

DIGITAL SHADOW EDUCATION AND THE EROSION OF ACADEMIC INTEGRITY: A POLICY ANALYSIS OF EXAMINATION MALPRACTICES IN MAHARASHTRA'S PAT FRAMEWORK

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Abstract:

The rapid digitalization of education in India has birthed a "shadow education" sector on platforms like YouTube and other social media. While providing accessible content, this sector has recently facilitated systematic academic malpractice through the leaking of state-level examination papers. This paper investigates the specific case of the Periodic Assessment Test (PAT) under the Maharashtra State Board, where question papers and answer keys for all standards were disseminated on YouTube prior to the examination dates. This analysis based on secondary data identifies specific channels responsible for amassing millions of views on leaked content, explores the policy loopholes—such as the "newspaper-style" distribution model—and illustrates how "false positive" data from compromised exams sabotages state-level pedagogical planning, explores the misalignment of these leaks with the National Education Policy (NEP) 2020, studies the international impact of the leakage, comparative global strategies for exam security, and the potential of blockchain and AI as technological remedies and importance to reclaim educational integrity. The findings suggest that without a transition to secure digital delivery and the stringent enforcement of the Public Examinations Act 2024, the integrity of foundational learning data in Maharashtra remains at critical risk which will deeply and negatively impact the state's education reform measures.

Keywords: Digital Education, Academic Integrity, Maharashtra Board, PAT, YouTube Leaks, NEP 2020, Blockchain, PARAKH.

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Introduction:

The global educational landscape is currently navigating a period of profound transformation, characterized by the rapid integration of digital platforms into formal learning environments. In the Indian context, this shift has been accelerated by national initiatives such as the National Education Policy (NEP) 2020 and the Strengthening Teaching-Learning and Results for States (STARS) project. While YouTube has democratized access to instruction, it has also facilitated a parasitic industry of "EduTubers" who exploit systemic vulnerabilities of standardized testing for digital engagement and financial gain. This research investigates the crisis of academic integrity in Maharashtra, where the Periodic Assessment Test (PAT) has been compromised by premature disclosures on social media, threatening the foundational goals of the state's educational reforms.

Statement of Problem:

The Periodic Assessment Test (PAT) in Maharashtra, a competency-based diagnostic tool funded by the World Bank under the STARS initiative, has faced a recurring crisis of confidentiality. Specifically, from the year 2023 to 2025 and again in 2026, question papers for the year 2025 and 2026 were uploaded to YouTube channels 24 to 48 hours before the scheduled examinations. These were videos for all standards for 2 to 8 and also for all subjects. These videos, often titled with provocative claims such as "This is the paper for tomorrow," include complete answer walkthroughs, garnering hundreds of thousands of views within hours. This phenomenon bypasses actual learning, encourages rote memorization of leaked keys, and generates "false positive" data that masks actual learning gaps, ultimately poisoning the state's educational planning and eroding the moral fabric of the upcoming generation.

Research Objectives:

1. To identify the loopholes in the physical distribution of PAT papers in Maharashtra.
2. To evaluate the impact of digital paper leaks on the academic integrity and diagnostic value of the Maharashtra PAT framework.
3. To analyze the misalignment between current digital malpractices and the assessment goals of NEP 2020 and PARAKH.
4. To perform a comparative analysis of international best practices in examination security (e.g., China, Singapore, UK).
5. To study this leak affair with international context.
6. To suggest comprehensive technological and policy-based remedies, including blockchain and AI-proctoring, to safeguard assessment integrity.

Literature Review:

PAT and its importance:

The Periodic Assessment Test (PAT) is a diagnostic evaluation framework implemented by Maharashtra State Council of Educational Research and Training (MSCERT) for Classes 2 to 8 in three sessions PAT 1,2,3 to measure grade-appropriate learning outcomes in Language and Mathematics. Its primary importance lies in identifying specific learning gaps early, enabling data-driven remedial teaching and ensuring standardized educational quality across all government and aided schools in the state.

Shadow Education and the Digital Shift:

"Shadow education" refers to private supplementary tutoring that mimics formal schooling. Traditionally associated with physical "cram schools," the digital age has moved this market to YouTube, where content is global and virtually unregulated.

The Backwash Effect:

In educational theory, the "backwash effect" (or washback) describes the influence of a test on classroom practice. When high-stakes or even diagnostic tests are compromised, the backwash is negative: teachers and

students abandon the syllabus to focus entirely on the leaked instrument, stunting the development of critical thinking .

Digital Ethics in Indian Education:

Despite the rapid increase in internet connectivity (reaching 63.5% in schools by 2024-25), a significant policy gap exists regarding "Digital Ethics". Research indicates that while students are aware of privacy, their understanding of intellectual property and academic integrity in digital contexts remains low.

STARS Project:

The **STARS (Strengthening Teaching-Learning and Results for States)** project is the administrative and financial backbone of the **PAT (Periodic Assessment Test)** in Maharashtra. Under this initiative, the STARS project provides the framework and funding for **SCERT Maharashtra** to design standardized assessments that track foundational literacy and numeracy. This connection enables the state to use PAT data for systemic reforms, such as targeted teacher training and evidence-based remediation, aligning with the goals of the **National Education Policy (NEP) 2020**.

Research Methodology:

This study adopts a **Policy Analysis and Case Study** methodology based on **Secondary Data Analysis**. The data sources include:

- Official notifications and guidelines from the Maharashtra SCERT and the Ministry of Education .
- Reports from the UDISE+ 2024-25 database and the STARS project appraisal documents .
- Case studies of documented paper leaks in Maharashtra (April 2025 and October 2025) as reported by major media outlets (Hindustan Times, Times of India, Indian Express)
- Comparative analysis of international exam security protocols from the UK (Ofqual), Singapore (SEAB), and China .

Findings of the Study

Logistical Vulnerabilities

The PAT involves the distribution of 3.94 crore question papers to over 1.21 crore students thrice annually . The SCERT admits that a "board exam-like" security arrangement is impossible at this scale . Papers arrive at schools in bundles like "newspaper deliveries," often days in advance, providing ample opportunity for unauthorized photography and viral dissemination.

Corruption of Diagnostic Data:

The primary goal of PAT is to inform the National Achievement Survey (NAS) . Leaks turn these assessments into "meaningless" exercises . High scores obtained through cheating mask foundational gaps in literacy and numeracy, leading to a misallocation of government resources based on flawed performance data.

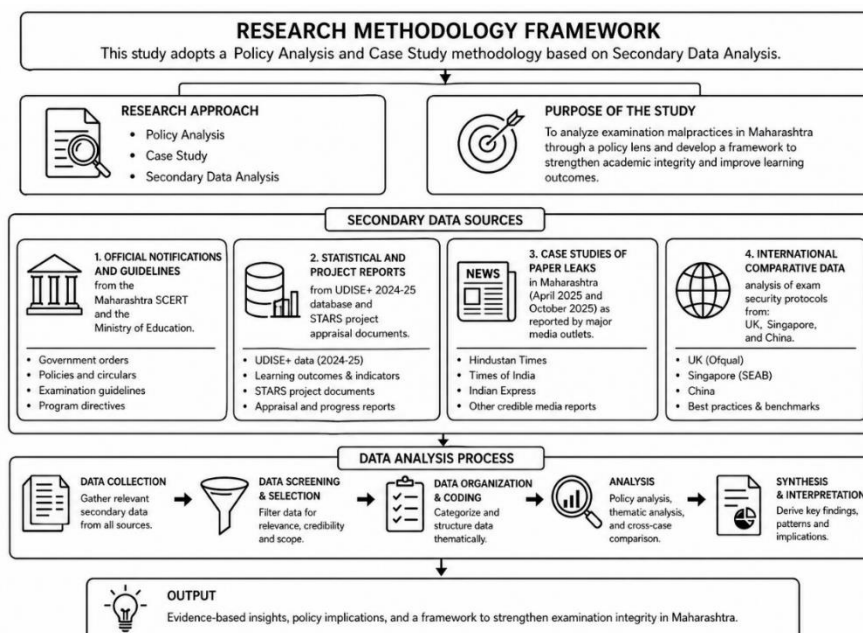


Figure 1: Steps of research

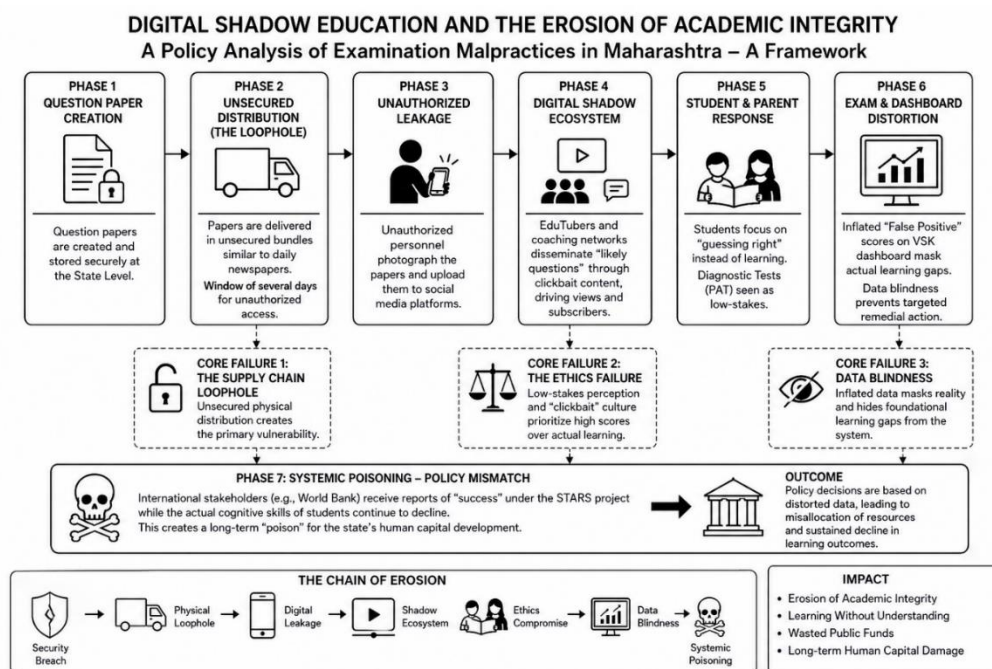


Figure 2: Phases of Malpractices and Impact

Misalignment with NEP 2020:

NEP 2020 emphasizes competency-based learning and the "light but tight" regulation of assessments through the **PARAKH** center . The "leak culture" on YouTube promotes the very rote-learning and "test-prep" mindset that NEP 2020 seeks to abolish.

International Developmental Accountability :

Periodic Assessment Test (PAT) is not merely a local school exam, but a critical audit tool for a multi-billion rupee international loan agreement. When YouTube channels leak these papers, they aren't just helping students cheat; they are technically committing **data fraud** against the Government of India and the World Bank.(See Figure 3)

Impact on students:

For **studious students**, paper leaks trigger a sense of "academic nihilism," where they feel their hard work is devalued, leading to burnout and a loss of trust in meritocracy. For **non-studious students**, leaks reinforce a "shortcut culture," promoting the dangerous belief that ethics are negotiable for success, which creates a long-term deficit in cognitive resilience and problem-solving abilities.

Severe Impact on Policy Making:

The leak of PAT papers results in "false positive" data that suggests a proficiency level far higher than actual student performance, leading policymakers to believe foundational goals are being met. Consequently, the government may prematurely withdraw remedial funding and teacher-training resources from districts that are actually struggling, effectively "blinding" the state to a brewing literacy crisis. This data corruption ultimately undermines the credibility of the STARS project, risking the loss of international development grants due to a lack of verifiable accountability.



Figure 3 : International Impact of the leak of papers

Global Comparative Analysis

Country	Security Protocol	Outcome
China	SWAT-escorted papers, GPS tracking, and drones to jam signals .	High deterrence; up to 7-year jail terms for leakers.
Singapore	Integrated Digitisation of Scripts and Electronic Marking System (OSM) .	Eliminates physical tampering; unique QR codes for tracking.
United Kingdom	Ofqual-regulated encrypted digital delivery and mandatory MFA for all accounts .	Strong defense against cyber-leaks.

Suggestions and Recommendations:

Technological Remedies:

1. **Blockchain-Based Distribution**
2. **Unique Watermarking**
3. **AI Proctoring**

These steps provide a technical roadmap for moving from physical vulnerabilities to a secure digital ecosystem.

1. Step-Wise Implementation: Blockchain-Based Distribution

Blockchain prevents "newspaper-style" delivery leaks by ensuring that no human has access to the readable content until the exact moment of the exam.

1. **Encryption and Metadata Generation:** The exam paper is first converted into an encrypted PDF using standard symmetric cryptography (like AES-128 or 256).
2. **Decentralized Storage (IPFS):** Instead of a central server, the encrypted file is uploaded to a decentralized InterPlanetary File System (IPFS), which returns a unique cryptographic hash called a Content Identifier (CID).
3. **Smart Contract Anchoring:** The CID is recorded on the blockchain (e.g., Ethereum or Hyperledger) via a smart contract. This contract defines immutable roles—who (e.g., the school principal) and when (the exact timestamp) the paper can be accessed.
4. **Programmatic Time-Locks:** A "Time-Lock" mechanism is programmed into the smart contract. It prevents any decryption key from being generated or used until a specific window, such as 30 minutes before the examination.
5. **Multi-Signature Authentication & Retrieval:** At the scheduled time, authorized personnel must authenticate themselves via biometrics or MetaMask. Only when the predefined conditions are met does the system release the decryption key to download and print the papers locally.

Estimated Cost (in Rupees):

- **Initial Development:** ₹50 lakh to ₹2 crore for a state-wide customized framework.
- **Recurring Cost:** SaaS-based models for blockchain-powered exams are currently priced at approximately ₹8,99,999 per month for large-scale implementations.

2. Step-Wise Implementation: Unique Digital Watermarking

Digital watermarking provides a forensic trail. If a paper is photographed and uploaded to YouTube, the watermark identifies the exact source of the leak.

1. **Watermark Generation:** Unique identifiers—such as the school's UDISE code, center number, or student roll number—are converted into a digital sequence or noise pattern.
2. **Domain Transformation:** The digital paper is transformed into its frequency or spatial domain using algorithms like Discrete Wavelet Transform (DWT) or Singular Value Decomposition (SVD).
3. **Embedding:** The identifier is embedded into the paper's pixels or coefficients using a secret key. This modification is statistically invisible to the naked eye but robust enough to survive low-quality mobile photography or image compression.
4. **Metadata Storage:** The link between the unique watermark and the specific recipient is stored in a secure, encrypted database or the blockchain for later verification.
5. **Forensic Extraction:** When a leaked image appears on social media, authorities use an extraction algorithm to recover the hidden identifier. This allows them to trace the origin back to the specific classroom or individual in seconds.

Estimated Cost (in Rupees):

- **Software Licensing:** Standard industrial watermarking software ranges from ₹2,000 to ₹15,000 per license.
- **State-Level Implementation:** Estimated at ₹10 lakh to ₹30 lakh annually, making it the most cost-effective forensic tool.

3. Step-Wise Implementation: AI Proctoring

For digital assessments, AI ensures that the student taking the exam is honest and that no external aids (like a second phone or person) are used.

1. **Identity Verification:** Before the exam begins, the AI uses facial recognition and biometric authentication to match the student's live image against the pre-registered state database.
2. **Continuous Behavioral Analysis:** During the exam, machine learning algorithms analyze real-time video feeds to monitor eye movements, facial expressions, and typing patterns to detect signs of academic dishonesty.
3. **Audio and Environmental Monitoring:** The AI uses the device's microphone to detect unauthorized speech or whispering and monitors the background to ensure no other people are present in the room.
4. **System and Browser Hardening:** The assessment is conducted in a "Secure Browser" environment that disables other applications, copy-paste functions, and screen-sharing, preventing students from accessing external digital resources.
5. **Real-Time Flagging & Human Oversight:** If an anomaly is detected (e.g., the student looking away from the screen for too long), the system flags the incident in real-time for an human proctor to review and determine if a violation has occurred.

Estimated Cost (in Rupees):

- **Per Student Rate:** Industry standard rates for AI proctoring range from ₹420 to ₹1,260 (\$5-\$15) per exam attempt.
- **Alternative Pricing:** Some Indian providers offer services at ₹20 to ₹100 per hour.

Policy and Legal Remedies:

1. **Enforcement of the 2024 Act:** Apply the **Public Examinations (Prevention of Unfair Means) Act, 2024** to "EduTubers." The Act mandates 3 to 10 years of imprisonment and fines up to ₹1 crore for organized malpractice.
2. **Digital Citizenship Curriculum:** Integrate "Digital Ethics" into the primary and secondary curriculum to educate parents and students on the social "poison" of cheating.

Conclusion and Inference:

The crisis of YouTube paper leaks in Maharashtra is not merely a logistical failure; it is a systemic challenge to the state's ability to provide a fair education. The "poison" identified by observers is the normalization of dishonesty and the corruption of national data. To reclaim educational integrity, Maharashtra must move beyond reactive FIRs toward a technologically fortified, ethically grounded, and digitally secure assessment framework as envisioned by NEP 2020. Failure to do so will result in a generation that values result over merit, undermining India's goal of becoming a "Vishwa Guru" in the 21st century.

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