISCUSSION

The findings of this study provide robust quantitative support for the proposition that high-intensity, job-embedded teacher PD produces substantially superior outcomes compared to conventional low-intensity workshop models across a broad range of teacher and student indicators in secondary school settings. The magnitude of observed effects, ranging from $d = 0.54$ to $d = 0.93$, places high-intensity PD among the highest-impact educational interventions identified in the broader literature, comparable to the effect sizes reported by Kraft et al. (2018) for instructional coaching and Hattie (2009) for other high-impact educational practices.

The particularly large effect observed for reflective practice ($d = 0.93$) is noteworthy and theoretically consistent. High-intensity PD programs that incorporate structured collaborative inquiry, coaching feedback, and sustained engagement with student learning evidence are theorized to develop teachers' capacity for critical self-examination, precisely because they build structured habits of evidence-based reflection into professional routines (Timperley et al., 2007). The large effect on reflective practice suggests that high-intensity PD may produce its broader instructional benefits not only through direct skill acquisition but through the development of a more reflective and adaptive professional orientation.

The moderation findings carry significant policy implications. The finding that early-career teachers benefit most from high-intensity PD, with an effect size of $d = 1.04$, suggests that investment in intensive induction-year and early-career PD represents a particularly high-return strategy. Early in a teaching career, the developmental gap between current and expert practice is largest, and the establishment of reflective habits, collaborative professional norms, and strong PCK at this stage may have compounding benefits across the career trajectory. Similarly, the larger effects observed in high-disadvantage school contexts align with Yoon et al.'s (2007) equity argument and suggest that differential investment in intensive PD for teachers in disadvantaged settings could serve as a meaningful lever for closing persistent achievement gaps.

Several limitations merit acknowledgment. The quasi-experimental design, while strengthened by school-level matching and pre-intervention equivalence checks, does not support causal inference with the confidence of a randomized controlled trial. Selection bias at the school level, with some districts more inclined to invest in intensive PD than others, cannot be fully ruled out. Additionally, the study examined outcomes at the end of a single academic year; it is possible that effects will consolidate, deepen, or decay over longer follow-up periods. Future research employing randomized designs and multi-year follow-up would substantially strengthen the causal warrant for these findings.

VI. CONCLUSION

This quantitative study contributes meaningful large-sample evidence to the debate about how teacher professional development should be designed and resourced in secondary education. Across six outcome measures spanning teacher knowledge, practice, efficacy, and student achievement, high-intensity job-embedded PD demonstrated substantial and statistically significant advantages over conventional workshop-based provision. The consistency of effects across diverse subject areas and school contexts, and the amplified benefits for early-career teachers and those in high-disadvantage schools, provide a compelling evidence base for systemic reorientation of PD investment toward sustained, collaborative, and job-embedded models.

For school and district leaders, the findings support a fundamental rethinking of how PD resources are allocated, with particular emphasis on building the structural conditions, including protected time for collaboration, access to instructional coaching, and coherent PD sequences across career stages, that enable high-intensity PD to flourish. For researchers, the field would benefit from randomized designs capable of providing higher-confidence causal estimates, longitudinal studies tracking

the durability of PD effects over multi-year periods, and investigations of the specific mechanisms through which high-intensity PD produces its observed effects on instructional practice and student learning.

REFERENCES

- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives*, 8(1), 1–44. <https://doi.org/10.14507/epaa.v8n1.2000>
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.
- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, 38(3), 181–199.
- Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, 38(4), 915–945.
- Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice*, 8(3), 381–391. <https://doi.org/10.1080/135406002100000512>
- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
- Ingvarson, L., Meiers, M., & Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student outcomes and efficacy. *Education Policy Analysis Archives*, 13(10), 1–28. <https://doi.org/10.14507/epaa.v13n10.2005>
- Knight, J. (2007). *Instructional coaching: A partnership approach to improving instruction*. Corwin Press.
- Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of Educational Research*, 88(4), 547–588.
- Larrivee, B. (2008). Development of a tool to assess teachers' level of reflective practice. *Reflective Practice*, 9(3), 341–360. <https://doi.org/10.1080/14623940802207451>
- 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>
- Pianta, R. C., Hamre, B. K., & Mintz, S. (2012). *Classroom Assessment Scoring System: Secondary manual*. Teachstone Training.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change*, 7(4), 221–258. <https://doi.org/10.1007/s10833-006-0001-8>
- Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). *Teacher professional learning and development: Best evidence synthesis iteration*. Ministry of Education.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783–805.
- Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education*, 24(1), 80–91.
- Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Shapley, K. L. (2007). *Reviewing the evidence on how teacher professional development affects student achievement* (Issues & Answers Report No. REL 2007–033). U.S. Department of Education, Institute of Education Sciences.