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METHODOLOGY FOR DEVELOPING CLINICAL COMPETENCE OF MEDICAL STUDENTS THROUGH INTEGRATIVE TECHNOLOGIES BASED ON THE USMLE PROGRAM (BASED ON THE METHODOLOGICAL ANALYSIS OF KAPLAN, UWORLD, NBME PLATFORMS)

Suyarov Shokhrukh

Lecturer, Fergana medical institute of public health.

shokh1995@gmail.com

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Abstract. *Developing clinical competence is a cornerstone of medical education and professional readiness for medical students. This study examines the impact of the integration of USMLE-aligned methodologies (using Kaplan, UWorld, and NBME platforms) within the curriculum of Fergana Medical Institute in Uzbekistan over a three-year period (2020–2023).*

The research focuses on 10 academic groups (N=300 students) and assesses how these tools influence foundational knowledge, clinical reasoning, and exam preparedness. By adopting evidence-based educational strategies, including content review, interactive question banks, and simulated assessments, the intervention aimed to bridge gaps between traditional pedagogy and competency-based training. A longitudinal interventional design was applied, comparing pre- and post-implementation performance metrics, student feedback, and faculty observations.

Results showed notable improvements in internal exam scores (Step 1-style exams: 60% to 75%; Step 2 CK-style exams: 58% to 78%) and enhanced diagnostic reasoning skills among experimental groups compared to control groups. Qualitative feedback indicated strong student engagement, increased confidence in clinical decision-making, and faculty satisfaction with platform usability.

However, challenges such as resource accessibility and adapting methodologies to local medical contexts were identified. This study demonstrates how integrative learning technologies can modernize medical curricula and foster globally competitive physicians. The findings pave the way for scaling these methodologies across higher education institutions in Uzbekistan and inspire further regional research on clinical education reform.

Keywords: *USMLE (United States Medical Licensing Examination), Kaplan, UWorld, NBME, clinical competence, medical education reform, integrated learning technologies, Fergana Medical Institute, Uzbekistan medical education.*

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МЕТОДОЛОГИЯ РАЗВИТИЯ КЛИНИЧЕСКОЙ КОМПЕТЕНТНОСТИ СТУДЕНТОВ-МЕДИКОВ ПОСРЕДСТВОМ ИНТЕГРАТИВНЫХ ТЕХНОЛОГИЙ НА ОСНОВЕ ПРОГРАММЫ USMLE (НА ОСНОВЕ МЕТОДОЛОГИЧЕСКОГО АНАЛИЗА ПЛАТФОРМ KAPLAN, UWORLD, NBME)

Аннотация. *Развитие клинической компетентности является краеугольным камнем медицинского образования и профессиональной готовности студентов-медиков. В этом исследовании изучается влияние интеграции методологий, соответствующих USMLE (с использованием платформ Kaplan, UWorld и NBME), в учебную программу Ферганского медицинского института в Узбекистане за трехлетний период (2020–2023 гг.). Исследование сосредоточено на 10 академических группах (N=300 студентов) и оценивает, как эти инструменты влияют на фундаментальные знания, клиническое мышление и готовность к экзаменам. Принимая основанные на фактических данных образовательные стратегии, включая обзор контента, интерактивные банки вопросов и смоделированные оценки, вмешательство было направлено на преодоление разрывов между традиционной педагогикой и обучением на основе компетенций. Был применен продольный интервенционный дизайн, сравнивающий показатели эффективности до и после внедрения, обратную связь студентов и наблюдения преподавателей. Результаты показали заметное улучшение результатов внутренних экзаменов (экзамены в стиле Step 1: от 60% до 75%; экзамены в стиле Step 2 CK: от 58% до 78%) и улучшение навыков диагностического обоснования среди экспериментальных групп по сравнению с контрольными группами. Качественная обратная связь показала сильную вовлеченность студентов, возросшую уверенность в принятии клинических решений и удовлетворенность преподавателей удобством использования платформы.*

Однако были выявлены такие проблемы, как доступность ресурсов и адаптация методологий к местным медицинским контекстам. Это исследование демонстрирует, как интегративные технологии обучения могут модернизировать медицинские учебные программы и способствовать развитию конкурентоспособных на мировом уровне врачей.

Результаты прокладывают путь для масштабирования этих методологий в высших учебных заведениях Узбекистана и вдохновляют на дальнейшие региональные исследования по реформе клинического образования.

Ключевые слова: *USMLE (экзамен на получение медицинской лицензии в США), Kaplan, UWorld, NBME, клиническая компетентность, реформа медицинского*

образования, интегрированные технологии обучения, Ферганский медицинский институт, медицинское образование в Узбекистане.

Introduction

Advancements in medical education have highlighted the critical need for developing clinical competence-an essential skill that ensures physicians are equipped for effective decision-making and patient care. Competency in clinical reasoning, diagnosis, and treatment planning is especially crucial for medical students preparing for the United States Medical Licensing Examination (USMLE), a standardized testing program that evaluates readiness for practice in real-world clinical environments. However, traditional teaching methodologies often struggle to bridge the gap between theoretical knowledge and practical application, leading to growing interest in integrative learning technologies.

Innovative educational platforms such as Kaplan, UWorld, and NBME have increasingly become instrumental in this process. These platforms are designed not only to prepare students for the USMLE but also to foster higher-order thinking skills necessary for efficient clinical practice. Each tool offers unique strengths: Kaplan is well-known for its comprehensive content review, UWorld provides question-based learning with detailed rationales, and NBME excels in simulating exam conditions for self-assessment. Despite their individual advantages, little research has been conducted on how these platforms collectively contribute to the development of clinical competence among medical students.

This paper explores the methodologies used by Kaplan, UWorld, and NBME, analyzing their effectiveness in embedding foundational knowledge, developing critical reasoning skills, and ensuring examination readiness under the USMLE framework. Additionally, it examines how integrative use of these technologies can address existing gaps in clinical education and enhance student outcomes. By investigating these methodologies, this study aims to provide actionable recommendations for optimizing medical education programs and empowering students to achieve professional success in clinical settings.

Literature Review

The Role of Clinical Competence in Medical Education

Clinical competence is a foundational goal of medical education, requiring the integration of cognitive and practical skills to enable effective patient care. The progression through Miller’s Pyramid of Clinical Competenc-which begins with acquiring knowledge (knows), applying it

(knows how), demonstrating its use (shows how), and performing in clinical settings (does)-is critical for preparing future physicians (Miller, 1990). To successfully implement this progression, medical curricula increasingly depend on evidence-based teaching methodologies and assessment frameworks such as the United States Medical Licensing Examination (USMLE) (Swanson et al., 2006).

The USMLE is designed to evaluate clinical readiness across foundational sciences (Step 1), clinical knowledge (Step 2 CK), and applied patient management principles (Step 3). Clinical competence broadly reflects how students synthesize theoretical knowledge into clinical scenarios, culminating in meaningful decision-making (Kassebaum, 1996). The structure of USMLE has driven institutions globally to adopt technology-enhanced learning solutions and assessment practices, as the exam emphasizes skills aligned with Miller's model of clinical competence.

Transformative Impact of USMLE on Medical Education

The introduction of USMLE-aligned teaching tools, such as Kaplan, UWorld, and NBME, has revolutionized how medical students prepare for practice and standardized exams.

These platforms leverage integrative technologies to address gaps in traditional teaching methods. Kaplan provides structured content review focusing on high-yield topics related to foundational sciences, enhancing students' ability to grasp theoretical frameworks (O'Neill et al., 2006). UWorld adds unique value by fostering problem-solving skills through detailed questions and rationales tailored for diagnostic reasoning (Anwari et al., 2021). NBME assessments simulate real exam conditions, helping students familiarize themselves with test-taking strategies and identify weaknesses in understanding (Ramani et al., 2017).

Research shows a significant relationship between the use of integrative platforms and improved competency outcomes among students:

- According to Anwari et al. (2021), students who engaged with UWorld question banks during Step 1 preparation demonstrated better diagnostic accuracy compared to peers relying solely on textbooks, with a 23% improvement in pass rates.

- Sandhu et al. (2019) found that Kaplan's comprehensive visual aids support knowledge retention, particularly for basic sciences, while their mock tests provide substantive predictions for real exam performance.

- Ramani et al. (2017) evaluated NBME's self-assessment exams and found them predictive of Step 1 and Step 2 CK scores, making them valuable for benchmarking students' readiness for the USMLE.

These platforms not only improve performance metrics but also encourage students to cultivate robust clinical reasoning skills necessary for real-world application. The educational technologies embedded within these systems align well with Bloom's taxonomy, particularly at higher cognitive levels such as analysis, synthesis, and evaluation during clinical decision-making processes.

Challenges in Adopting USMLE Practices in Global Contexts

Despite the documented benefits of USMLE-aligned platforms, challenges arise when introducing U.S.-based exam preparation methodologies into the context of developing countries. Cultural differences in teaching styles, accessibility issues, and resource constraints often hinder the adoption of these tools. For example, a study by Palafox et al. (2015) highlighted challenges faced by South American medical institutions in funding and training faculty to use preparatory platforms such as Kaplan and UWorld.

In Central Asia, countries like Uzbekistan have historically relied on traditional didactic teaching models and face systemic barriers that complicate the widespread adoption of technology-driven learning. According to Ismailov et al. (2020), incorporating international benchmarking systems such as USMLE into medical curricula poses logistical and ideological challenges, yet offers promising avenues for modernization. The study emphasizes that aligning Central Asian medical training practices with flexible integrative technologies can assist in bridging gaps between theoretical knowledge and clinical application. This aligns with ongoing efforts at Fergana Medical Institute, which recently introduced USMLE-based methodologies in selected academic groups.

The Case for Integration at Fergana Medical Institute

Fergana Medical Institute provides a unique case study in the application of USMLE-aligned tools like Kaplan, UWorld, and NBME within a non-U.S. institutional framework.

From 2020 to 2023, the implementation of USMLE preparation strategies was tested with 10 academic groups as part of a structured intervention program. Initial findings reflect positive feedback from faculty and students regarding the curricular changes, although challenges such as platform costs and training lag persisted. The longitudinal implementation aligns with studies such as Huda and Yousuf (2016), which documented how early adoption of technology-enhanced

learning platforms improved performance metrics and competency measures among medical students. As noted by Swanson et al. (2006), fostering active engagement and self-assessment practices is particularly effective in transitioning students from knowledge acquisition to practical skill application, providing insights that Fergana Medical Institute can leverage as its program continues to evolve.

Methodology

This study employed a longitudinal, interventional design to analyze the impact of USMLE-aligned educational strategies on clinical competence development and examination performance at Fergana Medical Institute. The focus was on the phased implementation of USMLE-based methodologies in 10 academic groups over three years (from 2020 to 2023).

The population consisted of Year 3 to Year 6 medical students enrolled in Fergana Medical Institute. A total of 10 academic groups (N=300 students) participated in the study, with groups being selected based on their willingness to participate and their alignment with course modules compatible with USMLE preparation. Students were divided into experimental (USMLE-based methodology) and control (traditional methodology) groups for comparative analysis.

The intervention involved incorporating USMLE-aligned tools and methodologies into the curriculum:

- Kaplan resources were used for content delivery on core medical sciences during lecture and seminar sessions.

- UWorld question banks were introduced during classroom discussions to encourage active learning and problem-solving skills.

- NBME simulated exams were held to evaluate students' preparedness periodically and provide feedback for performance improvement.

- To aid the transition, faculty attended workshops on integrating these tools into their teaching strategies.

The intervention was designed to supplement (rather than replace) the existing curriculum, ensuring compatibility with local teaching requirements.

Data were collected using the following tools:

Pre- and Post-Intervention Surveys:

- Students were surveyed regarding their perceived knowledge, clinical reasoning, and confidence levels before and after the intervention.

Exam Performance Metrics:

- Performance on internal exams (aligned with USMLE-style questions) was tracked before and after implementing the program.

- Specific data points included pass rates, average scores, and stepwise competency improvements.

Focus Group Discussions:

- Faculty and students participated in focus groups to provide qualitative insights into the practicality and challenges of using Kaplan, UWorld, and NBME in the local context.

NBME Self-Assessments:

- Periodic NBME self-assessment exams measured real-time progress.

Data Analysis

Quantitative and qualitative methodologies were applied:

- Descriptive Statistics: (e.g., averages, percentages) for assessing score improvements and feedback ratings.

- Comparative Analysis: Exam performance and survey results were compared between experimental and control groups using t-tests.

- Thematic Analysis: Qualitative feedback from focus groups was coded to identify emerging themes regarding usability, challenges, and benefits of the intervention.

Ethical Considerations

- All participants provided informed consent, and institutional ethical approval was obtained.

- Anonymity and confidentiality were maintained during data collection and analysis.

Limitations

- Resource constraints limited the number of student groups that could access Kaplan and UWorld.

-Outcomes are specific to Fergana Medical Institute and may not be broadly generalizable to other medical institutions in Uzbekistan.

Results

Academic Performance Outcomes

Implementing USMLE-aligned methodologies in 10 academic groups at Fergana Medical Institute led to notable improvements in students' knowledge retention and exam performance.

Key outcomes are summarized below:

Internal Exam Results

- Pre-intervention vs. Post-intervention comparison:

- Step 1-style exams (Focused on foundational sciences):

- Average scores increased from 60% pre-intervention to 75% post-intervention.

- Pass rates rose from 65% to 85% across the experimental groups

- Step 2 CK-style exams (Focused on clinical knowledge):

- Average scores saw an improvement from 58% pre-intervention to 78% post-intervention.

- Pass rates rose from 60% to 83%.

- Control groups showed no significant improvement, with average scores remaining around 62-65% during the same timeframe.

NBME Self-Assessment Results

- Students utilized NBME self-assessment exams periodically during the intervention.

- Results indicated an average predictive accuracy of 85% for Step 1 preparation.

- Predicted Step 1 performance correlated strongly with actual internal exam results (Pearson correlation coefficient = 0.78).

Survey Feedback

2.1 Student Surveys

A survey conducted at the end of the intervention period captured insights on students' perceptions of the USMLE-aligned methodologies, particularly their effectiveness in improving learning outcomes:

- Confidence Levels:

- 87% of students reported increased confidence in tackling clinical decision-making scenarios.

- Engagement:

- 82% of students found UWorld question banks "extremely helpful for practical learning" compared to traditional lecture formats.

- Kaplan's systematic content review was rated 4.5/5 for its comprehensiveness.

- Simulation Experience:

-91% of students valued NBME's simulated exams, citing the "realistic exam conditions" and "effective feedback on weaknesses."

Faculty Feedback

Faculty feedback from focus group discussions revealed insights regarding the integration of USMLE-focused platforms:

- Ease of Teaching:

- 75% of faculty indicated that Kaplan materials helped improve the clarity of their teaching sessions.

- Platform Challenges:

- Faculty noted challenges in transitioning to technology-driven methods. While basic USMLE concepts translated well, applying the platforms in a non-U.S. regulatory context required extra training.

3. Group Comparisons

3.1 Experimental vs. Control Group

The experimental groups (USMLE-based methodology) significantly outperformed their control group peers in simulated exams and clinical skill assessments:

- Simulated Exam Scores:

- Experimental groups averaged 80% in foundational sciences (Step 1-style exams), compared to 65% in the control group.

- Clinical Scenarios:

- Experimental groups scored 85% accuracy on diagnostic reasoning tasks, while control groups averaged 70%.

3.2 Long-term Retention

- Preliminary analyses indicate that students in experimental groups demonstrated better long-term knowledge retention, as evidenced by consistent improvement in their Year 5 assessments.

4. Qualitative Analysis

4.1 Thematic Findings

Qualitative feedback from student and faculty focus group discussions revealed several recurring themes:

- Positives:

- Students praised the interactive question-based learning offered by UWorld, which improved their problem-solving skills.

- Faculty appreciated the structured content in Kaplan resources, which facilitated curriculum alignment.

- Areas for Improvement:

- Difficulty accessing and affording premium resources in Uzbekistan.

- The need for further localization of teaching methodologies to match the clinical realities of Central Asia.

5. Limitations Highlighted by Results

- Access challenges: Implementation of USMLE-aligned platforms was limited by resource constraints, which restricted universal access across all academic groups.

- Variation in student engagement: While experimental groups actively engaged with NBME simulation exams and UWorld question banks, some students struggled with adopting technology-focused methodologies due to lack of familiarity.

Group	Pre-intervention Avg Score (%)	Post-intervention Avg Score (%)
Experimental (Step 1-style)	60%	75%
Control (Step 1-style)	62%	65%
Experimental (Step 2-style)	58%	78%
Control (Step 2-style)	60%	63%

Table 1: Pre- and Post-Intervention Average Scores for Experimental and Control Groups

Discussion

Interpretation of Results

The implementation of USMLE-based tools and methodologies at Fergana Medical Institute demonstrated significant improvements in both academic performance and clinical competence among medical students in experimental groups. Results highlighted that students exposed to Kaplan's comprehensive content review, UWorld's question-based learning, and NBME's simulation exams achieved higher scores in foundational science and clinical knowledge assessments compared to their peers using traditional methodologies. This aligns with similar findings in previous studies by Anwari et al. (2021) and Ramani et al. (2017), which demonstrated that integrative learning technologies enhance problem-solving skills and exam readiness.

The increase in average exam scores (from 60% to 75% in Step 1-style tests and from 58% to 78% in Step 2-style assessments) indicates that the platform-based intervention successfully bridged the gap between theoretical knowledge and diagnostic reasoning.

Qualitative feedback from students further reinforces this, as 87% of participants reported greater confidence in clinical decision-making scenarios, a key attribute of clinical competence.

Why Did Experimental Groups Perform Better?

Several factors may explain the superior performance of experimental groups:

1. Active Learning Strategies: UWorld's interactive question banks encouraged critical thinking and applied learning, which likely contributed to better diagnostic accuracy.

2. Structured Review Materials: Kaplan's content review and visual aids provided students with a clear understanding of high-yield topics for foundational sciences.

3. Simulated Practice: NBME's self-assessment exams offered students the opportunity to familiarize themselves with real exam conditions, boosting their preparedness and confidence.

These findings suggest that integrating USMLE-based platforms provides a multidimensional approach to medical education, benefiting students by combining foundational knowledge delivery with critical thinking exercises and performance benchmarking.

Alignment with Existing Literature

The results align with existing research on the transformative impact of USMLE methodologies:

- Improved Knowledge Retention: Similar to findings by Sandhu et al. (2019), students in the experimental groups at Fergana Medical Institute reported enhanced understanding of foundational concepts.

- Diagnostic Reasoning: As described by Anwari et al. (2021), UWorld's rationales for clinical scenarios were lauded for their effectiveness in developing applied reasoning skills among students preparing for Step 2 CK.

- Simulation Benefits: Ramani et al. (2017) emphasized the importance of NBME predictive assessments in preparing students for standardized exams, which echoes findings at Fergana where self-assessments directly correlated with improved internal exam scores.

While challenges related to resource constraints and accessibility were noted in Ismailov et al. (2020), the successful implementation at Fergana showcases how pilot interventions can gradually be scaled despite systemic limitations.

Implications for Medical Education in Uzbekistan

The results of this study highlight the broader value of integrating USMLE-aligned tools into medical curricula in Uzbekistan.

Traditional teaching methodologies, which prioritize lectures and rote memorization, are often insufficient for addressing real-world clinical challenges. By transitioning to platform-based learning, Fergana Medical Institute demonstrates a viable model for modernizing medical education in Central Asia.

-Enhanced Student Outcomes: Improved exam scores and confidence levels among students suggest that incorporating active learning strategies into the curriculum can better prepare medical trainees for both local and international medical practices.

-Faculty Development: Equipping faculty with training on integrative technologies (as noted in focus group discussions) is crucial for successful implementation. Faculty members noted that Kaplan materials simplified content delivery while NBME assessments provided valuable student insights.

-Scalability: While this study focused on 10 academic groups, the positive outcomes indicate potential scalability to other medical institutions in Uzbekistan.

Limitations

Despite these promising results, several limitations were observed:

-Resource Constraints: The availability and affordability of USMLE-based platforms posed significant challenges. Many students and faculty struggled to access premium features, limiting the scope of the intervention.

-Cultural Adaptation: While USMLE-aligned methodologies proved effective, their alignment with local clinical realities could be further optimized to match healthcare systems in Uzbekistan.

-Sample Size: The study was limited to 300 students in 10 academic groups, which may restrict the generalizability of findings across the entire student population at Fergana or other institutions.

Addressing these limitations requires a focus on easing resource accessibility, fostering greater collaboration between USMLE tool providers and local institutions, and adapting curricula to reflect regional healthcare priorities.

Recommendations for Future Research

This study opens pathways for further exploration:

-Broader Implementation: Future research should focus on scaling USMLE methodologies across multiple medical institutions in Uzbekistan and assessing their long-term effects on clinical competence development.

- Longitudinal Studies: A follow-up study investigating the Step 2 and Step 3 outcomes among experimental groups as they approach clinical practice would provide deeper insights into career-readiness.

- Regional Adaptation of Platforms: Collaborations with Kaplan, UWorld, and NBME to localize content and scenarios could make their platforms more relevant and accessible for Central Asian medical students.

- Faculty Training Programs: Continued professional development workshops for faculty would enhance their ability to implement integrative teaching strategies effectively.

Conclusion

The integration of USMLE-aligned tools and methodologies at Fergana Medical Institute has yielded valuable lessons in the modernization of medical education within Uzbekistan. By implementing Kaplan's structured content review, UWorld's interactive question banks, and NBME's self-assessment exams, the intervention successfully improved students' foundational knowledge, clinical reasoning, and exam preparedness. Compared to traditional teaching methods, students in the experimental groups demonstrated significant gains in their academic performance, diagnostic accuracy, and confidence levels, as reflected in pre- and post-intervention assessments.

This study highlights the transformative potential of USMLE-based educational frameworks in bridging the gap between theoretical understanding and clinical competence. Students benefited from active learning strategies, performance tracking, and simulated assessments, enabling them to align their preparation with global standards of medical education.

Faculty members also noted improvements in curriculum delivery, further underscoring the utility of integrative learning platforms in creating a structured pathway to clinical readiness.

Despite these promising results, the study also identified key challenges, including resource constraints, limited institutional accessibility to premium platform features, and the need for adaptation to local medical education norms. Addressing these barriers will require strategic investments in faculty training, resource allocation, and collaboration with platform providers to customize content for regional healthcare settings.

The findings of this study hold profound implications for medical education reform in Uzbekistan and beyond. As the global demand for competency-focused physicians continues to rise, adopting integrative, technology-driven methodologies will be pivotal in preparing medical students to meet the challenges of modern clinical practice.

Expanding the scale of USMLE-aligned methodologies in medical institutions across Central Asia could serve as a game-changing strategy for transforming healthcare education.

Future research should focus on further refining these interventions, assessing their long-term impacts on clinical skill development, and exploring their scalability in diverse educational contexts. In conclusion, the three-year pilot implementation at Fergana Medical Institute has demonstrated that modernizing medical education through USMLE-aligned platforms not only enhances student outcomes but also sets a precedent for elevating the standards of medical training in Uzbekistan. This initiative exemplifies how global best practices can be tailored to align with regional educational goals, creating future physicians who are clinically competent, globally competitive, and locally relevant.

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