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Brief Report

Let's "PREPARE": A Foundational Module to Guide Undergraduate Medical Students toward Their Future Practice of Entrustable Professional Activities

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Abstract

Background: Entrustable professional activities (EPAs) are core clinical tasks that medical graduates must perform independently to demonstrate competency. Introducing EPA-based training in the early years of medical education provides a solid foundation for workplace-based assessment (WBA), and emphasizes essential skills such as history taking, clinical reasoning, and decision making.

Objectives: This study aimed to evaluate the "PREPARE" (PRomote Entrustable Professional Activities via Responsible Engagement) module, which was designed to integrate EPAs early in medical training using a self-directed learning approach.

Methods: The module was validated by experts for face and content validity using the Item Content Validity Index (I-CVI) and Scale Content Validity Index for Universal Agreement (S-CVI/UA). Reliability was assessed using the Intraclass Correlation Coefficient (ICC). Following validation, the module was piloted among first-to-final-year medical students. Knowledge improvement was assessed using pretest and posttest, and the scores were analyzed for their statistical significance.

Results: The results showed adequate face and content validity (I-CVI, 0.992; S-CVI/UA, 0.96) and excellent reliability (ICC, 0.998). During the pilot testing phase, students demonstrated significant knowledge improvement, with posttest scores averaging 85% compared to pretest scores of 25% ($p < 0.0001$). Participants reported increased confidence and readiness to perform EPAs, highlighting the role of the module in fostering clinical preparedness.

Conclusion: "PREPARE" module introduces EPA-based training in the early stages of undergraduate medical education. With evidence of validity and reliability, and observed improvements in student knowledge and self-reported confidence, this module contributes to building clinical readiness. It offers a structured framework for developing core professional activities and supports students in preparing for future clinical responsibilities within the existing educational context.

Keywords: Entrustable Professional Activities; Medical Education; Clinical Competence; Undergraduate Medical Training; Workplace-Based Assessment; Self-Directed Learning

Background

Entrustable Professional Activities (EPAs) are a core set of tasks or responsibilities that medical graduates are entrusted to perform without supervision once they have attained a reliable level of mastery in the related competencies (1). These EPAs are independently executable and measurable in terms of process and outcome, and hence serve as reliable workplace-based assessments (WBA) to evaluate the essential skills of a medical practitioner (2). The American Association of Medical Colleges (AAMC) has drafted a set of 13 core EPAs for professionals entering medical residency. These skills, ranging from history taking to decision-making, offer a holistic evaluation modality (3). However, many may perceive EPAs to be at a higher level on the educational pyramid. Although entrustment of these tasks usually occurs at a higher or qualified level

in the medical profession, preparation begins much earlier.

The concept of the EPA is introduced only at a later stage, and learners are expected to have mastered the relevant skills. As EPAs are WBA requiring the interaction and execution of clinical tasks on real patients under no supervision, practice or training is generally not performed at the undergraduate level (4). Even during clerkships and internships, students are under supervision for clinical duties performed directly on patients. Supervision is an integral part of the internship/clerkship experience, ensuring that interns are guided, supported, and evaluated as they apply their medical knowledge and skills in clinical settings (5). Supervision levels may vary depending on the task, intern's competence, and specific clinical environment; however, supervisors are always present to ensure patient safety and promote professional development.

Some studies on the EPA have focused on its development and implementation in postgraduate training programs, such as for psychiatry residents in China and family medicine trainees in South Africa. These studies emphasize the need to create specialty-specific modular EPA frameworks to address advanced clinical competencies (6, 7). The Chinese study used the Delphi method to establish 17 EPAs tailored to standardize psychiatric training (6), whereas the South African study developed 19 EPAs through national collaboration, addressing challenges such as limited resources and heavy clinical workload (7). However, incorporation of the foundations of the EPAs at the undergraduate level remains underexplored, with limited studies focusing on early integration to bring in awareness and prepare the undergraduate students for clinical practice.

Medical education, at its best, should inform and transform the way students learn. EPAs are essential units of practice, and perfection occurs through repeated exposure. In light of this, it is essential to incorporate the foundations of the EPA, beginning with undergraduate medical education to guide learners on the path to practice. Taking this a step further, “PREPARE” (PRomote Entrustable Professional Activities via Responsible Engagement), a foundational module on EPAs, was developed, validated, and pilot tested among first to third professional part 2 (final professional year) medical students.

Objectives

This study aimed to evaluate the "PREPARE" (PRomote Entrustable Professional Activities via Responsible Engagement) module, which was designed to integrate EPAs early in medical training using a self-directed learning approach.

Methods

Development of the Module: The "PREPARE" module was developed to align with key learning objectives that prepare students for clinical practice through EPAs [8]. This module educates students about the role of EPAs in bridging the gap between medical schools and internships by enhancing practical skills and clinical readiness. Core EPAs were introduced, along with detailed guidance on integrating them into learning experiences. The module includes hands-on practice, assessments via direct observation, simulations and multisource feedback mechanisms. Strategies to address common challenges, such as time management and performance under pressure, were embedded to encourage self-assessment and proactive learning. The conceptual framework for the development of this module is shown in Figure 1.

Validation of the Module: Validation was conducted through an 18-item online questionnaire using a four-point Likert scale ranging from 0–3 (3-To great extent, 2-To moderate extent, 1-To some extent, and 0-To no extent). The questionnaire assessed the clarity, coherence, and content. A panel of 10 medical education experts was invited via email to participate, with a follow-up reminder sent after 1 week. Experts were selected through purposive sampling based on their qualifications, institutional roles, prior experience in curriculum development, competency-based medical education (CBME), and workplace-based assessments. All panelists had a minimum of 5 years of academic experience in undergraduate or postgraduate medical education and held advanced degrees (MD or equivalent), with several having additional credentials such as MMedEd, MHPE, or PhD in health education. Each had demonstrable engagement in the development or implementation of EPAs, either through CBME initiatives, national medical curriculum reforms, scholarly engagement, or EPA-aligned assessment courses. SurveyMonkey was used as the data collection platform. The validity of the module was assessed using Face Validity, Item Content Validity Index (I-CVI), and Scale Content Validity Index for Universal Agreement (S-CVI/UA). Reliability was measured using the Intraclass Correlation Coefficient (ICC). Face validity was included to ensure that the module was appropriate and relevant. As the goal was to introduce EPAs at an earlier stage than usual, expert

impressions of the content clarity and alignment were essential.

The I-CVI was used to further assess how well each item reflected the intended learning objectives. This measure is helpful when working with smaller expert panels, as it quantifies the proportion of agreement on the relevance of each individual item. To understand how well the module worked as a whole, the S-CVI/UA was applied, offering a more stringent examination of the overall consistency across items. For reliability, the ICC was selected because it reflects the degree of agreement among multiple raters, especially when they scored responses on a Likert scale, to ensure that different experts interpreted and rated the items consistently.

Pilot Testing of the Module: The module was piloted with first-to-final-year medical students (24 from each year) who were selected through random sampling. This number was selected based on methodological recommendations for pilot studies, which suggest that a minimum of 20–30 participants is sufficient to evaluate the feasibility, clarity of procedures, and preliminary effects of an educational intervention. A pretest with 30 multiple-choice questions was conducted to assess the participants' baseline knowledge of EPA principles, benefits, and applications. Following module implementation, pedagogy included self-directed learning activities. A posttest was conducted to evaluate knowledge improvement. Additionally, students completed a 9-item online questionnaire on a 10-point rating scale to evaluate the effectiveness of the module in achieving its educational objectives.

Data Variables: The variables used in this study were classified based on their functions during the evaluation. The primary outcome variables included the pretest and posttest scores, both treated as continuous variables, representing students' knowledge levels before and after engaging with the "PREPARE" module. Additionally, the students' perceived effectiveness of the module, measured using a 9-item questionnaire on a 10-point rating scale, was treated as a continuous variable to assess learner satisfaction and perceived educational value.

The exposure variable was participation in the module, which was a categorical variable with two levels: before (pretest phase) and after the module implementation (posttest phase). This structure enables the assessment of changes in knowledge and perceptions associated with the module.

Statistical Analysis: The pretest and posttest scores were analyzed using paired t-tests to determine the significance of knowledge improvement. Descriptive statistics, including means and standard deviations, were used to summarize student ratings of the module. The validation scores were analyzed using the I-CVI, S-CVI/UA, and ICC. Cronbach's alpha was calculated to assess the internal consistency and reliability of the questionnaire, yielding a value of 0.88, indicating adequate reliability. Statistical significance was set at $p < 0.05$. Stata BE/18.5 was used for the statistical analysis.

Results

Validation Results: The validation of the "PREPARE" module demonstrated strong agreement among experts regarding its clarity, coherence, and content. The module achieved a perfect Face Validity score of 1.00, indicating unanimous agreement that its content was appropriate, relevant, and reflective of its intended objectives. An I-CVI score of 0.992 reflected a high level of consensus among experts regarding the relevance and clarity of the individual items within the module. Additionally, the S-CVI/UA was 0.96, confirming that nearly all items met the criteria for inclusion and coherence within the module (Table 1). The reliability analysis further validated the module, with an ICC of 0.998, underscoring its consistency across expert evaluations. Collectively, these results affirm the validity and reliability of this module as an educational tool for preparing students for EPAs.

Pilot Testing Results: Pilot testing of the module with first-to-final-year medical students (24 from each year) revealed a significant improvement in their knowledge and understanding of EPAs. The pretest results showed an average score of 25%, with most students indicating limited awareness of the principles, benefits, and applications of EPA. After the module implementation, the posttest scores averaged 85%, demonstrating a substantial and statistically significant improvement ($p < 0.0001$) (Table 2).

Students provided highly positive evaluations of the module through a 9-item online questionnaire on a 10-point rating scale. They highlighted the relevance, clarity, and impact of the module on preparedness for clinical responsibility (Figure 2). Many participants reported increased confidence in applying EPAs and acknowledged the role of the module in bridging the gap between theoretical learning and practical application.

Mean indicates the average score, SD denotes standard deviation, pretest refers to the assessment conducted before the intervention, posttest refers to the assessment conducted after the intervention, mean (%)

represents the mean score expressed as a percentage of the maximum possible score, mean difference denotes the difference between posttest and pretest mean scores, and p-value indicates the level of statistical significance obtained using a paired t-test.

Table 1. Module validation results

Item Description	No. of Experts Selecting "3" (To great extent)	No. of Experts Selecting "2" (To moderate extent)	No. of Experts Selecting "1" (To some extent)	No. of Experts Selecting "0" (No extent)	I-CVI
Clarity of learning objectives	9	1	0	0	1.00
Relevance to EPA competencies	10	0	0	0	1.00
Logical flow of content	8	1	1	0	0.90
Depth and adequacy of content	10	0	0	0	1.00
Coherence between sections	9	0	1	0	0.90
Appropriateness of visuals and media	8	2	0	0	1.00
Alignment with learning outcomes	10	0	0	0	1.00
Clarity of language used	10	0	0	0	1.00
Effectiveness of interactive elements	9	1	0	0	1.00
Appropriateness of assessment methods	10	0	0	0	1.00
Ease of navigation	8	1	1	0	0.90
Support for self-directed learning	10	0	0	0	1.00
Relevance of real-life examples	10	0	0	0	1.00
Integration of reflective components	9	0	1	0	0.90
Practical applicability to clinical settings	10	0	0	0	1.00
Overall coherence of the module	10	0	0	0	1.00
Ease of understanding instructions	9	1	0	0	1.00
Suitability for medical students	10	0	0	0	1.00
S-CVI/UA (Universal Agreement)					0.96
Mean I-CVI (Average across all items)					0.992

S-CVI/UA: Scale-level Content Validity Index / Universal Agreement; Mean I-CVI: Mean Item-level Content Validity Index

Table 2. Pretest and Posttest Score Comparison of Medical Students

Academic Year	Pretest Mean (out of 30)	Pretest SD	Pretest Mean (%)	Posttest Mean (out of 30)	Posttest SD	Posttest Mean (%)	Mean Difference	p-value (paired t-test)
First Year	6.6	2.25	22	25.2	2.04	84	18.6	< 0.0001
Second Year	7.2	2.46	24	25.5	2.13	85	18.3	< 0.0001
Third Year	7.8	2.70	26	25.8	2.22	86	18.0	< 0.0001
Final Year	8.4	2.61	28	26.1	2.10	87	17.7	< 0.0001

SD: Standard deviation

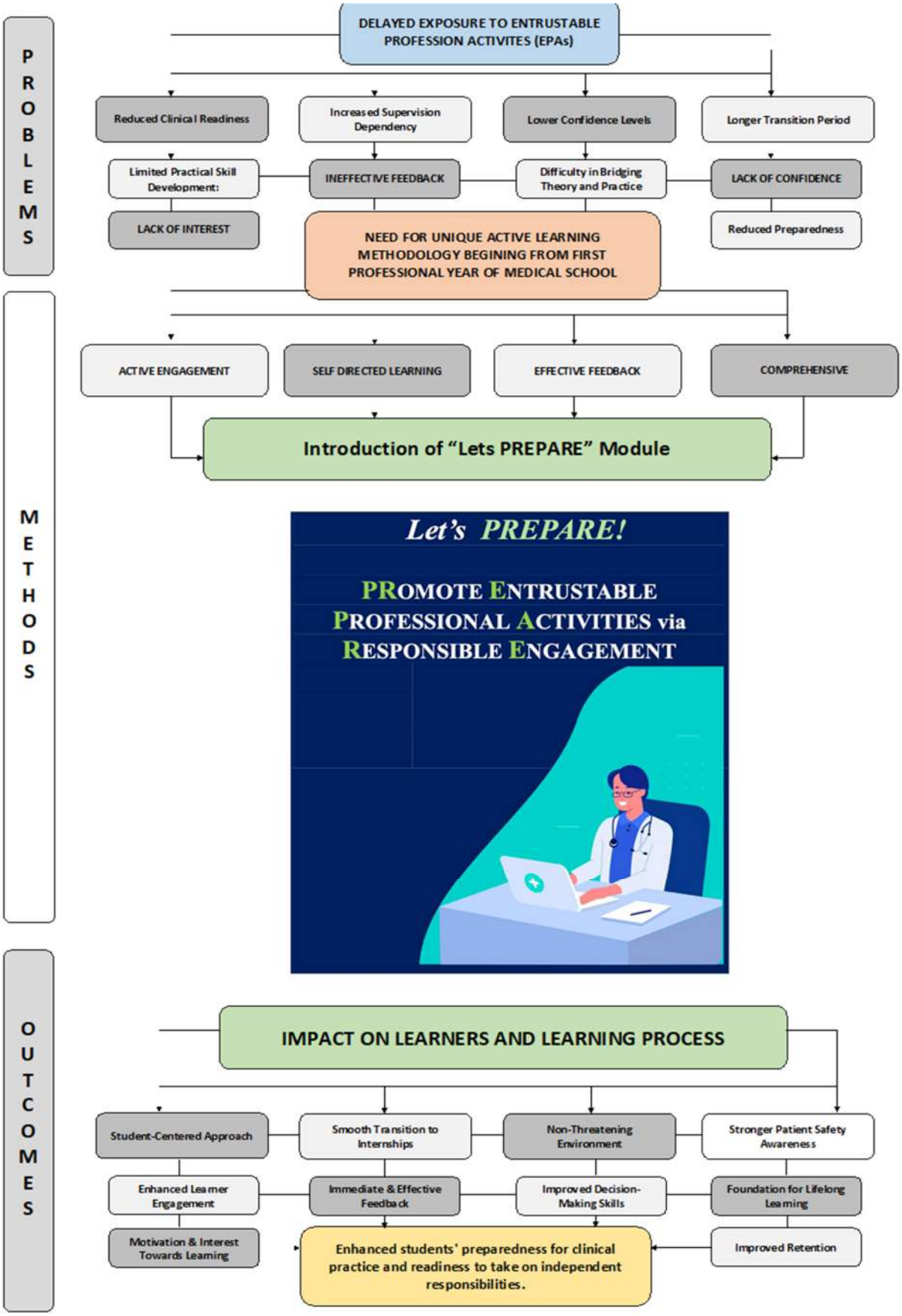

Figure 1. Conceptual framework

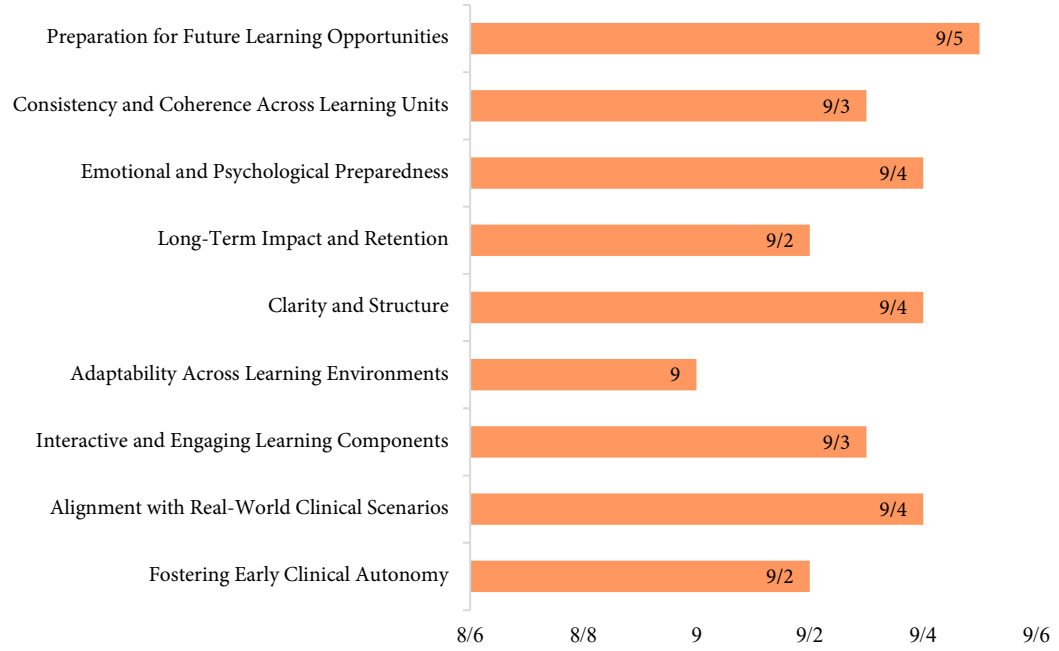

Figure 2. Evaluation of "PREPARE" (PRomote Entrustable Professional Activities via Responsible Engagement) Module on EPA

Discussion

The findings of this study underscore the effectiveness of integrating the EPA into undergraduate medical education. Unlike traditional models, in which EPAs are introduced at a later stage, this module offers a structured, self-directed learning approach starting from the first year of medical training. This aligns with the growing emphasis on early clinical exposure and progressive autonomy in medical education. Previous studies have highlighted the benefits of EPAs in fostering clinical competence. However, most implementations have focused on graduate students (9, 10). In contrast, the results of this study demonstrated significant knowledge gains among undergraduate students, with posttest scores showing an average improvement of 25–85%. These findings align with those of studies advocating scaffolded learning approaches to bridge the gap between medical schools and internship readiness.

However, these results contrast with earlier reports that documented limited success in implementing EPAs at the undergraduate level, often citing barriers such as lack of clinical autonomy, insufficient patient interaction, and unclear assessment frameworks (11, 12). A key methodological difference that may explain this contrast is the use of a focused, standalone module rather than embedding EPA training within broader curricular reforms. This allowed for targeted instruction without overhauling existing structures, making it easier for students to understand the core EPA principles.

Additionally, the design minimizes dependence on real-time clinical exposure to gain knowledge of the EPA, which is often cited as a limiting factor in undergraduate settings.

Contextual factors may have contributed to the positive outcomes observed. This study was conducted in an institution where CBME reforms were newly introduced, and students may have been receptive to structured, competency-oriented interventions. Faculty familiarity with newer assessment methods and institutional emphasis on early clinical readiness may have created a supportive environment for module implementation. These conditions differ from those in earlier studies conducted in regions or institutions where either EPA integration was attempted without sufficient faculty preparation or where logistical challenges limited hands-on exposure (13).

To implement these lessons in EPAs in medical schools, it is essential to create modules that integrate emotional readiness and real-world applications from the beginning of medical education. EPAs should be introduced early, using structured, scaffolded approaches that progressively build student autonomy. In physiology education, EPAs can be used to understand physiological processes in clinical contexts, such as linking cardiovascular physiology to patient

assessment skills. Incorporating interactive, case-based learning will help students practice EPAs in a simulated, yet realistic environment, thereby enhancing the practical application of theoretical knowledge. Adapting these modules across various learning environments ensures broader accessibility and effectiveness for diverse student groups.

In the future, it is important to expand the implementation of the module across larger and more diverse student groups to validate its effectiveness on a broader scale. Continuous assessment and refinement guided by student feedback and expert input are essential for developing a comprehensive approach to EPA training that better aligns with the evolving needs of medical students and the clinical demands they will face.

Conclusion

The study findings indicated that the "PREPARE" module was effective in enhancing undergraduate medical students' understanding of the term EPA. Validation by medical education experts confirmed that the module content was clear, coherent, and aligned with the intended learning objectives. Reliability analysis showed adequate consistency in the expert evaluations.

Following the pilot testing, students demonstrated a significant improvement in their knowledge of EPAs and reported greater confidence in their ability to apply these concepts in clinical contexts. These results support the usefulness of the module as a structured approach for introducing EPA-based learning into undergraduate medical education.

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Conflict of interests: There is no conflict of interest.

Ethical approval: This study was approved by the Institutional Human Ethics Committee of Panimalar Medical College Hospital & Research Institute (IHEC/PMCH&RI/2024/126; dated 16/04/2024).

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