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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებშიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи.** Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html. В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საყურადღებო!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე, დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემავსებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრაფიის ფოტოსურათები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგების ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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ACADEMIC ENGAGEMENT AS A CONTEMPORARY CHALLENGE IN HIGHER EDUCATION: TOWARD A FUNCTIONAL INTEGRATIVE MODEL

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Abstract.

Academic engagement has emerged as a central construct in higher education research, increasingly positioned as an integrative indicator of educational quality and long-term student outcomes. Despite exponential growth in engagement-related publications, the field remains theoretically fragmented, with models focusing on isolated components rather than the functional interrelations among motivational, regulatory, psychophysiological, and contextual factors. This article presents a comprehensive theoretical analysis and proposes a functional integrative model of academic engagement. Through systematic review of theoretical traditions—including involvement theory, motivational frameworks, self-determination theory, social-cognitive approaches, and psychosocial perspectives—we synthesize current knowledge and identify critical gaps. The proposed model conceptualizes engagement as a dynamic processual mechanism linking predisposing resources (psychological, psychophysiological, and educational), mediating processes (motivational, self-regulatory, and affective-regulatory systems), moderating contextual conditions (institutional, instructional, and social factors), and developmental outcomes (academic, psychological, and professional). The model specifies functional relationships among components, distinguishes between initiating and sustaining mechanisms, and positions well-being as both outcome and resource. This framework provides theoretical grounding for future empirical research and offers strategic guidance for educational practice aimed at fostering sustainable engagement, student well-being, and long-term professional development.

Key words. Academic engagement, student involvement, higher education, motivational processes, self-regulation, psychophysiological foundations, well-being, theoretical model.

Introduction.

Over the past two decades, academic engagement has emerged as one of the central constructs in higher education research, increasingly positioned as an integrative indicator of educational quality and long-term student outcomes. Beyond its association with academic performance, engagement is now widely regarded as a processual marker of how students interact with learning environments, mobilize personal resources, and transform educational opportunities into meaningful developmental trajectories.

In contrast to traditional outcome-oriented indicators such as grades or completion rates, academic engagement captures the qualitative dimension of students' participation in education. It reflects not only whether students are present in learning contexts, but how cognitively, emotionally, and behaviorally invested they are in academic activities. As such, engagement has been conceptualized as a critical mechanism linking

educational environments to learning depth, psychological well-being, and subsequent professional development.

Importantly, academic engagement is increasingly conceptualized not only as an individual student characteristic but also as an institutional indicator of educational quality. From this perspective, engagement reflects universities' capacity to create conditions that attract, support, and sustain meaningful student participation. This shift marks a movement from an individual-centered understanding of engagement toward a relational perspective emphasizing the interaction between students and learning environments.

Such expansion of the research focus has been accompanied by growing terminological and conceptual differentiation. Kalatskaya et al. (2025) note that English-language scholarship distinguishes between involvement, referring to the amount of energy, time, and psychological resources students invest in learning, and engagement, capturing institutional practices designed to enhance student success [1]. This distinction reflects deeper theoretical divisions between student-centered and institution-centered approaches, contributing to the complexity of developing a unified conceptual framework.

The rapid growth of engagement scholarship further underscores this diversification. A meta-analysis by Loyola-Carrillo et al. (2025) demonstrates an exponential increase in publications, particularly after 2019 [2]. Whereas earlier studies primarily emphasized emotional experiences and motivational characteristics, more recent research has expanded the conceptual scope to include cognitive strategies, behavioral persistence, motivational regulation, social embeddedness, and contextual influences. This shift reflects a broader transition toward process-oriented and well-being-sensitive models of learning.

Despite theoretical diversity, most contemporary perspectives converge on viewing academic engagement as a multidimensional construct encompassing participation, psychological investment, commitment, and identification with academic life [3-5]. Accordingly, engagement is increasingly understood as an integrative phenomenon capturing cognitive, emotional, behavioral, and, in some frameworks, agentic forms of student involvement.

Nevertheless, existing models predominantly address structural components of engagement in isolation, providing limited insight into how these components functionally interact and evolve over time. This limitation leaves key questions unresolved, including variability in engagement trajectories and the mechanisms through which engagement becomes developmentally sustained.

To address this gap, the present article proposes a functional integrative model of academic engagement that conceptualizes engagement as a dynamic process linking individual resources, regulatory mechanisms, contextual conditions, and developmental outcomes.

Methodology.

The present study employed a structured literature review design informed by PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to ensure transparency and methodological rigor.

A comprehensive search was conducted across multiple international academic databases, including Scopus, Web of Science, PubMed, and Semantic Scholar, covering publications from January 2005 to January 2025. The timeframe was selected to capture contemporary theoretical developments and empirical expansions in academic engagement research over the past two decades.

The search strategy combined controlled vocabulary and keyword-based queries using Boolean operators. Core search terms included: “academic engagement”, “student engagement”, “student involvement”, “higher education”, “university students”, “self-regulation”, “motivation”, “well-being”, “psychophysiological”, flow.

Eligibility Criteria and Screening Procedure:

Studies were included if they were peer-reviewed journal articles written in English, focused on higher education or university student populations, and addressed academic engagement as a primary construct. Both empirical (quantitative, qualitative, mixed-methods) and theoretically substantive contributions were considered.

Studies were excluded if they focused exclusively on primary or secondary education, represented conference abstracts, editorials, commentaries, or dissertations, lacked conceptual or empirical relevance to engagement processes, failed to operationalize academic engagement clearly, or constituted duplicate records.

The initial search yielded 1,092 records. After duplicate removal, 655 articles underwent title and abstract screening. Of these, 587 full-text articles were assessed for eligibility based on conceptual clarity, methodological transparency, and relevance to engagement mechanisms.

The final synthesis included 50 conceptual and empirically influential studies selected according to citation impact, theoretical contribution, methodological rigor, and representation of diverse explanatory traditions (motivational, self-regulatory, psychosocial, psychophysiological, and contextual perspectives). The review aimed at theoretical integration rather than statistical aggregation.

Data Extraction and Synthesis:

For each included study, data were extracted regarding theoretical orientation, operationalization of engagement, identified predictors, mediators, moderators, outcomes, and methodological approach. A thematic synthesis was conducted to identify converging and divergent conceptualizations and to clarify the functional relationships among engagement components.

This analytical process informed the development of the proposed functional integrative model.

Conceptual Foundations of Academic Engagement:

The theoretical understanding of academic engagement has evolved across several research traditions, each offering distinct

insights into the nature, antecedents, and consequences of students’ participation in higher education.

One of the earliest and most influential frameworks is Astin’s involvement theory, which conceptualizes involvement as the quantity and quality of physical and psychological energy students invest in their educational experiences. Within this perspective, the level of involvement is considered a central predictor of educational outcomes, as learning and development are assumed to be proportional to the degree of student investment [6,7].

More differentiated explanations of engagement mechanisms are provided by motivational theories, including expectancy–value theory, self-determination theory, and social-cognitive models. These approaches emphasize the roles of self-efficacy beliefs, subjective task value, goal orientations, and perceived autonomy in shaping students’ readiness to participate actively in learning. Within this conceptualization, engagement emerges when students interpret academic activities as meaningful, attainable, and aligned with their personal goals and values [7,8].

Beyond individual-level explanations, sociocultural and organizational perspectives highlight the contextual embeddedness of academic engagement. Research within this tradition demonstrates that social relationships, academic culture, institutional support, and educational practices significantly influence students’ patterns of participation in learning activities. From this standpoint, engagement is understood as a relational phenomenon formed within systems of interaction rather than residing solely within the individual learner [9,10].

An additional line of research adapts the concept of work engagement from occupational psychology to educational settings. Within this psychosocial framework, academic engagement is conceptualized as a positive motivational–energetic state characterized by vigor, dedication, and absorption. This perspective links engagement not only to academic achievement but also to psychological well-being, resilience, and the risk of exhaustion under conditions of sustained academic demands [4].

Taken together, these traditions portray academic engagement as a multidimensional and dynamic phenomenon emerging from the interaction between individual and contextual factors. However, theoretical diversity also contributes to conceptual ambiguity and complicates the development of integrative explanatory models.

Across most contemporary perspectives, academic engagement is described through behavioral, emotional, and cognitive components, with recent scholarship introducing agentic engagement as a dimension reflecting students’ proactive role in shaping their learning environment [3, 7]. In higher education contexts, agentic engagement may manifest through students’ participation in co-designing course syllabi, initiating academic discussions, requesting formative feedback, proposing alternative project formats, or negotiating deadlines and learning trajectories. This extension marks a shift from viewing students as passive recipients of instruction toward recognizing them as active agents in the educational process.

Mechanisms Underlying Academic Engagement:

Academic engagement emerges through the interaction of multiple psychological, regulatory, and contextual mechanisms that collectively shape both its initiation and sustainability over time.

Motivation and Meaning-Making: Motivation has long been regarded as one of the central explanatory constructs in engagement research. Within expectancy–value theory, academic engagement is conceptualized as a function of students’ beliefs about their likelihood of success and the subjective value they attribute to academic tasks. Students are more likely to engage deeply when learning activities are perceived as both attainable and meaningful [8].

Self-determination theory extends this perspective by emphasizing the quality rather than the quantity of motivation. Distinguishing between autonomous and controlled forms of regulation, this framework highlights the satisfaction of basic psychological needs for autonomy, competence, and relatedness as conditions fostering engagement. From this viewpoint, engagement emerges when learning is experienced as self-endorsed rather than externally imposed [7].

Social-cognitive approaches further enrich this understanding by underscoring the role of self-efficacy beliefs and reciprocal interactions between personal agency and environmental feedback. Engagement is thus conceptualized as both a product and a driver of motivational beliefs, reflecting dynamic and recursive processes rather than linear causality [8].

Despite these theoretical advances, motivation alone cannot fully account for the complexity of academic engagement. Rather than acting as an isolated determinant, motivation functions as a mediating mechanism through which personal resources and contextual affordances are translated into intentional involvement in learning.

Self-Regulation, Personal Resources, and Well-Being:

While motivational theories explain why engagement is initiated, they provide limited insight into how it is sustained under conditions of prolonged academic demands. This limitation has directed attention toward self-regulatory and resilience-related processes as core mechanisms supporting engagement continuity.

Self-regulation encompasses processes through which students plan, monitor, and adjust cognitive, emotional, and behavioral efforts in pursuit of learning goals. Empirical research consistently links self-regulatory capacities to persistence, strategic learning, and adaptive responses to academic challenges, positioning self-regulation as a functional bridge between motivational intent and sustained engagement [10].

Closely related is the construct of resilience, defined as the capacity to maintain purposeful activity and psychological stability under stress and adversity. In academic contexts, resilience is associated with adaptive coping, emotional regulation, and sustained involvement despite setbacks. Compared with motivation, which may fluctuate across situations, resilience represents a relatively stable personal resource buffering engagement against environmental stressors [10].

The relationship between academic engagement and well-being has received growing empirical attention. Many studies

conceptualize well-being as an outcome of engagement, demonstrating associations with positive affect, life satisfaction, academic satisfaction, and reduced burnout risk [11]. Conversely, alternative perspectives view well-being as a resource facilitating engagement by supporting attentional stability, effort regulation, and adaptive coping [12,13].

Longitudinal evidence indicates that these perspectives reflect bidirectional dynamics: well-being predicts subsequent engagement, while engagement contributes to later well-being [12,13]. Multivariate and cross-cultural studies further demonstrate direct positive effects of well-being on engagement trajectories [11].

Psychophysiological Foundations:

Although motivational and self-regulatory processes provide essential psychological explanations, they operate within functional constraints shaped by students’ psychophysiological state. Academic engagement unfolds within boundaries determined by attentional readiness, mental energy, and neurophysiological regulation [14].

Emerging research highlights the role of functional brain states in sustaining attention, cognitive flexibility, and emotional regulation—processes central to engagement. In particular, patterns of alpha (α) and theta (θ) activity have been discussed as indicators of regulatory readiness: alpha activity is associated with attentional control and inhibition of irrelevant information, whereas theta activity reflects cognitive effort and working memory demands involved in learning [15].

A conceptual bridge between psychophysiological regulation and experiential engagement is provided by the construct of flow. Flow represents a state of optimal experience characterized by deep concentration, intrinsic motivation, and perceived control emerging from the balance between task demands and individual capacities. Within engagement research, flow is best understood not as synonymous with engagement but as a qualitative state reflecting high functional integration across motivational, regulatory, and psychophysiological systems [14].

Contextual and Relational Mechanisms:

Academic engagement is also shaped by relational and institutional contexts. Sense of belonging, quality of feedback, autonomy support, and interpersonal relationships create conditions under which engagement may become stable or fragmented.

Empirical research consistently demonstrates that stronger belonging is associated with higher engagement, motivation, persistence, and reduced dropout risk [16,17]. Support from peers, teachers, family, and institutional structures further enhances well-being and indirectly strengthens engagement processes [11,18].

These findings underscore that engagement cannot be reduced to individual motivation or regulation alone but must be understood as emerging within broader relational and ecological systems.

Theoretical Gaps and the Need for Integration.

The scientific literature has systematically described the behavioral, emotional, cognitive, and agentic manifestations of academic engagement, while motivational, self-regulatory,

psychophysiological, and interpersonal factors are considered significant conditions underlying its development, maintenance, and outcomes. Despite this progress, the field remains theoretically fragmented.

Most existing frameworks emphasize particular components or mechanisms in relative isolation. Motivational models clarify meaning-making processes but provide limited understanding of engagement sustainability. Self-regulation and resilience perspectives explain persistence yet often remain disconnected from motivational initiation and contextual affordances. Psychophysiological research highlights the importance of student's functional readiness but is rarely integrated with psychological and educational models. Similarly, studies on well-being alternately conceptualize it as an outcome or a resource without clearly specifying its role within the engagement process.

As a result, engagement research remains predominantly descriptive, specifying what engagement consists of rather than how its elements operate together as a coordinated system. From a functional-dynamic perspective, however, the components of engagement can be understood as interrelated and mutually compensatory, such that the insufficient development of one element may be partially offset by others, while their coordinated functioning produces synergistic effects that enhance overall engagement. This limitation constrains the explanatory power of existing models and reduces their translational value for educational practice.

Addressing this gap requires a functional perspective capable of differentiating the roles of predisposing resources, processual mechanisms, contextual conditions, and developmental outcomes within the engagement system. Such differentiation enables a more precise understanding of engagement trajectories, resilience and vulnerability patterns, and the mechanisms through which situational involvement evolves into a sustained developmental strategy.

Guided by this rationale, the present article proposes a functional integrative model of academic engagement that conceptualizes engagement as a dynamic process emerging from the coordinated interaction of individual resources, regulatory mechanisms, contextual conditions, and developmental consequences.

A Functional Integrative Model of Academic Engagement.

In response to the identified theoretical limitations, the present study proposes a functional integrative model of academic engagement that conceptualizes engagement as a central processual mechanism linking individual resources, educational contexts, and developmental outcomes. Building upon existing theoretical traditions, the model introduces a functional differentiation of predictors, mediators, moderators, and outcomes, thereby providing a framework for understanding how engagement emerges, is sustained, and evolves over time (Figure 1).

Core Conceptualization: Engagement as Process.

At the core of the model, academic engagement is conceptualized as both a dynamic state and an emerging

strategy of learning-related activity. Rather than representing the mere presence of participation or affective involvement, engagement is understood as the coordinated activation of cognitive, emotional, behavioral, and agentic components that enable meaningful and sustained interaction with academic tasks [3,7]. In this sense, engagement reflects the quality of students' functioning in educational contexts, including their investment of effort, attentional regulation, emotional experience, and proactive (self-initiated) shaping of learning conditions through the selection of strategies, the seeking of resources, and the initiation of learning-related interactions.

In response to these theoretical limitations, the present study advances a functional integrative model of academic engagement, positioning engagement as a central processual mechanism linking individual resources, regulatory processes, contextual conditions, and developmental outcomes. The model differentiates predictors, mediators, moderators, and consequences, thereby clarifying how engagement is initiated, sustained, and transformed over time.

Within this framework, academic engagement is conceptualized as a dynamic configuration of cognitive, emotional, behavioral, and agentic processes that collectively enable meaningful and sustained interaction with academic tasks [3,7]. Rather than merely indicating participation or affective involvement, engagement reflects the quality of students' functional integration in educational contexts, including effort investment, attentional regulation, emotional experience, and proactive shaping of learning conditions.

Predisposing Resources (Predictors).

The model identifies a set of distal resources shaping the initial conditions for engagement. These resources do not determine engagement directly but delimit the range of possible engagement trajectories and influence the ease with which engagement can be initiated and sustained.

Psychological resources include self-regulatory capacities, academic self-efficacy, emotional stability, resilience, and dispositional characteristics supporting adaptive functioning in academic contexts [10].

Psychophysiological resources reflect functional readiness for learning and encompass attentional control, energetic capacity, and stress-regulatory systems, establishing boundaries within which motivational and regulatory processes operate [14].

Educational background variables, including prior learning experiences and academic socialization, influence expectations, learning strategies, and students' orientation toward higher education [9].

Processual Mechanisms (Mediators).

Central to the model are mechanisms through which resources are translated into actual engagement.

Motivational and meaning-making processes provide directional force by shaping value appraisals, goal orientations, and personal significance attributed to academic activities [7,8].

Self-regulatory implementation systems represent the executive component of engagement, enabling planning, monitoring, strategic adjustment, and sustained effort in response to academic challenges [10].

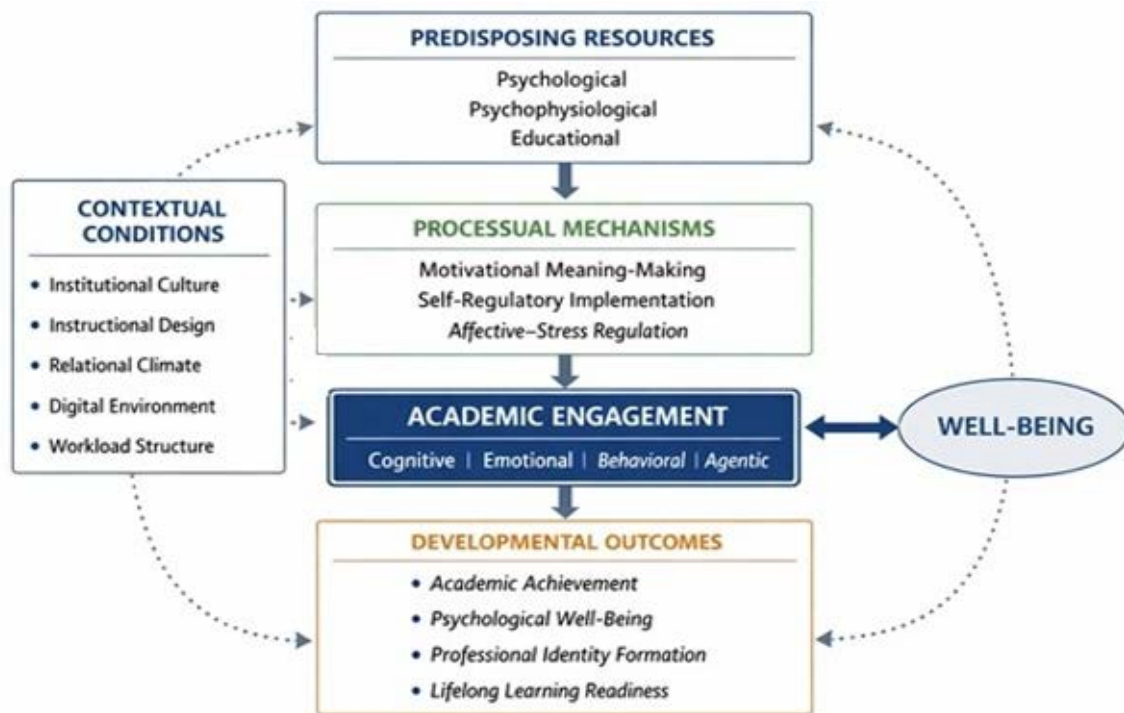


Figure 1. Functional Integrative Model of Academic Engagement.

Affective–stress regulation captures emotional dynamics and the capacity to maintain functional stability under academic demands, linking engagement processes with well-being and resilience [12,13].

Contextual Conditions (Moderators).

Educational environments function as moderators shaping both the strength and direction of relationships between resources, mechanisms, and engagement. Institutional culture, instructional design, digital infrastructure, academic climate, relational dynamics, and workload distribution collectively influence engagement processes [16-18].

Within this framework, contextual factors may facilitate the realization of personal resources or constrain engagement trajectories. Supportive environments can partially compensate for limited individual resources, whereas unsupportive contexts may undermine engagement even among well-resourced students [11].

Developmental Consequences (Outcomes).

Engagement is conceptualized as a mechanism producing multi-level developmental outcomes. Short-term outcomes include deeper learning, persistence, and academic achievement. Medium-term outcomes encompass psychological well-being, academic satisfaction, and reduced burnout risk [11].

In the long term, repeated engagement experiences contribute to professional identity formation, adaptive learning strategies, and readiness for lifelong learning [19,20]. Over time, engagement may become internalized as stable patterns of self-regulated and meaning-oriented functioning.

A distinctive feature of the model is the dual positioning of well-being as both an outcome of sustained engagement and a background resource supporting its continuity, reflecting bidirectional engagement–well-being dynamics [12,13] (Figure 1).

Thus, the model conceptualizes academic engagement as a central processual mechanism emerging from the interaction of predisposing resources (psychological, psychophysiological, and educational), processual mechanisms (motivational, self-regulatory, and affective-regulatory systems), and contextual conditions. Engagement generates multi-level developmental outcomes while maintaining a bidirectional relationship with well-being, which functions both as an outcome and as a sustaining resource. Contextual conditions operate as moderators influencing the strength and direction of relationships across model components.

Discussion.

The functional integrative model proposed in this study contributes to academic engagement research by addressing the conceptual fragmentation that has characterized the field and by advancing a process-oriented understanding of engagement. Rather than conceptualizing engagement as a collection of parallel dimensions, the model positions it as a coordinated mechanism emerging from the interaction of individual resources, regulatory processes, and contextual conditions [3,9]. This perspective enables a more nuanced interpretation of engagement as a dynamic phenomenon shaped by temporal development and contextual variability.

A central theoretical contribution of the model lies in distinguishing between mechanisms underlying the initiation and maintenance of engagement. Motivational processes provide direction and meaning to academic involvement [7,8], whereas self-regulatory capacities and resilience-related processes support engagement stability under conditions of prolonged academic demands [10]. This differentiation offers an explanatory basis for divergent engagement trajectories among students with comparable motivational profiles and highlights

the role of regulatory capacity in sustaining engagement over time.

The incorporation of psychophysiological foundations represents another important contribution of the model. By conceptualizing attentional readiness, energetic capacity, and neurophysiological regulation as functional preconditions of engagement, the framework extends beyond predominantly psychological interpretations of student involvement [14]. This perspective provides an additional explanatory layer for understanding fluctuations in engagement and emphasizes the role of functional readiness in shaping students' capacity for sustained academic activity.

The model also clarifies the bidirectional relationship between engagement and well-being. Consistent with longitudinal evidence, well-being is conceptualized both as an outcome of sustained engagement and as a resource supporting its continuity [11-13]. This dual positioning allows for a more differentiated understanding of engagement quality, including the possibility that high behavioral involvement may coexist with declining well-being under conditions of excessive demands or insufficient support.

By explicitly modeling contextual conditions as moderators, the framework reinforces the relational nature of engagement and underscores the importance of institutional, instructional, and interpersonal factors in shaping engagement processes [16-18]. The notion of compensatory dynamics suggests that supportive educational environments may partially offset limitations in personal resources, whereas unsupportive contexts can undermine engagement even among well-resourced students.

In addition to psychological and contextual interventions, the incorporation of psychophysiological assessment may enhance the precision of engagement diagnostics in higher education. Indicators such as EEG-based alpha and theta activity, reflecting attentional control and cognitive effort, can be operationalized as markers of functional readiness for sustained learning. In educational contexts, these parameters may be evaluated through short baseline assessments, task-related recordings, or wearable neurotechnological tools integrated into digitally mediated learning environments. Combined with self-report and behavioral indicators, psychophysiological metrics may allow for multi-level monitoring of attentional stability, cognitive load, and fatigue, thereby informing personalized engagement-support strategies and optimizing the balance between academic demands and student resources.

Beyond theoretical implications, the model provides a conceptual basis for multi-level engagement interventions. Effective strategies may involve fostering motivational meaning-making, strengthening self-regulatory skills, promoting psychological well-being, and designing learning environments that balance challenge and support. At the same time, as a conceptual framework, the model requires empirical validation across diverse educational contexts, including digitally mediated learning environments and different developmental stages.

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Conclusion.

1. Academic engagement should be conceptualized as a functional process rather than a static construct. The proposed model demonstrates that engagement emerges from the coordinated interaction of individual resources, regulatory mechanisms, and contextual conditions, highlighting its dynamic and developmental nature.

2. Differentiating initiation and maintenance mechanisms enhances explanatory power. Motivational processes primarily drive the emergence of engagement, whereas self-regulatory and resilience-related capacities contribute to its stability and sustainability over time.

3. Psychophysiological readiness constitutes an essential but often overlooked foundation of engagement. Incorporating functional states such as attentional readiness and energetic capacity provides a deeper understanding of variability in engagement trajectories and complements psychological explanations. Specifically, fluctuations in activation, fatigue, and attentional stability may enable or constrain students' capacity to mobilize cognitive and motivational resources, thereby shaping moment-to-moment engagement.

4. Well-being occupies a dual role as both outcome and resource of engagement.

This bidirectional perspective allows for a more nuanced interpretation of engagement quality and underscores the importance of balancing academic demands with psychological support in educational practice.

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Аннотация.

Вовлеченность в учебный процесс стала центральным понятием в исследованиях высшего образования, все чаще рассматриваемым как интегративный индикатор качества образования и долгосрочных результатов обучения студентов. Несмотря на экспоненциальный рост числа публикаций, посвященных вовлеченности, эта область остается теоретически фрагментированной, а модели фокусируются на отдельных компонентах, а не на функциональных взаимосвязях между мотивационными, регулятивными, психофизиологическими и контекстуальными факторами. В данной статье представлен всесторонний теоретический анализ и предложена функциональная интегративная модель вовлеченности в учебный процесс. Путем систематического обзора теоретических традиций, включая теорию вовлеченности, мотивационные концепции, теорию самоопределения, социально-когнитивные

подходы и психосоциальные перспективы, мы обобщаем современные знания и выявляем критические пробелы. Предложенная модель рассматривает вовлеченность как динамический процессуальный механизм, связывающий predisposing ресурсы (психологические, психофизиологические и образовательные), опосредующие процессы (мотивационные, саморегулирующие и аффективно-регуляторные системы), модераторные контекстуальные условия (институциональные, учебные и социальные факторы) и результаты развития (академические, психологические и профессиональные). Модель определяет функциональные взаимосвязи между компонентами, различает иницирующие и поддерживающие механизмы и рассматривает благополучие как результат и ресурс одновременно. Эта концептуальная основа обеспечивает теоретическую базу для будущих эмпирических исследований и предлагает стратегическое руководство для образовательной практики, направленной на содействие устойчивой вовлеченности, благополучию студентов и долгосрочному профессиональному развитию.

Ключевые слова: академическая вовлеченность, участие студентов, высшее образование, мотивационные процессы, саморегуляция, психофизиологические основы, благополучие, теоретическая модель.

ანოტაცია.

აკადემიური ჩართულობა უმაღლესი განათლების კვლევაში ცენტრალურ კონსტრუქტად იქცა და სულ უფრო მეტად პოზიციონირდება, როგორც განათლების ხარისხისა და სტუდენტების გრძელვადიანი შედეგების ინტეგრაციული ინდიკატორი. ჩართულობასთან დაკავშირებული პუბლიკაციების ექსპონენციური ზრდის მიუხედავად, სფერო თეორიულად ფრაგმენტირებული რჩება, მოდელები კი ფოკუსირებულია იზოლირებულ კომპონენტებზე და არა მოტივაციურ, მარეგულირებელ, ფსიქოფიზიოლოგიურ და კონტექსტუალურ ფაქტორებს შორის ფუნქციურ ურთიერთკავშირზე. ეს სტატია წარმოადგენს ყოვლისმომცველ თეორიულ ანალიზს და გვთავაზობს აკადემიური ჩართულობის ფუნქციურ ინტეგრაციულ მოდელს. თეორიული ტრადიციების - მათ შორის ჩართულობის თეორიის, მოტივაციური ჩარჩოების, თვითგამორკვევის თეორიის, სოციალურ-კოგნიტური მიდგომებისა და ფსიქოსოციალური პერსპექტივების - სისტემატური მიმოხილვის გზით, ჩვენ ვახდენთ არსებული ცოდნის სინთესს და ვავლენთ კრიტიკულ ხარვეზებს. შემოთავაზებული მოდელი ჩართულობას განიხილავს, როგორც დინამიურ პროცესუალურ მექანიზმს, რომელიც აკავშირებს წინასწარ განწყობის რესურსებს (ფსიქოლოგიური, ფსიქოფიზიოლოგიური და საგანმანათლებლო), შუამავლობის პროცესებს (მოტივაციური, თვითრეგულირებადი და აფექტურ-რეგულირებადი სისტემები), მოდერატორულ კონტექსტუალურ პირობებს (ინსტიტუციური, სასწავლო და სოციალური ფაქტორები) და განვითარების შედეგებს (აკადემიური, ფსიქოლოგიური და პროფესიული). მოდელი განსაზღვრავს კომპონენტებს შორის ფუნქციურ ურთიერთობებს, განასხვავებს ინიცირებისა და შენარჩუნების მექანიზმებს და კეთილდღეობას

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პროფესიული განვითარების ხელშეწყობას.

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