

Beyond Self-Reports: Using text analysis to explore first-year students' subjective experiences during their first examination session

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Received 11.09.2025; Received revised 12.06.2026; Accepted 19.06.2026;

Available online 19.08.2026

This study investigated first-year psychology students' exam experiences through narrative analysis with a mixed-methods approach that combines manual thematic coding and Latent Dirichlet Allocation (LDA) with psychometric self-report assessments. Higher education marks a vital developmental phase during which students face increased academic stress especially when they take their first set of examinations. Although standardized self-report measures are the primary instrument in traditional research about coping and learning strategies, they do not effectively capture the full range of students' real-life experiences, because they are limited by the theoretical frameworks on which they were based. The research conducted interviews with 175 first-year students to identify eight categories of coping and learning strategies (Smarandache et al., 2021), including deep learning and problem-solving strategies (Spătaru et al., 2024) as well as procrastination and avoidance (Kim et al., 2020). Our findings showed that linguistic patterns showed consistent relationships with motivational and affective variables, which proves the worth of textual data in supplementing traditional assessments methods. The present study demonstrates how natural language processing (NLP) methods can deliver advanced understanding of student adaptation to academic pressure and provides useful recommendations for implementing digital well-being programs and time management training and learning communities.

Keywords: first-year students, learning strategies, coping behaviors, natural language processing, Latent Dirichlet Allocation

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Introduction

The transition to higher education is a critical period in a student's academic development, extending beyond mere academic learning to include cognitive, emotional, and social adjustments. First-year university students must manage complex academic requirements, and increased personal responsibility, while adapting to new teaching styles, independent learning environments, and the loss of familiar support systems (Lubis et al., 2025). The first exam session stands out as a defining moment during this transition, serving as a test of students' ability to manage academic pressure and emotional stress. The first examination session is not necessarily the most intense evaluative experience in a student's academic career, but it is a qualitatively distinct one. The transition to university involves significant academic, social and emotional adjustments, particularly during the first year when students must adapt to greater autonomy, unfamiliar assessment methods and reduced external structure (Brinkworth et al., 2008; Lubis et al., 2025). During this period of change, the first exam is the first real test of a student's ability to perform at university level, even though they may not yet have developed stable learning routines that help them to study well (Bhat & Dahal, 2023). Unlike major pre-university examinations such as the baccalaureate exam, which are usually preceded by extensive and structured preparation, the first university examination period occurs while students

are still adapting to the academic and personal changes associated with entering higher education (De Clercq et al., 2018). Therefore, its relevance lies not only in its potential intensity, but also in the fact that it provides an informative context in which to examine how students initially describe and utilize their learning and behavioral coping strategies in response to academic stress.

Coping and learning strategies developed during this stage are crucial for determining both immediate academic success and long-term psychological well-being highlighting the importance of exploring how students articulate and implement these strategies during adjustment phase (Bhat & Dahal, 2023).

Research indicated that students often experience significant levels of academic stress and anxiety (Bewick et al., 2010; Kim et al., 2020). Factors such as differences in teaching styles, the expectation of independent learning, and social adaptation can create an overwhelming experience for first-year students. To cope with these stressors, students rely on various behavioral coping strategies that are essential for their academic success and overall well-being during this transition phase (Spătaru et al., 2024).

Recent studies have examined how first-year students respond to academic stress and adapt to the challenges of university life (Avci, 2024; Engelbrecht et al., 2020). While these studies improve our understanding of students' adaptation processes, they rely on standardized self-report instruments, which limits exploration of more nuanced or

personal aspects of students' experiences, especially during high-pressure periods, such as the first exam session (Cliniciu, 2013). Consequently, these methods often fail to capture the full variability and depth of students' personal experiences. This is particularly true for first-year students, for whom little research has been conducted into how they experience and cope with their first examination session, which is a period that can be more stressful than any other phase due to the pressure of academic adjustment. While there is a growing number of studies on the transition to higher education (Ciccone-Estrela, 2012; Keup, 2007), few examine how students naturally express their coping strategies outside of predefined theoretical categories.

The present study addresses this gap by exploring the first examination session as a distinctive and insightful moment in the academic adaptation process. Unlike previous studies which were limited to fixed, theory-bound instruments (De Clercq et al., 2018), this study takes a qualitative approach that allowed students to articulate their experiences in their own words and free from pre-established theoretical constraints. We analyzed student narratives collected through structured interviews, thus allowing us to explore dominant themes that were directly expressed in the students' own language. Through this approach, the present study provided a valuable insight into how first-year students manage the pressures of academic performance, particularly in their first exam period. By analyzing students' narratives through natural language processing (NLP) techniques such as Latent Dirichlet Allocation (LDA), this study aimed to uncover dominant themes regarding how students use coping strategies and to explore their relationship with academic and psychological outcomes. The following sections will provide more detailed information about the theoretical framework and methodological approach used in this research, starting with a closer look at the academic demands students experience when transitioning to university.

It is important to first understand the types of academic demands that characterize the transition to university and how they differ from previous educational experiences before examining students' coping strategies.

The challenges of adapting to academic demands

Many first-year students have difficulty adapting to university life because the academic demands of higher education differ greatly from those of secondary education. Unlike high school environments, where structured learning and teacher guidance are common, university students must take greater responsibility for their education (Parker et al., 2004). This transition often requires students to adapt to self-directed learning, which involves a greater autonomy and responsibility for managing their academic work. Unlike the structured guidance typical of secondary education, self-directed learning requires students to set goals, monitor their progress, and stay motivated independently, a shift that can cause additional stress during the transition to college (Tekkol & Demirel, 2018). It also involves critical thinking and independent problem solving. These are skills that many students have not had to develop previously. Recent research has revealed that many first-year students experience significant challenges during this adjustment period. These challenges include low readiness for autonomous learning and inadequate time management skills. These are strongly correlated with increased stress and reduced academic performance (Naik et al., 2025). Similarly, an international review of first-year student experiences identifies ongoing challenges in self-regulated

learning and academic integration as significant sources of stress during the transition to university life (Mickwitz et al., 2024). Therefore, it is essential to develop effective cognitive and metacognitive strategies (e.g., efficient note-taking, comprehension, synthesis), in order to prevent cognitive overload and potential academic burnout (Schaufeli et al., 2020).

First-year students often struggle with balancing coursework, extracurricular activities, and personal responsibilities, and the time management of all these demands is a fundamental challenge during the transition to higher education (Liu et al., 2024). The increased workload in university requires the development of efficient time management strategies to prevent academic overload and stress (Kim et al., 2020). Self-regulation plays a key role in determining students' success in managing their time effectively (Wolters & Brady, 2020). Self-regulated learners set goals, monitor their progress, and adapt their strategies as needed (Zimmerman, 2002). However, students who lack self-regulation skills may procrastinate or misallocate study time, leading to last-minute cramming and heightened anxiety. Studies have shown that students who practice effective time management tend to report lower stress levels and higher academic satisfaction (Gagné et al., 2014).

The transition to university also involves significant social and emotional changes. Many students move away from home for the first time, losing the familiar support structures of family and high school friendships. The need to establish new social networks can be stressful, and students who struggle with this aspect of transition may feel isolated or disconnected (Pittman & Richmond, 2008). The emotional adjustment to university life is influenced by self-efficacy and resilience. Students with higher self-efficacy are more likely to engage in proactive problem-solving and seek support when needed, whereas those with lower self-efficacy may experience heightened stress and withdrawal (Schunk et al., 1989). Emotional regulation strategies, such as mindfulness and cognitive reappraisal, have been found to mitigate the negative effects of academic stress and enhance well-being (Gross, 2015).

Students' approaches of the first exam period

The first exam session serves as a critical point in a student's academic transition. For many first-year students, the first exam period represents their initial encounter with university-level assessment practices, which may differ significantly from those in secondary education (Brinkworth et al., 2009). Research suggested that students who engage in structured preparation, such as spaced repetition and active recall, tend to perform better and experience less anxiety, while students who rely on last-minute reading or passive learning strategies often report higher levels of stress and lower performance outcomes (Dunlosky et al., 2013). Therefore, how students approach the academic learning requirements is important for their successful adaptation to the academic environment.

Coping strategies also vary widely among students and their theoretical framework (i.e., developed by Carver et al., 1989) is also useful for understanding how students adapt to stressful periods. In higher education contexts, students often use a combination of problem-focused coping strategies, such as developing study schedules or participating in peer discussions, and emotion-focused coping strategies such as self-reassurance, or relaxation techniques (Lari et al., 2025). Analyzing students' narratives for these patterns can provide deeper insight into how coping strategies can influence academic outcomes.

However, some students may also show avoidant coping behaviours, such as procrastination, withdrawal, or disengagement from academic responsibilities (Kim et al., 2020). Effective behavioral coping strategies, such as time management, structured study routines, and social support, are positively correlated with academic success and well-being (Adams & Blair, 2019). In contrast, inadapative strategies like avoidance and procrastination are linked to increased levels of anxiety, reduced motivation, and academic underperformance (Schaufeli et al., 2020). By examining students' narratives about their first exam experiences, this study seeks to identify dominant coping strategies and their impact on academic and psychological outcomes.

Traditional research on coping strategies has predominantly relied on self-report surveys, structured questionnaires, and observational studies to assess how individuals manage stress. While these methods offer valuable information, they can limit participants' responses to predefined theoretical categories, potentially failing to capture the full contextual complexity and variability of personal experience (Pennebaker et al., 2003). It is also important to acknowledge that open-ended verbal responses are influenced by explicit self-expression and are therefore susceptible to response biases and the tendency to manage one's impression. Furthermore, participants may differ in their ability or willingness to describe their experiences in detail and reflectively. Therefore, narrative data should not be considered a bias-free alternative to self-report instruments, but rather as a complementary source of information that can reveal patterns that are not easily captured by standardized scales.

Natural Language Processing (NLP) is a useful methodological tool for analyzing students' narratives in this case. Rather than assuming linguistic data is entirely free from conscious self-presentation, NLP enables us to examine recurring patterns in word choice, semantic associations and discourse organisation across a large number of responses (Jurafsky & Martin, 2000; Pandey & Pandey, 2017). Such linguistic patterns may provide insight into how students express stress, effort, coping and adaptation in their own language, offering a complementary perspective to the structured information obtained through psychometric instruments. From this perspective, the advantage of NLP is less about eliminating bias and more about expanding the variety of observable indicators through which academic adaptation can be studied.

Latent Dirichlet Allocation (LDA)

Among various NLP techniques, Latent Dirichlet Allocation (LDA) has been widely used to identify hidden thematic structures in textual data (Blei et al., 2003). LDA is a probabilistic topic modeling algorithm that assumes that a collection of documents consists of multiple underlying topics, each characterized by distinct distributions of words. Unlike manual thematic coding which is inherently subjective and requires a large amount of time, LDA allows for a data-driven, automated identification of dominant themes without the need for predefined categories. Over the recent years, LDA has been successfully applied in educational psychology and in cognitive science to extract themes from student essays, online discussions, and reflective writing (Xing et al., 2020). Its application to coping strategies in academic settings is particularly valuable because it enables researchers to detect patterns in how students describe their emotional and cognitive responses to academic stress.

In the context of this study, LDA is applied to student interview narratives to identify latent strategies emerging from their narratives about their first exam session. This allows for an exploratory, inductive approach to understanding how students frame their coping experiences, rather than imposing predefined psychological constructs. Furthermore, by linking these extracted themes to self-reported psychological measures (such as motivation, procrastination, and affect regulation), this study bridges qualitative and quantitative methodologies, offering a comprehensive perspective on student adaptation to academic stress.

Advantages of NLP over traditional assessments

The integration of NLP techniques like LDA into psychological and educational research offers several advantages over traditional assessments: (1) uncovering implicit behavioral strategies – while self-report measures ask students to assess behaviors explicitly, textual analysis reveals implicit patterns in how students conceptualize stress and resilience; linguistic features such as word choice, sentiment, and narrative structure provide insights into emotional regulation and cognitive processing. (2) capturing dynamic and contextual variability – traditional self-report measures often treat coping as a static trait, whereas textual data can capture fluctuations in coping responses. (3) reducing social desirability bias for which self-report measures can be vulnerable to desirability bias, where students might report socially acceptable coping strategies rather than their actual behaviors; assessments based on NLP-based analysis of authentic, spontaneous responses, which lead to more ecologically valid insights. (4) handling large-scale data in a more efficient way – NLP techniques, including LDA and sentiment analysis, enable the analysis of thousands of narratives without the manual effort required for traditional qualitative coding. In this sense, the research is made more reproducible.

The first exam session serves as a key period for examining the intersection between academic stress, coping strategies, and motivation. For example, students who perceive exams as a challenge rather than a threat are more likely to engage in deep learning and problem-solving strategies (Spătaru et al., 2024). In contrast, those who experience performance anxiety and avoidance tendencies are at higher risk of burnout. This study explores how different coping strategies align with students' motivation levels and affective experiences during their first exam session.

Overall, these challenges suggest that the first-year students' academic adaptation involves the use of specific learning and behavioral coping strategies, as well as subjective interpretation and articulation of these experiences in language. The present study therefore focuses on the difficulties students face during their first examination session, as well as how they describe these difficulties and their responses to them. This approach is particularly relevant in an exploratory context, where the aim is to determine whether students' spontaneous discourse reflects existing theoretical categories or reveals more subtle thematic patterns.

The present research

The current research takes an exploratory, mixed-methods approach to analyzing students' narratives about the first examination session. Specifically, two complementary analytical strategies were combined: a category-based analysis of responses, which is based on

predefined theoretical frameworks of learning approaches and behavioral coping strategies, and a topic modeling approach using Latent Dirichlet Allocation (LDA), which is based on data. These two approaches were used together to examine whether students' naturally generated discourse aligns with existing theoretical classifications or whether it reveals alternative, more nuanced thematic structures. Accordingly, this study is organized around exploratory research objectives, not predefined hypotheses.

Inspired by previous studies that utilized categorization methods (e.g., Smarandache et al., 2021), LDA was applied to narratives collected from first-year psychology students to identify themes related to learning and behavioral coping during their first examination session. Integrating manual classification and computational text analysis offers a dual perspective on students' academic adaptation, examining whether there are meaningful associations between linguistic themes and psychological constructs such as burnout, intrinsic motivation and procrastination.

Unlike previous work that has focused primarily on predefined self-report categories, this study focuses on how students describe their experiences in their own words, and on whether these narratives can be interpreted using complementary theoretical and data-driven approaches. From this perspective, the study is exploratory and fundamental. The study's main contribution is to extend the use of LDA to the analysis of students' narratives in an educational context, and to examine how computational text analysis can be used to extend more traditional approaches. Evaluating the students' well-being at the time of the interview is a secondary goal of the study, that is meant to provide context for the psychological importance of the identified discourse patterns.

This paper's remaining sections are organized as follows: The Method section describes the procedures used for data gathering and processing, such as LDA modeling, interviewing, and participant recruiting. The extracted topics and their relationships to psychological variables, together with the visualization of data, are shown in the Results section. The Discussion section examines the findings' practical significance for researchers and educators while interpreting them in the context of the body of previous literature. The Conclusion follows by summarizing the main findings and offering ideas for future study directions.

Methods

We used a structured interview as the primary method for collecting qualitative data, designed to explore students' experiences during their first exam session. The interview guide was organized into five thematic categories, each of which corresponds to specific research objectives relating to learning strategies, academic coping behaviours and psychological adaptation. Table 1 presents the structure of the interview guide with some of the questions asked.

The first category Introduction and Learning Strategies, began with an open-ended question asking students to describe how they had prepared for the exam session (Q1). This question was intended to prompt spontaneous reflections on their study routines, effort and planning.

The second category, Negative Aspects, explored students' challenges and stress management. It included questions about the most challenging aspects of the exam period (Q2.1), the actions they took to overcome these

challenges (Q2.2), and their stress management strategies (Q2.3). These items addressed the objective of identifying students' behavioral coping strategies under academic pressure.

The third category, Positive Aspects, investigated changes in study habits and the personal strengths that students had developed during the transition from high school to university. They were asked whether their preparation and stress management strategies had evolved (Q3.1) and which personal qualities they believed had helped them to succeed (Q3.2). These questions were related to the aim of understanding the changes in behavior and motivation that took place during this transition period.

The fourth category, Motivation and Support, addressed the questions of how students engaged with their studies and interacted socially. Students were asked to describe how they stayed motivated and focused (Q4.1) and if they had asked peers or faculty for advice or support (Q4.2). The intention behind this section was to explore self-regulatory strategies and perceived social resources.

The fifth category, Academic Climate, provided a context for students' experiences within the broader social environment. Questions explored the general emotional atmosphere among students (Q5.1) and their use of collaborative learning techniques (Q5.2). These items were included to examine the collective aspects of stress and adaptation during the exam period.

The interview included a total of 20 questions, including follow-up questions tailored to the participants' responses. Although the interview was initially designed to last around 12 minutes, its actual duration varied depending on the level of engagement of each student and how much they elaborated on their responses. Based on the audio recordings, the average interview length was approximately 11 minutes, running from 6 minutes to 18 minutes. This variation likely reflected differences in individuals' willingness to elaborate on their responses and provide detailed narrative descriptions.

The purpose was to obtain a deep and relevant understanding of the student experience during the exam session. Therefore, the participants were informed about the fact that they have no correct or wrong answers.

In addition to the structured interview, we used self-reported questionnaires to gather additional data on well-being and other variables. These questionnaires offered an additional perspective on the perceptions and experiences of the students during the exam session, thus completing the information obtained from the interviews.

Participants' affectivity was assessed using the 16-item IWP Multi-Affect Indicator scale (Warr et al., 2013). This instrument captures four distinct affective dimensions, each of which is assessed using four items. These dimensions are: high-activation pleasant affect (HAPA; e.g., enthusiasm, Cronbach's $\alpha = .90$), low-activation pleasant affect (LAPA; e.g., calmness, Cronbach's $\alpha = .86$), high-activation unpleasant affect (HAUA; e.g., anxiety, Cronbach's $\alpha = .89$), and low-activation unpleasant affect (LAUA; e.g., sadness, Cronbach's $\alpha = .90$). Participants responded using a 7-point Likert scale, with higher scores indicating higher levels of the respective affective state.

Burnout was assessed with the 12-item short version of Burnout Assessment Tool (BAT - Schaufeli et al., 2020). The BAT includes four subscales: Emotional Exhaustion (Cronbach's $\alpha = .87$), Mental Distance (Cronbach's $\alpha = .60$), Cognitive Impairment (Cronbach's $\alpha = .75$), Emotional Impairment (Cronbach's $\alpha = .80$). All items were rated on a 5-point scale, from 1 = never to 5 = always (e.g.,

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Everything I do at work requires a great deal of effort). A higher score indicated a higher level of burnout-related symptoms.

Motivation was assessed using two subscales from the Multidimensional Work Motivation Scale (Gagné et al., 2014): Identified Regulation (Cronbach's $\alpha = .79$) and Intrinsic Motivation (Cronbach's $\alpha = .83$). Each subscale consisted of three items rated on a 5-point scale from 1 = strongly disagree to 5 = strongly agree. An example item for Identified Regulation is: Because putting efforts in this job aligns with my personal values, while an example item for

Intrinsic Motivation is: Because the work I do is interesting. Higher scores indicated a higher level of the respective motivational construct.

Procrastination was evaluated with the short version of the academic procrastination scale (Yockey, 2016), consisting of 5 items evaluated on a scale from 1 = strong agreement to 5 = strong disagree (e.g., I know I should work on schoolwork, but I just don't do it). Higher scores indicated a greater tendency to procrastinate over academic tasks. Cronbach's α value was .85.

Table 1. Interview questions categorized by thematic area of academic coping and learning strategies

Category	Question
Introduction and learning strategies	Q1. Let's start by learning a bit about how you prepared for the exam session. Based on your personal experience, in a few words, how did you prepare for the exams?
Negative aspects	Q2.1. What are the most difficult aspects of the exam session for you? Q2.2. What do you do specifically to try to overcome them? Q2.3. How do you manage to cope with stress during the exam session?
Positive aspects	Q3.1. Have you felt that your exam preparation strategies or the way you manage stress have changed when transitioning from high school to university? Q3.2. What are the qualities that you think help you the most in learning and preparing for exams?
Motivation and support	Q4.1. How do you motivate yourself to study and stay focused during the exam session, especially when it feels difficult? Q4.2. Have you ever asked for help or advice from professors or colleagues during the exam session?
Academic climate	Q5.1. How would you describe the usual mood of your university peers during the exam session? Q5.2. Have you ever used collaborative or group learning techniques?

Note. The questions were originally asked in Romanian and translated into English for reporting purposes.

Procedure

Following the initial quantitative phase, a qualitative component analysis was conducted using structured interviews. Participants became eligible for the second phase of data collection, consisting of an individual interview, after completing the online self-report questionnaire. Eligible students received a link to a scheduling platform (i.e., Doodle <https://doodle.com/en/>), allowing them to select a convenient date and time to participate. All interviews were conducted online, individually and in Romanian during the second semester of the academic year. All interviews were conducted by the same interviewer, a doctoral student. As they had no prior teaching or seminar-related contact with the participants, and were not previously known to them, the interviewer was able to occupy a neutral role in the interview context.

Participation in the study was voluntary and based on informed consent. Before completing the self-report questionnaire, participants were informed about the study and the conditions of participation. Before each interview, the study instructions were repeated, and participants were informed about the purpose of the audio recording, where the recordings would be stored, who would have access to them, and how they would be used for research purposes. Verbal consent for participation and audio recording was obtained before recording began.

Processing of recorded narratives

Each interview was audio-recorded within the participants' consent to ensure that all verbal content was

captured accurately for further analysis. The audio files were transcribed verbatim in Romanian using the speech-to-text platform SONIX (Sonix, n.d.), with each transcript afterwards reviewed manually to identify and to correct potential transcription errors, thus ensuring accuracy. Following transcription, a preprocessing phase was conducted to transform unstructured textual data into a cleaner and more structured format. Specifically, the preprocessing phase included tokenization of the text into individual words using the NLTK library (Bird et al., 2009), removal of punctuation, conversion of all characters to lowercase, and elimination of stopwords, which included both the standard NLTK English stopwords list and an extended custom list. These steps improved text uniformity and accuracy for the following analyses. Stemming or lemmatization was not applied, in order to preserve the natural word forms that could be relevant to the interpretation of students' narratives.

Latent Dirichlet Allocation (LDA) was the analytical tool used for extracting main themes from student responses, therefore aligning closely with the research objectives by identifying predominant strategies related to learning and stress management. By using an unsupervised clustering algorithm, LDA automatically identifies underlying themes or topics within textual data based on probabilistic associations of words within a given corpus (Xing et al., 2020). To facilitate this automated text analysis, student responses initially collected in Romanian were translated into English, enabling the use of more advanced and accessible computational resources for English-language NLP.

While this step was necessary from a methodological perspective, it is important to acknowledge that the translation process may have introduced subtle shifts in meaning of expression, particularly in segments of the narratives that are linguistically nuanced or depend on context. For the purposes of topic modeling, the LDA solution was specified with five topics ($K=5$). This choice is discussed in more detail in the Results section, alongside the model selection procedure. The five identified topics should not be confused with the five thematic sections of the interview guide, as they represent linguistic structures extracted from the full set of narratives. For each student narrative, LDA computed a probability distribution across the five identified topics, indicating the prevalence of each theme within the response. These scores were then used in quantitative analyses to examine their associations with psychological self-report measures.

The qualitative analysis of responses was conducted using two complementary methods: manual analysis and automated analysis using Latent Dirichlet Allocation (LDA). The manual analysis involved two evaluators independently reviewing the content, while the automated analysis leveraged text-processing applications. To facilitate the automated analysis, responses were translated into English, as the available analytical tools and computational methods are more advanced and accessible for English-language texts. By integrating these dual methods (manual categorization alongside automated topic modeling), we achieved a thorough and objective assessment of dominant themes present in students' responses.

Manual categorization was based on a codebook based on well-established theoretical constructs from educational sciences and psychological literature, including approaches to learning and behavioral coping strategies. Eight such categories were used to capture students' responses to academic stress: deep approach to learning, surface approach to learning, problem-focused coping, emotion-focused coping, avoidance, procrastination, social support, and substance use. The analysis of these eight categories captures the variety of students' coping strategies and learning behaviors in addressing academic stress and challenges. Manual categorization involved two independent raters who evaluated 875 student responses, assigning each response into one of the identified thematic categories. Manual coding was performed to classify the content of the responses qualitatively, rather than to score participants. As some responses were more detailed and reflected various aspects of learning and coping, one response could be associated with more than one thematic category. Therefore, depending on the content of their answers, individual students could be represented across multiple categories. The inter-rater reliability varied across categories, reflecting the complexity and subjective interpretation required. For instance, agreement rates ranged from moderate levels, such as 62.08% for Deep Learning Approach and 56.74% for Surface Learning, to high levels of agreement like 87.32% for Avoidance, and even perfect agreement (100%) for Procrastination and Substance Use categories. These rates highlight both the clarity and interpretative challenges inherent in categorizing diverse behavioral responses. While most narratives were successfully categorized, a few remained difficult due to their vague, overly general, or non-informative content. These responses typically lacked

specific behavioral or emotional content, and they did not reflect any identifiable strategies or attitudes towards learning. For example, some students offered vague statements like I just did my best, or It depends on my mood, which lacked the contextual or specific details for accurate classification. Although these kinds of narratives were few, they highlight the limitations of qualitative categorization when responses do not align with clearly specified patterns. However, the eight-category classification system was sufficiently reliable and comprehensive, capturing the majority of the data and reflecting a broad range of learning methods and behavioral coping strategies used by students.

Results

The Results section is structured to reflect the study's dual analytic approach, which combines qualitative and quantitative analyses. First, we present the results of the manual qualitative analysis, in which we categorized students' narratives into eight predefined categories of learning and behavioral coping strategies. This part includes descriptive examples, frequency distributions, and linguistic patterns associated with each category. Next, we provide results from the automated textual analysis using LDA. This included identifying five data-driven topics based on student responses, describing the thematic content of each topic, and reporting the most representative words. To facilitate interpretation, we also included visualizations, such as topic maps and wordclouds. Finally, we presented the quantitative integration, linking each topic's probabilistic distribution with the students' psychological self-reported scores through correlational analysis. This approach allowed for a more comprehensive interpretation of the psychological significance of students' discourse topics during their first exam session.

Qualitative Analysis of Responses

In our qualitative examination of students' responses, we searched for a diverse pattern of strategies for managing academic demands, varying from highly proactive and structured approaches to passive, avoidant behaviors such as procrastination. Based on the methods utilized by students, we outlined eight primary coping and learning strategy categories, ranging from highly constructive approaches to nonadaptive practices.

The first category included students' responses that indicated the use of a deep approach to learning. These students are intrinsically motivated and aim for a comprehensive understanding of course material by seeking detailed explanations and additional information sources, and by using cognitive techniques such as explaining concepts to others or themselves. For instance, one student mentioned, *I try to explain the information to someone else to ensure I understand it while another added, When I study neuropsychology, I look for additional information and explain things to myself, which helps me understand the material better.* For the deep approach of learning category, frequently occurring words included: *understand, deeply, logical, and associations*, with recurring expressions like *I try to explain it to someone else.*

Another category of responses suggested that some students used a surface approach to learning. Their primary goal was to learn just enough information to pass exams, often relying on rote memorization without

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engaging deeply with the material. One student shared: *My main strategy is studying on the last day*, while another said, *I isolate myself completely before the exam and cram as much as possible*. Such methods typically lead to short-term success but can negatively affect long-term knowledge retention and overall academic performance (Klapproth et al., 2016). In the surface learning category, common words included: *memorize*, *superficial*, *repeat*, and *fatigue*, accompanied by expressions such as *I isolated myself completely* or *I crammed quickly*.

A third category of students' strategies is to actively engage with academic challenges through structured time management and meticulous planning. These students used problem-focused coping strategies, prioritizing task organization and effective resource allocation. For instance, one participant described their method: *I create associations to better memorize content*, while another said, *I carefully plan and organize my schedule to cover all the topics*. This proactive approach significantly helps students to manage stress and to improve academic outcomes. In the problem-focused coping category, prominent terms included: *organize*, *planning*, and *time management*, with expressions such as *I structure my schedule*, being commonly cited.

In contrast, the emotion-focused coping category included responses in which students were primarily concerned with managing academic stress through relaxation, social interaction, or recreational activities. Participants in this group frequently mention taking breaks or engaging in calming activities, as evidenced by statements like, *I take regular breaks to relieve stress*, and *I spend time outdoors to calm down*. Although it is beneficial for short-term, reliance solely on these methods may prove ineffective for long-term academic success unless complemented by more proactive strategies. Emotion-focused coping strategies predominantly featured words like: *relaxation*, *stress*, and *break*, alongside statements like *I take breaks to manage stress*.

The avoidance category shows students who manage academic stress by avoiding tasks altogether and by choosing to engage in unrelated activities or social distractions. Such practices can lead to unresolved tasks accumulating overtime, thereby increasing anxiety levels. For example, a student explained, *Sometimes, I just avoid studying and prefer going out with friends*. This illustrates how avoidance often involves turning one's attention to unrelated activities or social interactions. While these behaviors may provide temporary relief, they indirectly contribute to unresolved academic tasks, which can increase stress over time. Words such as: *avoid*, *postpone*, and *escape* frequently appear in this category, often expressed as *I postpone tasks* or *I put off problems*.

Procrastination, another frequently reported behavior, can be understood as a specific form of avoidance, characterized by the intentional delay of academic tasks despite knowing the potential negative consequences. Students frequently reported behaviors such as, *I procrastinate starting my study sessions, which increases my stress*, and *It always feels easier after I finally begin*. These examples show how putting things off can make stress worse and cause panic when there's not much time left. Students often expressed procrastination with phrases like *I delay starting to today*.

Social support, by contrast, comes as an essential strategy that is significantly helping students' management

of academic stress and is enhancing learning outcomes. Students frequently mentioned receiving emotional support and academic assistance from peers, teachers, family, or friends. Typical responses included statements like, *I discuss challenging topics with classmates, which helps both of us*, and *During exam periods, explaining content to peers has helped solidify my own understanding*. Responses from the social support category commonly contained words like: *colleagues*, *help*, and *discussion*, illustrated by frequent mentions such as *study with peers* or *study group meetings*.

Finally, a smaller yet notable category involves substance use, predominantly caffeine and energy drinks, to cope with stress and maintain academic performance. As reported by students: *Coffee helps me stay focused, although I try not to overdo it*, and *In my first exam session, my coffee consumption became problematic, reaching seven cups per day*. Although these substances may provide immediate boosts to focus and productivity, excessive reliance can negatively affect health, induce dependency, and potentially diminish long-term academic effectiveness. Finally, the substance use category predominantly included references to: *coffee*, *energy drinks*, and phrases indicating high caffeine consumption. Additionally, a supplementary analysis involved identifying frequently occurring words and phrases within each thematic category. This additional lexical analysis intended to provide interpretative support for the manual categorization by identifying recurring words and phrases within each category. The analysis provided an additional basis for comparing categories based on theory with themes based on data, and for identifying areas of overlap between the two approaches.

Text Processing and LDA

We also used an unsupervised machine learning approach, Latent Dirichlet Allocation (LDA), in order to explore other linguistic patterns and dominant themes that may not align with predefined theoretical approaches. This computational method enables the data-driven identification of thematic patterns directly from students' own language, providing an additional source of insight in addition to the manual classification system. Prior to performing LDA modeling, we took several preprocessing steps to enhance model accuracy. These preprocessing procedures were important in ensuring that textual inputs aligned closely with model expectations, enhancing overall reliability and precision in the resulting topic extraction. In determining the optimal number of topics (K) most effectively capturing the central themes in student responses, we tested multiple LDA models with K values ranging from 2 to 12. The upper limit of 12 was chosen based on prior empirical recommendations for small to medium sized text corpora, as interpretability becomes difficult beyond this point (Greene et al., 2014). In the present study, this choice was also supported by the theoretical assumption that undergraduate narratives about academic stress and learning would not have an extremely complex thematic structure. The objective was to prevent overfitting while maintaining sufficient thematic specificity. We estimated log-likelihood values for each model and plotted them to assess model fit. Visual examination of the resulting plot (Figure 1), revealed that K=5 produced the highest log-likelihood value. This suggests that the corresponding model provided the most

balanced solution in terms of statistical fit and thematic clarity. For this reason, K=5 was selected as the optimal parameter for the LDA analysis.

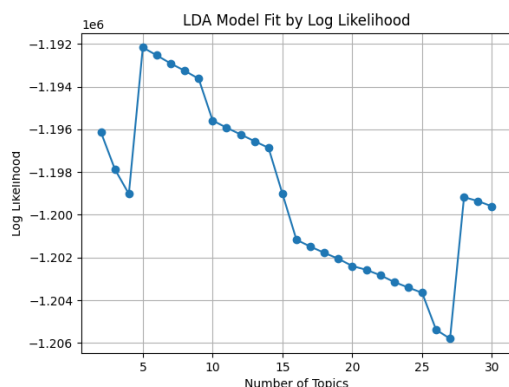


Figure 1. Log-Likelihood Scores for LDA Models With Varying Numbers of Topics

The implementation of Latent Dirichlet Allocation (LDA) generated five distinct topics, each of which summarizes a central theme in students' discourse related to academic coping and learning approaches. Each topic includes a set of words associated with specific probabilities or weights, reflecting their relative importance and representativeness within the respective theme. Through this approach, the most representative words for each theme were determined by their associated probabilities, facilitating a clearer interpretation of the

primary issues discussed by students. The following section presents the five identified topics along with their most representative words and respective weights.

In general, word probabilities above .015 are considered highly representative in small to medium corpora, such as the present one, when using LDA for topic modeling (*Choosing Words in a Topic*, 2016). However, the interpretive value lies more in the relative ranking of words within a topic (e.g., comparing .020 versus .008), than in absolute word probability thresholds alone (*Choosing Words in a Topic*, 2016). Table 2 presents the five topics identified through LDA modeling. The values in parentheses represent the probability weights assigned to each word within its respective topic, indicating how likely a word is to appear in that topic compared to other words in the model. Higher values suggest a stronger association with the topic's central theme (e.g., if *notes* has a probability of .020, and *reading* has .010 within the same topic, *notes* is considered more central to the topic's meaning).

In practice, researchers interpret topics by focusing on the words most strongly associated with the theme (Blei et al., 2003). They give more weight to the relative ranking of terms than to fixed probability cutoffs. These words, which are typically the top 10-15 per topic, constitute the semantic core that is used for interpretability because coherence among the top-ranked words often indicates meaningful thematic content (AlSumait et al., 2009).

Table 2. Topics Identified and Associated Word Probabilities using LDA

Topic	Representative words and probabilities
1	<i>notes</i> (.020), <i>trying</i> (.016), <i>remember</i> (.013), <i>thought</i> (.013), <i>break</i> (.012), <i>felt</i> (.012), <i>reading</i> (.010), <i>calm</i> (.010), <i>times</i> (.010)
2	<i>year</i> (.012), <i>focus</i> (.011), <i>felt</i> (.011), <i>phone</i> (.010), <i>course</i> (.010), <i>minutes</i> (.009), <i>comes</i> (.008), <i>different</i> (.007), <i>speak</i> (.007), <i>hour</i> (.007)
3	<i>come</i> (.012), <i>knew</i> (.011), <i>year</i> (.010), <i>trying</i> (.010), <i>need</i> (.008), <i>sleep</i> (.008), <i>head</i> (.008), <i>everyone</i> (.008), <i>find</i> (.008), <i>problem</i> (.007)
4	<i>sleep</i> (.019), <i>knew</i> (.011), <i>felt</i> (.009), <i>studying</i> (.009), <i>night</i> (.009), <i>thought</i> (.009), <i>stressful</i> (.009), <i>together</i> (.008), <i>calm</i> (.008), <i>remember</i> (.007)
5	<i>write</i> (.012), <i>look</i> (.010), <i>remember</i> (.009), <i>person</i> (.009), <i>point</i> (.009), <i>need</i> (.009), <i>talk</i> (.008), <i>people</i> (.007), <i>book</i> (.007), <i>important</i> (.007)

Note. Probabilities represent the relative importance (weight) of each word within each topic as determined by LDA analysis. Higher values indicate greater representativeness within the respective theme.

Topic 1 included words such as *notes* (0.020), *trying* (0.016), and *remember* (0.013). The prominence of words like *notes*, *remember*, and *reading* suggested a theme focused on strategies involving active engagement with the study material, possibly reflecting a structured and deliberate approach to learning, aimed at internalizing and comprehending academic content. Students whose responses were characterized by the linguistic patterns within Topic 1 were more likely to experience low-activation negative emotions, such as sadness or exhaustion, indicating a relationship between this topic and students' frequent expressions of challenging emotional experiences or reduced emotional control.

Topic 2 is characterized by words such as *focus*, *felt*, *phone*, and *minutes*, indicating a theme primarily concerned with concentration challenges and managing distractions. The inclusion of the word *phone* alongside expressions related to concentration highlights students' struggles to maintain sustained attention and manage external distractions during study sessions. This topic likely captures the interaction between technology use and attentional resources, emphasizing students' difficulties in maintaining focus during study periods.

Topic 3 predominantly includes terms like *problem*, *need*, *head*, and *everyone*, suggesting an importance on stress and problem-solving approaches. These terms could

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also indicate a recognition of commonly experienced stressors or academic challenges. This topic is about recognizing that stress and academic pressure are common experiences for many people. Students tend to express that these difficulties are not unique to them, which often leads to an awareness of the need for mutual or external support.

Topic 4 strongly highlights the theme of *sleep* alongside other relevant words such as *felt*, *studying*, *night*, and *tired*, clearly pointing toward the connection between rest patterns and academic experiences. The prominence of sleep-related terms within this topic underlines the importance students assign on managing rest and energy during demanding academic periods.

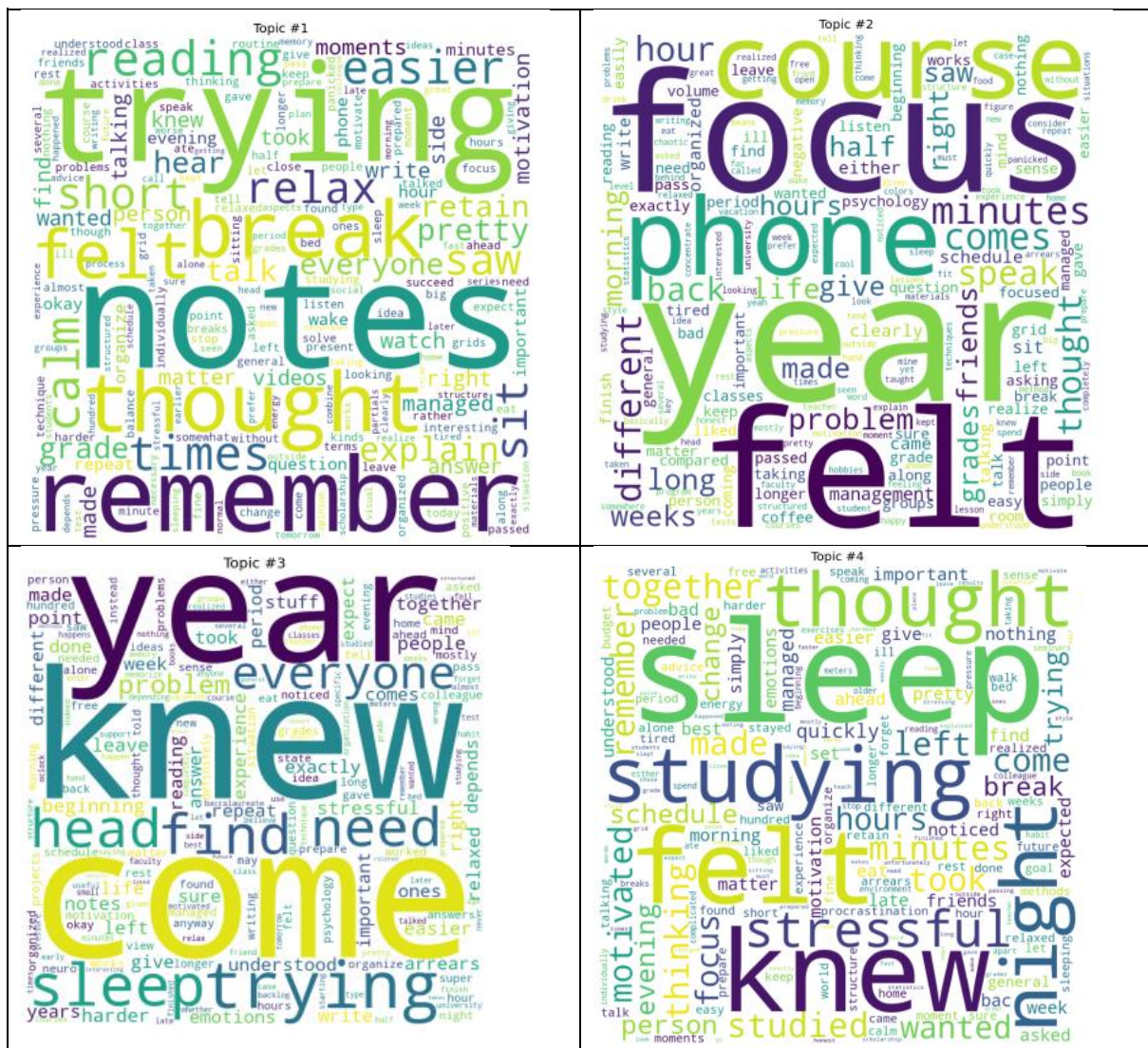
Topic 5 includes terms such as remember, person, point, book, and talk, reflecting themes around recall strategies and interpersonal interactions. The terms *talk*, *person*, and *people* suggest a strong emphasis on social interaction or communication-oriented coping strategies.

Each identified topic reveals distinct patterns in student responses, illustrating unique combinations of

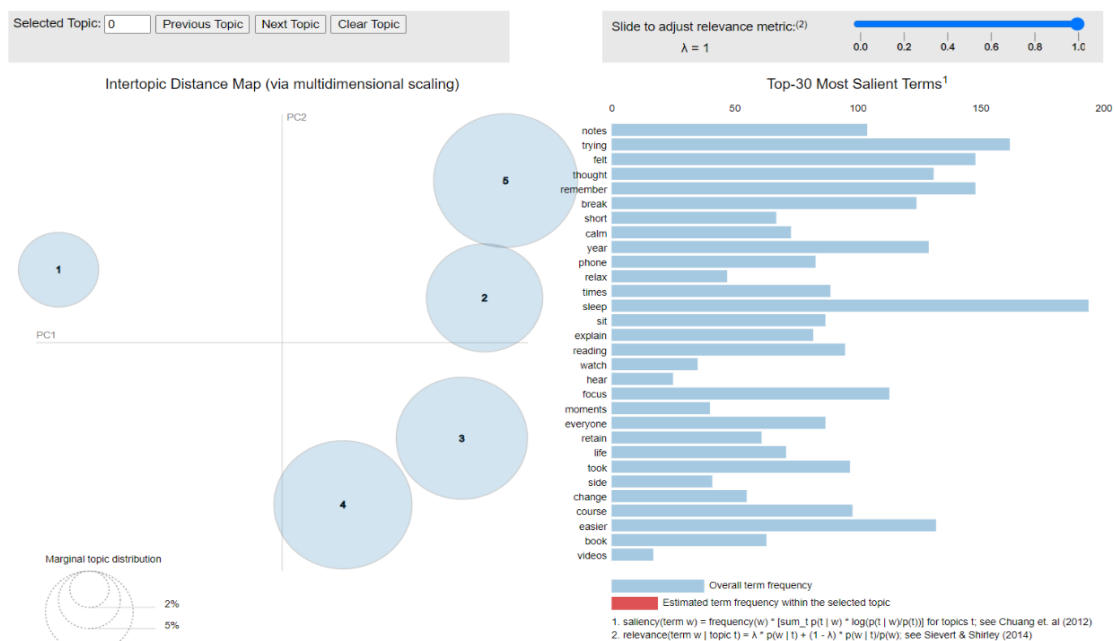
behavioral coping strategies and learning approaches. These topics do not perfectly fit into singular theoretical categories. For example, they might use cognitive structuring with emotional regulation. Or they might use social interaction with reflective learning. The probabilistic structure of LDA enabled the identification of these themes in an objective, data-driven method based on the natural linguistic patterns found in students' narratives. Collectively, these interpretations clarify the dominant themes present in students' responses, providing nuanced insights into how students approach learning and manage stress within the academic environment.

In addition to the topic interpretations, word clouds were created for each of the five LDA topics (see Figure 2). The most common terms associated with each topic are highlighted based on their frequency and their ability to differentiate between categories. Word clouds provide an immediate, visual interpretation of complex textual data, enabling quick identification of dominant themes and key linguistic patterns.

Figure 2. Word clouds illustrating the five topics identified through Latent Dirichlet Allocation (LDA).



This suggests that students who mention one theme are likely to mention aspects of the other as well. On the other hand, distant topics have fewer language parts and show more different or unrelated ideas.



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Figure 3 displays the distances between the topics. The topic that is both the largest and the most centrally positioned is Topic 5 (i.e., accent on social interaction and reflective coping). This means that it appears in the corpus most frequently and is conceptually connected to multiple other topics, especially Topic 2 (i.e., interference between technology use and focusing on studying). This central positioning suggests significant conceptual overlap or shared linguistic content between these topics. The central positioning for Topic 5 suggests that interpersonal reflection and communication-oriented coping do not occur independently of other aspects of academic adaptation, but alongside issues related to concentration, shared academic challenges and study-related exhaustion. This interpretation aligns with studies indicating that the adjustment of first-year students involves simultaneously

managing cognitive, emotional, and social demands rather than responding separately to individual stressors (Pittman & Richmond, 2008; Wolters & Brady, 2020). In contrast, Topic 1 (i.e., structured study behaviors and emotional regulation), appears smaller and relatively isolated, suggesting a more distinct thematic content with fewer overlaps, potentially highlighting unique or less commonly expressed themes.

This may indicate individualized or specific learning behaviours that are not widely represented by other students. Overall, this interactive map allows dynamic exploration of thematic content and detailed assessment of word relevance and frequency within each identified topic.

Further examination of these topics is facilitated by the interactive visualization provided in Figure 4.

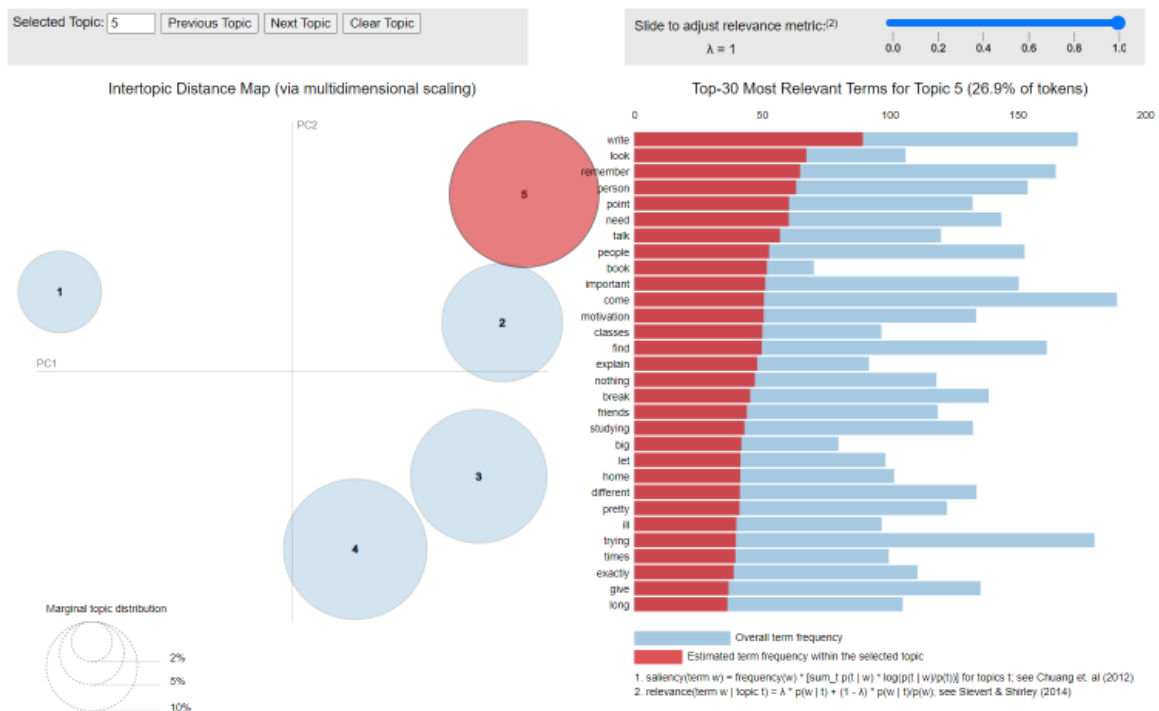


Figure 4. Intertopic Distance Map highlighting Topic 5 and displaying the most relevant terms associated with this topic

Figure 4 specifically highlights Topic 5 (i.e., accent on social interaction and reflective coping), to illustrate the analysis of relevant terms and the relationship between the identified themes. The right side provides a bar chart displaying the most relevant terms for this topic, determined by combining overall frequency with each term's ability to differentiate this topic from others. The top relevant terms within Topic 5 include words such as: *write*, *look*, *remember*, *person*, *point*, and *need*. The bars highlighted represent the relative relevance of these terms within the topic, whereas blue bars indicate their overall frequency across the entire corpus. From a topic modeling perspective, highly relevant terms contribute to the semantic foundation of a topic, making it interpretable by differentiating it from related thematic clusters (AlSumait et al., 2009). In the present study, terms such as *write*, *remember*, *person*, and *talk*, suggest that reflective processing may be important linguistic markers of how students express academic coping strategies in natural discourse. Terms such as *book* and *remember* suggest

strong educational and reflective components, accentuating interpersonal communication and reflection as key processes in academic engagement. Given Topic 5's proximity to Topic 2 (i.e., interference between technology use and focusing on studying), Topic 3 (i.e., shared experiences and challenges), and Topic 4 (i.e., sleep and intensive study routines), it likely shares thematic elements with these adjacent topics, although its relatively larger size denotes greater overall importance in students' linguistic expressions.

Correlates of LDA Topics

To explore the correlation between topics extracted via LDA and students' psychological characteristics, we examined the correlation between each topic's prevalence and self-report measure scores. We computed topic prevalence for each individual narrative in order to reflect the degree to which a specific topic was present in that response. Next, we used these topic probability scores as continuous variables in correlational analyses with

participants' self-reported levels of affect, burnout, motivation, and procrastination.

Adding to the qualitative thematic analysis, a quantitative analysis was performed using data obtained from several self-report measures. This enabled the examination of correlations between participants' scores and their topic association probabilities derived from the

LDA model. These self-report measures provided insight into participants' emotional states, motivational tendencies, and academic behaviors, enriching the understanding of the identified qualitative themes. The result of these correlations is summarized in Table 3, which presents the associations between topic prevalence and the measured psychological constructs.

Table 3. *Correlations Between LDA-Derived Topics and Psychological Variables*

	Emotional Exhaustion	Mental Distance	Cognitive Impairment	Emotional Impairment	HAUA	HAPA	LAUA	LAPA	Identified Regulation	Intrinsic Motivation	Procrastination
Topic 1	.072	.117	.046	.151*	.090	.020	.162*	.012	-.091	.006	-.036
Topic 2	-.096	-.132	-.106	-.141	-.216**	.038	-.193*	.150*	-.032	.019	.035
Topic 3	-.037	-.035	-.015	-.006	-.069	-.024	-.064	-.003	-.035	-.023	.030
Topic 4	-.017	-.009	.009	-.051	.099	.155*	.049	.013	.161*	.068	.052
Topic 5	.082	.069	.064	.065	.088	-.180*	.058	-.150*	-.032	-.067	-.084

Note. Topic 1 = Structured study behaviors and emotional regulation; Topic 2 = Interference between technology use and focusing on studying; Topic 3 = Shared experiences and challenges; Topic 4 = Sleep and intensive study routines; Topic 5 = Accent on social interaction and reflective coping, * $p < .05$, ** $p < .01$

For Topic 1 (i.e., structured study behaviors and emotional regulation), we identified a significant positive correlation with Low-Activation Unpleasant Affect (LAUA; $r = .162$, $p < .05$). Additionally, Topic 1 correlated positively and significantly with Emotional Impairment ($r = .151$, $p < .05$). In contrast, Topic 2 (i.e., interference between technology use and focusing on studying), showed significant negative correlations with High-activation unpleasant affect (HAUA; $r = -.216$, $p < .01$) and Low-activation unpleasant affect (LAUA; $r = -.193$, $p < .05$). Topic 3 (i.e., shared experiences and challenges), did not exhibit statistically significant correlations with any of the measured constructs. For Topic 4 (i.e., sleep and intensive study routines), significant positive correlations appeared with Identified Regulation ($r = .161$, $p < .05$) and High-activation pleasant affect (HAPA; $r = .155$, $p < .05$). Finally, Topic 5 (i.e., accent on social interaction and reflective coping), exhibited negative correlations with both Low-activation pleasant affect (LAPA; $r = -.150$, $p < .05$) and High-activation pleasant affect (HAPA; $r = -.180$, $p < .05$).

Discussion

This study aimed to explore the predominant learning strategies and coping behaviors students utilize in response to academic challenges, as revealed through both

qualitative and quantitative analyses. Using a dual-method approach (i.e., manual qualitative coding combined with automated linguistic analyses using LDA), we achieved a comprehensive understanding of how students manage academic demands. Moreover, by integrating these findings with validated self-report questionnaires measuring emotional and motivational variables, we provided deeper insights into the psychological dimensions underlying these strategies.

The manual qualitative analysis used eight primary categories to structure the diverse learning and coping strategies expressed by students. These categories were deep learning approach, surface learning approach, problem-focused coping, emotion-focused coping, avoidance, procrastination, social support, and substance use. These categories are based on well-established theoretical constructs from educational sciences and psychological literature, and were used to guide the thematic classification of student responses. The difference between deep and surface learning, first introduced by Marton and Säljö (1976), remains central to ongoing research in higher education, with recent studies highlighting its importance for the adaptation and performance of first-year students (Diseth, 2011). In a similar vein, coping strategies, such as problem-focused and emotion-focused coping, are still widely used among

student populations, as demonstrated by recent studies on academic stress and well-being (Lari et al., 2025; MacCann et al., 2010). Studies have consistently identified avoidance and procrastination as problematic academic coping strategies, associating them with lower performance and higher stress levels (Steel & Klingsieck, 2016). Furthermore, social support and substance use are consistently included in contemporary coping frameworks. Empirical studies indicate that these factors play a protective role in response to academic pressure (Bewick et al., 2010).

These perspectives all suggest that existing theoretical perspectives on learning approaches and coping strategies offer a valuable framework for organizing and interpreting students' experiences. As the manual coding framework was theory-informed from the beginning, it is not surprising that the resulting categories correspond with existing constructs from educational psychology. However, more meaningfully, the fact that most narratives could be successfully and clearly categorized suggests that these theoretical frameworks continue to offer a useful way of organizing and interpreting students' narratives of adapting to academic life and managing stress. Several responses revealed themes and nuances that fall outside these models. This highlights the importance of exploring students' perspectives without restricting them to predefined theoretical categories. For instance, students referred to substance use (e.g., drinking coffee or energy drinks to stay focused) and technology-related distractions (e.g., having difficulty maintaining attention due to phone use), which are not explicitly addressed in traditional theories, but came up as significant elements in their narratives. This suggests that, although existing theories offer valuable insights, they do not fully capture the diversity and complexity of first-year students' experiences with academic pressure.

Although most responses could be successfully categorized, a small number could not be reliably classified to any category. These included brief or vague responses that often lacked behavioral details or emotional content (e.g. *I just did what I had to do*, or *It was okay, I managed*). Such narratives did not offer enough context to be classified. Their presence highlights that not all students verbally express their coping strategies in clearly defined language and suggests the value of using methods like LDA to identify nuanced linguistic patterns in addition to categorical approaches.

The most frequently mentioned strategies were deep learning, problem-focused coping, social support, and procrastination. This suggests that students commonly oscillate between highly proactive and passive approaches, depending on contextual factors or personal tendencies. The LDA analysis completed findings by identifying five distinct linguistic topics in our students' answers, and each topic reflected various patterns in how students describe their academic and emotional adaptation. Notably, learning approaches and coping

strategies did not appear as distinct categories but frequently overlapped within the same patterns. This indicates that students naturally integrate cognitive, emotional, and behavioral aspects when discussing their academic experiences rather than referring to learning and coping as separate categories. As manual coding and LDA are based on different analytical principles, it was not considered likely that they would be directly comparable. Manual coding involves applying specific, theory-based categories to the data, while LDA generates probabilistic topic structures based on recurring linguistic co-occurrences. Therefore, the comparison between the two approaches aimed to identify thematic overlaps and differences at an interpretative level rather than exact correspondence at category level.

The most prevalent and conceptually central theme was Topic 5, which focused on social interaction and reflective coping strategies. The linguistic analysis of this topic suggests that students often expressed their academic experiences through references to dialogue and reflection. However, Topic 5 was negatively correlated with both low-activation and high-activation pleasant affects (LAPA and HAPA, respectively), indicating that a greater prevalence of this discourse pattern was associated with lower levels of calm and energized positive emotions. While this result may initially seem contradictory, there are several possible explanations. One possibility is that during examination periods, interpersonal interaction may not always have a positive impact, but may also involve negative thoughts, mutual worry, or the sharing of academic dissatisfaction, all of which can reduce positive emotions even when students remain socially engaged. Another possibility is that students experiencing lower levels of positive affect may be more likely to seek reflective or interpersonal forms of coping because they are struggling to manage their academic stress internally. This suggests that the association may be a way of compensating for others rather than being a sign of a problem. This interpretation is consistent with previous studies indicating that social and emotional adaptation during university exam periods is complex and not always positive. For example, examination stress has been associated with changes in social behavior and reduced well-being among student groups (Koudela-Hamila et al., 2022). Meanwhile, other studies on the adjustments of first-year students suggest that their emotional experiences are closely shaped by the quality and nature of their social interactions during transition periods (Pittman & Richmond, 2008). Given the exploratory nature of the present findings, these interpretations should be viewed as potential explanations for further investigation.

The second most important theme was Topic 1 (i.e., structured study behaviors and emotional regulation). It combined elements of deep learning approach, including active recall, explanation, and note-taking, as well as emotion-focused coping strategies, such as deliberate attempts to manage anxiety or remain calm. Students

described how structuring and rehearsing study material helped them feel more in control of academic pressure, indicating a combination of cognitive engagement and emotional regulation. This output may suggest that students using structured learning methods and emotional regulation strategies are simultaneously experiencing and actively managing lower-energy negative affective states. Topic 3 (i.e., shared experiences and challenges), reflected students' awareness of personal challenges and resilience in navigating academic demands. Interestingly, Topic 3 did not yield any statistically significant correlations with the measured psychological variables, suggesting that this topic represents patterns or behaviors that are either unrelated or only minimally associated with the emotional or motivational variables examined through the self-report measures. This absence of correlation indicates the presence of potential nuances or distinct experiences that may not be fully captured by standardized measures. Further exploration through in-depth qualitative interviews or alternative psychometric assessments may be necessary to understand these nuances. For example, the exploration of students' self-narratives about academic identity, perceived control, or implicit beliefs regarding learning effort and success.

Topic 4 which focused on sleep and intense study routines, was positively correlated with identified regulation and high-activation pleasant affects. This suggests that students whose narratives included intensive study, such as studying late into the night, were also more likely to report goal-directed motivation and positive states such as enthusiasm and engagement. One possible interpretation is that the topic captures a form of academically driven coping, in which students remain highly motivated and committed to their academic goals, even when their study routines become demanding or potentially unsustainable. This suggests that when students are highly engaged with their studies, they may be less likely to experience restless sleep and more likely to feel positive. This interpretation is consistent with literature suggesting that self-regulated academic effort and goal orientation can coexist with increased activation during demanding study periods (Gagné et al., 2014). However, the presence of sleep-related language also indicates that such engagement may carry self-regulatory consequences. Therefore, the present findings should be understood as reflecting a mode of academic adaptation that is motivated but potentially exhausting, and not indicating that intensive or night-time studying is universally beneficial.

Finally, Topic 2, which focused on difficulties with concentration and how technology use interferes with studying, negatively correlated with both high-activation unpleasant affects (e.g., anxiety, anger) and low-activation pleasant affects (e.g., relaxation, contentment). This suggests that students whose narratives focused on distraction and difficulty maintaining focus, experienced lower levels of both negative and positive affect. One possible interpretation is that this discourse pattern

reflects a form of attentional disengagement, whereby students are less likely to experience calm engagement with their academic work, rather than being emotionally overwhelmed. In this sense, the topic may capture a state of general involvement with studying, where there is less intense distress, but reduced emotional clarity. This interpretation is supported by previous literature showing that students' time management and self-regulated learning are closely associated with attentional control and managing external distractions, particularly during demanding academic periods (Wolters & Brady, 2020). The study has shown that technology-related distraction can interfere with concentration and academic engagement, even when it is not accompanied by intense distress (Lepp et al., 2013). Overall, the quantitative findings significantly extend and support our qualitative analyses, providing robust empirical support for understanding the psychological and emotional aspects of students' learning behaviors and coping strategies. By correlating automated linguistic analyses with psychological self-report measures, this study provides an integrative, multidimensional perspective on how first-year students manage academic stress. These findings are of considerable significance for both educational research and practical interventions designed to improve student well-being and academic adjustment.

Limitations and Future Research

Despite the advancement to our understanding of academic coping strategies and emotional responses, it is essential to acknowledge the limitations of this study. First, the sample was constrained to 175 first-year psychology undergraduate students from a single faculty. This limitation restricts the generalizability of the findings, as students from different academic backgrounds may face distinct learning demands and stressors, resulting in a need for different coping strategies. For instance, Medicine students may be required to memorise large amounts of information and take frequent, high-pressure exams, whereas Law students may be expected to demonstrate their ability to argue, interpret and produce analytically structured responses. In contrast, Mathematics students may face more problem-solving evaluations that require abstract reasoning and accuracy in procedures. These faculty-specific contexts may influence not only academic expectations, but also learning and coping strategies that students adopt during exam periods (Smarandache et al., 2021). In addition, the significant gender imbalance in the sample should be taken into consideration when interpreting the affective correlates of the identified topics, since gender differences in emotional reporting could have affected some of the reported associations. Future research would benefit from including students from multiple faculties to examine whether the thematic structures identified here remain stable across different academic contexts.

Secondly, the cross-sectional nature of the data means that it is not possible to make causal inferences or

assess the development of coping strategies over time. Moreover, the narratives were collected after the examination session, meaning they reflected the students' retrospective experiences. This is a significant limitation because retrospective reporting can reduce the accuracy, specificity, or detail of participants' narratives. Despite this, the interview guide was designed to facilitate recall of their preparation, stress management, and academic experiences during the examination period.

Another limitation is that learning strategies and behavioral coping responses might vary considerably depending on the nature of the subject matter or the particular characteristics of the examination. For example, the preparation for a statistics examination may necessitate a different set of cognitive and emotional demands compared to studying for an epistemology exam. For this reason, future research would benefit from longitudinal designs that capture changes in strategy use in different contexts over time, including before, during, and after crucial academic milestones.

An additional methodological limitation is the translation of the students' narratives from Romanian to English before the LDA analytics. While the step was necessary to enable the use of more advanced and accessible NLP tools, the translation process may have altered the subtle semantic, contextual or linguistic nuances of the original responses. Consequently, some nuances in students' natural expression may not have been fully preserved in the analysed corpus. Future research could address this issue by using computational tools developed for Romanian text, or by comparing analysis of both the original and the translated versions of the narratives.

Lastly, from a methodological point of view, the improvement of computational approaches, such as natural language processing and Latent Dirichlet Allocation, is important for psychological and educational research. One way to improve this would be to analyse narratives in their original language whenever sufficiently advanced tools are available, in order to capture semantic and contextual nuances more effectively. Another improvement would be to combine topic modelling with more context-sensitive methods or stronger cross-checking against qualitative coding and external psychological variables, to improve both interpretability and thematic precision. This could help researchers to more accurately identify different forms of academic coping and learning discourse, while also making text analysis more useful for studying how students adapt.

Practical Implications for Educational Research and Interventions

From a practice-based perspective, the present findings suggest that students' narratives during their first examination session reflect a combination of adaptive and less adaptive patterns of academic coping. Alongside themes related to deep learning, problem-focused coping and social support, the data included references to

procrastination, avoidance, difficulty concentrating and substance-related coping strategies. One possible implication of this is that universities could benefit from supporting students in developing more structured self-regulatory and behavioral coping strategies during the early stages of their academic transition. This support could focus on time management, maintaining study routines and constructive peer support, while taking into consideration the exploratory nature of the present findings.

As the present findings are based on students' own narrative descriptions, they suggest that academic coping is often expressed in everyday, practical language. This creates an opportunity for student support initiatives to be designed in a way that is more closely aligned with how students naturally describe academic stress, difficulty concentrating, and interpersonal coping strategies. However, these implications should be interpreted with caution, as the present study did not assess the effectiveness of specific interventions.

Additionally, Topic 3, which reflected shared experiences and academic challenges, suggests that students often framed stress in ways that acknowledged its collective and socially anchored nature. This may indicate that peer dialogue and shared reflection are meaningful ways for some students to process academic demands. In this sense, first-year support initiatives that encourage structured peer interaction, or guided discussion of academic challenges, could be a promising approach.

The thematic patterns identified in Topic 2 also suggest possible practical applications for interventions addressing attentional regulation and technology-related distraction. As this topic focused on difficulties with concentration and interference from phone use or fragmented attention, universities could benefit from providing support relating to digital self-regulation, distraction management and sustainable study routines during the early stages of the academic transition period. Existing literature indicates that such interventions are beneficial for students, particularly with regard to attention, multitasking, and study-related self-regulation (Wolters & Brady, 2020).

Similarly, the frequent occurrence of content related to procrastination and avoidance in the manually coded narratives suggests that some students described their academic coping strategies as involving delay, disengagement, or difficulty initiating tasks. This highlights the potential usefulness of early support initiatives focused on planning, task initiation and self-monitoring, particularly during the first university examination period when stable routines are still being developed. Previous studies indicate that interventions targeting time management and procrastination may be beneficial in university contexts (Häfner et al., 2014; Van Eerde & Klingsieck, 2018). However, the present findings should be interpreted as suggesting possible support strategies rather than as evidence of the effectiveness of interventions.

Finally, the present study also suggests that narrative-based approaches may provide valuable additional information for identifying students' stress-related concerns. As the analyses identified themes concerning distraction, fatigue, interpersonal coping and academic pressure in the students' own discourse, future educational research could benefit from examining how text-based reflections could supplement traditional assessments of student adaptation. Therefore, regularly collected narrative material could provide a more context-sensitive understanding of early academic stress. Further validation of such approaches is necessary before they can inform practice directly.

Conclusion

In conclusion, this study demonstrated that a combination of qualitative thematic analysis, computational linguistic modeling, and quantitative measures offers a more comprehensive and detailed understanding of how first-year university students experience and cope with academic stress. This integrative methodological approach improves our understanding of students' academic transitions, particularly by highlighting the connections between language use and behavioral coping strategies.

Ultimately, our findings provide a data-driven understanding of early academic adjustments, opening promising opportunities for future NLP applications in psychological and educational research.

Conflict of interest: The authors report no potential conflict of interest.

Ethical Approval: The study was conducted in accordance with the World Medical Association Helsinki declaration. No ethical board approval was required because of the minimal risk nature of the study.

Consent to participate: Each participant granted their own informed consent to participate.

Funding: This research was supported by internal funding awarded by the Faculty of Sociology and Psychology at the West University of Timișoara, following the internal competition for young researcher projects (Hotărârea Consiliului Facultății nr. 4/29.03.2024). The authors are grateful for the support received throughout the development and implementation of the study.

Data availability statement: Data supporting this study is available upon request from the corresponding author.

Author contributions

Eusebiu Ștefancu: Conceptualization, Data collection, Data analysis, Writing – Original draft preparation.

Laurentiu Maricuțoiu: Conceptualization, Data analysis, Writing – Final draft preparation.

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