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Blended Learning Challenges and the Contribution of Self-Regulated Learning to Health Care Students' Resilience: A Cross-Sectional Study

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ABSTRACT

Health science students face significant challenges in post-COVID-19 learning, including time management difficulties, technological adaptation, and academic pressure. Blended learning, now a standard model in health education, demands strong self-regulated learning (SRL) and resilience for academic success and well-being. This cross-sectional study investigated the relationship between SRL and academic resilience (ARS) among 302 undergraduate students from various health disciplines at Universitas Brawijaya. Data were collected using validated instruments: the Self-Regulation for Learning Questionnaire and the Academic Resilience Scale (ARS-30). Descriptive statistics and Pearson correlation analysis were used to analyze the data. Findings revealed that 68.5% of students exhibited high SRL, and 68.9% demonstrated high ARS. The correlation analysis showed a statistically significant moderate positive relationship between SRL and ARS ($r = 0.477$, $p < 0.001$). Students with higher levels of self-regulation were more likely to demonstrate greater resilience in navigating academic challenges within the blended learning environment. The results underscore the critical role of SRL in fostering academic resilience among healthcare students. These findings suggest that targeted strategies to enhance SRL—such as goal setting, time management training, and reflective practices—can improve students' ability to adapt and persist in blended learning contexts. Educational institutions should implement structured learning support and psychological resilience programs to support student success.

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1. INTRODUCTION

Blended learning, which combines online and in-person teaching techniques, provides students with flexibility and a more engaging learning experience (Posey & Pintz, 2017). During the COVID-19 pandemic, this evolution further accelerated, prompting institutions to adopt blended models as a permanent fixture in higher education (Rafi et al., 2022). Recent models of blended learning emphasize pedagogical integration, where online and offline components are intentionally designed to

complement each other, rather than function independently (Practices & Aravind, 2024). Blended learning, according to Cronje (2020), blended learning is more than just integrating online and offline instruction, it thoughtfully incorporates educational philosophies such as constructivism, behaviorism, and cognitivism to create a meaningful learning experience. In healthcare education, blended learning addresses challenges related to time management and enhances clinical reasoning and critical thinking skills (Rowe et al., 2012). Studies have shown that this method effectively improves the clinical skills of both students and practitioners (Saber et al., 2022). The flexibility of blended learning allows students to access materials on demand and learn at their own pace (Leinster et al., 2021). By integrating theoretical knowledge with practical applications through online simulations and digital tools, blended learning strengthens critical thinking and clinical competency (Petty, 2013). Post COVID-19 pandemic, blended learning has become a common approach, requiring further research to assess its impact on student focus and attention across different learning areas (G. Esternon et al., 2023; Iqbal et al., 2022). Yang et al. (2023) emphasize that well-designed blended learning fosters student independence, which is crucial for healthcare professionals in clinical settings.

Within this learning model, Self-Regulated Learning (SRL) is a key component for academic success. SRL enables students to set goals, monitor their progress, and reflect on their achievements (Yan, 2020). Coffman & Taber (2024) outline several SRL dimensions, including motivation, time management, behavioral self-monitoring, and effective use of social and physical environments. In medical studies, SRL plays a critical role in developing essential skills such as critical thinking, time management, and problem-solving, which are vital for academic success and clinical practice (Yang et al., 2023). Moreover, SRL is essential for coping with demanding schedules and adapting to complex learning environments (Petty, 2013). Studies have shown that SRL also contributes to sustained engagement and higher performance in health-related disciplines such as nursing, medicine, and pharmacy (Balakrishnan et al., 2021; Ballouk et al., 2022).

SRL is also closely linked to resilience and mindful agency. Resilience helps students manage academic pressures and environmental challenges, enhancing motivation and adaptability in learning (Ching et al., 2020). In higher education, resilience is a multifaceted construct shaped by personal attributes, social support systems, and institutional frameworks that enable students to overcome obstacles and achieve academic success (Ang et al., 2021). In healthcare education, resilience allows students to navigate academic, clinical, and emotional challenges, fostering continuous growth (Abram & Jacobowitz, 2021). It manifests in the ability to recover from setbacks, maintain focus, and stay motivated even in adversity (Abram & Jacobowitz, 2021). Resilience enables learners to handle difficulties effectively, sustain motivation, and maintain a positive attitude, thereby enhancing clinical adaptability and quality care (Donnellan et al., 2024). Mindful agency, characterized by emotional regulation and focused attention, further strengthens resilience by reducing anxiety and increasing engagement with challenging tasks (Kakoschke et al., 2021).

Although Self-Regulated Learning (SRL) and academic resilience have been widely explored as separate constructs in higher education, limited research has focused on how these two elements interact, particularly within blended learning settings in healthcare education. Most existing studies tend to isolate SRL and resilience, overlooking the potential influence of self-regulation in strengthening students' capacity to cope with academic challenges. This oversight is critical, given that blended learning demands both strategic learning behaviors and emotional adaptability. Thus, the present study aims to examine the connection between SRL and academic resilience among undergraduate healthcare students engaged in blended learning. Understanding this relationship may guide the development of targeted interventions that support student performance and psychological well-being in increasingly blended learning environments.

While blended learning, SRL, and resilience have been widely studied as separate topics, little research has explored how SRL and resilience interact within the context of blended learning for healthcare students. There is limited empirical evidence examining how SRL may actively foster resilience, particularly within blended learning environments that require students to manage complex

academic and technological challenges. This issue is especially critical in health-related program, where students are regularly exposed to high academic loads, emotional pressure, and the fast-paced nature of clinical training. With blended learning now firmly established as a post-pandemic educational model, it is increasingly important to understand how SRL can enhance students' capacity to adapt and thrive. To bridge this gap, this study examines the role of SRL in fostering resilience among healthcare students in blended learning settings. The findings are intended to inform the development of targeted educational strategies that reinforce both self-regulated learning and resilience, supporting academic achievement and student well-being in blended learning contexts.

2. METHODS

2.1. Study approach

This study adopts a cross-sectional design to explore the challenges of blended learning and the influence of SRL in building resilience (ARS) among healthcare students. By gathering data at a single point in time, this approach allows for the examination of correlations between this two variables (Hamaker, 2022). However, it is essential to acknowledge that cross-sectional study cannot establish causality, as it lacks the ability to determine the temporal order or direction of the relationships observed.

2.2. Place and time of research

This study was conducted at the Faculty of Medicine and the Faculty of Health Sciences at Universitas Brawijaya. The study took place over two months, specifically in January and February 2025.

2.3. Population and sample

This study involved health sciences students at Universitas Brawijaya, with a total of 302 participants selected through purposive sampling. Respondents were selected based on specific criteria, including being regular undergraduate medicine, nursing, midwifery, pharmacy, and nutrition students, having already participated or currently participating in blended learning as part of their educational process, being willing to take part in the study. While purposive sampling ensures the selection of participants relevant to the study objectives, it also carries a risk of selection bias, which may affect the broader applicability of the results.

2.4. Ethical consideration

This study received ethical approval from the Ethics Committee of the Faculty of Health Sciences, Universitas Brawijaya, and was conducted in accordance with ethical principles.

2.5. Data collection

This study utilized the Self-Regulation for Learning (SRL) Questionnaire developed by Broadbent et al. (2023) to evaluate key components of self-regulated learning, such as self-efficacy (e.g., "I am confident in my capacity to manage and direct my own learning in a blended learning setting"), intrinsic and extrinsic motivation, effort regulation, planning, time management, metacognition, study environment, and task strategies. To assess academic resilience, the study employed the Academic Resilience Scale (ARS-30), adapted from Cassidy (2016). This scale provides a context-specific measure of students' cognitive, emotional, and behavioral responses to academic challenges. The ARS-30 includes representative items such as "I reflect on my strengths and weaknesses to enhance my academic performance", and is structured around three main domain such as perseverance, emotional regulation, and adaptive help-seeking. For this study, the instrument was also translated and culturally

adapted for use in the Indonesian educational setting, with careful attention to linguistic clarity and conceptual alignment through expert evaluation.

The validity and reliability of the SRL Questionnaire were assessed. Most items showed significantly and positively correlations ($p < 0.05$), supporting the instrument's construct validity, such as SRL1 ($r = 0{,}821$, $p < 0.001$) and SRL3 ($r = 0.926$, $p < 0.001$), suggesting strong alignment with the overall construct of SRL. Internal consistency demonstrated excellent reliability with a Cronbach's alpha ($\alpha > 0.9$), with strong sub-scale consistency ($\alpha = 0.95$). Similarly, the ARS showed significant correlations with the total score (up to $r = 0.887$, $p < 0{,}01$)) and high reliability ($\alpha = 0.902$), confirming its validity and internal consistency. Missing data were minimal (< 5%) and were addressed using listwise deletion to maintain the integrity of the statistical analysis.

2.6. Data analysis

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize the data, while Pearson's correlation analysis measured relationships between variables.

3. FINDINGS AND DISCUSSION

The demographic distribution of participants indicates that most students are in their sixth semester. This suggests that the majority of respondents are in the early to mid-stages of their studies. In terms of age, the largest proportion of students are 20 years old, followed by 21-year-olds, with a smaller percentage being 18 years old. Academically, most students have a GPA between 3.5 and 4.0, followed by those in the 3.0–3.5 range, while a smaller portion have a GPA below 3.0 (Table 1).

Table 1. Profile of participants

Category	Subcategory	N= 302	Percentage (%)
Semester	1st Semester	42	13.76%
	2nd Semester	49	16.11%
	3rd Semester	19	6.38%
	4th Semester	44	14.77%
	5th Semester	36	12.08%
	6th Semester	107	35.23%
	7th Semester	2	0.67%
	8th Semester	3	1.01%
Age	18 years	45	14.89%
	19 years	54	17.89%
	20 years	112	37.08%
	21 years	71	23.51%
	22 years	20	6.62%
Gender	Male	49	16.23%
	Female	253	83.77%
GPA	3.0 - 3.5	115	38.12%
	3.5 - 4.0	130	43.05%
	Below 3.0	57	18.83%

The findings show that most students demonstrate strong self-regulated learning skills and high levels of academic resilience (Table 2). Specifically, more than two-thirds of the participants demonstrate strong self-regulation in their learning processes, while a similar proportion show high resilience in academic challenges. Meanwhile, a smaller group of students falls into the moderate category for both variables.

Table 2. Distribution of SRL and academic resilience results.

Variable	Category	N=302	Percentage (%)
Self-Regulated Learning (SRL)	High (1)	207	68.5%
	Moderate (2)	95	31.5%
	Total	**302**	**100.0%**
Resilience (ARS)	High (1)	208	68.9%
	Moderate (2)	94	31.1%
	Total	**302**	**100.0%**

Descriptive analysis showed that students reported relatively high level of Self-Regulated Learning (SRL) and academic resilience (ARS). The mean SRL score was 4.12 with a standard deviation (SD) of 0.56, while the mean ARS score was 4.09 with a SD of 0.60, indicating that most participants demonstrated strong Self-Regulated Learning and resilience within the blended learning environment (Table 3).

Table 3. Descriptive Statistics of SRL and ARS Scores (N = 302).

Variable	Mean (M)	Standard Deviation (SD)	Interpretation
Self-Regulated Learning (SRL)	4.12	0.56	High level of Self-Regulated Learning
Resilience (ARS)	4.09	0.60	High level of Resilience

The analysis revealed a clear pattern indicating that students with higher academic performance tend to exhibit stronger Self-Regulated Learning (SRL) and academic resilience (ARS) (Table 4). These findings suggest a positive association between students' academic achievement and their ability to self-regulate and remain resilient in the face of academic challenges. It implies that as students' GPA increases, so does their capacity for self-directed learning and effective coping strategies in blended learning environments.

Table 4. SRL and ARS Scores Based on GPA Categories (N = 302).

GPA Category	SRL (M)	SRL (SD)	ARS (M)	ARS (SD)
3.5 – 4.0	4.23	0.51	4.21	0.55
3.0 – 3.5	4.05	0.58	4.01	0.61
Below 3.0	3.89	0.63	3.76	0.65

M (Mean), SD (Standard Deviation)

Gender-based analysis indicated that female students reported marginally higher levels of self-regulated learning (SRL) and academic resilience (ARS) compared to male students (Table 5). While these differences were modest, the pattern is consistent with previous findings suggesting that female learners in health education may demonstrate greater self-regulation and emotional resilience. This could be attributed to variations in learning strategies, stress management techniques, or motivational factors between genders in blended learning environment.

Table 5. Mean Scores of SRL and ARS by Gender.

Gender	N=302	SRL – Mean (SD)	ARS – Mean (SD)
Female	253	4.14 (0.55)	4.10 (0.59)
Male	49	4.03 (0.58)	4.02 (0.62)

The analysis identified a significant positive relationship between Self-Regulated Learning and Academic Resilience ($r = 0.477$, $p < 0.001$). This finding indicates that students with stronger SRL skills

are more likely to demonstrate higher resilience in academic environments. The correlation coefficient indicates a moderate relationship (Table 6).

Table 6. Correlation test between SRL and resilience.

Variable	N	Pearson Correlation (r)	Sig. (2-tailed)
Self-Regulated Learning (SRL)	302	1.000	0.000*
Resilience (ARS)		0.477	

***p < 0.01**, indicating a significant correlation

From a practical standpoint, the correlation value (r = 0.477) represents a moderate effect size, as outlined by Cohen (1988), where values near 0.3 are considered small, 0.5 moderate, and 0.7 large. This finding suggests that roughly 23% of the variation in academic resilience can be explained by students' levels of self-regulated learning (r^2 = 0.227). Within the demanding context of health education, this level of association is considered meaningful, as it may contribute to students' abilities to persist academically, manage emotional stress, and prepare effectively for future professional challenges.

3.1. Self-regulated learning (SLR) among healthcare students

For blended learning to be effective, students require strong self-regulation skills, similar to other learning approaches (Van Laer & Elen, 2019). The integration of technology in education not only promotes independent learning but also fosters collaboration and a supportive learning environment (Jansen et al., 2020). To maximize the benefits of blended learning, healthcare students must develop metacognitive skills and self-regulated learning (SRL) strategies to effectively manage their learning outside the classroom. Wang et al. (2023) highlight that SRL behaviors, such as strategic planning and goal setting, play a significant role in academic performance.

Findings indicate that most students exhibit strong SRL skills, reinforcing the idea that self-regulation is essential for academic success in healthcare education. SRL has been widely recognized as a key factor in student achievement across nursing, medicine, pharmacy, and other health-related disciplines. Specifically, SRL enhances problem-solving abilities, improves academic performance, and prepares students for their professional roles. According to Hwang & Oh (2021), RL is closely linked to problem-solving skills, with academic self-efficacy and self-regulation acting as mediators. These findings align with this perspective, as students with high SRL scores also reported better problem-solving capabilities in academic tasks.

Self-regulated learning (SRL) is particularly crucial in medical education, especially within blended learning environments. Studies by Ballouk et al. (2022) suggest that blended learning fosters SRL by increasing flexibility, motivation, and resource management skills. These studies emphasize the importance of instructional scaffolding and instructor support in developing SRL among medical students. Similarly, in pharmacy education, SRL has been associated with improved academic performance. Balakrishnan et al. (2021) found that blended learning enhances SRL strategies, including rehearsal, elaboration, organization, and critical thinking. These findings align with the present study, which indicates that students in blended learning environments tend to adopt more effective SRL strategies, ultimately leading to greater academic success.

Beyond specific disciplines, SRL practices among undergraduate healthcare students involve goal setting, performance monitoring, and self-reflection. Chitra et al. (2022) explored SRL strategies and found that students actively engage in time management, resource selection, and self-assessment. Our study corroborates these findings, as participants who reported high SRL levels demonstrated strong time management and resource utilization skills. In addition, the COVID-19 pandemic has affected learning patterns considerably, and students have been forced to adjust their approaches due to the increased reliance on online learning.

3.2. Resilience among healthcare students

Blended learning requires the learner to be independent in coordinating learning, i.e., active participation in web-based forums, completion of assignments individually, posing questions independently, etc. Vineesha et al. (2024) identified that more resilient students would score less on the stress scale and achieve better results on the academic front. Here in this study, using the ARS-30 questionnaire, most of the subjects were high on resilience, especially in areas of perseverance, emotional regulation, and adaptive help-seeking. These subdomains represent core academic coping strategies such as goal setting, staying motivated under stress, and responding constructively to feedback that support persistence and academic success. This aligns with previous research showing that resilience helps students manage academic pressure and maintain focus on learning goals.

Healthcare students experience significantly higher stress levels than those in other academic disciplines, which can lead to difficulties in concentration, sleep disturbances, and anxiety. However, resilience helps mitigate these effects. (Orines et al., 2023) found that stress negatively correlates with resilience, influencing students' quality of life, motivation, and persistence. This research verifies this, as resilient students were more likely to view academic challenges as opportunities and not as barriers. Their commitment to working harder and striving for academic improvement is a goal-setting strategy that ensures resistance to setbacks. Resilient students are also growth-minded since they perceive challenges as temporary and overcome, knowing that diligent work and problem-solving skillfully can lead to success.

This adaptability is crucial in the ever-changing medical practice environment, where professionals are continually honing their skills to handle complex medical cases. Furthermore, specific academic and professional objectives aid students in being motivated even when faced with tough circumstances (Orines et al., 2023). From this study, it was found that resilient students initiate setting their own academic goals and self-motivating for achievement, allowing for long-term commitment to education.

Resilience in health students is not just a personal quality but rather an active process shaped by numerous factors. Donnellan et al (2024) introduced the Model of Resilience, where resilience is described as a multidimensional construct with intrapersonal, interpersonal, and socio-ecological components. The model differentiates resilience into three sub-components: internal resilience (personal traits, psychological well-being, and emotional regulation), coping strategies (problem-solving ability, stress management, and adaptive learning strategies), and external resilience (social support systems and institutional resources). These results match this model because students who were high in resilience also endorsed good personal coping strategies and good learning environments.

3.3. The relationship between SRL and resilience

Self-regulated learning (SRL) and resilience are largely dependent on one another, each being an invaluable resource for coping and managing stress. Failure to learn has been identified as one of the best predictors of resilience, which skill SRL positively supports through its reinforcement processes (Zhang et al., 2022). Resilience is analogous to self-regulation. Resilience represents the expression of a person's ability to navigate chronic stress, adversity, or even trauma.

The findings reveal that students with higher GPAs tend to exhibit greater levels of self-regulated learning (SRL) and academic resilience (ARS), indicating more developed skills in self-management and coping with academic challenges. Conversely, students with lower GPAs displayed reduced SRL and ARS scores, suggesting that deficiencies in these areas may contribute to poorer academic performance. Moreover, the data show that female students slightly outperformed their male peers in both SRL and ARS, which may be attributed to more effective emotional control and active engagement in learning. This points to the need for gender-responsive educational support, with particular focus on fostering self-regulation and resilience among male students in blended learning contexts.

The observed positive correlation between Self-Regulated Learning (SRL) and academic resilience supports Zimmerman's cyclical model of SRL, which involves three key phases, forethought (including goal-setting and strategic planning), performance (such as self-monitoring and execution), and self-reflection (Figure 1). Students who actively apply this process tend to manage academic demands more effectively by maintaining motivation and employing flexible learning strategies. Complementing this, Fredrickson's broaden-and-build theory of positive emotions explains how resilient individuals, by cultivating optimism and emotional regulation, can expand their cognitive resources and develop adaptive capacities over time. In this context, resilience enhances SRL by enabling students to remain focused, manage stress, and persist in achieving academic goals, particularly in the dynamic setting of blended learning.

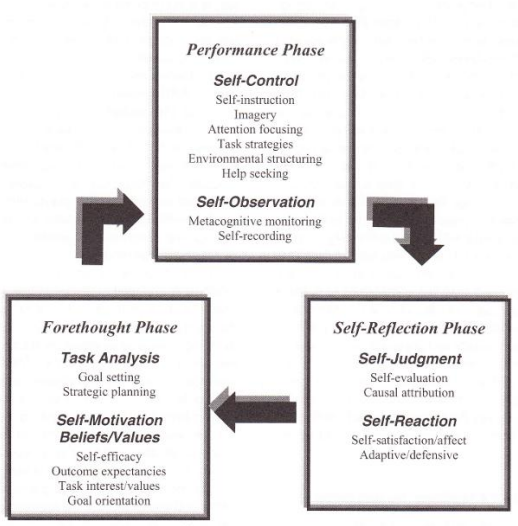

Figure 1. SRL phase and subprocess cycle model
Adapted from (Zimmerman, 2013)

Besides SRL and resilience, several other factors influence a learner's ability to control their learning. Grit, for instance, facilitates perseverance, allowing students to stay committed to their goals despite challenges. Personal motivation and social support in clinical settings during medical education can both enhance SRL, making students more adaptive and motivated. In addition, properly structured clinical clerkships present an external system of support that helps students develop their self-regulation strategies and improve their hands-on skills within authentic settings (Artuch-Garde et al., 2017; L. Wang, 2021).

This findings suggests that although a majority of students demonstrated strong SRL and resilience, a significant portion still face challenges in effectively managing their learning processes and coping with academic pressures. Several underlying factors may contribute to this outcome. First, differences in academic level may play a role, students in earlier semesters are generally less experienced in managing independent learning and adjusting to the demands of blended learning environments. Without sufficient exposure to clinical experiences or structured self-directed learning, their SRL and resilience skills may remain underdeveloped. Second, the availability and effectiveness of academic and psychosocial support systems can significantly influence students' ability to self-regulate and remain resilient. According to Donnellan et al. (2024) resilience framework, students benefit from not only personal traits and coping strategies but also institutional and social support. Students with moderate scores may lack access to such support structures. Third, differences in learning styles and adaptability to blended learning may affect students' ability to self-regulate and remain resilient. Difficulties with time management, motivation, or digital engagement along with

lower levels of grit, self-efficacy, or emotional regulation can hinder their progress. Additionally, external factors such as limited family support or financial stress may impact academic persistence.

This findings are consistent with prior studies that highlight the role of SRL in supporting academic success and emotional regulation in health education (Ballouk et al., 2022; Chitra et al., 2022). However, some research suggests the relationship may be bidirectional resilience can also predict SRL. For instance, Yang et al. (2023) reported that psychological resilience and mindful agency significantly influenced SRL among postgraduate nursing students. Additionally, other studies argue that resilience may develop through external factors, such as social support and learning context, rather than SRL alone (Artuch-Garde et al., 2017). This implies a complex interplay between SRL and resilience, shaped by both personal and environmental influences.

While this study confirms a direct association between self-regulated learning (SRL) and resilience, the underlying mechanisms may involve more complex and nuanced pathways. Future research should consider examining mediation or moderation models to further elucidate this relationship. Specifically, grit—characterized by perseverance and passion for long-term goals—may serve as a mediator by translating sustained self-regulatory behavior into adaptive responses under stress. Alternatively, intrinsic motivation could function as a moderator, enhancing the impact of SRL on resilience among students who are more internally driven.

3.4. Limitation of the study

The sample used in this study consists of just chosen faculties from a single institution, Universitas Brawijaya using purposive sampling, which can limit the generalizability of findings. Future research should apply a larger set of faculties and institutions so that representativeness is improved. Despite these limitations, the present study delivers useful data about self-regulated learning and resilience in blended learning environments. Data collection relied entirely on self-report questionnaires, which introduces the possibility of common method bias and social desirability bias, where participants may have overestimated their SRL or resilience due to self-perception or the desire to respond in a socially favorable way. Future research should consider using multiple data sources such as observations or academic records to enhance validity and minimize bias.

4. CONCLUSION

The findings of this study emphasize the significant role of self-regulated learning (SRL) and academic resilience (ARS) in supporting academic success among healthcare students in blended learning environments. A positive moderate correlation between SRL and ARS suggests that students with stronger self-regulation skills are more resilient in managing academic challenges. These results align with existing resilience theories, which highlight the interaction between personal capacities, social support, and institutional resources. However, this study is limited by its cross-sectional design, which prevents causal interpretation, and by the use of purposive sampling within a single institution, limiting the generalizability of the results. Additionally, reliance on self-report questionnaires may introduce bias. Future research should explore longitudinal designs to examine changes over time and investigate causal pathways between SRL and resilience. It is also recommended that future studies include diverse institutions and objective performance measures to validate these findings further. Educational stakeholders are encouraged to integrate SRL-focused strategies—such as goal-setting, metacognitive training, and reflection—into curriculum design, and to implement resilience-building programs through student support services. These combined efforts can better equip healthcare students with the adaptability and persistence required for academic and professional success.

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