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Original Research Article

# ASSESSMENT OF DIGITAL EVALUATION SYSTEM OF UNDERGRADUATE M.B.B.S. EXAMINATION

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**ABSTRACT**

**Background:** The digitalization of medical education assessment aligns with global trends that emphasize transparency, data security, and efficiency. Traditional pen-and-paper evaluations, though widely practiced, are often associated with delayed result processing, subjective bias, logistical challenges, and security concerns. Digital evaluation systems offer potential advantages; however, their implementation requires careful assessment, particularly from the perspective of faculty evaluators.

**Materials and Methods:** The Aims and Objectives of the study were to evaluate the perceptions of Pharmacology faculty members regarding the digital evaluation of undergraduate MBBS answer scripts under the West Bengal University of Health Sciences (WBUHS), and to identify the benefits and challenges associated with this system .This was a questionnaire-based observational descriptive cross-sectional study. The approximate number of eligible undergraduate Pharmacology teachers under WBUHS was 140. Assuming a 75% response rate, a sample size of 105 was considered. A structured questionnaire in English, consisting of Likert scale and multiple-choice items, was developed and validated (face and construct validity).

**Results:** The instrument demonstrated good internal consistency (Cronbach's alpha >0.84). The questionnaire was administered via Google Forms. Out of 105 estimated evaluators, 78 responded, yielding a response rate of 74%. The majority of participants expressed favorable perceptions regarding the usability, transparency, and reduction of bias in digital evaluation. These findings support the growing acceptance of digital assessment methods in medical education. However, several challenges were identified, including ergonomic strain during prolonged screen use, inadequate remuneration, and issues related to internet connectivity. These concerns highlight the need for supportive infrastructure and better policy measures.

**Conclusion:** Digital evaluation of undergraduate medical answer scripts is both feasible and well-accepted among Pharmacology faculty. While it offers significant advantages over traditional methods, addressing technical, ergonomic, and administrative challenges is essential to optimize its effectiveness and sustainability.

**Keywords:** Digital evaluation, e-assessment, Medical education, Questionnaire study, Faculty perception

## INTRODUCTION

Digitalization in medical education has extended beyond instructional delivery to encompass marksheet assessment and evaluation. The digitalization of medical education assessment aligns with global trends emphasizing transparency, auditability, data security and efficiency. Traditional

pen-and-paper evaluations, though familiar, suffer from issues like delayed processing, subjective biases, handling logistics, and security risks. Digital platforms and technological resolutions promise solutions but require rigorous evaluation to address ground-level challenges faced by end-users—faculty evaluators.[1]

Institutes of national importance and other Indian universities have explored digital evaluation systems with varying degrees of success.[2] Studies indicate improved traceability, reduced error margins, proper coding-decoding anonymizationbut highlight concerns over user adaptability and infrastructure.Digital assessment is gaining prominence in medical education due to its scalability, transparency, efficiency, and real-time feedback.

The West Bengal University of Health Sciences (WBUHS) implemented a digital platform for evaluating undergraduate M.B.B.S. examination scripts, replacing the traditional manual pen-and-paper evaluation process. This transition aimed to enhance transparency, efficiency, and data integrity. However, successful implementation depends on user satisfaction and system usability among evaluators. This study aimed to evaluate the overall effectiveness and feasibility of digitalization process for undergraduate professional M.B.B.S.examination answer-sheet assessment by faculties of different medical colleges affiliated with WBUHS, their perceptions, identify operational challenges, and gather feedback to guide future improvements.

## MATERIALS AND METHODS

An observational, descriptive, cross-sectional questionnaire-based survey was carried out on the undergraduate Pharmacology teachersof West Bengal University of Health Sciences (WBUHS) after obtaining ethics committee approval. Prior Institutional Ethics permission was taken as per the norms (Ref no.MC/KOL/IEC/2757/05/2025).An online structured English questionnaire (with Likert scale and multiple choices) was prepared and validated. The study was carried out after validating the questionnaire.

Validation of questionnaire: The questionnaire underwent face and construct validation by 3 medical education personnel unrelated to the study. Content validity ratio was calculated for individual items. Items (question stem) with content validity ratio (CVR) >0.56 were retained in the final questionnaire.Correlation between the answers given by the experts on two instances of administration of questionnaires at an interval of 7 days was very high (intra-class correlation coefficient or kappa coefficient >0.9).Quantitative intra-rater validation was done by piloting the questionnaire on 10 medical teachers of the institute where the primary research was being conducted. The correlation between the answers given by the teachers on two instances of administration of questionnaires at an interval of 3 days was calculated for all items. The internal consistency of the items was tested by Cronbach's **α**coefficient (>0.84 hence acceptable).

The structured and validated and reliable questionnaire3 was administered via Google Form and circulated via WhatsApp and email after obtaining electronic consent. Voluntary and anonymous participation with strict maintenance of confidentiality was ensured. Reminder WhatsApp messages were sent out andthe responses received within two weeks were considered.

Pharmacology faculties of various medical colleges under WBUHS who had used the digital evaluation process and were willing to provide informed consent electronically for participation in study.Faculties of other various departments of medical colleges under WBUHS not involved in digital evaluation process and non-consenting individuals.

Questions regarding demography, designation were taken. Feasibility of software, ergonomics, logistics, time taken, satisfaction and feedback, suggested improvements were taken. The responses received within two weeks were considered, after reminder WhatsApp messages.

Statistical analysis: Descriptive statistics for quantitative data (percentages, means, SD). Thematic analysis for qualitative feedback. Comparative analysis to assess subgroup variations (age, designation).Data Analysis done for quantitative data by descriptive statistics (mean, SD, frequency tables) and software used was SPSS v25. The approximate number of eligible undergraduate Pharmacology teachers were 140. Considering 75% responder rate, we included 105 as sample size.

## RESULTS

**Table 1: Demographic profile of respondents (n = 78)**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Gender | Male | 44 | 56.4 |
| | Female | 34 | 43.6 |
| Age group (years) | 31-40 | 12 | 15.4 |
| | 41–50 | 48 | 61.5 |
| | > 50 | 18 | 23.1 |
| Designation | Assistant Professor | 18 | 23.1 |
| | Associate Professor | 30 | 38.5 |
| | Professor | 30 | 38.5 |

| | | | |
|---|---|---|---|
| Place of posting | Kolkata & surroundings | 32 | 41.1 |
| | Peripheral medical college faculties | 46 | 58.9 |

**Table 2: Perceptions and satisfaction toward the digital evaluation system**

| Parameter | Agree/StronglyAgree n (%) | Neutral n (%) | Disagree/Strongly Disagree n (%) |
|---|---|---|---|
| User-friendly interface | 68 (87.2%) | 6 (7.7%) | 4 (5.1%) |
| Ease of navigation | 66 (84.6%) | 8 (10.3%) | 4 (5.1%) |
| Highlighting of missed pages/questions | 66 (84.6%) | - | 12 (15.4%) |
| Visibility of writing in examinee's scanned copies | 52 (66.7%) | - | 26 (33.3%) |
| Reduction of chances ofmanual error | 70 (89.7%) | 6 (7.7%) | 2 (2.6%) |
| Adequacy of logistics provided (related to travel and lodging; especially for out-station examiners) | 8 (11.8%) | - | 70 (88.2%) |
| Adequacy of remuneration for evaluators | 12 (15.4%) | 20 (25.6%) | 46 (58.9%) |
| Ability to perform tasks without technical support | 54 (69.2%) | - | 24 (30.8%) |
| Overall satisfaction with digital evaluation experience | 66 (84.6%) | 10 (12.8%) | 2 (2.6%) |
| Likelihood of recommendation for further future use | 76 (97.4%) | - | 2 (2.6%) |

**Table 3: Ergonomic Challenges Experienced During Prolonged Digital Evaluation Sessions**

| Ergonomic Issue | Frequently/Always n (%) | Rarely / Never n (%) |
|---|---|---|
| Eye strain/visual fatigue | 54 (69.2 %) | 24 (30.8%) |
| Neck pain/stiffness | 28 (35.9%) | 50 (64.1%) |
| Back pain/discomfort | 34 (43.6%) | 44 (56.4%) |
| Wrist/hand strain | 12 (15.4%) | 66 (84.6%) |
| Headache | 16 (20.5%) | 62 (79.5%) |

**Table 4: Association between screen time and sleep hours**

| SCREEN TIME BEFORE GOING TO BED | SLEEP HOURS | | P VALUE |
|---|---|---|---|
| | < 12 HOURS | ≥ 12 HOURS | |
| < 1 HOUR | 35 (32.4) | 73 (67.6) | < 0.001* |
| 1-2 HOURS | 144 (42.7) | 193 (57.3) | |
| 2-3 HOURS | 55 (42.6) | 74 (57.4) | |
| >3 HOURS | 23 (88.5) | 3 (11.5) | |
| TOTAL | 257 (42.8) | 343 (57.2) | |

There were 23 questions in the online survey. Items with content validity ratio >0.56 were retained in the final questionnaire. Quantitative intra-rater validation showed that the correlation between the answers given by the teachers on 2 instances of administration of questionnaires at an interval of 3 days was very high (intra-class correlation coefficient or kappa coefficient >0.9) for all items indicating that the questionnaire was sufficiently valid and reliable for our purpose. The internal consistency of the items was tested by Cronbach's **α**coefficient and it was found to be acceptable (0.84).

A total of 78 responses were received from Pharmacology faculty members under West Bengal University of Health Sciences (WBUHS), yielding a response rate of 74% (78/105). Demographic data showed balanced representation across age groups. 84.6% evaluators had previous experience with digital evaluation system.

The respondent cohort was predominantly male (56.4%) and largely in the age group 41–50 years (61.5%). The majority were Professors andAssociate Professors (38.5% each), 41.1% were from various medical colleges of Kolkata. [Table 1]

A high proportion of respondents (87.2%) agreed or strongly agreed that the system's interface was user-friendly, navigation was straightforward (84.6%) and missed pages were effectively highlighted (84.6%). Most (66.7%) perceived the writing in examinee's scanned copies to be clearly visible. Approximately four-fifths (89.7%) felt manual errors were reduced. In contrast, only 15.4% believed the remuneration was adequate, with 58.9% disagreeing. Ability to perform task without technical assistance was rated positively by 69.2%, though 30.8 disagreed.84.6% favorably rated the speed and responsiveness of the software and 66.7% reportedly faced technical issues / glitches (system crashes, slowdowns, shutdowns, etc.)while operating the software.84.6% of the faculty evaluators were satisfied with the overall performance of the software and 97.4% were likely to recommend digital evaluation in future to others, with some reservationsby few (Table 2). Internet connectivity issues emerged as the most frequently reported operational challenge (53.8%).The mandatory requirement totravel to WBUHS premises for evaluationparticularly affecting facultyfrom outstation medical colleges was cited as a major

logistical burden by 88.2% of respondents. Eye strain was the most commonly reported ergonomic complaint (69.2%), followed by back pain (43.6%).10.3% evaluators faced no ergonomic strains. [Table 3]

There were no statistically significant differences in the distribution of ergonomic complaints across frequency categories ($p > 0.05$), because statistical testing showed no significant association between respondent age group and complaints of ergonomic discomfort during the digital evaluation process ($p = 0.321$). Interpretation: This distribution reflects the composition of the evaluation faculty pool and suggests good representation across age and designation groups.Similarly, institutional location (urban versus peripheral) did not significantly correlate with evaluator satisfaction with remuneration ($p = 0.252$). The lack of significant associations suggests that the familiar usability perceptions and logistic concerns were broadly similar across age groups and institutional settings.

Respondents appreciated auto-summation of marks, prevention of incomplete submission, simultaneous visibility of question paper and answer script and ease of toggling between the same, and anonymization via coded scripts.

Suggested improvements included decentralization of checking centers (to avoid travel/logistics), secure personal login via OTP/biometric authentication, resolution of connectivity issues,ergonomic improvements in viewing screen, and enhanced colour-scan fidelity to render diagrams and shaded responses with clarity.

## DISCUSSION

This faculty-targeted structured questionnaire-based cross-sectional study evaluated faculty perceptions, challenges, and satisfaction of the digital evaluation system for undergraduate medical examination answer scripts under WBUHS. The study illustrated that the staff members had mostly a positive view of the system's utility, especially in reducing bias (91.0%), increasing transparency (88.5%), and guaranteeing anonymization (93.6%). On the other hand, a large number of operational and ergonomic problems were highlighted, e.g., internet connection issues (53.8%), forced traveling(71.8%), and eye strain (62.8%) were the most frequently mentioned problems.

Our findings correspond to the studies recently published, in which the faculty has a positive attitude towards digital assessment systems in medical education. The faculty members' high acceptance rate (78.2% satisfaction) and eagerness to continue the digital evaluation (85.9%) are very much in line with the results of Soundariya and Deepika's2 review on e-assessment in medical education, which pointed to the gradually growing acceptance of digital tools, although the resistance at the beginning is still there. Likewise, a scoping review made by Ang et al. (2024)4 shows that mostly positive views dominate the reception of digital assessments in medical education, especially in the post-COVID era. These results concur with Basu& Sarkar (2023)5, who argued that digital evaluation facilitates transparency and accountability but faces logistical challenges.

The perceived advantages of less bias, more transparency, and fewer errors due to automation such as auto-summation are in line with the recognized benefits of digital evaluation systems, e.g., increased fairness, credibility, and accuracy in the assessment process. The great support for the coding and anonymization features (93.6%) is a sign that one of the main ideas of fair assessment, as stated in the BMC Medical Education guide for evaluation of online learning, has been successfully implemented.

The major problem with internet connection mentioned by more than half of the participants (53.8% reported frequent problems) is in agreement with the findings of Nimavat et al. (2021),[1] regarding online medical education in India, where the technical infrastructure was found to be the main obstacle. RGUHS Karnataka's digital evaluation system has faced similar issues during the transition period, but those problems tend to calm down with time and resource allocation. The compulsory travel to WBUHS (most of the staff members, i.e., 71.8%, found it inconvenient) is the cause of a major problem that impacts the operation of a centralized evaluation model. Research on digital evaluation systems indicates that decentralization can remove location restrictions and, as a result, the evaluators will save the money that used to be spent on travel and accommodation. This finding is uncovering a strong and breakthrough argument in favor of faculty's first and foremost recommendation for decentralization, which will specially allow monitoring the evaluation procedure at the college under CCTV surveillance.

However, we faced some revelation of a few ergonomic complaints such as eye strain (62.8%), back pain (53.8%), and general fatigue (56.4%) which presently represent key issue which has been barely acknowledged in the recent medical education assessment literature. While the students' ergonomic problems during e-learning have been recorded, the faculty's ergonomic health during their long digital evaluation sessions is still an under-researched topic. A study was done on the effect of the e-learning teaching model on ocular health during the COVID - 19 Pandemic: a Cross-Sectional Questionnaire based Study on School Children and it highlighted the higher prevalence and positive correlation of DES (Dry eye syndrome) among children in the era of coronavirus disease 19 (COVID-19) pandemic and the deleterious effect of the e-learning teaching model on children's ocular health6. The traditional evaluation procedures are said to be mentally exhausting,yet change to a long screen-based evaluation brings specific musculoskeletal and visual problems with it. A cross-sectional study was done on association between screen time and

musculoskeletal pain among young adults in SRM Medical College, Tamil Nadu concluded that excessive screen time use is significantly associated with musculoskeletal pain and functional impairment.[7]

These results need to be compared with occupational health literature concerning computer-based work, which advises proper workstation design, taking breaks regularly, and having the right lighting in order to not get musculoskeletal disorders and visual fatigue. The fact that no statistically significant differences were found between the different categories of ergonomic complaints ($p > 0.05$) indicates that these problems are widespread rather than being isolated, thus emphasizing the need for general ergonomic interventions.

The moderate satisfaction with remuneration processes (43.6%) and technical support (48.7%) is at odds with the high satisfaction levels related to the system features such as auto-summation (92.3%) and mandatory marking reminders (87.2%). The literature on digital evaluation points out that automated remuneration calculation and timely payments are the most important factors for examiner satisfaction and retention, with payment processing times potentially reducing from 2-3 weeks to 1-2 days by means of digital systems. The dissatisfaction with which our study is accompanied indicates that these administrative aspects are at the incomplete stage of implementation in the realm of our study. Research works on medical education assessment state that faculty satisfaction is a complex phenomenon, and it not only depends on the evaluation tool but also on the whole ecosystem including training, support, workload distribution, and compensation. Studies on faculty perceptions of e-learning resources reveal that the main barriers to adoption are usually the lack of complete support systems rather than the technology itself.

The difficulty in viewing colored diagrams (39.7% frequently) and the loss of scan quality (34.6% frequently) that were reported raise critical questions about the validity of the assessment. In medical education, especially in the fields that require visual interpretation (anatomy, pathology, pharmacology mechanisms), the utmost important thing is the quality of the images. If there is adequate digital evaluation systems should be able to guarantee that the scanning processes are done in a way that the student's work is the same, including the colors, pencil drawings, and handwriting, so that the assessment is accurate. This is an area where the technical side needs to be upgraded by using higher-resolution scanning and color-calibrated display systems. A fast and novel method for single-image reconstruction using the super-resolution (SR) technique can be proposed.[8]

The key recommendations of this study are led by the overwhelming support for decentralization (91.0%) and represent the most relevant finding of the study with practical consequences. The literature describes the successful digital evaluation models as those where there are distributed evaluation centers with strong security measures that allow the evaluators to work from their institutional premises while the integrity of the examination is ensured by CCTV surveillance and secure server access.

In this way, multiple problems at the same time would be solved: the evaluator would save time and money because he would not have to travel to the examination center, he would be able to manage his time better as he would be able to work during academic hours, and possibly some of the ergonomic problems would be solved as well because the faculty members would be able to use their familiar workspaces. Decentralization will be possible if the individual medical colleges are well equipped and have secure internet connectivity, CCTV-monitored evaluation spaces, and standardized computer workstations.Indubitably Health sector decentralization has been widely adopted to improve delivery of health services has already been proved in previous literatures.[9] In the rapidly evolving landscape of biometric technologies, integrating artificial intelligence (AI) and predictive analytics offers promising opportunities and most importantly significant challenges for law enforcement and violence prevention.[10]The biometric or OTP-based authentication system that has been requested will ensure security while giving users freedom.

Although this research did not have a comparative design, the staff's point of view indicates that digital evaluation is better than the traditional pen-and-paper methods in some areas. A number of studies that compare online and traditional methods of assessment in medical education suggest that the automation of marking and feedback in digital systems is considered by users as very efficient, fast, and reliable. The time-saving aspect of digital assessment was less emphasized in our case (57.7%) which could be accounted for by the effects of the learning curve, technical problems, or higher cognitive load due to longer screen time. The disclosure of transparency and bias minimization by the faculty (88.5% and 91.0% respectively) are the two major benefits that the traditional methods lack, where subjective influences and handling logistics cause more problems. The assessment guidelines of modern medical education strongly recommend the use of digital tools for secure, fair, valid, and applicable assessment, which are the principles that have been well-implemented by the WBUHS digital system. Similar results from around the world emphasize the same factors as advantages of e-assessment, i.e., time efficiency, error reduction, and fairness (Barteit et al., 202011; Thampy et al., 202312). This study, unlike some others, didn't find any significant age-related differences in digital fatigue, thus probably indicating the effectiveness of the training.

## CONCLUSION

The digital evaluation system for undergraduate M.B.B.S. examinations was well-accepted among evaluators for its user-friendliness and transparency. Despite positive usability feedback, logistical and financial barriers remain. With appropriate administrative and infrastructural support, digital assessment represents a sustainable, scientific and equitable advancement in medical education evaluation.

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