Future-Focused Mathematics Teaching: Personalized Systems Versus Traditional Classrooms in Alleviating Student Anxiety

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Abstract

This study presents a comparative examination of the Personalized System of Instruction (PSI), commonly known as the Keller Plan, and the traditional teacher-centered model, with particular attention to their relevance for 9th-grade learners. The rollout of the National Education Policy (NEP) 2020 across various Indian states has initiated a significant shift in the education landscape, opening avenues for innovative teaching strategies that strengthen conceptual understanding, lower academic stress, and promote better learning outcomes. Within this context, the paper underscores the advantages of PSI—its self-paced progression, emphasis on mastery, and learner-centered orientation—over the rigid, uniform pace of conventional classrooms. By analyzing key pedagogical distinctions and their effects on students' motivation and academic performance, the paper argues that PSI offers a more effective and future-ready instructional model for secondary education.

Keywords

Personalized system of Instruction (PSI), Keller Plan, National Education Policy (NEP) 2020, Self-Paced Learning, Mastery-Based Learning, Secondary Education, Student Motivation and Performance.

Introduction

Secondary education plays a crucial role in shaping students' academic foundation, future studies, career opportunities, and overall personal growth. However, the traditional classroom model has shown limitations, particularly for students in Grade IX. At this stage, students often face heavy academic pressure, an overloaded curriculum, and limited personalized support. Since this period is considered a key foundation for higher education and professional preparation, it requires a teaching model that ensures deep conceptual understanding, flexibility in learning, and active student engagement.

To address this, Fred S. Keller, a behavioral psychologist, introduced the Personalized System of Instruction (PSI) in 1968. This learner-centered model emphasizes self-paced progress, mastery of each concept before moving ahead, and regular individualized feedback. Such features make PSI suitable for students with varied learning abilities and educational backgrounds. In contrast, the traditional teacher-centered model follows a fixed pace, lecture-driven delivery, and mainly summative assessments. This often leads to partial comprehension, student disengagement, and anxiety, especially in subjects like mathematics.

This paper focuses on the structural and philosophical contrasts between PSI and conventional teaching and argues that PSI offers a more effective framework for Grade IX classrooms to ensure meaningful learning outcomes.

Literature Review

In recent years, education has increasingly moved toward personalized and activity-based learning, aiming to make classrooms more engaging and effective. This review brings together key theories, studies, and applications related to PSI, activity-based teaching, and broader personalized learning methods.

The idea of tailoring education to each learner is not new. Bloom (1968) introduced the concept of "Learning for Mastery," proposing that all students can reach high achievement if given adequate time and personalized instruction. Keller (1968) expanded this idea through PSI (also called the Keller Plan), where students move through modular content at their own pace, take frequent short assessments, and receive immediate feedback. Studies by Kulik, Kulik, & Cohen (1979) confirmed PSI's effectiveness in improving both performance and retention. Scholars like Green (1971) and Morrison, Ross, & Kemp (2004) traced its roots to Skinner's work on operant conditioning, emphasizing reinforcement and feedback in learning.

Shifting from teacher-centered to learner-centered education was later advocated by Barr and Tagg (1995), who stressed the importance of students constructing their own knowledge. Similarly, Keefe and Jenkins (2002) argued that personalized instruction directly enhances student achievement by addressing individual differences.

Over the decades, PSI has been tested in many contexts. While Sherman (1992) praised its flexibility and learner focus, he also noted challenges like training needs and higher implementation costs. Other researchers showed PSI's adaptability: Zencius et al. (1990) used it to teach practical life skills to adults with disabilities, while Grant and Spencer (2003) found it effective in distance education. More recently, Mannion et al. (2023) confirmed PSI's value in higher education but emphasized that results depend on how faithfully it is implemented.

However, PSI is not without drawbacks. Fox (2004) and Alpert & Bitgood (1985) reported that while students liked the flexibility, some struggled with self-discipline. Similarly, Penn (1989) and Kulikowski (1973) observed resistance from students and the heavy preparation workload for instructors.

Apart from PSI, activity-based teaching has also been highlighted as an effective approach. Studies such as Noreen & Rana (2019) in elementary mathematics showed that hands-on, interactive activities improved understanding and retention. Similarly, Umugiraneza et al. (2017) observed that in South African schools, activity-based methods promoted deeper conceptual understanding, though they required strong teacher preparation. At the higher education level, Voskoglou (2019) concluded that interactive and activity-based strategies fostered critical thinking better than lectures.

Assessment plays an equally important role in personalized learning. Black & Wiliam (1998) introduced "assessment for learning," showing that frequent, formative evaluations with feedback guide student progress and motivation. This aligns with PSI's focus on continuous assessment to ensure mastery.

Technology has further strengthened personalized learning. Schmid et al. (2022) found that digital tools supported adaptive content delivery and real-time feedback. Papamitsiou & Economides (2014) discussed how learning analytics can personalize instruction, while Pane et al. (2017) provided evidence that technology-driven personalized learning particularly boosted mathematics performance.

Despite these strengths, challenges remain. Definitions of personalized learning vary widely (Bernacki et al., 2021), and its success depends on teacher training, resources, and student readiness (Hidalgo-Cabrillana & Lopez-Mayan, 2018). Spector et al. (2014) stressed that teacher preparation is crucial for effective technology integration. Earlier voices like Bigge (1982) and Gage (1984) also reminded us that teaching approaches must be aligned with learning theories to truly succeed

Comparative Analysis of PSI and Traditional Teaching Models

The Personalized System of Instruction (PSI) reshapes the classroom structure by adapting to the different learning paces and needs of students. Unlike the traditional "one-speed" approach, PSI requires learners to master each unit before moving forward. This prevents knowledge gaps, ensures stronger conceptual clarity, and builds long-term retention.

The major distinctions between the two approaches can be summarized as follows:

Aspect	Traditional Model	Personalized System of Instruction (PSI)
Pacing	Same for all students	Flexible, self-paced, tailored to individuals
Assessment	Periodic, largely summative	Ongoing, formative, and mastery-based
Teacher's Role	Knowledge provider	Facilitator, guide, and mentor
Student's Role	Passive recipient	Active, self-directed learner
Feedback	Delayed and generalized	Immediate, specific, and corrective
Motivation	Primarily external (marks, exams)	Intrinsic (mastery, progress, self-growth)
Learning Resources	Textbooks and lectures	Structured modules, interactive content, peer tutoring
Remediation	Limited and time-bound	Built-in mastery checks with opportunities for reattempts
Flexibility	Low	High

Table 2.1: Key differences between Traditional and PSI teaching methodologies

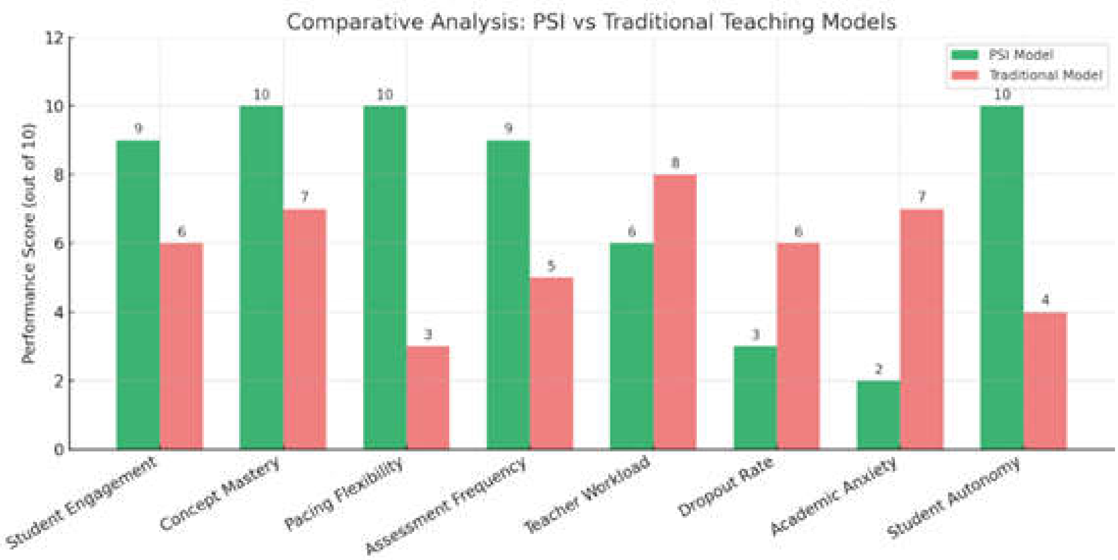
Keller (1968) first demonstrated the effectiveness of PSI while teaching introductory psychology, where students not only performed better academically but also expressed greater satisfaction with their learning experience compared to those in conventional classrooms. Later, a meta-analysis by Kulik, Kulik, and Bangert-Drowns (1990) confirmed these outcomes, highlighting consistent gains in achievement, knowledge retention, and student attitudes under PSI.

Graphical Analysis from Historical Perspective

Comparative evidence from past research demonstrates that the Personalized System of Instruction (PSI) consistently outperforms traditional teaching across major pedagogical dimensions such as student engagement, mastery of concepts, flexibility in pacing, frequency of assessments, and learner autonomy. By emphasizing self-paced learning, regular formative assessments, and mastery before progression, PSI encourages students to take ownership of their learning while lowering performance-related anxiety (Keller, 1968; Kulik, Kulik & Cohen, 1979; Sherman, 1992).

Traditional classroom methods, on the other hand, offer certain advantages for instructors, particularly in terms of reduced workload through standardized lesson delivery and fewer individualized assessments. However, they tend to rank lower when it comes to student well-being, often showing higher dropout rates and contributing to academic stress due to rigid pacing and limited personalized feedback (Taveggia, 1976).

Overall, historical data underscores PSI's strengths as a learner-centered approach, especially in subjects like mathematics, where deep conceptual understanding and step-by-step mastery are crucial (Slavin, 1990).



Relevance of PSI for Grade IX Students

Students in Grade IX face a unique set of academic and developmental challenges. This stage involves preparing for board examinations, beginning to specialize in subjects, and navigating the psychological changes of adolescence. Unfortunately, the rigidity of the conventional teaching system often amplifies these pressures, increasing the likelihood of stress, disengagement, and even dropouts.

The PSI model is particularly well-suited to this age group because of its mastery-based and self-paced design. Its benefits include:

- Boosting Confidence – Students advance only after mastering each concept, which builds assurance and a sense of achievement.

- Reducing Stress – Flexible pacing helps learners avoid the pressure of keeping up with peers, particularly in difficult topics.
- Ensuring Conceptual Clarity – By strengthening foundational understanding before moving on, PSI is especially effective in mathematics and science.
- Promoting Inclusivity – Both high achievers and slower learners benefit, as the model adapts to individual pace and ability.
- Developing Essential Skills – Independent study, goal setting, and time management naturally develop, preparing students for senior secondary studies and competitive exams.

Given these advantages, PSI can act as a transformative educational strategy in Grade IX classrooms, especially in resource-limited or high-stakes academic environments.

Since 10th grade marks a critical turning point in students' educational journeys, laying a strong foundation in Grade IX is essential. Nurturing positive learning habits and mathematical confidence at this stage not only improves academic performance but also fosters curiosity and enjoyment in learning. The PSI model can play a pivotal role in this process by making mathematics more approachable and rewarding.

Future studies should explore how PSI influences the learning habits, performance levels, and attitudes of Grade IX students toward mathematics. Such research would provide valuable insights for educators and policymakers, helping them design strategies that cultivate both academic success and a genuine passion for learning

Conclusion

The reviewed literature highlights the effectiveness of personalized and activity-based learning approaches, with the Personalized System of Instruction (PSI) standing out as a powerful model for improving student engagement and academic performance. Foundational contributions by Bloom (1968) and Keller (1968) laid the theoretical groundwork for mastery learning and self-paced progression, and subsequent empirical research has consistently validated these benefits. PSI's emphasis on individualized pacing, mastery before advancement, and active participation makes it highly relevant for today's learners.

At the same time, successful adoption of PSI is not without challenges. Key issues such as the need for adequate teacher preparation, sufficient resources, and support for student self-discipline must be addressed for long-term effectiveness. Looking ahead, research should aim to develop clearer, standardized definitions of personalized learning and investigate scalable, technology-enabled models that can make these methods more accessible across diverse educational settings.

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