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Creativity and Innovation in University Undergraduate Teacher Preparation Programs

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Abstract

This study explores how university undergraduate teacher preparation can integrate creativity, innovation, and educational technologies to boost pre-service teachers' (PSTs) confidence and adoption of these tools. Drawing on interdisciplinary research, the literature highlights the value of experiential learning in preparing PSTs for modern classrooms. A key aim of this research is to build a foundation for the Creativity and Innovation Lab (CIL), a university makerspace designed by visual arts and technology faculty to foster interdisciplinary collaboration and hands-on engagement with educational robots (ER). The research also aims to inform the design of future CIL workshops by supporting the development of a pedagogical model.

Utilizing the Technology Acceptance Model (TAM) to examine PSTs' adoption of ERs will provide data focusing on their perceptions of ease of use and usefulness in predicting their future integration of these tools (Davis, 1989; 1993). Additionally, the Teaching Creativity Scale (TCS) is employed to assess teacher self-efficacy in promoting creativity (Rubenstein et al., 2013). The literature suggests that effectively scaffolded makerspaces can enhance PSTs' confidence in using unfamiliar technologies and support the development of creative pedagogy. The CIL model highlights how structured innovation labs can foster transformative learning experiences, enabling PSTs to create engaging, interdisciplinary lessons that prepare K–12 students for a rapidly changing world. Implications for curriculum design, faculty collaboration, and scalable innovations in teacher education are discussed.

Key Words: creativity, pre-service teachers, educational robots, interdisciplinary learning

Introduction

In 21st-century education, key skills such as critical thinking, problem-solving, collaboration, communication, creativity, and innovation are essential for student success (Dilekçi & Karatay, 2023). Student learning extends beyond cognitive development to include the cultivation of perseverance, adaptability, and transferable skills (Bertrand & Namuskasa, 2020). The integration of creative and innovative activities in education may foster the transfer

of knowledge and skills across disciplines. Modern scholarship on creativity and innovation has moved beyond the traditional idea of innate talent, recognizing that these qualities can be cultivated individually and collectively. Drawing from diverse fields like neuroscience, economics, psychology, design, and the arts, researchers emphasize creativity and innovation as learnable skills (Kaufman & Sternberg, 2010; Starko, 2021). A thoughtfully designed curriculum that incorporates creativity, innovation, and technology can help simulate real-world experiences, allowing students to develop practical and creative abilities.

The integration of creativity and innovation in education extends to university teacher preparation programs, which provide foundational training for future educators. This proceedings paper reviews the literature supporting the incorporation of creativity and innovation in these programs. Specifically, the use of educational robots (ER) offers a promising avenue for pre-service teachers (PSTs) to enhance their skills and adapt teaching strategies for the future classroom. One potential approach is the development of Creativity and Innovation Lab (CIL) experiences, created by an art education professor and a technology education professor. These experiences focus on interdisciplinary integration, combining the visual arts, technology, and real-world issues, with connections to subjects like science, reading, and mathematics. This experiential approach helps PSTs develop teaching strategies that build self-efficacy and confidence in using unfamiliar technologies such as educational robots.

CIL Guiding Research Questions

The objective of the CIL is to foster innovative concepts that could influence pre-service teachers' future instruction and contribute to the field of education, with the researchers focusing

on how CIL workshops build PSTs' self-efficacy and impact their use of educational robots. The following questions guide the literature review:

1. How does a Creativity and Innovation Lab with hands-on engaged activities build self-efficacy in preservice teachers (PSTs)?
2. What are the benefits and challenges of integrating educational robots (ERs) into PST preparation?
3. How can the Technology Acceptance Model (TAM) be used to help explain PSTs' adoption of ERs as an instructional tool for future classroom use?

Literature Review

Narrowing the focus to educational applications helps establish a foundation for integrating creativity and innovation in classrooms, while defining these concepts broadly aids in building support for this curricular approach.

Educational Creativity and Innovation

Creativity and innovation are pivotal components of modern education, fostering essential skills like problem-solving, critical thinking, and collaboration. Sternberg and Lubart (1991) define creative ideas as novel, high-quality, and relevant to the task at hand, emphasizing that creativity involves not just producing new and good ideas but ensuring that those ideas are meaningful and appropriate. Creative teachers inspire students to think independently, cultivating not only academic knowledge but also attributes such as adaptability, perseverance, and confidence. These traits empower students to generate unique ideas, redefine problems, and apply cognitive skills like fluency, flexibility, and elaboration. Sternberg and Lubart (1991) argue that creative individuals can transform familiar ideas into groundbreaking innovations through

careful preparation, purpose, and strategy. They think beyond the immediate situation, considering all possibilities and constraints, and display resilience when facing challenges. This notion aligns with Kauffman and Sternberg's (2010) perspective, which stresses that creativity is both an individual and collective skill that can be cultivated over time.

Innovation, in educational contexts, is the process of introducing and applying new ideas to create meaningful improvements. This includes the development of new pedagogical theories, teaching methods, instructional tools, and even institutional models that promote more effective learning (Serdyukov, 2017). Educational innovation aims to increase efficiency, effectiveness, and overall quality of the experience. When successfully integrated into educational practices, these innovations lead to significant improvements in teaching and student outcomes.

Educational Makerspaces

Makerspaces have become increasingly recognized for their potential to foster creativity, innovation, and hands-on learning in educational settings. Despite growing interest, research on the impact of makerspaces, particularly on pre-service teachers (PSTs), remains limited. Halliburton et al. (2024) investigated how elements of makerspaces influence PSTs' confidence, particularly in STEM-related subjects where many PSTs report low levels of self-efficacy. In their study, PSTs collaborated in small groups within a university makerspace to design and develop a product, leading to notable growth in confidence. Key factors contributing to this development included access to sophisticated equipment and support from makerspace facilitators. Makerspaces provide flexible environments that encourage creativity, open-ended exploration, and collaborative learning (Stevenson et al., 2019). Teachers involved in makerspace activities have demonstrated a deeper understanding of maker pedagogies and have experienced

increased confidence (Cohen et al., 2017). Incorporating makerspaces into PST education offers a unique opportunity to engage pre-service teachers in authentic, creative learning experiences. However, to maximize their effectiveness, professional development experiences in these spaces must be scaffolded to provide adequate support, especially when PSTs are unfamiliar with the tools and technologies involved (Halliburton et al., 2024).

Educational Robots

Educational robots (ERs) have become valuable tools in fostering computational thinking (CT) and STEM skills in K-12 classrooms. These robots are widely used across various disciplines, including science, technology, engineering, and mathematics, as well as in fields like sociology, music, and visual arts (Sheridan et al., 2013). According to Zhang et al. (2021), ERs have gained popularity due to their user-friendly interaction and open-source programming capabilities, making them ideal for cultivating analytical skills, problem-solving, and innovation in students. Robotics education has been shown to enhance learning experiences and increase participation in STEM fields, preparing students for careers in these areas (Sheridan et al., 2013). For pre-service teachers, the integration of ERs into their education offers opportunities to explore innovative teaching methods early in their careers, although the practice comes with certain challenges (Adler & Beck, 2020).

Benefits of Integrating ERs into PST Education

Incorporating ERs into PST preparation offers several benefits, particularly in fostering critical thinking, problem-solving, and computational thinking. Robotics activities encourage PSTs to engage in trial-and-error learning, reflection, and problem-solving, all of which are

essential for effective teaching (Adler & Beck, 2020). Studies have demonstrated that coding with ERs enhances PSTs' computational thinking skills, a finding also supported in K-12 classrooms (Jaipal-Jamani & Angeli, 2017; Berland & Wilensky, 2015). One review of studies found that a significant majority of PSTs reported increased knowledge of coding, robotics, or computational thinking (Mason & Rich, 2019). ERs also contribute to the development of cognitive and social skills, benefiting PSTs who will later guide K-12 students (Ioannou & Makridou, 2018). Integrating ERs offers a powerful method for developing the skills and competencies essential for future teaching success.

Challenges of ER Integration

Despite the many benefits, integrating ERs into PST preparation is not without its challenges. Many elementary PSTs lack prior experience in engineering and coding, leading to feelings of unpreparedness and low self-efficacy (Kidd et al., 2025). Current pedagogical strategies often rely on complex programming tools and simulations, which can overwhelm PSTs who are new to these concepts, leading to stress and hesitation (Wang & Kale, 2025). Moreover, the success of ER integration is influenced by contextual factors such as the level of support from engineering partners and student engagement, which can affect PSTs' self-efficacy and perceived success (Kidd et al., 2025). Technical difficulties also pose challenges, with PSTs often struggling with troubleshooting and debugging robots (Hrastinski et al., 2019; Kim et al., 2018).

Conclusion

In conclusion, this foundational literature highlights the importance of interdisciplinary research in supporting creativity and innovation within university-based teacher preparation programs, emphasizing experiential learning as a key component. The review aimed to inform the design of Creativity and Innovation Lab (CIL) experiences that encourage pre-service teachers (PSTs) to build confidence, take pedagogical risks, and engage meaningfully with instructional technology, particularly educational robotics, as part of their future teaching practices.

Future research within the CIL will adapt two validated instruments to assess how maker-space experiences influence PSTs' beliefs, confidence, and instructional philosophies. The Technology Acceptance Model (TAM) will be tailored to evaluate PSTs' perceived ease of use and usefulness of educational robots (ERs), providing insight into their intentions to integrate these tools into classroom practice (Davis, 1989). Additionally, the Teaching for Creativity Scale (Rubenstein et al., 2013) will be adapted to measure PSTs' self-efficacy in fostering creative learning environments. Both instruments will be revised to reflect the interdisciplinary nature of CIL lessons, which blend artistic expression, design-based inquiry, and cross-disciplinary problem-solving. Data collection using these instruments will guide ongoing research, offering insights into how teacher education programs can better prepare PSTs for the increasingly complex demands of contemporary classrooms, providing opportunities for exploration, iteration, and reflection that traditional coursework often lacks.

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Relationship Between Socioeconomic Status and Incidence of Specific Learning Disability

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Abstract

This quantitative study examined the relationship between socioeconomic status (SES), operationalized as child poverty levels, and the incidence of specific learning disability (SLD) using simple linear regression. Data were aggregated from publicly available Texas state databases across the 20 Texas Education Service Centers (ESCs). Analysis revealed a strong positive correlation between poverty rates and SLD placement rates ($R = .90$, $R^2 = .81$, $p < .01$), indicating that poverty explained 81% of the variance in SLD identification. The null hypothesis was rejected. Findings suggest higher poverty levels are strongly associated with increased SLD placement rates. Implications for educational policy, resource allocation, trauma-informed practices, and future research are discussed. Limitations include reliance on state-specific aggregate data and a cross-sectional design.

Keywords: specific learning disability, socioeconomic status, linear regression, special education, trauma-informed practices

Introduction

The recognition of special education needs in the United States dates to the 19th century. The passage of Public Law 94-142 in 1975, later renamed the Individuals with Disabilities Education Act (IDEA), guaranteed students with disabilities a Free Appropriate Public Education (FAPE). Among the 13 disability categories under IDEA, specific learning disability (SLD) remains the largest, accounting for approximately 32% of students receiving special education services nationwide (Schaeffer, 2023). According to IDEA (2023), a Specific Learning Disability (SLD) is a disorder in one or more basic psychological processes involved in understanding or using language, manifested in difficulties with listening, speaking, reading, writing, or mathematical calculations. This definition explicitly excludes learning problems that are

primarily the result of sensory impairments, intellectual disability, emotional disturbance, or environmental factors. Contemporary SLD identification has shifted from the historical "rule-out" or discrepancy model to a more comprehensive approach that incorporates Multi-Tiered System of Supports (MTSS) and Response to Intervention (RTI) frameworks, which require documented inadequate response to high-quality, evidence-based instruction in addition to evidence of psychological processing deficits (Berkeley et al., 2020; Gilmour et al., 2024; Individuals with Disabilities Education Act, 2023; Muktamath et al., 2021).

Concerns about overrepresentation of low-SES students in special education, particularly under the SLD category, persist (Cruz & Rodl, 2018). Children living below the federal poverty level are more than twice as likely to be identified with SLD (Boat & Wu, 2015). Poverty is linked to risk factors such as exposure to environmental toxins and low birth weight, often quantified as adverse childhood experiences (ACEs) (Samuels, Hare, & De Man, 2015).

Students with SLD frequently present with comorbidities such as attention-deficit/hyperactivity disorder (ADHD), language delays, anxiety, and behavioral challenges (Kohli et al., 2018). Long-term outcomes remain concerning, with only about 68% of students with SLD earning a regular high school diploma (Individuals with Disabilities Education Act, 2023).

Adverse Childhood Experiences, Poverty, and Specific Learning Disabilities

Adverse childhood experiences (ACEs) — including abuse, neglect, household dysfunction, and poverty — are strongly associated with increased risk for neurodevelopmental difficulties. Chronic toxic stress from ACEs disrupts brain structures critical for learning,

including the hippocampus (memory), prefrontal cortex (executive function), and amygdala (emotional regulation) (CDC works 24/7, 2024; Shonkoff et al., 2012).

Poverty functions both as a distinct ACE and as a driver of additional adversities such as low birth weight, environmental toxin exposure, food insecurity, and limited early learning opportunities. Children in poverty experience higher cumulative ACE scores and are significantly more likely to be identified with SLD (Boat & Wu, 2015; Okoli et al., 2022). The present study builds upon this literature by quantifying the regional association between child poverty levels (as a proxy for low SES and elevated ACE exposure) and SLD placement rates using statewide administrative data.

Demographic and Socioeconomic Factors

Low socioeconomic status remains one of the strongest predictors of academic underachievement and disability identification (Birken & MacArthur, 2004; Hosp & Reschly, 2004). Research on disproportionality shows mixed findings regarding race/ethnicity, with many studies suggesting that socioeconomic factors may explain a substantial portion of observed disparities in SLD identification (Morgan et al., 2015; Sullivan & Bal, 2013).

Purpose of the Study

While interventions for identified SLD are well researched, the role of poverty as a premorbid contributor linked to adverse childhood experiences (ACE) remains underexplored. The purpose of this quantitative study is to examine the relationship between regional poverty levels (independent variable) and SLD placement rates (dependent variable) using simple linear regression. Poverty is defined as household income below the federal threshold required to meet

basic needs (Institute for Research on Poverty, 2023). In Texas, child poverty rates remain above the national average. In the 2023–2024 school year, approximately 857,000 students received special education services, with roughly 365,916 identified with SLD. This study investigates the strength of the association between regional poverty levels and SLD placement rates across the 20 Texas Education Service Centers. Specifically, we asked: Is there a significant relationship between regional child poverty rates and SLD placement rates in Texas public schools?

Methodology

A correlational research design was employed, specifically using simple linear regression analysis to explore the relationship between one independent variable (poverty levels, as a proxy for low SES) and one dependent variable (percentage of students placed in special education with an SLD diagnosis). This design was selected because it allows for the examination of associations between variables without manipulating them, making it suitable for analyzing existing archival data. The study relied on secondary data sources to ensure non-intrusive data collection and to leverage publicly available, reliable state-level information. Data were aggregated at the level of the 20 Texas Education Service Centers (ESCs) to provide a regional perspective within the state, facilitating a structured comparison across geographic areas.

The 20 ESCs in Texas serve as regional hubs that support school districts with resources, training, and administrative services. They are geographically distributed as follows: ESC 1 (Edinburg), ESC 2 (Corpus Christi), ESC 3 (Victoria), ESC 4 (Houston), ESC 5 (Beaumont), ESC 6 (Huntsville), ESC 7 (Kilgore), ESC 8 (Mt. Pleasant), ESC 9 (Wichita Falls), ESC 10 (Richardson), ESC 11 (Ft. Worth), ESC 12 (Waco), ESC 13 (Austin), ESC 14 (Abilene), ESC 15 (San Angelo), ESC 16 (Amarillo), ESC 17 (Lubbock), ESC 18 (Midland), ESC 19 (El Paso), and ESC 20 (San Antonio). Aggregation by ESC allowed for normalization of data across counties

and school districts, accounting for regional variations in population and educational infrastructure.

Data Sources

Data for the dependent variable (SLD placement) were obtained from the Texas Education Agency (TEA) public databases, specifically the most recent available reports on special education enrollment for students aged 3–21 during the 2022–2023 school year (Texas Education Agency, 2023). These data include the percentage of students identified with SLD and receiving special education services under IDEA, disaggregated by school districts and subsequently aggregated by the researchers into the 20 ESCs. The TEA data were derived from annual child count reports and are publicly accessible via the TEA website.

Data for the independent variable (poverty levels) were sourced from the U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program, using the latest available county-level estimates for the percentage of individuals under 18 living at or below the federal poverty level. The SAIPE data provide model-based estimates combining survey data from the American Community Survey with administrative records, offering reliable poverty metrics at the county level. Data were downloaded from the Census Bureau's data tools portal. For aggregation, poverty rates from counties within each ESC region were averaged to create a regional poverty index.

All data were publicly available and did not require institutional review board approval, as no human subjects were directly involved.

Procedures for Data Collection and Aggregation

Data collection involved the following steps:

1. **SLD Data Retrieval:** Accessed the TEA's special education data reports to extract the number and percentage of students with SLD by school district. Districts were mapped to their respective ESCs using the TEA's regional directory. Percentages were calculated as the proportion of SLD students relative to total special education enrollment or total student population, as appropriate, and averaged across districts within each ESC to yield a regional SLD rate.
2. **Poverty Data Retrieval:** Downloaded the SAIPE county-level poverty dataset for Texas. Counties were assigned to ESCs based on geographic boundaries (e.g., using maps from TEA resources). For each ESC, poverty rates for children under 18 were averaged across constituent counties, weighted by county population where necessary to ensure representativeness.
3. **Data Normalization:** Both datasets were normalized as percentages to facilitate comparison and regression analysis. Missing data were minimal and handled via listwise deletion if encountered.
4. **Quality Checks:** Data accuracy was verified by cross-referencing with summary reports from TEA and Census sources. Outliers were examined for plausibility based on regional demographics.

The aggregation process ensured that the data points (n = 20) represented balanced regional units, reducing variability due to individual district or county differences.

Data Analysis

The aggregated data were imported into IBM SPSS Statistics (Version 29) for analysis. Descriptive statistics were computed to summarize regional means and standard deviations for poverty and SLD rates. Simple linear regression was then performed, with poverty percentage as the predictor and SLD placement percentage as the outcome. The model assessed the slope (β), coefficient of determination (R^2), and F-statistic for significance. Assumptions of linearity, homoscedasticity, normality of residuals, and independence were checked using scatterplots, residual plots, and diagnostic tests (e.g., Shapiro-Wilk for normality). The null hypothesis was tested at an alpha level of .05, with $p < .05$ indicating rejection of H_0 and evidence of a significant relationship.

Results

Table 1 *Linear Regression Results Predicting SLD Placement Rates from Child Poverty Levels (N = 20 ESC Regions)*

Predictor	R	R^2	Adjusted R^2	F(1, 18)	p-value
Poverty Levels	0.90	0.81	0.80	74.75	<0.01

Note. Poverty levels explained 81% of the variance in SLD placement rates across Texas Education Service Center Regions.

Linear regression examined the relationship between poverty (independent) and SLD placement (dependent), aggregated by 20 regions. The model yielded $R = .90$, $R^2 = .81$, adjusted $R^2 = .80$, $F(1, 18) = 74.75$, $P < .01$. Thus, 81% of variance in SLD is explained by SES, rejecting H_0 with a strong effect size.

Discussion

The results demonstrate a very strong positive relationship between regional child poverty rates and SLD placement rates ($R = .90$, $R^2 = .81$, $p < .01$). This large effect size indicates that poverty is a powerful regional correlate of SLD identification in Texas.

Poverty likely influences SLD placement through multiple pathways, including chronic toxic stress, limited early learning opportunities, and higher exposure to environmental risks. These premorbid factors can impair the psychological processes central to learning. The findings raise important questions about over- versus under-identification and align with national disproportionality literature. Texas-specific factors such as economic diversity and variation in MTSS implementation across ESCs likely moderate these patterns. This study addresses a gap by providing strong regional evidence using statewide data.

Several interrelated mechanisms likely underlie this strong association. Poverty rarely occurs in isolation; it frequently co-occurs with multiple ACEs, generating chronic toxic stress that alters critical neurodevelopmental systems. Prolonged activation of the hypothalamic-pituitary-adrenal (HPA) axis can impair the hippocampus (memory consolidation), prefrontal cortex (executive functioning and self-regulation), and amygdala (emotional processing) — brain regions essential for the psychological processes outlined in the IDEA definition of SLD (CDC works 24/7, 2024; Shonkoff et al., 2012). Additionally, children in high-poverty areas often experience higher rates of low birth weight, environmental toxin exposure (e.g., lead), food and housing insecurity, and reduced access to high-quality early language and literacy experiences. These premorbid environmental factors can manifest as

academic difficulties that trigger referral and eventual SLD identification.

This robust regional correlation raised critical questions about identification equity. In high-poverty Education Service Centers, elevated SLD rates may partly reflect genuine impacts of environmental adversity on learning. However, they may also signal systemic overidentification resulting from insufficient Tier 1 instruction, limited early intervention resources, or assessment practices that do not adequately account for socioeconomic and cultural contexts. Conversely, lower-poverty regions may experience underidentification if subtle learning disabilities are masked by stronger home and school supports. Such patterns contribute to ongoing national concerns about disproportionality in special education and underscore the limitations of current eligibility criteria that attempt to separate intrinsic disabilities from environmental influences (Morgan et al., 2015; Sullivan & Bal, 2013).

Texas-specific contextual factors further illuminated these findings. The state's large geographic size, substantial economic diversity, decentralized educational governance, and high overall child poverty rate created natural laboratory conditions for examining these relationships. Variation in MTSS/RTI implementation quality, per-pupil funding, and evaluator training across the 20 ESCs likely moderated identification practices. South Texas and Rio Grande Valley regions (ESC Regions 1 and 2), which consistently show high poverty, also tended to report higher SLD rates, which highlighted the interplay between structural inequality and special education systems.

The current study addressed an important gap in the literature. While previous research has documented associations between individual-level SES and learning difficulties, few studies have demonstrated such a pronounced relationship using aggregated statewide administrative data. By focusing on regional patterns within a single large and demographically diverse state,

this analysis provided actionable insights for policymakers and educators working at the systems level.

Implications and Recommendations

These findings aligned with and extended the broader literature on socioeconomic disadvantage and learning disabilities (Hosp & Reschly, 2004; Okoli et al., 2022; Shifrer et al., 2011). Several mechanisms may explain why higher poverty rates are strongly associated with increased SLD identification. Poverty often co-occurs with multiple adverse childhood experiences (ACEs), producing chronic toxic stress that disrupts neurodevelopmental processes critical for learning, including executive function, working memory, and language processing (Shonkoff et al., 2012). Children in high-poverty areas also experience higher rates of low birth weight, exposure to environmental toxins, food insecurity, and limited access to early literacy experiences — all of which can manifest as academic difficulties that lead to formal SLD evaluation and placement.

This strong association raised important questions about overidentification versus underidentification. In high-poverty regions, elevated SLD rates may reflect genuine environmental impacts on development, but they may also indicate systemic overidentification due to inadequate universal instruction, limited early intervention, or assessment practices that do not sufficiently account for socioeconomic context. Conversely, in lower-poverty areas, underidentification remains a risk if subtle learning disabilities are overlooked. These patterns contributed to longstanding concerns about disproportionality in special education (Morgan et al., 2015; Sullivan & Bal, 2013).

Systemic and policy factors in Texas likely play a role. Variation in local resources, implementation of Multi-Tiered System of Supports (MTSS), and differences in evaluation practices across Education Service Centers may have influenced identification rates. Texas's large size, diverse student population, and decentralized educational governance create natural variation that this study captured effectively.

The current findings addressed a key gap in the literature by demonstrating a very strong regional association between poverty and SLD placement using statewide administrative data. While previous studies have documented individual-level links between SES and learning difficulties, few have quantified this relationship with such magnitude at the regional level.

The substantial association between poverty and SLD placement highlights the need for targeted resource allocation and systemic changes. Districts in high-poverty areas should prioritize enhanced universal and early intervention resources to support struggling learners before formal SLD identification becomes necessary. Policymakers should consider increasing funding for high-need Education Service Centers, expanding access to high-quality early childhood programs, and supporting comprehensive MTSS implementation. Special education assessors should be trained to carefully consider socioeconomic and environmental factors when determining eligibility to reduce potential misidentification. Finally, future research should replicate this study across other states and incorporate longitudinal and individual-level data to better understand causal pathways and long-term outcomes.

Limitations

This study relied on publicly available aggregate data at the level of the 20 Texas Education Service Centers. As such, the findings are susceptible to the ecological fallacy:

relationships observed at the regional level may not hold at the individual student level (Robinson, 1950). For example, while high-poverty regions showed substantially higher SLD placement rates, it cannot be assumed that individual children from low-income households are necessarily more likely to receive an SLD diagnosis. Other unmeasured regional factors—such as variation in MTSS/RTI implementation quality, evaluator training, referral practices, or resource availability—may contribute to the observed patterns. Future research using individual-level student data is needed to disentangle student-level versus system-level effects and to better understand causal mechanisms.

The strong regional association observed in this study should be interpreted cautiously due to the potential for ecological fallacy. While the findings clearly demonstrate that high-poverty Education Service Centers have markedly higher SLD identification rates, this does not necessarily imply that poverty directly causes SLD at the individual level. Instead, the results point to important system-level inequities that warrant targeted policy attention.

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Unleashing Innovation: The Transformative Power of Creativity Through Play

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Abstract

Play serves a foundational role in fostering creative and innovative individuals, influencing how they think, explore, and tackle problems well before they enter the workforce. When we foster a culture of curiosity, inquiry-based learning, and open-ended problem-solving, individuals learn to experiment, question assumptions, and generate new ideas (Chu & Schulz, 2020). Scholars and psychologists debate how play is far more than just entertainment; it's a fundamental aspect of human development and cognition (Tok, 2022).

Keywords: Play, innovation, creativity, exploration, curiosity

Introduction

Do you remember making mud pies and sandcastles? Climbing trees? Jumping in puddles? Playing with mud? Cuddling a baby doll? Enjoying a tea party? Dragging a stick along the ground? Digging a sand tunnel? Following a snail's trail?

These questions are examples of engaging and creative play development. Through play, there is joy and discovery of what is in the world around them. Play helps children understand their world through their interactions and explorations, and it strongly influences their optimal growth, development, and learning. They become empowered, autonomous, and self-confident as early learners. Wasserman (2000) points out that play discovery gives early learners a sense of competence, which is seminal for children's development.

Researchers have documented that play is the optimal vehicle for learning and development. In Table 1, Isenberg and Jalongo (2010) explain five essential play characteristics, and each characteristic is also accompanied by an example. The examples described are how children engage in block play. Teachers, parents, and administrators need continued support in their efforts to include play in the early childhood curriculum. Almy (1984) explains how

children have the right to play and how adults are to provide opportunities for engaging in play. These opportunities are essential for children to express themselves and to spark their creativity.

Table 1

Play Characteristics and Examples

Play Characteristics	Examples
Play is voluntary and intrinsically motivated.	Children are motivated by the variety of block materials.
Play is symbolic, meaningful, and transformational.	Children are constructing blocks that reflect an experience.
Play is active.	Children are playing and sharing blocks.
Play is rule-bound.	Children are following the rules/procedures of playing with blocks.
Play is pleasurable.	Children are playing with blocks and other play materials.

Children are not passive receivers of knowledge; rather, they actively work at organizing their experiences into more complex mental structures (Joubert and Harrison, 2021). Children's play, sometimes called work, promotes development in all aspects of growth, such as cognition, language, and physical development. Materials or equipment are not always required for play, and the learning environment can vary from outdoors to indoors (Ahmad et. al., 2016). Play is the best context for children's learning and development because it is free and open-ended. An influential theorist, Jean Piaget, conducted extensive research on the profound connections between play and creativity.

Jean Piaget

Swiss psychologist Jean Piaget dedicated fifty years to studying how children develop cognitively with an emphasis on the importance of play as a natural and essential aspect of a child's growth (Passer & Smith, 2009). Piaget's cognitive theory and its relation to play development is an influential theory in the fields of psychology, socialization, and education. During Piaget's research, patterns in children's observations and their incorrect responses led to findings about play as a phenomenon and its relationship to children's age (Manal, 2022).

Play Development

Play comes naturally to children, where they interact with the environment, so it makes sense that they learn from it. The naturalness of play provides children with opportunities to practice problem-solving and decision-making abilities, two important elements of cognitive development. Piaget believed that the naturalness of play has a significant role in the development of a child's creative abilities. The development of creativity is also related to cognitive development because creative thinking contributes to problem-solving (Brewer, 2001). When children are playing, they are learning how to cooperate with others, problem-solve, build language, and identify their human potential. To put it plainly, play helps children understand and discover their place in the world. Harley (1971) supports Piaget's philosophy: "play is the vehicle by which youngsters impart, entertain, find out about their general surroundings, comprehend themselves as well as other people, manage their issues, and practice a portion of the abilities they will use later on" (p. 81).

Piaget's play research extends to the identification of cultural norms and expectations, while discovering the workings of the world and negotiating within the surroundings (Brewer, 2001). During play, children are engaging in learning and interacting with their environment and

exploring the world. Children become active and enthusiastic agents of their environment as they explore new concepts and ideas. Brewer further explains that through their enthusiasm, they are experimenting with their individual research of play by constructing their cultural experiences, problem-solving, and creativity. Piaget provided a foundational understanding of play as a process that involves imagination, skill development, higher-order thinking, and engagement, all grounded in cognitive development.

Piaget's Cognitive Development

Cognitive development is the process by which children gradually develop the ability to think, reason, and understand the world around them (Piaget, 1962). Each stage of cognitive development holds intrinsic value, and through these stages, young children actively construct knowledge. Tok (2022) adds that through cognitive development, "play is the most significant activity to boost creativity in educational environments" (p. 957). In Piaget's stages of cognitive development, there are distinct stages from birth through the end of adolescence. Each cognitive stage happens in the same order, and no stage is skipped. There is a significant transformation in each stage that anchors in developmental skills (Puckett & Diffily, 2004). Table 2 provides a characteristic description of each stage of cognitive development and the role of the adult.

Table 2

Piaget's Stages of Cognitive Development

Stages and Ages	Characteristics	Role of Adults

Sensorimotor Period Birth to 2 years old	Responds to reflex behaviors, where they become more coordinated; object permanence; and the development of mental schemas.	Respond to and enhance the infant's sensory exploration of touch, taste, sight, sound, and smell; talk to the infant.
Concrete Operational Thinking 7 -11 years old	Can solve concrete problems with physical objects. Thinking is based on prior experience. Beginnings of simple logic.	Provide opportunities to pursue interests. Help obtain materials. Share interests in school and other activities and accomplishments.
Formal Operational Thinking 11 years old - adulthood	Formulates and tests hypotheses. Thinks abstractly. Uses deductive reasoning. More logic is practiced.	Challenged with solving hypothetical problems. Discusses ethical issues. Encourages and supports personal responsibility.

Note: Piaget's stages of cognitive development, their characteristics, and the role of the adult.

Piaget's theory of cognitive development has had an enormous impact on thought and practice in philosophy, psychology, and education for almost half a century (Puckett & Diffily, 2004). The explanation is that young children think within a particular developmental age; therefore, learning environments and instruction should match children's emerging cognitive abilities. Educators now acknowledge that, according to Piaget's theory of cognitive development, learners build understanding through meaningful interactions with both objects and people.

Play and Creativity are Interwoven

Play is understood as a creative act that reconstructs, appropriates, and transforms human experience to produce new realities (Penfold, 2019). Play is often dismissed as unimportant and something reserved for children or leisure time. Scholars and psychologists have debated that play is far more than just entertainment; it's a fundamental aspect of human development and

cognition (Tok, 2022). Imaginative play is not only essential for cognitive development, but also in viewing the world from various perspectives.

Creativity is the driving force behind innovation; the spark that ignites progress and pulls society forward. The ability to think differently, conceive ideas, and create something unique are important examples of creativity. In an era where artificial intelligence is gaining popularity, it is essential to remain aware that the center of innovation is creativity (Kurmi et al., 2024). Fueling creativity is crucial and non-negotiable, regardless of the type of industry. Play, though simple, is a fundamental part of human nature and is central to this creative process. In examining why innovation originates in creativity, it is vital to emphasize that play and its underlying mechanics demonstrate their critical function in human cognition and problem-solving (Riede et al., 2018). Creativity is the generator of original ideas and possibilities, while innovation transforms those ideas into practical and impactful solutions.

Innovation

Creativity is critical to innovation as it provides the foundation for developing new ideas and solutions. It entails thinking beyond conventional boundaries, imagining new possibilities, and drawing unexpected connections between unrelated things. Creativity generates the first ideas that propel the innovation process, allowing individuals and organizations to meet new trends, explore needs, and solve challenges in novel ways (Yusuf, 2009). Ultimately, creativity lays the groundwork for sustainable innovation by empowering people to imagine what it could be. Through this imaginative leap, creativity becomes the spark that brings future opportunities into view.

What is Innovation?

Innovation is the process of generating and implementing new ideas, products, services, or processes that add value to businesses or society (Kogabayev & Maziliauskas, 2017). It is frequently seen as a critical driver of competitive advantage and long-term performance in dynamic environments. Innovation can occur gradually, through small improvements, or dramatically, through disruptive innovations that reshape businesses (Drucker, 1998). For innovation to be successful, it requires curiosity, exploration, creativity, and the effective application of new ideas within an organization. A favorable environment, including leadership support, teamwork, and a culture that supports risk-taking, is necessary for successful innovation (Garcia & Calantone, 2002).

What Fuels Innovation?

Innovation is more than new products; it is about making incremental changes, stopping what may not be working, and changing the way we think, do, and experience things. Innovation allows for molding free from conventional standards and entering the unexplored territory of novel ideas (Carr et al., 2016). Creativity acts as the driving force behind organizations, enabling individuals and cultures to conceive of possibilities beyond the constraints of conventional paradigms. Whether in science, technology, art, or business, creativity powers the engine of progress, resulting in change and shaping the future when afforded proper space and time.

As the world changes, established methods and solutions rapidly become obsolete. As a result, individuals and businesses must constantly adapt and innovate to remain competitive and relevant. Furthermore, innovation promotes agility and resilience, key qualities for navigating the complexities and uncertainties of changing environments. By incorporating innovation into a new skill set, we can better address emerging challenges, capture new opportunities, and achieve long-term development in a constantly changing landscape (Cobo & Cobo, 2013).

To remain competitive in an ever-changing and connected society, creativity and innovation will be critical. It begins with nurturing creativity and innovation in conditions conducive to the growth of new ideas, supported by enhanced leadership. Leadership practices such as self-awareness, adaptability, collaboration, visionary thinking, critical thinking, a global mindset, and effective communication will be required to articulate change and champion novel ideas (Fotso, 2021). Effectiveness and performance can depend on guiding individuals and teams from idea to implementation, ensuring creative efforts lead to actual results.

21st Century Skills

Due to the rapid pace of technological breakthroughs and global interconnectedness, innovation is an essential component of 21st-century skill sets. Creativity and innovation are foundational skill sets, as they enable development and flexibility in a continually changing world. As technology improves and global difficulties emerge, creative thinking enables individuals to devise fresh solutions and adapt to new situations (Mumford et al., 2017). Innovation encourages more than the creation of new products; it impacts services, structures, processes, and new ways of thinking, which can result in competitive advantages and economic growth. In a constantly changing environment, the ability to think creatively and innovate ensures that individuals and organizations remain relevant, competitive, and capable of effectively solving difficult situations (Adeoye & Jimoh, 2023). Creativity and innovation are critical for developing and executing new ideas, as well as addressing and forecasting challenges (Al Mubarak, 2022).

Innovation Supports 21st Century Skills

The World Economic Forum highlights a set of abilities and competencies critical to skills and upskilling for the next generation of leaders. In Table 3, skills and competencies such

as analytical thinking, innovation, creativity, collaboration, and communication are and will be imperative for success in today's complex and rapidly evolving world. Li's (2022) upskilling and reskilling competencies are highlighted and additionally explained in Table 3, with an example of relevance as it pertains to creativity and innovation.

Table 3
Reskilling and Upskilling for a Future-ready Workforce

Core Skills 2020	**Core Skills 2025**	**Role in Creativity and Innovation**
Analytical Thinking and Innovation	Analytical Thinking	Enables individuals to break down complex problems and identify innovative, data-driven solutions.
Active Learning and Learning Strategies	Resilience, Flexibility, and Agility	Allow individuals to adapt creatively to change and bounce back from setbacks and failures with renewed strategies and approaches.
Complex Problem Solving	Leadership and Social Influence	Inspire teams to embrace new ideas and foster a culture that supports and empowers innovation and creative solutions.
Critical Thinking and Analysis	Creative Thinking	Drives the generation of original ideas, problem-solving, and novel approaches, which are critical for innovation.

Creativity, Originality, and Initiative	Motivation and Self-Awareness	Innate and persistent pursuit of creative solutions and goals while aligning personal strengths with innovative outcomes.
Leadership and Social Influence	Technological Literacy	Ability to equip individuals to leverage digital tools and resources in creating novel solutions and improvements.
Technology, Monitoring, and Control	Empathy and Active Listening	Uncovers unmet needs and diverse perspectives that spark user-centered innovation.
Technology Design and Programming	Curiosity and Lifelong Learning	Encourages the exploration and acquisition of new knowledge, which leads to fresh perspectives and innovative insights.
Resilience, Stress Tolerance, and Flexibility	Talent Management	Builds pipeline and innovative teams by recognizing and nurturing diverse strengths and creative potential.
Reasoning and Problem-solving	Service Orientation and Customer Service	Thinking is inspired by feedback and fuels innovations that directly address user/customer needs and challenges, and enhance customer experiences.

Note: World Economic Forum skills for the 21st Century and their role in creativity and innovation.

Complex Problem-Solving

Complex problem-solving is a leading core skill because today's problems may not have simple solutions; they involve ambiguity, multiple variables, changing constraints, and systems that are linked to each other. Individuals who can analyze ambiguous situations, synthesize information across disciplines, and generate creative solutions are better equipped to drive progress and adapt to change. This ambidextrous skill enables people to go further than quick fixes, uncovering the real issues, predicting future effects, and creating new solutions that deliver lasting benefits (Randhawa et al., 2021). In fast-changing environments, the ability to approach problems with structure, curiosity, and resilience becomes essential not only for individual success but also for organizational agility and sustained innovation.

Creativity, Originality, and Initiative

Creativity and initiative are core skills enabling individuals to generate new ideas, envision possibilities beyond the existing, and approach challenges from a fresh perspective. The idea of originality invites us to reimagine what we know, revealing solutions and opportunities that only bold thinking can uncover. In a world where environments, technologies, and customers need to continually evolve, creativity fuels the ability to innovate. It encourages curiosity, originality, experimentation, and the willingness to challenge assumptions (Wood et al., 2022). By fostering imaginative and creative thinking and the capacity to connect seemingly unrelated concepts, creative thinking becomes a catalyst for innovation, continuous learning, and long-term competitive advantage for both individuals and organizations.

Resilience, Stress Tolerance, and Flexibility

The core skills outlined in Table 3 required to reskill and upskill the next generation of the workforce delineate a set of foundational competencies, such as complex problem-solving, creativity, resilience, flexibility, and critical thinking that serve as the bedrock for rapidly

changing environments. These core skills play a pivotal role in fostering creativity and innovation by equipping individuals with strong communicative and collaborative capabilities. These core skills enable cross-functional idea generation by enhancing adaptability and lifelong learning orientation; they allow individuals to pivot, experiment, and problem-solve, cultivating novel environments where novel solutions can flourish. Table 3 underscores how developing such core competencies is not just about keeping the status quo with technological change, but about establishing the mindsets that enable agile, innovative, and creative behaviors that organizations will need in the new millennium.

Creativity and innovation serve as catalysts for core skill sets such as critical thinking, collaboration, and collective problem-solving for the future (Li, 2022). Fostering creativity and embedding it within innovative processes, individuals and organizations can meet the demands of the 21st century effectively. Li further explains that providing both the culture and structures for developing and applying both concepts is important to an organization's success.

How Does Creativity Support New Skill Sets for the 21st Century?

To remain competitive and thrive in a rapidly changing world, creativity is essential and a building block to drive innovation. Twenty-first-century skills are the vital abilities required for success in today's fast-paced, technologically advanced, and interconnected environment. These skills include critical thinking and problem-solving, effective communication abilities, and digital literacy, which are all essential for working with new tools and technologies. Additionally, self-awareness and cultural awareness fuel understanding, differences, and perspectives, allowing individuals to think globally. Agile leadership will be needed to motivate, inspire, and guide others, encouraging proactive ideation and innovation to meet current opportunities and challenges (Surapto et al., 2024). Collective creativity is needed for innovation because it is

fueled by meaningful conversations, inquiry, and societal interactions, empowering individuals to navigate the current and complex dynamic environments by leveraging their experiences and perspectives (Huang et al., 2022).

Innovative Classroom: Implementing Loose Parts

Simon Nicholson coined the term Loose Parts and described it as the importance of interactive materials that can have many affordances (Cankaya et al., 2023). According to the Affordance Theory, the world is perceived as an object of possibilities for action or affordances, which refers to how an object or material can be used or interacted with (Gibson, 1979). Loose parts can involve a variety of items: everyday synthetic or natural objects, reusable, and upcycled materials. Play items with many affordances provide children with more opportunities to gain experience and develop new creative and innovative skills through their play.

The theory of loose parts provides early childhood environments and experiences by using open-ended materials to encourage exploration, problem-solving, creativity, and innovation (Nicholson, 1977). The more loose parts and materials for children to engage with, the more opportunity for ingenuity to take place. For children to make sense of their world, loose parts provide endless opportunities for their innate curiosity and wonder to aid in their development. Beloglovsky and Daly (2016) point out how children love to play, experiment, discover, and invent with loose parts as part of their early childhood environment. It allows them to have their own ideas, to build things the way they choose, and to figure out for themselves how to make them work.

Children can transform and repurpose loose parts based on their imagination, whereas other objects may have predetermined uses or fixed representations. Thus, loose parts give children more opportunities for flexibility and adaptability in object and exploratory play (Cankaya et al., 2023). As they figure out how to use loose parts effectively, they experiment with different combinations and overcome challenges. Loose parts give children greater freedom, flexibility, and open-ended possibilities compared to other objects, making them unique components of children's play experiences (Cankaya et al., 2023). Collaboration and social interactions are also part of loose parts play; for example, they build and establish joint goals using receptive and expressive language. Such a compromise allows them to establish what they would build and how they would build it (Vriens-van Hoogdalem et al., 2016).

Children engage in open-ended exploration, creative problem-solving, and collaborative building experiences with loose parts. In sharing loose parts, the students' roles can be negotiated, and working together allows for creativity and innovation in developing play scenarios. Researchers have conclusive evidence that highlights the potential of engaging in specific types of play with indoor loose parts to positively influence young children's cognitive development and equip them with essential skills for lifelong learning. There is a growing global interest in loose parts play for enriching children's experiences to motivate experimentation and learning (Beaudin 2021; Beloglovsky & Daly 2015, 2016; Caldwell 2016; Casey & Robertson 2016; Daly & Beloglovsky 2014; Eren-Öcal 2021).

The Implementation of Loose Parts

Mrs. Ramirez, a pre-K 3- and 4-year-old teacher at St Thomas More Catholic School in San Antonio, Texas, is a 20-year experienced early childhood teacher. She enriches her early

learners' creativity and innovation throughout the day with loose parts activities. Every student has a personal zipper bag filled with loose parts from the classroom, such as geo shape cubes, playdough, buttons, connecting cubes, and manipulatives that connect. In Figure 2, the different loose parts bags are filled with interlocking cubes, connecting manipulatives, and geo shapes. The zipper bags are included in the school supply list and are purchased by the parents at the beginning of the school year.

Figure 1

Loose Parts Materials

Note: The loose parts are put in zipper bags. The materials are items from the classroom.

Writing materials such as a journal, a pencil, and crayons are not included in the loose parts materials zipper bag; however, they are part of the activity. Mrs. Ramirez believes that if the early learners draw their loose parts design or attempt to sound out words, this stimulates language development and creativity.

When the early learners finish their work, Mrs. Ramírez instructs them to take out their loose parts bag and "play with their loose parts." The word "play" is emphasized to engage and innovate with their loose parts. After students returned to school in 2021, during the COVID era, Mrs. Ramirez has been including loose parts as an extension enrichment activity or as a play

activity. The researchers found that students who played with loose parts were generally successful in various divergent and convergent problem-solving tasks, suggesting that engaging with loose parts activities instills the idea of numerous creative solutions to a problem (Pepler and Hildy, 1981; White, 2012). “When students play with their loose parts, they are building language development, socialization, and creativity,” states Mrs. Ramirez. In Figure 2, early learners are actively engaging with the loose parts and designing innovative structures.

Figure 2

Early Learners Playing with Loose Parts

Note: The early learners are playing with their loose parts.

Academically, the early learners demonstrated high gains in their early childhood assessments. The skills that had high marks were critical thinking and problem-solving. Creativity was not presented in the assessments; however, Mrs. Ramirez added that creativity also increased; for example, students took more initiative in adding details to their drawings. They also showed more interest in wanting to play with open-ended materials such as blocks and art. Playing with loose parts engages children in self-directed learning experiences, promoting agency and the value in their cognitive growth (Cankaya et al., 2023). Therefore, educators and

families should incorporate loose parts play in children's environments to enrich their cognitive development and holistic learning experience.

Conclusion

Play serves a foundational role in fostering creative and innovative individuals, influencing how they think, explore, and tackle problems well before they join the workforce. When we foster a culture of curiosity, inquiry-based learning, and open-ended problem-solving, individuals learn to experiment, question assumptions, and generate new ideas (Chu & Schulz, 2020). Collaboration strengthens communication, perspective-taking, and adaptability, all of which are essential to experimentation and resilience.

A 2014 study from Adobe Systems Incorporated found that creativity and innovation drive the increase in economic growth. Creativity and innovation play a crucial role in human, social, and economic development. The study further indicated that creativity is being stifled by modern education systems. "Today's institutions of learning are discouraging creativity within young people," states Robinson (Zonta, 2014, p. 1). Without creative individuals, we would not be able to enjoy and experience the innovation that punctuates our daily lives (Rabotapi, 2012).

Economists and policymakers identify creativity and innovation as engines of economic growth and social dynamism. A company's most important asset isn't raw materials; "it is creative capital, an arsenal of creative thinkers whose ideas can be turned into valuable products and services" (Florida & Goodnight, 2005, p. 125). To further elaborate, Shah (2013) discusses the importance of moving forward for economic growth, creativity, critical thinking, communication, and collaboration, which are critical in preparing students for the future.

Collectively, creativity and inquiry fuel critical thinking and problem-solving, providing the cornerstone of a future-ready and innovative workforce. Inquiry drives perpetual learning and compels humans to investigate beyond the apparent. Creativity converts insights into innovative concepts and methodologies, whereas play fosters safety and encouragement essential for experimentation and learning from setbacks. Subsequently. skills such as critical thinking, adaptability, and complex problem-solving are developed and inform novel and high-impact solutions. From creativity, inquiry, and critical thinking, these skills allow individuals and organizations to thrive, quickly adapt, and promote prominent sustainable innovation.

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Impact of Targeted Pharmacogenomics Education and Personal Pharmacogenetic Testing on Student Pharmacists' Knowledge, Confidence, and Professional Role Perception

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Abstract

Pharmacogenomics (PGx) is an expanding component of precision medicine with increasing relevance to medication optimization and patient-centered care (Koyama et al., 2024; National Human Genome Research Institute, 2024; Wondrasek et al., 2024). Despite growing clinical applicability, pharmacists and pharmacy students frequently report limited confidence and preparedness related to PGx implementation (Marcinak et al., 2018; Wondrasek et al., 2024). A prospective pre-post observational study evaluated the impact of a targeted educational intervention incorporating personal pharmacogenetic testing among Doctor of Pharmacy students at Southwestern Oklahoma State University College of Pharmacy. Confidence interpreting PGx test results increased from 50% pre-intervention to 79% post-intervention. Familiarity with PGx clinical resources increased from 56% to 71%, while perceived efficiency utilizing evidence-based PGx resources increased from 50% to 71%. Mean knowledge assessment scores improved from 66% correct responses pre-intervention to 73% post-intervention. Agreement that pharmacists have a responsibility to educate patients and providers regarding PGx declined from 94% to 76% following the intervention. Experiential PGx educational interventions incorporating personal pharmacogenetic testing may improve learner confidence, familiarity with evidence-based resources, and preparedness for clinical PGx applications.

Key Words: pharmacogenomics, pharmacy education, precision medicine, pharmacogenetic testing, student pharmacists

Introduction

Pharmacogenomics (PGx), the study of how genetic variability influences medication response, represents an important component of precision medicine and individualized patient care (National Human Genome Research Institute, 2024). A long-term evaluation of the World

Health Organization mortality database (2001–2019) across 54 countries identified increasing trends in adverse drug event-related mortality, with the highest rates observed in North America (Koyama et al., 2024). The National Human Genome Research Institute (2024) reports that more than 98% of individuals may carry at least one genomic variant with the potential to influence response to commonly prescribed medications. Pharmacogenomic research continues to demonstrate the potential to improve medication safety, optimize therapeutic efficacy, and reduce adverse drug reactions through genotype-guided therapy selection (Koyama et al., 2024; National Human Genome Research Institute, 2024; Wondrasek et al., 2024).

Despite expanding clinical guidance, increased access to pharmacogenetic testing, and calls from the American Society of Health-System Pharmacists (ASHP) supporting pharmacist engagement in clinical implementation and patient/provider education, PGx remains underutilized in pharmacy practice (Haidar et al., 2022; Wondrasek et al., 2024). Previous literature has identified multiple barriers to PGx implementation, including limited knowledge, insufficient confidence in interpretation of test results, and uncertainty regarding professional roles and responsibilities. In a systematic review evaluating pharmacists and pharmacy students across multiple countries, many respondents reported inadequate preparation and low confidence in applying PGx information in clinical practice (Wondrasek et al., 2024). Deficiencies in pharmacy curricula have been identified as a major contributor to these perceptions (Frick et al., 2018; Marcinak et al., 2018; Wondrasek et al., 2024).

Traditional didactic instruction may provide foundational knowledge; however, experiential educational approaches may better support confidence development and clinical application. Previous studies evaluating PGx instruction in pharmacy education demonstrated significant improvements in student confidence and perceptions following targeted coursework

(Marcinak et al., 2018). Additional research incorporating personal pharmacogenetic testing suggested that direct engagement with individualized genetic data may further enhance perceived relevance and future clinical utilization (Frick et al., 2018). The Accreditation Council for Pharmacy Education (2025) identifies PGx as a required component of Doctor of Pharmacy curricula, further emphasizing the importance of effective instructional strategies.

This study evaluated the impact of a targeted educational intervention incorporating personal pharmacogenetic testing on student pharmacists' knowledge, confidence, and perceptions regarding PGx utilization and professional responsibility. Findings from this study will inform future curricular design, course structure, and continued research related to pharmacogenetic testing implementation in pharmacy education.

Methods

Study Design

A prospective, pre-post observational study design was utilized to evaluate the educational impact of a targeted PGx intervention on student pharmacists' knowledge, confidence, and perceptions regarding PGx utilization. Institutional Review Board approval was obtained prior to study initiation. Doctor of Pharmacy students enrolled at Southwestern Oklahoma State University College of Pharmacy were invited to voluntarily participate in the study from April to August 2025. Participants included students from multiple professional years within the curriculum. Students served as both learners and research participants throughout the educational intervention.

The educational intervention incorporated experiential PGx activities designed to promote applied understanding and clinical relevance. Participants completed a ClarityX®

pharmacogenetic cheek swab test at home. The testing platform evaluated 23 genes associated with medication response, including several genes with established clinical actionability and evidence-based therapeutic recommendations. Students independently completed sample collection and submission according to manufacturer instructions.

Approximately four weeks following test distribution, participants attended an optional faculty-led debriefing session focused on interpretation of PGx reports, application of Clinical Pharmacogenetics Implementation Consortium (CPIC) recommendations, and PGx clinical resources (ClinPGx, n.d.-a). Publicly available evidence-based clinical decision support tools were reviewed to increase familiarity with PGx implementation strategies (ClinPGx, n.d.-a; ClinPGx, n.d.-b).

The learner-centered intervention was designed to enhance engagement and support practical application of PGx principles beyond traditional lecture-based instruction.

Data Collection

Participants completed a pre-intervention survey assessing baseline PGx exposure, self-reported knowledge, confidence in interpretation and clinical application, familiarity with PGx resources, and perceptions regarding the pharmacist's role in PGx education and implementation. Following completion of the intervention activities, participants completed a post-intervention survey assessing the same domains. The knowledge assessment included 10 PGx-related questions evaluating understanding of clinically relevant enzyme and transporter protein variants, medication response implications, and PGx resource utilization. Participants were also provided with the option to voluntarily submit de-identified pharmacogenetic reports for descriptive analysis. Submission of test results was not required for participation in the study.

Data Analysis

Pre- and post-intervention survey responses were summarized descriptively and compared to evaluate changes in learner perceptions, confidence, and knowledge. Knowledge-based assessment scores were evaluated by comparing accuracy on PGx-related questions before and after the intervention.

Voluntarily submitted de-identified pharmacogenetic reports were reviewed to identify clinically actionable genetic variants and associated therapeutic implications supported by established CPIC guidelines and Food and Drug Administration (FDA) PGx labeling (ClinPGx, n.d.-a; ClinPGx, n.d.-b).

Results

Participant Characteristics

Sixteen pharmacy students completed the pre-intervention survey and received ClarityX® pharmacogenetic testing kits. Among the initial 16 student participants, the majority were White (87.5%) and female (62.5%), with a mean age of 24.6 years (see Table 1). Participants represented multiple professional years within the Doctor of Pharmacy curriculum and demonstrated varying levels of prior PGx exposure. Five participants (31.3%) reported receiving five or more prior PGx-focused lectures before study participation. Fourteen participants completed the post-intervention survey, and four students participated in the optional debriefing session. Five participants voluntarily submitted de-identified pharmacogenetic reports for descriptive analysis.

Table 1
Participant Demographic Characteristics (N = 16)

Characteristic	n (%) or Mean
Age, years	24.6 (mean)
Sex	
Female	10 (62.5)
Male	6 (37.5)
Race	
American Indian/Alaska Native	1 (6.3)
Black or African American	1 (6.3)
White	14 (87.5)
Ethnicity	
Hispanic/Latino	2 (12.5)
Non-Hispanic/Latino	14 (87.5)

Note. Data are presented as n (%) unless otherwise indicated. Percentages may not add to 100 due to rounding.

Changes in Knowledge, Confidence, and Perceptions

Post-intervention survey findings demonstrated descriptive improvements across multiple educational outcomes. The percentage of participants who agreed or strongly agreed that they felt confident interpreting PGx test results increased from 50% pre-intervention to 79% post-intervention. Familiarity with PGx clinical resources increased from 56% to 71%, while perceived efficiency in utilizing evidence-based PGx resources increased from 50% to 71% following completion of the intervention.

Participants also demonstrated improved performance on knowledge-based assessment questions, with mean accuracy increasing from 66% correct responses pre-intervention to 73% correct responses post-intervention.

Perceptions regarding pharmacist responsibility in PGx education demonstrated mixed findings. Agreement or strong agreement that pharmacists have a responsibility to educate patients and providers regarding PGx declined from 94% pre-intervention to 76% post-intervention.

Table 2
Pre- and Post-Intervention Educational Outcomes

Outcome	Pre (%) (N = 16)	Post (%) (N = 14)
Confidence interpreting PGx results	50	79
Familiarity with PGx resources	56	71
Efficiency utilizing PGx resources	50	71
Pharmacist role perception	94	76
Knowledge assessment accuracy	66	73

Pharmacogenetic Findings

Analysis of the five voluntarily submitted de-identified pharmacogenetic reports focused on 10 of the 23 genetic variants included in the ClarityX® report, emphasizing genes supported by established CPIC guidelines for genotype-guided therapeutic modification. At least one clinically relevant genetic variant was identified in each submitted report. These variants were

associated with 105 medications, including 44 with Food and Drug Administration (FDA) labeling containing PGx information. This finding is consistent with previous estimates suggesting that most individuals carry at least one clinically relevant PGx variant (National Human Genome Research Institute, 2024). Identified variants were associated with numerous medications commonly encountered in clinical practice and corresponded with published CPIC recommendations and FDA PGx labeling (ClinPGx, n.d.-a; ClinPGx, n.d.-b) (see Table 3).

The presence of clinically relevant variants across all analyzed reports provided students with exposure to individualized therapeutic considerations and practical applications of PGx in patient care.

Table 3
Clinically Actionable Pharmacogenomic Variants Identified in Submitted Reports (N = 5)

Gene	Number of Participants with Variant	CPIC Actionability/Clinical Relevance
COMT	4	Associated with altered catecholamine metabolism and potential variability in pain perception and neuropsychiatric medication response
CYP2B6	1	May influence metabolism of medications such as bupropion, efavirenz, and methadone
CYP2C9	2	Associated with altered metabolism of nonsteroidal anti-inflammatory drugs and warfarin dosing considerations
CYP2C19	4	Influences metabolism and therapeutic response of clopidogrel, proton pump inhibitors, and several antidepressants
CYP2D6	3	Affects metabolism of opioids, antidepressants, beta blockers, and other commonly prescribed medications
CYP3A4	0	No clinically actionable variants identified in submitted reports
CYP3A5	4	Associated with tacrolimus metabolism and dosing variability
OPRM1	2	Associated with altered opioid sensitivity and analgesic response
SLCO1B1	1	Associated with increased risk of statin-associated myopathy, particularly with simvastatin
Gene	**Number of Participants with Variant**	**CPIC Actionability/Clinical Relevance**
VKORC1	4	Influences warfarin sensitivity and dosing requirements

Note. Frequencies reflect voluntarily submitted de-identified pharmacogenetic reports. Clinical relevance summaries are based on publicly available CPIC guidance and PGx evidence resources (ClinPGx, n.d.-a; ClinPGx, n.d.-b).

Discussion

This study demonstrated that a targeted educational intervention incorporating personal pharmacogenetic testing positively influenced student pharmacists' confidence, knowledge, and familiarity with PGx resources. Similar to the findings reported by Frick et al. (2018), incorporation of personal pharmacogenetic testing appeared to enhance learner engagement and perceived clinical relevance of PGx education.

Personal pharmacogenetic testing may provide a particularly meaningful educational experience by transforming PGx from an abstract scientific concept into a personally relevant clinical application. The identification of clinically actionable variants in all analyzed reports likely contributed to increased appreciation for the prevalence and significance of PGx variability in patient care.

Improvements in confidence and familiarity with evidence-based PGx resources are particularly important given previously identified barriers to implementation perceptions (Frick et al., 2018; Marcinak et al., 2018; Wondrasek et al., 2024). As pharmacists continue to assume expanded responsibilities related to medication optimization and precision medicine, educational interventions that strengthen clinical preparedness may facilitate broader PGx adoption and support precision medicine initiatives across individual and population-level care.

The observed decline in agreement regarding the pharmacist's role in PGx education warrants additional exploration. Rather than suggesting diminished professional responsibility, these findings may reflect increased recognition of the collaborative and interdisciplinary nature

of PGx implementation. Effective PGx integration frequently requires coordination among pharmacists, prescribers, genetic specialists, and other healthcare professionals. Limited participation in the debriefing session may have influenced these findings by reducing opportunities for guided discussion related to interpretation and personalized application of PGx reports.

Limitations

Several limitations should be considered when interpreting study findings. The study involved a small sample size from a single institution, limiting generalizability. Participation in debriefing sessions and voluntary submission of de-identified reports was incomplete, potentially affecting interpretation of educational impact. Additionally, outcomes relied primarily on self-reported perceptions and confidence measures rather than objective measures of long-term clinical competency. The relatively short follow-up period also limits assessment of sustained knowledge retention and future application in practice settings.

Implications for Education and Practice

These findings support incorporation of experiential and learner-centered PGx education within pharmacy curricula. Applied educational activities that include personal testing, interpretation of PGx reports, and utilization of clinical resources may improve learner confidence and readiness to engage in precision medicine implementation.

As PGx continues to expand within healthcare practice, pharmacy programs may benefit from integrating longitudinal PGx experiences throughout the curriculum to support development of clinical competency and interprofessional collaboration skills.

Conclusion

Targeted PGx education incorporating personal pharmacogenetic testing enhanced student pharmacists' confidence, familiarity with PGx resources, and knowledge related to clinical PGx application. Experiential learning approaches may strengthen student readiness to incorporate PGx information into patient-centered care and support broader implementation of precision medicine within pharmacy practice.

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A Primer on Effectively Facilitating Course Tutoring: Considerations Beyond Selecting a Warm Body!

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Abstract

Tutoring has become a commonplace academic support service at most institutions of higher learning. However, simply selecting a "warm body" as a course tutor and then instructing students to seek tutoring may not be enough to facilitate effective tutoring for a course. This paper presents a discussion of important yet easily overlooked factors for instructors to consider to better facilitate tutoring for their courses. The paper outlines the purposeful making of considerations and decisions related to (1) establishing the course tutor, (2) integrating the course tutor, and (3) managing the logistical issues related to course tutoring. Making such considerations can enable instructors to help shape a context which effectively facilitates course tutoring and thus supports student learning. This reflective discussion is based on 12 years of experience in working with course tutors as a faculty member in a relatively small Political Science academic unit at a relatively small public liberal arts university.

Key Words: course tutoring, higher education, instructor facilitation of tutoring

Introduction

Improving student learning has long been an important goal of institutions of higher learning. Higher education instructors, along with other institutional personnel, engage in various activities to facilitate student learning outcomes. Institutions of higher learning typically offer academic support services to assist students with learning. One academic support service that has become a staple part of the environment at most institutions of higher learning is tutoring (Maxwell, 1994). For many years, higher education instructors have referred students to tutoring. Likewise, students themselves have sought tutoring assistance to improve their learning. Many institutions of higher learning even provide tutoring services free of charge to students (Johnson & Hanson, 2015).

Faculty members at institutions of higher learning often carry rigorous workloads that include a combination of teaching, research, and service responsibilities. Significant increases in faculty workload occurred between the 1980's and the late 1990's (Faculty Work, 2008). According to the American Association of University Professors, a study by the U.S. Department of Education's National Center for Education Statistics (1999) found that full-time faculty worked about fifty-five hours per week (as cited in American Association of University Professors, n.d.). Similarly, data from the National Center for Education Statistics indicated that full-time faculty worked about 53 hours per week in 2003 (Snyder & Dillow, 2013). In a recent study on faculty time allocation, Allen et al. (2023) found that tenured and tenure-track faculty members reported working an average of about 59 hours per week. Given the heavy workload of many higher education instructors, even those strongly dedicated to teaching may find themselves challenged by time constraints when it comes to committing to activities meant to improve student learning.

Given the longstanding presence of tutoring in institutions of higher learning (Allendale, 2010a), research has explored the relationship between tutoring and student learning in the context of higher education. Studies (Arco-Tirado et al., 2020; Coladarci et al., 2013; Colver & Fry, 2016; Cooper, 2010; Laskey & Hetzel, 2011; Munley et al., 2010; Oley, 1992; Rheinheimer et al., 2010) have found tutoring to be positively associated with improvements in student academic performance in institutions of higher learning. Additionally, studies have also found tutoring to be positively associated with increased retention for students in institutions of higher learning (Civitas report, 2019; Coladarci et al., 2013; Cooper, 2010; Fowler & Boylan, 2010; Laskey & Hetzel, 2011; Rheinheimer et al., 2010). Other research studies have investigated the relationship between tutoring and academic performance for at-risk students in higher education.

Some studies have found a positive association between tutoring and improved academic performance and retention for at-risk higher education students (Laskey & Hetzel, 2011; Rheinheimer et al., 2010). Some researchers (e.g., Tinto, 1999) have suggested that access to student support services can be a key factor in degree completion for students who are not well-prepared for college academics.

Another strand of research has explored the conditions under which tutoring is more or less likely to be effective for student learning in institutions of higher learning. Studies have shown that tutoring is more likely to have a positive impact on academic performance and retention when students both begin tutoring early in the term and attend tutoring sessions on a frequent basis (Arco-Tirado et al., 2020; Laskey & Hetzel, 2011; Munley et al., 2010). Similarly, other studies have failed to find significant impacts of tutoring on academic performance (GPA) for students who attended tutoring sessions infrequently (Hodges and White, 2001; McGinty, 1989). Thus, previous research suggests that starting point and frequency of attendance are important elements related to the effectiveness of tutoring with respect to academic performance. Despite the long-standing presence as an academic support service in the collegiate environment (Arendale, 2010a), effectively using tutoring to help improve student learning in one's course may be neither simplistic nor automatic. Given the time and attention devoted to teaching, service, and research, some higher education instructors may not put significant time and attention into facilitating course tutoring. Merely selecting a warm-bodied student to serve as a course tutor and instructing students to seek tutoring do not necessarily amount to an effective facilitation of tutoring for one's course. Numerous considerations exist beyond those two actions when using tutoring to support student learning in courses. If instructors do not purposively take enough factors into account, they may fail to set up a context which is favorable to the effective

usage of tutoring by students in their courses. This paper discusses important yet easily overlooked factors to consider when facilitating tutoring for courses. The factors for consideration are based on the culmination of experiences from approximately 12 years of working with course tutors in an introductory American Government class at a relatively small southeastern public institution of higher learning.

Context and Background

This discussion of warranted considerations related to facilitating course tutoring is based on approximately 12 years (2007-2019) of experience working with course tutors as a faculty member at a relatively small, public, primarily undergraduate liberal arts university in the southeastern United States. During this period, the University's enrollment ranged between approximately 2300 and 2800 students. I served as one of no more than three full-time Political Science faculty members in the Political Science department over the 12-year period. The experiences (on which the discussions in this paper are based) in working with course tutors were related to the Introduction to American Government classes. One or two full-time faculty members usually taught most sections of this course. During some semesters, a part-time instructor also taught the course. Although this course was required for all Political Science majors, most students in the Introduction to American Government classes were first-year students who were not majoring in Political Science. Most of these non-majors took the class to help fulfill a general education requirement.

Between 2007 and 2019, the institution's academic support services center administered a tutoring program to assist undergraduates with their academic performance. The center hired undergraduate students from the University to serve as "course tutors" for various undergraduate courses offered by the University. Although course tutors were hired by the academic support

services center, they had to be recommended by a faculty member who had previously taught them. One qualification was for the course tutors to have received an A (or a B with a strong faculty recommendation) in the class for which they would tutor. A strong preference was for the course tutor to have at least a 3.0 cumulative grade point average. Also, one student could serve as the course tutor for multiple courses if they had the required faculty recommendations and approval from the academic support services center. Students signed up for tutoring appointments through the center's website and then met with the course tutors at the tutoring center (or other approved location). These tutoring services offered through the academic support services center were free of charge to students.

During the 12-year period, the academic support service center varied the operations of the peer tutoring program. While the course tutors routinely received training provided by the academic support services center, the type of training received varied during the 12-year period. During the first several years, most course tutors took a one-time, one-hour credit class either before or while they tutored for the first time. In the remaining years, course tutors took various types of non-course credit training offered by the center. Further, both the expected roles of the course tutors and the tutoring arrangements used by the academic support services center varied during this period. For several years (beginning in 2007), the tutors' responsibilities included attending at least one section of the classes for which they tutored. While attending the class, the tutors were expected to take notes and help the instructor with small tasks such as distributing and collecting materials. However, the expectation of class attendance for the course tutors ended after several years. Then, the academic support services center allowed a faculty member to designate a "lead tutor" for their sections of a class. Under this arrangement, a faculty member would encourage their students to seek assistance from the "lead tutor" for their course section if

possible. However, students were still free to seek assistance from any of the tutors working at the academic support services center for the course. Finally, during the last few years of the time period, "lead tutors" were usually no longer designated for an instructor's Introduction to American Government course sections. Instead, students were encouraged to seek tutoring from any of the multiple tutors available through the academic support services center. In this situation, each tutor worked with students across all Introduction to American Government course sections, taught by different instructors.

Discussion: Three Sets of Considerations to Help Facilitate Course Tutoring

This discussion presents and discusses factors for instructors to be mindful of as they attempt to facilitate effective course tutoring. The recommended considerations relate to (1) establishing the course tutor, (2) integrating the course tutor into the course, and (3) managing logistical issues related to course tutoring.

Establishing the Course Tutor

Some fundamental considerations related to effectively facilitating course tutoring are related to mindfully establishing course tutors. In situations where instructors have a significant role in selecting course tutors, they can make important considerations that relate to tutor qualifications. First, instructors should find out their institution's academic support services center's criteria for course tutors. Instructors who function on a day-to-day basis mainly in the context of their academic departments could easily overlook such criteria as they are considering students who appear to be great choices as course tutors. For instance, an instructor could choose a student for a tutoring position who received A's in several classes taught by the instructor, only to be informed that the student fails to qualify as a tutor because they lack the 3.0 institutional cumulative GPA, which is required by the academic support services center. By familiarizing

themselves with institutional course tutor criteria, the instructor can avoid wasting time in selecting or recommending students as course tutors who will ultimately not qualify for course tutoring positions. Second, instructors should investigate whether an official set of departmental criteria for course tutors exists. If such criteria do exist, then instructors need to familiarize themselves with the departmental criteria and consider them accordingly when selecting a course tutor. Other departmental instructors (especially those who have been teaching in the department longer) can be great resources for explaining any formal departmental criteria used in the past when choosing effective course tutors.

In addition to considering official departmental and institutional qualifications for course tutors, instructors may need to consider relevant, unofficial criteria or preferences when selecting course tutors. Such considerations may include things such as a prospective course tutor's experience in the course area, the prospective course tutor's classification year, and the prospective course tutor's commitment level. When selecting a student to tutor for an introductory course, instructors need to consider how much experience in the subject area the prospective tutor needs to tutor effectively. For instance, would a student who has taken the Introduction to American Government course but no other American Government courses tutor as effectively for that course as a student who has had multiple courses related to American Government? Students who have taken additional courses related to the course for which they are tutoring may be better able to provide illustrative examples, deliver background explanations, and place course concepts into a larger framework. Alternatively, students who have taken fewer related courses may be particularly skilled at presenting information and assist students from the perspective of an introductory course student.

Next, instructors should examine the degree of importance that a student's classification has for tutoring for a given course. For instance, an instructor may contemplate whether a sophomore tutor would be as effective as a senior tutor for an Introduction to American Government class. Also, an instructor should consider whether establishing a course tutor over the long term—several academic terms or years—is an important goal. If establishing a long-term tutor is a goal in course tutor selection, then instructors may want to give preference to selecting students who have at least several semesters left at the school during which they can commit to serving as a course tutor.

Further, a commitment-related issue that instructors may consider is examining whether a student's schedule will afford them the time to fully commit to course tutoring responsibilities. They may be participating in multiple extracurricular activities, working a significant number of hours on a job, or tutoring for other courses. Depending upon the sizes of the courses, instructors may also need to contemplate whether having the same student tutor for two or more relatively large introductory courses constitutes a manageable workload. Instructors should discuss tutoring time commitments with prospective course tutors before they are hired by the institution's academic support services center to avoid establishing a course tutor who is "overbooked" with other responsibilities and thus unable to serve the tutoring demand of the course.

Integrating the Tutor into the Course

After establishing the course tutors, instructors need to integrate the tutors into the course. Simply selecting a "warm body" in place as the authorized course tutor and informing students to seek tutoring may not be enough to encourage students to take full advantage of tutoring opportunities. First, instructors should consider introducing the concept of tutoring early during the term. This is especially important in introductory courses with many first-year

students who are new to the college environment. Instructors can announce the availability of tutoring and briefly explain why students might consider seeking tutoring. Some students believe there is a stigma associated with seeking academic assistance (Arendale, 2010b; Ciscell et al., 2016; Winograd & Rust, 2014). Consequently, instructors should emphasize that students of various performance levels can benefit from tutoring. Instructors could also either demonstrate or provide instructions for the process of signing up for tutoring so that the sign-up process will not be perceived as a barrier to accessing tutoring.

Next, the instructor should attempt to introduce the class to the actual students who will serve as the course tutors. At the very least, instructors should name each course tutor and briefly say something about the tutor (such as their major, interests, classification year, career aspirations, etc.). Also, including the tutor's name and contact information in the syllabus or online learning system would make the information readily available to students at any time. If feasible, instructors could have the actual tutors come to class briefly and introduce themselves so that students can match the tutor's face with the tutor's name. Other instructors (especially those in the same department) may even be willing to dismiss tutors for a few minutes at the beginning or end of their classes so that the tutors can introduce themselves to students in classes for which they tutor.

At this point, instructors can consider whether or to what extent they will count student attendance at tutoring sessions in the student's overall course grade. Under what, if any, circumstances would attendance at tutoring sessions affect a student's overall course grade? Will students be offered extra credit for merely attending tutoring sessions? Informing students early in the semester of how tutoring is configured into their overall course performance potentially encourages students to take advantage of the opportunity for assistance.

Instructors should also consider explaining to students how they can prepare for productive tutoring sessions. Here, instructors can warn students against practices such as asking tutors to do student assignments, seeking tutoring without having a general idea of what concepts they are not understanding, and waiting until the day before an exam to seek tutoring on a massive amount of course material. It is also crucial for instructors to emphasize that merely attending a tutoring session alone or attending only one tutoring session does not ensure student success in a course. This could help avoid situations in which students are mystified as to why their exam scores did not improve after attending only one or two tutoring sessions. Instructors should inform students that attending tutoring early in the term and attending frequently are associated with improved academic performance (Arco-Tirado et al., 2020; Laskey & Hetzel, 2011; Munley et al., 2010). Essentially, instructors can enforce the reality of tutoring assistance to their students so that students who seek tutoring will do so with both preparation and realistic expectations.

Given that students and course tutors can be unclear or confused about the roles and responsibilities of the course tutor, it is important for the instructor to specify and clarify the expected roles of course tutors (Smith 2008). The lack of clarification of the roles of tutors has been identified by tutors as a source of concern and stress (Abbot et al. 2018; Colvin & Ashman 2010). Instructors have a myriad of situations they could address when clarifying tutor roles. Will the course tutors be expected to mainly assist students with understanding course material used in exams and quizzes? Or will the course tutors be expected to perform other activities such as assisting students with study and note-taking skills, providing exam review sessions, or assisting students with homework assignments? Will course tutors have access to exam keys that

they can use to go over exams with students? Or would students have to meet with the instructor if they want to go over missed exam items?

Managing Course Tutoring Logistics

A third area of warranted considerations pertaining to course tutoring that instructors need to make has to do with logistical issues that may arise when using course tutors for a course. It may be relatively easy to select a "warm body" as a course tutor and instruct students to seek tutoring without considering logistical issues that could impact the effectiveness of the tutoring process. Such considerations include, but are not limited to, the following: ensuring that necessary course materials are in place at the academic support center, providing course tutors with access to important course materials, and establishing a system of course tutor-instructor communication. Before the course begins, instructors should contact the tutoring center to find out what, if any, materials (such as textbooks or workbooks) the instructor needs to make available to the academic support services center. Overlooking the placement of the current course textbook at the tutoring center is easy to do, especially as a new academic year begins. Likewise, as soon as tutors are selected, the instructor needs to be sure that each tutor has access to a copy of the current textbook in use for the course. Instructors should be mindful that when either a new textbook or a new edition of a textbook is being used in a course, the current tutors will not have it. Before the course begins, instructors should also assess whether course tutors need access to other course materials such as exam study guides, quizzes, lecture slides, handouts, and other supplemental course material. Further, instructors can consider adding all course tutors to the course page of the online learning system so that course tutors will receive all course-related information that students receive.

In some situations, instructors may select course tutors without putting much thought into plans for communicating with the tutors during the semester. Studies (Abbot et al., 2018; Colvin & Ashman, 2010) have identified tutors to be potentially beneficial in providing feedback on course matters to instructors. Hence, establishing a system of tutor-instructor communication potentially offers multiple benefits. Instructors can alert tutors to potential situations ranging from a likely upcoming surge in tutor appointments due to poor student exam performance or concepts that students struggled with in class that will likely be addressed in upcoming tutoring sessions. Likewise, tutors can alert instructors to observations from tutoring sessions such as lack of reading by students before an exam or students' lack of understanding of an important concept covered in class. Thus, instructors could consider the following questions regarding course tutor-instructor feedback. Does the instructor expect to have any communication with the tutor regarding the progression of the tutoring? Will the instructor expect the course tutor to initiate all contact, or will the instructor plan to initiate some tutor contact? Will such contact take place electronically or in person? How frequent will such course tutor-instructor contact be? While it is not always feasible to establish systematic course tutor-instructor feedback, doing so could lead to a greater awareness of student learning issues by the instructor.

Conclusion

Effectively facilitating course tutoring to enhance student learning may require doing more than simply selecting a "warm body" as a course tutor and instructing students to seek tutoring. Given the heavy workloads of many instructors in higher education, some instructors could easily overlook opportunities to mold the elements of a course tutoring system. However, it could be beneficial for them to invest time and effort to a deeper level of thinking on how to facilitate tutoring in their classes. To better facilitate course tutoring, this discussion proposes the

purposeful consideration of factors related to (1) establishing the course tutor, (2) integrating the course tutor into the class, and (3) managing the logistical issues of course tutoring.

Given the significant attention that institutions of higher learning commonly place on student learning outcomes, it would be wise for faculty to devote meaningful attention and thought regarding what they can do to better facilitate course tutoring. A purposeful facilitation of effective course tutoring could help support student achievement on student learning outcomes. Facilitating the academic support service of tutoring is particularly important given the associations between tutoring assistance and factors like improved academic performance and student retention. Thus, instructors are encouraged to take a closer look at the entire course tutoring process. Finally, making both new and veteran faculty in an academic department (or institution as a whole) aware of important course tutoring considerations could mark the beginning of a continuous practice of making critical considerations related to facilitating effective course tutoring.

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The Missing Link in Math Instruction: Concepts & Vocabulary

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Abstract

National student measures of educational progress have consistently shown decreasing test scores, especially in math, reading, and science. Clearly, the instruction needs improvement. What is missing in the math curriculum? Obviously, if students cannot read or understand the vocabulary, then how can they perform well in math, science, or any other subject? What might be missing in the math curriculum? Our investigation explores the question of what math concepts and vocabulary students have experienced and to what degree during their early childhood through the 12th grade (EC-12). Students in a university freshman math class were administered a Likert-scale survey on math concepts and vocabulary to assess their familiarity with the terms. Our research presents an argument for integrating math concepts and vocabulary across all grade levels, including the university level, to improve students' knowledge & skills so they can compete in the real world.

Introduction

Educational progress from early childhood through 12th grade has consistently shown declining test scores, especially in math, reading, and science. Additionally, there are significant differences in math and science achievement between males and females. Clearly, the instruction needs improvement. What is missing in the curriculum? Clearly, if students cannot read, then how can they perform well in math, science, or any other subject? Our research presents an argument for integrating math instruction concepts and vocabulary across all instruction in all grade levels.

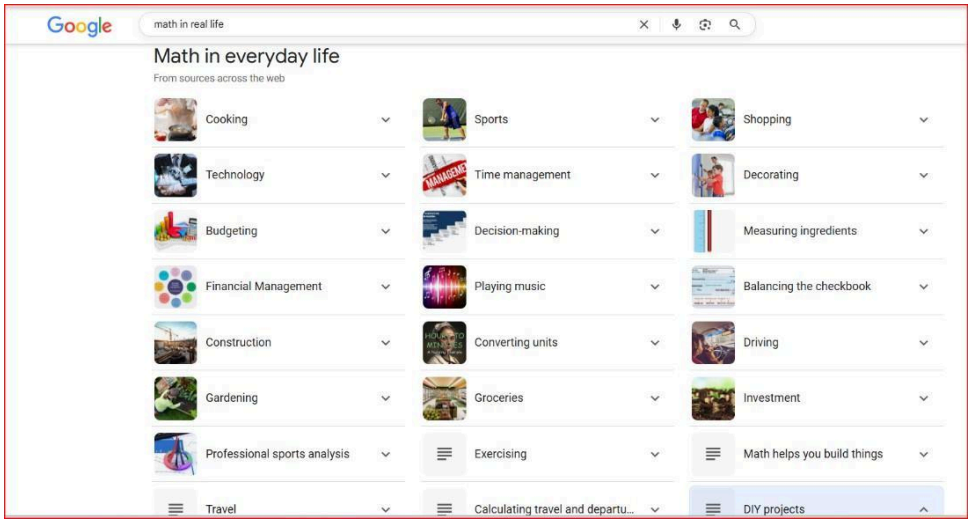
If students do not understand math concepts and vocabulary, how can they succeed in assessments? They cannot. Much worse is the growing evidence that teachers are using Faux Math (Patton & LeSage Clements, 2025; Patton et al, 2025) in their teaching. This math instruction is incorrect and taught at an early age. For example, the concept of zero. Many

students think it is nothing, but zero is infinite. The concept of zero and the vocabulary word both need to be understood by teachers and students. Students have a slim chance of advancing to algebra without an understanding of zero. When students learn something incorrectly, it is hard to correct, and a misconception can last a lifetime.

Every subject can use math concepts and vocabulary. Math is in everything. Figure 1 below (retrieved 10/18/25) shows math used in everyday life, such as gardening, technology, and building things.

Figure 1

Math in Everyday Life



Retrieved October 15, 2025, Google.

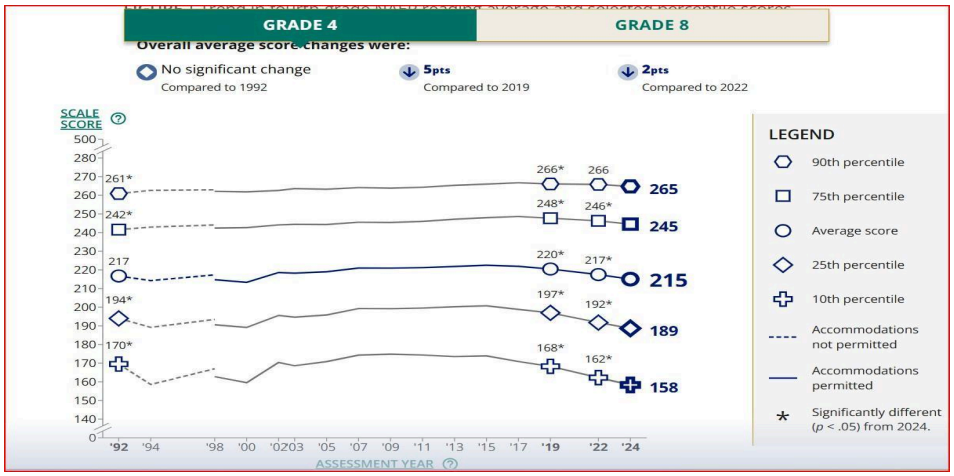
You really do not need an imagination to understand the math connections to all subjects-it does. Using math concepts and vocabulary will boost your intellectual skills and those of your students. It is key to your students' math achievement and anything related to performing math.

The National Assessment of Educational Progress (NAEP) has shown consistently decreasing or stagnant student test scores in reading and math (NAEP, 2025). Students have not

recovered from learning loss since 2019 due to the COVID pandemic interrupting education, especially in reading. All reading scores have been lower since 1992, except at the 90th and 75th percentiles. The students' average score and those in the lower percentiles are not performing well. Figure 2 below shows the NAEP reading test scores. The reading scores are trending down.

Figure 2

4th Grade Reading NAEP Scores

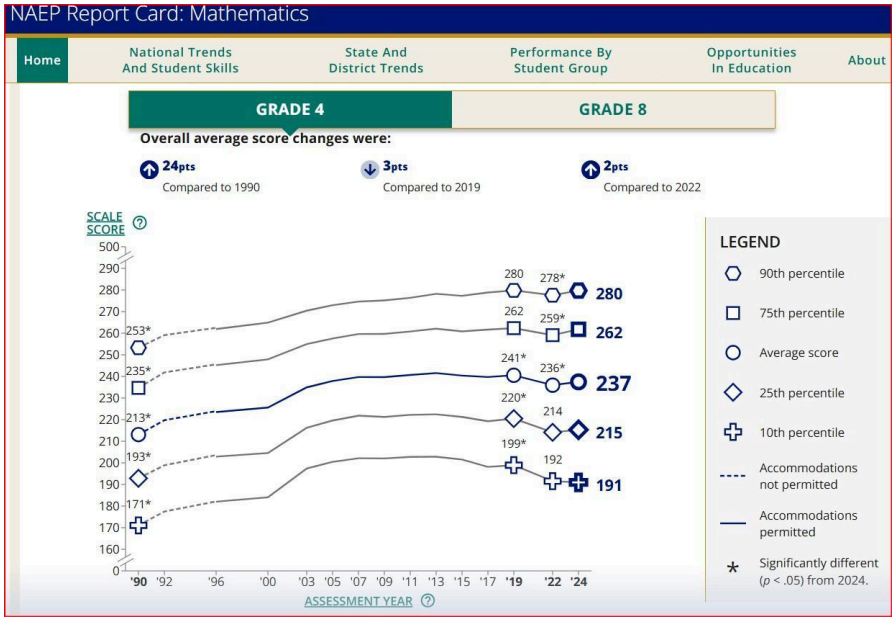


NAEP 4th Grade Reading Scores (retrieved from NAEP, October 15, 2025)

The math NAEP scores are stagnant, as shown in Figure 3 below. There is not much movement up or down for the 90th, 75th, and average percentiles, although the lower percentiles have suffered, especially since COVID. You can speculate that lower-scoring students needed more resources, such as face-to-face instruction and accommodations, during the pandemic, and that it was impossible to provide them at that time. It was a challenging situation for all educators and students. Even without COVID issues, students are still falling behind.

Figure 3

NAEP 4th Grade Math Scores (retrieved from NAEP, October 15, 2025)



NAEP 4th Grade Math Scores (retrieved from NAEP, October 15, 2025)

Crosscutting Concepts & Vocabulary Survey

Twenty-seven students in a freshman math seminar class completed the Crosscutting Concepts and Vocabulary Self-Assessment Survey. Students are in this class because they did not pass the Texas Success Initiative (TSI) Assessment. The test is a mandatory reading, writing, and mathematics placement test for students entering Texas public colleges to evaluate college-level readiness. Students who do not pass the math placement have historically needed help passing college algebra.

The crosscutting concepts and vocabulary list used in this survey were not exhaustive. A Likert scale was administered, ranging from 1 (the lowest level of awareness or knowledge) to 5 (the highest level of awareness or knowledge), regarding the concepts and vocabulary. The concepts and vocabulary included in this survey are as follow: Big ideas, logic, algorithms (algebra), algebraic reasoning, geometric reasoning, problem solving, counting principles, zero, comparing, spatial sense, patterns, fractions, place value, parts & wholes, measuring, symbols,

groups, data, graphs, 3 D and 2 D shapes, polyhedrons, spheres, cones, cylinders, polygons, transformations, Euclidean, composing shapes, and decomposing shapes (McGregor et al., 2010; Howard, et al. 2024; Small, 2019). The above concepts and vocabulary words do not represent all of math.

Limitations

This work was exploratory, and the results may not be transferable to other institutions.

Results

Five math concepts and vocabulary words with a mean of 2.5 or greater revealed low student awareness of the terms transformation, decomposing, composing, spatial, and Euclidean. All of these concepts/vocabulary words are related in the sense that you have to transform something to decompose and compose, and you need spatial sense with an Euclidean understanding of geometry to advance to higher math levels. You need spatial sense to do any of the five terms identified. The authors predict that these five concepts/words will be highly significant when correlated with larger data sets.

Conclusions & Next Steps

What might be missing in the math curriculum? Our investigation revealed that the concepts/vocabulary words transformation, decomposing, composing, spatial, and Euclidean were the gaps in students' math term awareness. More research is needed, and our research presents an argument for better math diagnostic tools. If the students do not understand the words, then they do not know what to do. The evidence shows that US students continue to fall behind the rest of the world. Doing the same thing repeatedly and expecting different results is called insanity. You cannot get to the moon or Mars if the math is wrong. The country, states, and

school districts can do better. Math concepts and vocabulary need to connect across all disciplines. We will all be smarter for it. Leadership and stakeholders all need to ensure educators are content-competent, especially in elementary math, where the foundation is laid, and that the teachers have the resources to do an excellent job.

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From the Caribbean to the Classroom

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Abstract

The purpose of this study is to examine the lessons I learned from a research trip to the Caribbean in the summer of 2024 and how to bring them back to the classroom. In the spring of 2024, I was invited by a colleague at the southwestern university where I work to join her and other colleagues across the United States and the Caribbean in a study on socio-hydrology, the social practices of water, on an island in the Caribbean. I was asked to join because my background is in literacy and working with schools, and my colleagues wanted someone with my experience to introduce their work to American and Caribbean schools.

This proposal is a story about my experience during my month-long trip to an island in the Caribbean. In this study, I explored my growth during my trip and the lessons learned; specifically, I explored how the lessons I learned could be applied to my job as an assistant professor at my southwest university to my student teachers and my teacher residents. I chose Dewey's Theory of Experience as my theoretical framework and narrative inquiry, specifically the bildungsroman, as my methodology. Data sources for this study consist of daily journal entries from my personal journal and over 500 photographs I took with my iPhone 15. Preliminary findings showed that working outside my comfort zone and deeper collaboration with others were beneficial for my student teachers and teacher residents.

Keywords: Caribbean, secondary education, teacher candidates

Introduction

One of my colleagues joined our southwestern university from a university in the northwestern region of the United States, bringing with her two major research grants. Both grants involved colleagues from across the United States and research on socio-hydrology conducted on an island in the Caribbean, a place I had always dreamed of visiting. My colleague invited me to visit her on this island in the summer of 2024 as a literacy consultant, given the team's desire to work with local schools. My dissertation is concentrated within language, literacy, and diversity studies, and I spent all four years of my Ph.D. as a research assistant

working alongside local schools. I happily accepted the invitation to join this research team. We had lunch together on a very windy day in March of 2024, where we ate, laughed, and hashed out when I could visit. She planned to spend the entire three months of our summer vacation on the island, and we decided the best time for me to join her was the last month, after the students working on both grants had returned to the United States. We discussed having me officially join one of the grants as a literacy consultant for the summers of 2025 and 2026, and unofficially, there were still things I could do to help with the research work in the summer of 2024.

Overall, I was very excited about this trip, focusing on visiting a new place and getting to know new people. I decided to write journal entries documenting my trip and take as many pictures as possible to celebrate the experience. Given my unofficial capacity as a part of the research team in the summer of 2024, I had time to explore how I could bring this experience back to our southwestern university. Specifically, I began to wonder if what I was experiencing and learning during this trip could benefit both my teacher candidates and me in our classrooms.

This is a story about my experience during my month-long trip to this island in the Caribbean. I explored my growth during my trip and the lessons learned; specifically, I explored how the lessons I learned could be applied to my job as an assistant professor at my southwest university and to my secondary education teacher candidates in preparation for their own classrooms.

Theoretical Framework

The theoretical framework I chose for this study is Dewey's Theory of Experience. According to Kim (2016), experience is necessary for narrative inquiry (p. 69). Dewey (1963) developed two principles for his Theory of Experience: "the continuity of experience or what may be called the experiential continuum" (p. 28) and "interaction" or "*situation*" (p. 42). The

first principle, according to Kim (2016), "means that every experience builds up from previous experiences and modifies in some way the quality of the experiences that come after" (p. 70). Therefore, our understanding of our experiences is not immovable (Kim, 2016, p. 70). The second principle "means that we live in a series of situations where interaction is going on between an individual and objects and/or other persons" (Kim, 2016, p. 71). Environment is key to forming experiences (Kim, 2016, p. 71).

In his article exploring Dewey's curriculum theory, Berding (1997) cited Dewey (1892, p. 154) in stating that "[o]ur experience is simply what we do" (p. 25). Berding (1997) explained that Dewey refused to separate experiences into smaller parts (p. 25) and that Dewey saw "experience primarily as a down-to-earth and bodily affair" and an "active-passive affair; it is not primarily cognitive" (p. 26, as cited in Dewey, 1912, p. 140). Berding (1997) found that, for Dewey, experience is a 'natural' phenomenon, not outside the human species but entirely within it, as part of our evolutionary makeup. Experience denotes the way living organisms interact with their environment. For humans, the environment is social, cultural, and political. (p. 26). According to Berding (1997), experience is not "individualistic" (p. 26).

Literature Review

Stone and Petrick (2013) conducted an extensive review of the literature to investigate "educational outcomes and the benefits of travel" (p. 731) and found an increase in confidence (Alexander et al., 2010; Inkson & Myers, 2003), cultural awareness (Inkson & Myers, 2003; Pearce & Foster, 2007a; Richards & Wilson, 2003), and improvement in many skills (Pearce & Foster, 2007a; Pearce & Foster, 2007b). Chen and Petrick (2013) also reviewed previous literature to examine "how travel experiences impact the emotional and physical health and wellness of individuals" (p. 709). In the ninety-eight articles they reviewed, overall findings

included happiness (Dolnicar et al., 2012; Neal et al., 2007), Sirgy et al. (2011), better health (Gilbert & Abdullah, 2004; Fritz & Sonnentag, 2006; Strauss-Blasche et al, 2000), and increased feelings of being relaxed (Etzion, 2003; Kuhnel & Sonnentag, 2011; Westman & Etzion, 2002).

M.R. and Joseph (2024) surveyed 500 participants, ages 15 to 25, with differing socioeconomic (SES) backgrounds and found benefits of travel for academic performance, such as "the enhancement of critical-thinking, problem-solving abilities, and cultural sensitivity" (p. 115). This aligns with the findings of Stone and Petrick (2013) and Chen and Petrick (2013). However, M.R. and Joseph (2024) also noted the imbalance in travel opportunities due to SES and institutional resources (p. 116).

Liang et al. (2015) interviewed twenty-two young adults and discovered "gains in both intra- and interpersonal learning" (p. 231), such as an increase in independence, confidence, and self-awareness. The authors also noted a "departure from comfort zone" (p. 231) as one of their four themes from their analysis of their data. However, Stone and Petrick (2013) also noted the limited research "about the educative benefits of travel undertaken outside of a formal college or university program" (p. 732).

Methods

My chosen methodology for this study is narrative inquiry. In defining narrative inquiry, Dr. Kim (2016) cited Connelly and Clandinin (2006), who defined narrative inquiry as "the study of experience as story, … [and] first and foremost a way of thinking about experience" (Connelly & Clandinin, 2006, p. 477, as cited in Kim, 2016, p. 18). Lessard et al. (2018) argued that narrative inquiry "means much more than telling stories, much more than living stories" (p. 194). Rosiek and Snyder (2018) agreed and noted the impact of stories on the researcher (p. 7), "stories that have frequently gone unnoticed" (Kim, 2016, p. 23). According to Clandinin and Caine

(2008), these stories are "situated and understood within larger cultural, social, and institutional narratives" (p. 1), in this case, stories that are cultivated in productive action across differences and divides. Kim (2016) stated that "[n]arrative inquiry, although it does not deny that great events are important, presumes the importance of the everyday, the ordinary, the quotidian stories that have frequently gone unnoticed" (p. 23).

In particular, I believe a bildungsroman is the most appropriate. Kim (2016) stated that "[b]ildungsroman is a German term that is a combination of *Bildung* (formation or education) and *Roman* (a story. It is a story of one's *Bildung* that focuses on one's personal growth and identity development" (p. 127). According to Dr. Kim (2016), as cited in Kontje (1993), "*Bildung* originated in the eighteenth-century idealism of Humboldt and Schiller, who identified *Bildung* as the primary goal of humanity. They believed it was up to humans to develop to their full potential through active engagement with the world around them" (p. 127). Dr. Kim (2016) stated that, "[f]or them, passive ripening is not good enough for human beings" (p. 127). In short, this study is "a reflexive story about the self" (Kim, 2016, p. 127).

Data Sources and Analysis

Data sources for this study consist of daily journal entries from the journal I kept from my month-long trip and over five hundred photographs I took with my iPhone 15. Kim (2016) cited Bell (2013) in describing the increase of "visual materials" in narrative inquiry since its inception (p. 143). Kim (2016) also stated the increasing usage and accompanying seriousness of visual data "to share the lived experiences of our participants" (p. 143). Greenwood (2012) wrote that "it is not always possible to fully separate specific cognitive findings from less definable aesthetic *knowings*" (p. 3).

For my data analysis, I chose to utilize the analysis of narratives, or the paradigmatic mode of analysis (Kim, 2016, p. 196). Kim (2016) explained that this method of data analysis is used to "examine the narrative data to focus on the discovery of common themes or salient constructs in storied data" and to "organize [themes] under several categories using stories as data" (p. 196). Like grounded theory, themes are a result of the grouping of findings from stories (Kim, 2016, p. 196). In this study, the different "stories" (Kim, 2016, p. 196) came from each day's journal entry and any photographs taken daily.

Findings

After examining and analyzing my data, I found two main themes: the importance of collaboration with others outside of my content area and the importance of both working hard and playing hard. I discovered these themes from extensive examinations of my two data sources: my journal and my photographs. Coincidentally, these themes are also important philosophies of my teaching career that I consistently discuss with my students.

The Importance of Collaboration with Others

The importance of collaboration with others outside my content area is a theme I stress constantly in my classes. As an assistant professor working in secondary education, I do not teach just one content area; rather, I teach strategies that all content areas can use in their classrooms. Most of my classes involve a heavy amount of class discussion, which I prefer over straight lecturing, as I have found that it often leads to the discovery of shared ideas, fostering further collaboration and future work among my students. The rewards of collaboration are boundless.

This theme again showed itself to me two days after I arrived on the island, when I first met one of the leaders at the [Island] Port Authority who had already worked with my colleagues

on their previous projects. I was introduced as the literacy expert with previous school experience, and the leader immediately lit up at the thought of having someone with experience working with teachers and students in helping this group introduce their work to local schools. My journal entry dated July 9, 2024, stated: “Meeting with [Name] at [Island] Port Authority” (Stewart, 2024). I knew my place as a new member of this research team, and I was excited to join this team and help however I could. I am no expert in their content areas, but I hoped my perspectives on literacy could be of use. I took a picture of the [Island] Port Authority on July 12 as we drove by, and I took the brightly painted exterior as a good omen for the future. Further journal entries dated July 13, July 17, July 18, and July 30 noted outside work and further meetings as a team, including discussions of focus groups and reviews of previous notes and articles. I wrote in my journal entry on July 13 about outside work I had no desire to do, but I knew it was overall helpful to the research team. July 17 and 18’s entry described a meeting at the [Island] Port Authority, and July 30’s entry noted a meeting with another member of the team (Stewart, 2024).

My colleague from our southwestern university and I were also asked to assist a friend of my colleague from previous visits to the island, a local environmentalist working to increase the number of mango trees to prevent further erosion and devastation from future hurricanes. My colleague and I spent several days working with the environmentalist, reviewing a previous presentation as per my journal entry dated July 11, meeting with the environmentalist on July 28, as noted by photographs and my journal entry, and a collection of propagules and mango seedlings, as noted by photographs and my journal entry on July 29. Photographs I took on August 5 and 6 also show additional time spent together and discussions about future research (Stewart, 2024).

My colleague had worked extensively with the university system of the island during her own previous grant work, and she invited me to join her multiple times at the university to work. In my journal entry dated July 12, I described a meeting with an instructor employed at the university, one whose international work greatly appealed to me and to my colleague. We instantly connected and joined her network in hopes of working together in the future, and my journal entries dated July 15, July 19, July 23, July 25, and July 30, as well as photographs taken July 22, note further work at the university, and a meeting with the instructor. Our island guide heavily assisted in her grant work, as described in journal entries dated July 10, July 13, July 15, July 18, July 22, July 25, and August 6. Notably, we were invited to join the ceremony at which the provost of the university and the American Chargé d'Affaires opened a new library stocked with American books and other resources, demonstrating the strong partnership between the two nations. Photographs taken that day, July 26, and my journal entry display our excitement at being included and my glee at my colleague's recognition for her grant work (Stewart, 2024).

The Importance of Working Hard and Playing Hard

The importance of both working hard and playing hard is a theme that my students will laugh and say that they have heard me discuss at least a million times. I am a firm believer that my teacher candidates must take care of themselves before taking care of anyone else, and if that means skipping my class for a concert or a movie, then so be it (as long as they tell me ahead of time). Self-care is a constant theme in all my classes, and I want my students to work hard and have fun. I do not want their lives to be solely consumed by their careers.

In my journal entry dated July 12, I wrote about my colleague in a Zoom meeting with our dean of the graduate school at this southwestern university, also her department chair. I could not help but overhear the tail end of the conversation when I heard our graduate dean ask if I had

arrived safely to the island. My colleague said yes, and our graduate dean laughed and said it was my job to ensure that we both had plenty of fun while we were off campus. I remember shouting back that he was not to worry, much to his amusement. I took his charge of ensuring we had fun seriously, and I genuinely thought that my trip on the island would be a great way to model self-care to my students with all our hard work. Balance was key on our trip.

From the day my flight landed on the island, my photographs of myself and my journal entries about myself display nothing but sheer joy and amazement at the opportunity to be a part of this research team. After successfully completing our first full year at the southwestern university, I wanted to take the time to relax and play on the island. Relax and play I did. My first photograph of myself, taken July 9, shows me smiling in front of the Caribbean Sea, and my journal entry described my desire to run right into the ocean fully clothed. Multiple photographs (i.e., July 10, 11, 12, 13, 15, 20, 24, 31; August 2, 4, 5, and 6) taken over my month-long stay also show my smiles in front of the ocean and wearing clothing other than my school clothes. My posture in each of those photographs is much more relaxed, taking advantage of the benefits of working in the Caribbean.

I celebrated my fortieth birthday during my month-long stay, and I insisted on celebrating with a dinner with my colleague. We ate dinner at a restaurant on the western end of the island, and photographs taken that day by my colleague and myself, July 15, show that I practically ate my body weight in local delicacies. A bonus of this restaurant was the opportunity to feed sharks with raw chicken every hour on the hour, and my journal entry that day described one of the workers handing me the chicken bucket without paying the extra fee to feed the sharks as a birthday gift. Photographs taken by my colleague that same evening show the sheer joy and

amazement on my face at such an opportunity, and I kept leaning over the rails like an excited child to see the bull sharks and lemon sharks more closely (Stewart, 2024).

At the far western end of the island lies a cove and a tourist hotspot, and this cove quickly became one of my favorite places on the island. We visited twice: once on July 29 for lunch on our way to find more propagules, and on an overnight trip on August 5 and 6. Photographs taken on July 29 show me digging into the food and looking out over the ocean. Photographs from our overnight trip a few days later show me walking along the beach collecting seashells, a favorite activity since childhood, and just sitting and breathing and watching the ocean waves. My journal entries from both trips described laughter and my joy at being able to spend some time with friends on the ocean (Stewart, 2024).

Discussion

I returned to campus in mid-August much more relaxed than I was when I left, to the pleasure of my dean and other colleagues. I had traveled to a new place for research work with new people, and I had managed to also have plenty of fun in the meantime. Mentally, I was much more prepared for the fall semester than when I had left campus a month earlier. I cried upon leaving the island, as I wrote in my journal entry dated August 8 (Stewart, 2024), but I had made new connections and new friends, and I had plenty of new ideas to implement in my classes that fall. I was also very excited about future research work with others, thanks to working outside of my content area than I had been before. I had immersed myself in "the importance of the everyday" (Kim, 2016, p. 23). I had also used reflexivity to examine and learn more about myself in meeting the requirements for a bildungsroman (Kim, 2016, p. 127). This experience certainly impacted "previous experiences and modifies in some way the quality of the experiences that come after" (Kim, 2016, p. 70).

This study is significant because the lessons I learned can easily be transferred to my classroom. Karker Esperat (2021) noted the importance of teachers modeling for students (p. 24-25), and Warren (2021) discovered that student achievement increases with true "teacher leaders" (p. 14). In telling my students about my trip later that fall, I demonstrated the benefits of collaboration with others outside of my content area and the benefits of both working hard and playing hard, and I thought that hopefully my students would do the same in their classrooms for themselves and their students. That fall, many students took advantage of my insistence on self-care, and I hoped my stories from my trip had helped.

My findings align with those of Stone and Petrick (2013), Chen and Petrick (2013), M.R. and Joseph (2024), and Liang et al. (2015), as my findings reflected theirs. My findings positively affected my overall health (Chen & Petrick, 2013) and my academic performance for myself and with my students (M.R. & Joseph, 2024). Collaboration was a huge benefit to me during my trip, as was working hard and playing hard.

Limitations

In this study, I examined experiences from my trip in the hopes of bettering myself and one day my students; however, this study suggested findings just for me, and I am only one person. The research from Stone and Petrick (2013), Chen and Petrick (2013), M.R. and Joseph (2024), and Liang et al. (2015) was very positive overall. As we all know, travel experiences are not always positive. Many of the studies reviewed by Stone and Petrick (2013) and Chen and Petrick (2013) involved studies based on students' study abroad experiences. According to Stone and Petrick (2013), most studies do not involve domestic or short-term travel experiences (p. 741).

*A link to photographs can be found here: https://liveenmu-my.sharepoint.com/:f:/g/personal/stewarel_ad_enet_enmu_edu/IgDsmuA0ORyoRrCG2uJP89hsARgiSWu4JTjncsi9yGRDW7M?e=pGw3et

Please note that this folder will continue to be updated to edit some photographs to protect the privacy of other individuals.

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Entrepreneurial Climate in India (2013-2026)

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Introduction

The main objective of the paper is to focus on the entrepreneurial climate in India in the past 25 years, with an emphasis on examining the opportunities and innovations (Startups) that occurred. The paper will be discussed in five sections. In the first section, the factors that contribute to entrepreneurial growth in any economy are outlined, whereas the focus in the second section is a brief Review of literature related to the topic. The third section deals with the data and methodology used in the paper followed by the trends in Economic Growth in India for the study period in the fourth section. The next section presents the analysis of data related to the innovation and startups in India during these years, and the conclusions are given in the end.

Section1—Entrepreneurial Growth in any Economy

In order to comprehend the Growth of any economy, researchers refer to the Schumpeter Principles suggested. It is observed that Schumpeter's theories on innovation and entrepreneurship, especially his idea of "creativedestruction," are very relevant to understanding India's economic growth. Further, in India, researchers are applying his framework to analyze India's evolving startup ecosystem, the role of traditional business groups like Marwaris, and the push for innovation in diverse sectors from IT to agriculture, highlighting how entrepreneurs drive structural change and disrupt old models for new ones. Most Indian researchers often adapt Schumpeter's model to specific contexts, exploring intrapreneurship, digital transformation, and

policy impacts, recognizing entrepreneurs as key agents for economic development and structural transformation in a developing nation.

Joseph Schumpeter's The Theory of Economic Development (1911) argues that economic growth isn't gradual but driven by innovation, introduced by the entrepreneur, which disrupts the "circular flow" of the economy, causing business cycles. This process, known as creative destruction, replaces old industries with new ones through new products, methods, markets, or organizational structures, with credit and profit being key mechanisms. Entrepreneurship is the core of Schumpeter's theory of Economic Development, as the dynamic factor of economic development. It is also the means of efficient use of resources or factors of production and production improvements.

The following have been identified as the **Core** Schumpeterian Concepts in India:

- **Innovation as Growth Engine:** Schumpeter viewed entrepreneurs as innovators who introduce new products, processes, or markets, driving economic cycles (trade cycles) and sustained growth, a core idea applied to India's growth story.
- **Creative Destruction:** The process where new innovations replace older ones (e.g., digital services displacing traditional models) is central to understanding India's dynamic economy, from the Green Revolution to the tech boom.
- **Entrepreneur as Agent of Change:** Indian entrepreneurs, whether modern tech founders or historical figures like the Marwaris, are seen as revolutionaries disrupting the status quo and bringing structural shifts, as argued in studies by IMF and others.

Applications & Research in India

- **Startup Ecosystem:** Policy initiatives like "Startup India" aim to foster Schumpeterian innovation, supporting new ventures that create jobs and boost performance, particularly in tech hubs like Bangalore, Delhi, and Mumbai, with hopes for Tier 2/3 cities too.
- **Historical Context:** Research examines historical Indian entrepreneurship (e.g., Marwaris) as resilient innovators who built networks and new industries despite colonial pressures, laying the groundwork for post-independence growth.
- **Sectoral Innovation:** Schumpeter's framework helps analyze radical innovations in diverse Indian domains, from agriculture (Green Revolution) to digital services.
- **Policy & Institutions:** Scholars study how Indian institutions, culture, and government policies influence the environment for innovation and disruption, crucial for harnessing entrepreneurship for development

Section 2 Review of Literature

In this section, a brief Review of Literature is given. The studies are related to Schumpeter's theory as well as some studies related to the development and allocation of Schumpeter's principle in the Indian economy.

According to Tariq Mehmood, Haitham M. Alzoubi, Muhammad Alshurideh, Anwar Al-Gasaymeh, and Gouher Ahmed, "Schumpeter's entrepreneurship theory associates entrepreneurship not only with organizations of businesses, but also with Innovations or continuous business development. Schumpeter considers entrepreneurship as the central factor of economic development. The result is not the doom of capitalism foreseen by Marx, but a progressive free-enterprise system. Thus, it is the human factor which emerges as the dominant factor in business and economic development. The theory is of contemporary relevance, as

evident from the current entrepreneurship and micro enterprises to combat multiple socioeconomic problems." Their conclusion is that States should be entrepreneurial states, as the United Arab Emirates, which runs many successful innovative enterprises like Ports and Airways. There should not be any running away from innovative state entrepreneurship. Government should take all steps from infrastructure to training to finance to monitoring to marketing to promote healthy and productive entrepreneurship. Sound banking is essential for healthy entrepreneurship, but presently banking all over seems to be in a perfect state.

Ducker (1999), in his article, points out that "We live in an age of unprecedented opportunity: If you've got ambition and smarts, you can rise to the top of your chosen profession, regardless of where you started out. But with opportunity comes responsibility. Companies today aren't managing their employees' careers; knowledge workers must, effectively, be their own chief executive officers. It's up to you to carve out your place, to know when to change course, and to keep yourself engaged and productive during a work life that may span some 50 years. To do those things well, you'll need to cultivate a deep understanding of yourself—not only what your strengths and weaknesses are but also how you learn, how you work with others, what your values are, and where you can make the greatest contribution. Because only when you operate from strengths can you achieve true excellence."

The Asian Development Bank reported that the Bangladesh Government should consider that better governance is required in the banking sector. Indications of weak governance are a high ratio of expenditure to income, high administrative and operating expenses, lending with scant appraisal, weak credit monitoring, a lack of integrity and compliance with applicable laws and regulations, and inefficient appointments in management. To address banking sector issues, the authorities have taken a number of measures under past reform programs: enforcing stronger

regulations, introducing a bankruptcy law, establishing money loan courts and a credit information bureau, corporatizing SCBs, applying a uniform guideline for writing off loans, changing loan classification, and loan-loss provision, would provide better opportunities for the economy to provide opportunities for growth and innovation.

In their article, **Sreevas Sahasranamam a**nd Kuppuswamy point out that

- With a cultural mindset shift towards entrepreneurship, India is now the world's third-largest startup ecosystem.
- The gap between male and female entrepreneurs has almost closed in recent years.
- Levels of startup activity remain heavily concentrated in certain regions

Simar Singla, in her article, states that Startup entrepreneurs in India are consistently making it to the front page of daily news media. India has now become a new hub for startups. In her paper, she traces the path leading to the new wave of entrepreneurship in India and examines the socio-political and financial factors related to the emergence of new entrepreneurs in India. Her argument is that entrepreneurship, in the form of startups, is critical to India's future journey towards becoming a global superpower and expresses the opinion that Entrepreneurs must be supported by additional, concrete government policy.

Pais (2025) in the study identifies that in India, startups face critical challenges such as limited financing due to investor hesitancy, complex regulatory environments, a shortage of skilled professionals in sustainability, stiff competition from traditional businesses, and the disruptive impact of the COVID-19 pandemic. These factors create a challenging environment for scaling sustainable business models. Startups should demonstrate the impact of their sustainable initiatives to build investor confidence. Policymakers need to streamline regulations

and invest in infrastructure, while entrepreneurship education should emphasize sustainability. Startups must develop strategies to compete with traditional businesses. This study contributes to the literature on sustainable entrepreneurship, offering insights into the challenges faced by sustainability-driven startups in India and providing recommendations for overcoming these barriers.

Pragati Guptaand and Dr. Anvita Raghuvanshi, in their paper, study the rise of startups in India, that has been fueled by a young and talented workforce, government support & funding options provided by the investors. Their paper is an attempt to find out the dynamic changes that Startup India campaign has brought to the country. In addition, the study aims to discover opportunities, gaps & challenges that Startups face during their stages of operation. Since its inception, the journey of Startup India campaign has successfully nurtured a large number of startup firms in the country and has enabled thousands of youth to be employed & fulfill their dreams of building a startup. Focusing on this notion, the paper tries to find out the opportunities and challenges that startups are facing in the present scenario.

Section 3 Data and Methodology

In this section, a brief description of the data and Methodology used are given; secondary data has been collected through different sources. The website www.startupindia.gov.in has been referred. Annual status reports from the Department for Promotion of Industry and Internal Trade (DPIIT) are used. Data for GDP and Log (GDP) (2000-01 to 2024-25) Regression 1 Log GDP = a +b Time-this is the Methodology used India's Historical Growth Performance: India's economic performance over the past 25 years provides a strong empirical foundation for assessing its readiness to pursue the Vision 2047 milestone of becoming a developed, USD 30-trillion economy. Using constant (2011–12) prices, India's real GDP expanded steadily from

₹32.4 lakh crore in 2000–01 to an estimated ₹18.8 trillion in 2024–25. The regression of $\log_{10}$(GDP) on time shows an exceptionally strong fit ($R^2 \approx 0.98$), indicating that nearly all long-term variations in GDP are explained by a smooth upward trend. The estimated coefficient implies an underlying real growth rate of about 7.9 percent annually—a trend that aligns with India's high-growth mid-2000s expansion and confirms the economy's structural resilience despite shocks such as the global financial crisis and the COVID-19 contraction. In nominal terms, India's GDP is currently about ₹330 trillion (approximately USD 4 trillion), now ranking as the world's fifth-largest economy. This dual picture—real output at constant prices and nominal output at current prices—underscores the methodological distinction needed to correctly interpret India's long-term growth path and future projections. The historical trend establishes a strong base, but sustaining and elevating growth above this trajectory will be essential to achieving the Viksit Bharat 2047 goals.

Table 1: GDP and Log10(GDP), 2000–01 to 2024–25 (At 2011-12 Constant Prices)

Year	GDP (Rs crore)	$\log_{10}$(GDP)	Time
2000–01	32,42,170	6.5108	1
2001–02	33,89,780	6.5302	2
2002–03	35,43,050	6.5494	3
2003–04	38,62,210	6.5864	4
2004–05	41,75,930	6.6205	5
2005–06	45,54,340	6.6586	6
2006–07	49,75,030	6.6965	7
2007–08	53,92,090	6.7321	8
2008–09	55,84,540	6.7465	9
2009–10	59,98,260	6.7788	10
2010–11	66,02,210	6.8195	11
2011–12	87,36,329	6.9413	12

2012–13	92,13,017	6.9647	13
2013–14	98,01,370	6.9913	14
2014–15	1,05,27,674	7.0224	15
2015–16	1,13,69,493	7.0558	16
2016–17	1,23,08,193	7.0902	17
2017–18	1,31,48,582	7.1189	18
2018–19	1,39,92,914	7.1460	19
2019–20	1,45,34,641	7.1625	20
2020–21	1,36,49,869	7.1351	21
2021–22	1,50,21,846	7.1767	22
2022–23	1,61,64,913	7.2086	23
2023–24*	1,76,50,591	7.2468	24
2024–25*	1,87,96,955	7.2741	25
Source: MoSPI National Accounts + Economic Survey 2023–24 (Volume 2) 2023-24 and 2024-25 figures are estimates			

1.1 Regression Analysis

Statistic	Value	
Multiple R	0.98995	R=Corr (Yactual, Ypredicted)
R Square (R^2)	0.97990	
Adjusted R Square	0.97930	
Standard Error	0.01662	
Observations	25	

1.2 Coefficient estimates

Variable	Coefficient	Std. Error	t-Statistic	p-Value	95% CI (Lower)	95% CI (Upper)
Intercept	6.4718	0.01021	633.68	<0.0001	6.45109	6.49251
Time	0.03380	0.00101	33.52	<0.0001	0.03172	0.03588

Model : log10(GDP) = 6.4718+0.0338×Time	

1.3 Regression Summary: The regression confirms that India's real GDP has followed a remarkably stable, exponential growth path for 25 years. Time alone explains almost 98 % of GDP's long-term movement, and the estimated slope corresponds to an average real growth rate of roughly 7.9 % per year. The model smooths temporary fluctuations, including the COVID-19 dip, revealing strong underlying growth momentum. All coefficients are highly significant, validating the robustness of the long-term trend. These results provide quantitative evidence that India has maintained resilient real growth, while also highlighting that further acceleration will require productivity enhancement, technological upgrading, infrastructure expansion, and strengthened human capital capabilities.

4.2 Entrepreneurial Climate in India

It is stated that India's startup ecosystem is a vibrant tapestry of innovation and ambition. Two factors that fuel this growth are startups born from solving pressing problems, or from seizing emerging opportunities. These are clearly two distinct paths and need to be understood as to how they shape the Indian entrepreneurial climate.

The Problem-Based Path: Addressing India's Real Challenges

In India, the problem-based approach often tackles fundamental issues that impact millions. It's about identifying and solving the everyday struggles of a diverse population. The process follows a clear structure:

1. **Problem:** Understanding the depth and impact of the problem in the Indian context.
2. **Solution:** Developing a scalable and accessible solution.
3. **Value:** Demonstrating the tangible benefits for the target audience.

4. **Market:** Reaching the specific segment experiencing the problem across India's varied demographics.

   Indian Examples of the first approach are **Pharm Easy, Arvind Eye Hospital**

   In order to use this approach the Start-up CEO needs to be able to possess these qualifications:

   - **Empathy and Ground-Level Understanding:** Deeply connecting with the challenges faced by diverse Indian communities.
   - **Resourcefulness and Adaptability:** Developing solutions that work within India's unique constraints.

On the other hand, it is suggested in the literature that the second approach is:

The Opportunity-Based Path: Riding the Wave of India's Growth

This approach focuses on capitalizing on India's rapid economic and technological transformation. It's about spotting and leveraging emerging trends. The process involves:

1. **Market:** Analyzing India's evolving market landscape and identifying growth sectors.
2. **Need:** Understanding the changing needs of India's increasingly digital and aspirational population.
3. **Gap:** Identifying gaps in the market where innovative solutions can thrive.
4. **Opportunity:** Formulating a business opportunity that aligns with India's growth trajectory.

5. **Product:** Developing a product or service that caters to the emerging needs of the Indian market.

Indian Examples of the second approach are **Zomato/Swiggy; Paytm**

In order to adopt this approach, the CEO of the startup needs to have this perception

- **Foresight and Market Awareness:** Anticipating future trends in India's dynamic market.
- **Scalability and Reach:** Building solutions that can cater to India's vast and diverse population.
- **Digital Savvy:** Leveraging India's growing digital infrastructure and tech-savvy population

In India, both approaches are crucial. Problem-based startups address fundamental needs and contribute to social impact, while opportunity-based startups drive economic growth and innovation.

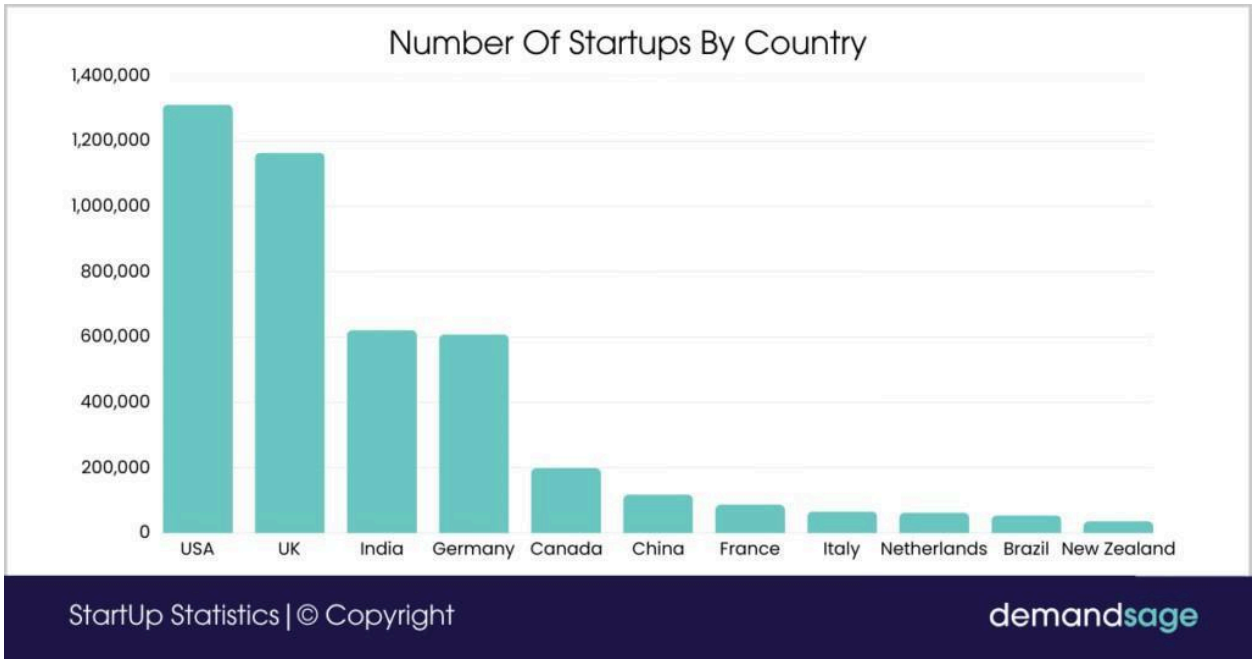
It has been stated that one-third of the startups fail due to the lack of product demand, and 34% of the startups stated that their failure was due to a lack of demand for their products. Meanwhile, 2 in 10 startups fail because they are not able to market their products properly. The other reasons cited for failure are: Lack of Product Demand (34%), Marketing Problems (22%), Team Problems (18%), Financial (16%), Technical Problems (6%), and Legal and Operational Problems (each 2%)

It is found that only 10% to 20% of the startups become successful in the long run. First-time business owners have a success rate of 18%. While the business owners who failed in the past have a slightly higher startup success rate. On the other hand, business owners who have

had a successful startup in the past have a success rate of around 30%. The reasons cited by the successful startup owners are that they have the relevant qualifications and experience to run their own business. **Source:** Small Business Trends, Failory

It is observed that around 10% of the startups fail within a year of establishment. At the same time, 70% of startups fail between the second and fifth years. Further, it is seen that the startup failure rates increase over time. The majority of businesses throughout the industries fail within 10 years of establishment. Thus, in the long run, 90% of the startups fail, and only 1 in 10 startups are able to survive.

In the Table below, the data is given for 2022. This reveals that the U.S. has the highest number of startups globally, followed by India, which has 621,448 startups.



About 1% of startups evolve into unicorn startups. Since 2018, more than 250 new unicorns have been created each year. However, in 2021, the number increased to 787.

Unicorn StartUps

There are over 1,624 unicorn startups from 48 countries. Startups are known as Unicorn startups when Less than 1% of the startups can cross a valuation of $1 billion. Some of the popular Unicorn startups worldwide are Uber, Airbnb, SpaceX, and more.

Globally, 2,800 startups have achieved a valuation of more than $1 billion. Of these, only 1,624 are still private and venture-backed, while over 240+ are rumored and unverified. The number of unicorn startups in India in 2023 was 87, and in 2025 there were 117, and India ranked fourth. All the above analysis that the Entrepreneurial climate in India is favorable.

Conclusion

Economist T.N. Srinivasan stated that India has been an entrepreneurial society with suppressed entrepreneurial skill, which is now thriving.' Entrepreneurship in the form of startups has grown rapidly in the past twenty years, creating wealth, and generating employment. Crucial efforts initiated after economic liberalization — including systematic attempts to reduce the 'license raj', greater efforts to make finance more easily accessible to entrepreneurs and other institutional support to 'techno-preneurs' — have helped improve the climate for entrepreneurship (NKC, 2008).

The number of entrepreneurs and startups is likely to increase in the future in India and across the globe because of beneficial incentives that globalization has brought, including emerging markets, increased political will and technological innovation. The rich talent pool that once provided back-end support for US companies has now turned towards entrepreneurship, being expected to grow to $20-25 billion over the next five years.

Entrepreneurship has been widely recognized as a potent factor in economic development. The concept of entrepreneurship is decorated by various attributes like

‘innovation’, ‘organization-building ability’, ‘gap-filling function’, ‘input completing ’, etc. Persons with these qualities are required to initiate and sustain the process of industrialization (Wohl, 1969). As nations around the world grapple with unique domestic transitions and unpredictable international environments, entrepreneurship policy is viewed as an important tool for sustaining and growing an economy (Venkataraman, 2000). Formulation of an entrepreneurship policy is complicated and complex but is also the need of the hour in India.

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Small business trends, Failory.

Teachers' Perceptions of Digital Game-Based Learning on Student Engagement, Motivation, and Learning Outcomes in K-12 Social Studies Education: A Systematic Literature Review

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Abstract

This systematic review explores patterns in how K–12 social studies teachers navigate digital game-based learning (DGBL) amid the realities of technology integration and discipline-specific instruction. Drawing on 10 qualitative and mixed-methods studies published between 2015 and 2024, the review follows PRISMA guidelines and employs Braun and Clarke's (2006) reflexive thematic analysis to identify trends in teacher perceptions related to student engagement, motivation, and learning outcomes. Findings reveal that while DGBL is not seen as a panacea to disengagement, many teachers recognize its potential as a supplement to instruction, offering interactivity, authenticity, and curricular relevance. Educators emphasized its ability to foster multidimensional engagement, stimulate curiosity, and build disciplinary and transferable skills; yet, implementation remains limited by structural constraints such as limited time, rigid pacing guides, and a lack of high-quality, standards-aligned games. These challenges do not reflect teacher resistance, but rather the practical realities of teaching within constrained systems. Teachers demonstrated an intentional approach to game integration, prioritizing alignment with learning objectives, instructional relevance, and the role of teacher facilitation in guiding gameplay. This study's findings suggest that social studies educators are especially attuned to the affordances and limitations of digital technologies in a content area often marginalized in K–12 education.

Keywords: K12 Social Studies Education, Digital Game-based learning, student motivation, student engagement, student learning outcomes, teacher perceptions

DGBL in Social Studies

Social studies classrooms often face a dual challenge: content that students perceive as abstract or disconnected, and a marginalized status within the broader K–12 curriculum,

particularly when compared to tested subjects like math and reading. Teachers report struggling to sustain student interest amid limited instructional time, rigid pacing guides, and pressure to prioritize standards over exploration. In this context, digital game-based learning (DGBL) has emerged as a promising approach for engaging learners in more interactive, emotionally resonant, and student-centered ways.

The extant literature is overwhelmingly positive regarding the benefits of DGBL for student engagement, motivation, and learning outcomes. Features such as immediate feedback, progress tracking, and rewards support intrinsic and extrinsic motivation (Annetta, 2010; Landers, 2014). However, other features, like competition, remain more nuanced, with Chen and Chang (2020) finding that competition as a game element may be less effective in subjects like social studies, where collaboration and inquiry may be more beneficial (Chen et al., 2020). The interactive nature of games fosters active learning, a core aspect of DGBL. Gilbert (2019) found that students playing *Assassin's Creed* formed emotional connections with historical figures, which enhanced students' historical empathy. Such outcomes challenge narrow definitions of engagement and highlight DGBL's affective potential.

Moreover, design balance is crucial, as exemplified by Charsky and Ressler (2010), who noted that while Civilization III sustained motivation, additional scaffolds outside the game reduced autonomy, thereby hindering engagement. Similarly, Andersson (2023) found vocabulary gains in both players and observers, but active players reported greater effort and retention. Wang and Huang (2023) affirm that interactivity promotes deeper learning, emphasizing the pedagogical value of well-designed game experiences.

Despite growing interest in technology-enhanced learning, the integration of DGBL in K–12 social studies remains inconsistent and often under-supported. This study was designed to explore how in-service social studies teachers perceive the role of DGBL in shaping student engagement, motivation, and learning outcomes, especially within a discipline that often receives limited time and resources. By centering teacher perspectives, this review seeks to understand both the opportunities and obstacles that influence how DGBL is used in practice. Two guiding questions shaped the analysis:

2) What are K–12 teachers' perceptions of student engagement and motivation in digital game-based social studies instruction?
2) What are K–12 teachers' perceptions of student learning outcomes when using DGBL in the social studies classroom?

Methods

This study used a systematic literature review approach following Page et al.'s (2021) Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to examine teacher perspectives on DGBL in K–12 social studies. The researchers carefully selected search terms and identified their synonyms through ERIC database searches aligned with the core research themes of K-12 teacher perceptions, digital games, engagement, motivation, and learning outcomes. Truncation and Boolean operators to refined and expanded the searches across Google Scholar, EBSCO, and ERIC, and the searches were conducted in stages to sequentially address engagement, motivation, and learning outcomes. Although searches were done separately for engagement, motivation, and learning outcomes, the researchers acknowledged the interconnectedness of these constructs during analysis.

Ten peer-reviewed qualitative and mixed-methods studies published between 2015 and 2024 were selected based on criteria emphasizing in-service teacher experiences, non-mobile digital games, and relevance to social studies content. Data analysis leveraged Braun and Clarke's (2006) reflexive thematic analysis to identify patterns in how teachers perceive DGBL's impact on student engagement, motivation, and learning outcomes.

Findings

The review identified seven key themes across two research questions, with four related to student engagement and motivation (Table 1) and three connected to learning outcomes (Table 2).

Table 1

Summary of Findings for Research Question 1

Theme	Description	Supporting Sources
DGBL contributes to active student engagement across dimensions, which enhances student motivation	Teachers consistently perceive DGBL as enhancing student engagement across cognitive, behavioral, social, and emotional domains. They emphasize its role in supporting and sustaining students' interest in social studies content, promoting collaboration, and increasing motivation through enjoyable, student-centered learning experiences.	Cannatella, 2022; Huizenga et al., 2017; Karaman et al., 2022; Mozelius et al., 2017; Sáez-López et al., 2015; Somen & Goksu, 2020
Competitions and challenges embedded support cognitive engagement through emotional and social engagement	Teachers observed that competitive and challenge-based elements within DGBL promote cognitive engagement by activating emotional investment and encouraging social interaction. Students demonstrated deeper content exploration through peer collaboration, discussion, and strategic gameplay, although a few concerns were raised about students potentially prioritizing play over learning.	Huizenga et al., 2017; Lee et al., 2022; Somen & Goksu, 2020
Authentic learning sparks student interest and sustains student engagement.	Teachers reported that authentic learning experiences within DGBL, particularly through simulations and choice-driven gameplay, stimulate student interest and support sustained engagement. These environments help students apply abstract concepts in realistic contexts, making social studies content more concrete and meaningful.	Gampell et al., 2020; Huizenga et al., 2017; Mozelius et al., 2017; Somen & Goksu, 2020

Theme	Description	Supporting Sources

DGBL is not viewed as a cure-all for existing student disengagement and demotivation	While teachers view DGBL as a valuable tool, many caution that it is not a comprehensive solution for disengagement. Concerns include limited intrinsic	Chen & Jenks, 2023; Gampell et al., 2020; Lee et al., 2022; Mozelius et

	motivation among students, behavioral and classroom management challenges, time constraints, and technology barriers. DGBL is seen as one component of a broader instructional approach.	al., 2017; Somen & Goksu, 2020

Table 2

Summary of Findings for Research Question 2

Theme	Description	Supporting Sources
Teachers' game selection preferences relate to constructive alignment to learning objectives	Teachers prioritize DGBL tools that align with curriculum goals and student learning outcomes. While engagement is important, alignment with grade level, content standards, and time constraints is essential. Limited availability of high-quality, accurate, and educationally relevant games presents a barrier to broader integration.	Cannatella, 2022; Gampell et al., 2020; Karaman et al., 2022; Lee et al., 2022; Mozelius et al., 2017; Sáez-López et al., 2015; Somen & Goksu, 2020
DGBL facilitates the development of skills both within and outside of social studies.	Teachers view DGBL as promoting social studies content knowledge alongside broader skills such as creativity, collaboration, problem-solving, and critical thinking. Games help visualize complex concepts, foster conceptual understanding, and support disciplinary vocabulary use, while also encouraging teamwork and student agency.	Cannatella, 2022; Huizenga et al., 2017; Karaman et al., 2022; Mozelius et al., 2017; Sáez-López et al., 2015; Somen & Goksu, 2020
Teacher facilitation is essential to maximizing learning in DGBL environments.	Teachers emphasized that DGBL should be paired with active facilitation. Educators play a critical role in guiding gameplay, offering feedback, prompting reflection, and reinforcing curricular objectives. Without teacher support, students may struggle to make meaningful connections between game content and social studies learning goals.	Chen & Jenks, 2023; Gampell et al., 2020; Huizenga et al., 2017; Lee et al., 2022

Discussion

This review explored K–12 teachers' perceptions of DGBL in social studies, highlighting its promise and the structural constraints shaping its use. Findings should be understood in light of the structural constraints facing social studies education and the unique affordances DGBL offers within that context. High-stakes testing environments push schools to prioritize tested subjects, thereby marginalizing social studies, especially in the early grades.

Across the identified studies, teachers frequently cited time constraints, limited planning support, and challenges finding standards-aligned games as key barriers to DGBL integration. Despite these constraints, teachers largely viewed DGBL not as a novelty. Instead, educators recognize DGBL as a tool to provide a strategic response to ongoing engagement challenges,

which echoes findings by Akhan et al. (2023) and Doornbos et al. (2024), who note that DGBL

adoption often reflects structural pressures rather than pedagogical reluctance. Teachers also emphasized that DGBL must be paired with intentional instructional design to reinforce content and support student collaboration. As constructivist models recommend, sustained student engagement depends on how teachers frame and guide gameplay and prompt reflection to reinforce learning (Gampell et al., 2020; Kangas et al., 2017).

Moreover, disciplinary concerns also influence DGBL adoption as teachers frequently cited the importance of historical accuracy, age-appropriate content, and curriculum alignment in game selection (Sáez-López et al., 2015; Gampell et al., 2020). These findings support McCall's (2016) argument that games should be treated as interpretive texts to contextualize and supplement game content through discussion and comparison with traditional sources. A media literacy orientation enables students to distinguish between entertainment and historical facts (Kellner & Share, 2005; NCSS, 2021). Interestingly, few studies emphasized technological barriers, likely reflecting improved access in post-pandemic classrooms. However, the digital divide remains a pressing issue, especially in under-resourced schools. As Lopez (2025) warns, disparities in broadband access and device availability still shape the uneven technological landscape, which DGBL is not exempt from.

To conclude, educators view DGBL in a primarily positive light as a strategy. However, its practical implementation presents limitations as its success depends on curricular alignment, teacher support, and institutional flexibility. Instead of positioning games as substitutes for traditional instruction, educators might consider how they can enrich learning when used alongside established methods. Educational leaders must support this potential by investing in high-quality, standards-aligned DGBL resources, sustained professional development, collaborative teacher networks, and structural flexibility in curriculum and scheduling. Without

such systemic support, even the most motivated educators will struggle to realize DGBL's full potential.

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Understanding Why In 1912 and In 1932 The Incumbent President Did Not Win The Election

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Abstract

The purpose of this paper is to increase the understanding of why, in the 1912 election and in the 1932 election, the incumbent president did not win the election. Firstly, this paper examines how the Tariff Act of 1909, signed by President William Taft, contributed to his loss in the 1912 Presidential Election. Secondly, this paper examines how the Tariff Act of 1930, signed by President Herbert Hoover, contributed to his loss in the 1932 Presidential Election. Lastly, this paper concludes with an analysis of how the tariff policies of President William Taft and President Herbert Hoover impacted their presidential legacies.

***Key Words*:** incumbent, tariff, consumers, election, and president.

Introduction

The purpose of this paper is to increase the understanding of why, in the 1912 election and in the 1932 election, the incumbent president did not win the election. Firstly, this paper examines how the Tariff Act of 1909, signed by President William Taft, contributed to his loss in the 1912 Presidential Election. Essentially, the Tariff Act of 1909 lowered the overall average tariff rate from 46% to 41% over 14 schedules. The Progressive Republicans disliked that President Taft signed the Tariff Act of 1909 into law to satisfy both factions of his party, which contributed to his loss in the 1912 presidential election to Democrat Woodrow Wilson.

Secondly, this paper examines how the Tariff Act of 1930, signed by President Herbert Hoover, contributed to his loss in the 1932 Presidential Election. The Tariff Act of 1930 raised the average tariff rate from 40% to 59% over 15 schedules. The Tariff Act of 1930 caused foreign nations to impose retaliatory tariffs, worsening the Great Depression and contributing greatly to

President Herbert Hoover losing to Democrat Franklin Roosevelt in the 1932 presidential election, after Democrat Woodrow Wilson. Lastly, this paper concludes with an analysis of how the tariff policies of President William Taft and President Herbert Hoover impacted their presidential legacies.

President William Taft (1909–1913)

According to the article "William Howard Taft" (2025), William Taft became the 27th United States President on March 4, 1909, after winning the 1908 Presidential Election. The six important bills that he signed into law were the Tariff Act of 1909, the Corporate Income Tax Act of 1909, the Mann–Elkins Act of 1910, the Enabling Act of 1910, the Mann Act of 1910, and the Labor Department Act of 1913.

Essentially, the Tariff Act of 1909 lowered the average tariff rate from 46% to 41%. Essentially, the Corporate Income Tax Act of 1909 imposed a 1% corporate income tax on income above $5,000. Essentially, the Mann–Elkins Act of 1910 or the Railway Rate Act of 1910 gave the Interstate Commerce Commission (ICC) the power to regulate railroad, telephone, and telegraph rates, and it created a commerce court to handle disputes over the regulations of the Interstate Commerce Commission. The Enabling Act of 1910 allowed New Mexico to become the 47th state on January 6, 1912, and allowed Arizona to become the 48th state on February 14, 1912. Essentially, the Mann Act of 1910, or the White-Slave Traffic Act of 1910, made it a felony to engage in interstate or foreign commerce as it relates to the transport of any woman or girl for the purpose of prostitution. Essentially, the Labor Department Act of 1913 was the last bill signed by President Taft, and it created the Department of Labor by separating it from the Department of Commerce and Labor.

Key Features of the Tariff Act of 1909

According to the article "Address on the Tariff Law of 1909" (2025), the Tariff Act of 1909 was one of the key reasons President Taft lost the 1912 Presidential Election. The Tariff Act of 1909 divided the Republican Party because it was a compromise between the Progressive Republicans, who wanted lower tariffs, and the Conservative Republicans, who wanted higher tariffs. Essentially, the Tariff Act of 1909 lowered the average tariff rate from 46% to 41% across 14 schedules as follows. The average tariff rates on Spirits and Wines (89%), Tobacco (87%), Sugar (65%), Wool (57%), Silk (52%), Cotton (50%), Glass (48%), and Yarn (44%) were all above the overall 41% average tariff rate. The average tariff rates on Agricultural Products (32%), Metals (31%), Chemicals (28%), Sundries (24%), Papers and Books (23%), and Wood (12%) were all below the overall average of 41%.

Impact of the Tariff Act of 1909 on Public Opinion

According to the article "Tariff of 1909: Lowering and Raising Rates at the Same Time," the Tariff Act of 1909 led Progressive Republicans to leave the Republican Party and form the Progressive Party. The Progressive Republicans disliked that President Taft signed the Tariff Act of 1909 into law to satisfy both factions of his party, which contributed to his loss in the 1912 presidential election to Democrat Woodrow Wilson. Progressive Republicans opposed the Tariff Act of 1909 because they wanted a lower average tariff rate to protect the interests of the consumers. Conservative Republicans opposed the Tariff Act of 1909 because they wanted a higher average tariff rate to protect the interests of the business owners. Democrats opposed the Tariff of 1909 because they wanted a lower average tariff rate to protect the interests of consumers. Business owners opposed the Tariff Act of 1909 because they wanted a higher average tariff rate to protect them from lower foreign prices. Consumers opposed the Tariff Act of

1909 because consumer prices increased, resulting in higher average prices for basic food products. The average price for a pound of sugar was 4¢ in 1909 and 6¢ in 1912. The average price for a pound of steak was 17¢ in 1909 and 21¢ in 1912. The average price for a dozen eggs was 28¢ in 1909 and 30¢ in 1912. The average price for a gallon of milk was 32¢ in 1909 and 36¢ in 1912.

Impact of the Tariff Act of 1909 on the 1912 Election Results

According to the article "The Presidential Election of 1912" (2025), the main issue of the 1912 Presidential Election was the Tariff Act of 1909. The four key presidential candidates were Woodrow Wilson, Theodore Roosevelt, William Taft, and Eugene Debs. Democrat Governor Woodrow Wilson (New Jersey) opposed the Tariff Act of 1909. Progressive Former President Theodore Roosevelt (New York) opposed the Tariff Act of 1909. Republican President William Taft (Ohio) supported the Tariff Act of 1909. Socialist Former State Representative Eugene Debs (Indiana) thought the Tariff Act of 1909 was irrelevant to the problems faced by the working class.

According to the article "The United States Presidential Election of 1912" (2025), there were 48 states, 531 electoral votes, and a candidate needed at least 266 electoral votes to win the presidential election. As a side note, the 13 most populous states had a total of 276 electoral votes, which were more than enough electoral votes to elect the president in the 1912 Presidential Election. Essentially, Democrat Governor Woodrow Wilson (New Jersey) did win 10 of the 13 most populous states, but he did not win Pennsylvania (the 2nd most populous state), Michigan (the 8th most populous state), or California (the 12th most populous state).

Woodrow Wilson won 40 states, Theodore Roosevelt won 6, President William Taft won 2, and Eugene Debs won 0. Woodrow Wilson won 41.8% of the popular vote, Theodore Roosevelt won 27.4% of the popular vote, President William Taft won 23.2% of the popular vote, and Eugene

Debs won 6.0% of the popular vote. Woodrow Wilson won 435 electoral votes (81.9%), Theodore Roosevelt won 88 electoral votes (16.6%), President William Taft won 8 electoral votes (1.5%), and Eugene Debs won 0 electoral votes. According to the article, *The United States Presidential Election of 1912* (2025), President William Taft did not win the 1912 Presidential Election because he lost his plurality voter support in 27 of the 29 states that he won in the 1908 Presidential Election due to the policy outcomes of the Tariff Act of 1909. Democrat Woodrow Wilson won the 1912 Presidential Election because Republican votes were split between the Republican and Progressive Parties due to the policy outcomes of the Tariff of 1909.

New York (45 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Illinois (29 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Ohio (24 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Massachusetts (18)	**Republican William Taft**	**Democrat Woodrow Wilson**
Missouri (18 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Indiana (15 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
New Jersey (14)	**Republican William Taft**	**Democrat Woodrow Wilson**
Iowa (13 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Wisconsin (13 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Kansas (10 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
West Virginia (8)	**Republican William Taft**	**Democrat Woodrow Wilson**
Connecticut (7)	**Republican William Taft**	**Democrat Woodrow Wilson**
Maine (6 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
North Dakota (5)	**Republican William Taft**	**Democrat Woodrow Wilson**
Oregon (5 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Rhode Island (5)	**Republican William Taft**	**Democrat Woodrow Wilson**
Idaho (4 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Montana (4 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
New Hampshire (4)	**Republican William Taft**	**Democrat Woodrow Wilson**
Delaware (3 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Wyoming (3 votes)	**Republican William Taft**	**Democrat Woodrow Wilson**
Pennsylvania (38)	**Republican William Taft**	**Progressive Teddy Roosevelt**
Michigan (15 votes)	**Republican William Taft**	**Progressive Teddy Roosevelt**
California (13 votes)	**Republican William Taft**	**Progressive Teddy Roosevelt**

Minnesota (12 votes)	**Republican William Taft**	**Progressive Teddy Roosevelt**
Washington (7)	**Republican William Taft**	**Progressive Teddy Roosevelt**
South Dakota (5)	**Republican William Taft**	**Progressive Teddy Roosevelt**

Impact of the Tariff Act of 1909 on the Presidential Legacy of Taft

Essentially, the policy outcomes of the Tariff of 1909 impacted the presidential legacy of William Taft. His legacy is that he lowered the average tariff rate on dutiable imports from 46% to 41%, causing a division within the Republican Party. His legacy is that he lost 27 flipped states, making him the 6th of 11 incumbents to try and fail to win re-election. The 11 are John Adams (1800), John Q. Adams (1828), Martin Van Buren (1840), Grover Cleveland (1888), Benjamin Harrison (1892), William Taft (1912), Herbert Hoover (1932), Gerald Ford (1976), Jimmy Carter (1980), George Bush (1992), and Donald Trump (2020).

President Herbert Hoover (1929–1933)

According to the article (Herbert Hoover, 2025), Herbert Hoover became the 31st President of the United States on March 4, 1929, after winning the 1928 Presidential Election. Six important bills that President Herbert Hoover signed into law were the Reapportionment Act of 1929, the Tariff Act of 1930, the Norris–La Guardia Act of 1932, the Revenue Act of 1932, the Emergency Relief and Construction Act of 1932, and the Buy American Act of 1933. The Reapportionment Act of 1929 created a permanent method for apportioning the 435 seats in the United States House of Representatives based on each census. The Tariff Act of 1930 raised the average tariff rate on dutiable imports from 40% to 59% to protect businesses and farmers from foreign competition. Essentially, the Norris–La Guardia Act of 1932 banned yellow-dog contracts and barred the federal courts from issuing injunctions against nonviolent labor disputes. The Revenue Act of 1932 raised the personal income tax rate on the highest income bracket from 25% to 63% and raised the corporation income tax rate from 12% to 13.75%. Essentially, the Emergency Relief and Construction Act of 1932 provided funds for public works projects and temporary employment.

Essentially, the Buy American Act of 1933 requires federal agencies to purchase goods, products, and supplies from U.S. industries.

Key Features of the Tariff Act of 1930

According to the article, *Tariff of 1930* (2025), the Tariff Act of 1930 was one of the key reasons why President Hoover lost the 1932 Presidential Election. The Tariff Act of 1930 was a compromise between the conservative and progressive factions of the Republican Party. The Conservative Republicans supported the Tariff of 1930 because they thought that it would protect the interests of business owners against the low priced products of foreign competition. The Progressive Republicans opposed the Tariff of 1930 because they thought that it would cause retaliatory tariffs, decrease international trade, and cause the Great Depression to get worse. The Tariff Act of 1930 raised the average tariff rate from 40% to 59% over 15 schedules. The average tariff rates for Sugar (77%) and Tobacco (64%) were above the overall 59% average tariff rate. The average tariff rates for Wool (59%) and Silk (59%) were the same as the overall 59% average tariff rate. The average tariff rates for Glass (53%), Rayon (53%), Spirits and Wines (47%), Cotton (46%), Chemicals (36%), Metals (35%), Agricultural Products (35%), Sundries (28%), Papers and Books (26%), Yarn (19%), and Wood (11%) were below the overall 59% average tariff rate.

Impact of the Tariff Act of 1930 on Public Opinion

According to the article, *Tariff of 1930* (2025), the Tariff of 1930 did cause foreign nations to impose retaliatory tariffs and the Great Depression to get worse. By 1932, about 45% of the banks had failed and about 35% of the businesses had closed. By 1932, the production of goods had declined about 54% and the amount of international trade had declined about 51%. By 1932, most Conservative Republicans and business owners still supported the Tariff Act of 1930. By 1932, most Progressive Republicans and Democrats still opposed the Tariff Act of 1930. By 1932, most

consumers now opposed the Tariff of 1930 because of the ways in which it impacted their everyday lives. The unemployment rate was 9% in 1930 and 25% in 1932. The poverty rate was 40% in 1930 and 45% in 1932. The consumer spending amount was $38 billion in 1930 and $24 billion in 1932.

Impact of the Tariff Act of 1930 on the 1932 Election Results

According to the article, *The Presidential Election of 1932* (2025), the Great Depression was the major issue of the 1932 Presidential Election. The New Deal Platform of Democrat Governor Franklin Roosevelt (New York) called for relief for the unemployed, poor, and farmers, recovery to get the economy back to normal levels, and reform of the financial system to prevent a repeat depression. Republican President Herbert Hoover (California) and his Anti-Depression Platform called for continuing his anti-depression policies to overcome the Great Depression.

There were 48 states, 531 electoral votes, and a candidate needed to win at least 266 electoral votes to win the 1932 Presidential Election. The 12 most populous states had a total of 277 electoral votes. According to the article, *The Presidential Election of 1932* (2025), Democrat Governor Franklin Roosevelt (New York) won 11 of the 12 most populous states in the 1932 Presidential Election. Franklin Roosevelt won 42 states and President Herbert Hoover won 6 states. Franklin Roosevelt won 57.4% of the popular vote and President Herbert Hoover won 39.6% of the popular vote. Franklin Roosevelt won 472 electoral votes (88.9%) and President Herbert Hoover won 59 electoral votes (11.1%).

According to the article, *The United States Presidential Election of 1932* (2025), President Herbert Hoover did not win the 1932 Presidential Election because he lost 34 of the 40 states that he won in the 1928 Presidential Election due to the impact of the Tariff Act of 1930 on the Great Depression.

New York (47 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Illinois (29 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Ohio (26 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Texas (23 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
California (22 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Michigan (19 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
New Jersey (16 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Missouri (15 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Indiana (14 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
North Carolina (13 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Wisconsin (12 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Minnesota (11 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Iowa (11 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Virginia (11 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Kentucky (11 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Tennessee (11 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Oklahoma (11 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Kansas (9 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Maryland (8 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
West Virginia (8 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Washington (8 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Nebraska (7 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Florida (7 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Colorado (6 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Oregon (5 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
North Dakota (4 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
South Dakota (4 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Montana (4 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Idaho (4 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Utah (4 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Wyoming (3 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
New Mexico (3 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Arizona (3 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)
Nevada (3 votes)	Herbert Hoover (R)	Franklin Roosevelt (D)

Essentially, the policy outcomes of the Tariff Act of 1930 impacted the presidential legacy of Herbert Hoover. His legacy is that he raised the average tariff rate on imports from 40% to 59% causing the Great Depression to get worse. His legacy also is that he lost 34 flipped states causing him to become the 7th of 11 incumbents to try and fail to win re-election. The 11 are John Adams (1800), John Q. Adams (1828), Martin Van Buren (1840), Grover Cleveland (1888), Benjamin Harrison (1892), William Taft (1912), Herbert Hoover (1932), Gerald Ford (1976), Jimmy Carter (1980), George Bush (1992), and Donald Trump (2020).

Conclusion

The tariff policies were the key reasons why President William Taft failed to win the 1912 Election and why President Herbert Hoover failed to win the 1932 Election. Therefore, this paper concludes with an analysis of how the tariff policies of President William Taft and President Herbert Hoover impacted their presidential legacies.

- Tariff Act of 1909 impacted the presidential legacy of Taft because he gets credit for trying to please the factions of his party by lowering the average tariff rate from 46% to 41%, causing many of the Progressive Republicans to vote for Teddy Roosevelt, and being the 6th of 11 incumbents to try and fail to get re-elected.
- Tariff Act of 1930 impacted the presidential legacy of Hoover because he gets credit for making the Great Depression get worse by raising the average tariff rate from 40% to 59%, causing party re-alignment, and being the 7th of 11 incumbents to try and fail to win re-election.

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