



Exploring students' approach to learning tendencies among prospective biology teachers across years of study

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ABSTRACT

Students' Approaches to Learning (SAL) are widely recognized as critical determinants of educational quality and academic success. Despite their importance, empirical understanding of how students, particularly those in teacher education programs, adopt and develop these approaches remains limited. This study aims to investigate the learning approach tendencies among prospective biology teachers across different academic years. A total of 57 participants voluntarily participated in the study, comprising 24 first-year, 17 second year, and 16 third-year students enrolled in a biology teacher education program. The research employed a quantitative methodology to examine students' preferences across four dimensions of learning approaches: deep motive (DM), deep strategy (DS), surface motive (SM), and surface strategy (SS). The findings indicate that third-year students exhibited a greater tendency toward deep learning approaches (DM and DS), suggesting a more intrinsic motivation and strategic engagement with learning materials. Conversely, first- and second-year students demonstrated a preference for surface learning approaches (SM and SS), which are typically associated with extrinsic motivation and superficial engagement. However, statistical analysis revealed that these differences were not significant, indicating that the year of study does not exert a substantial influence on the adoption of learning approaches. These results underscore the complexity of learning approach development and suggest that factors beyond academic progression may play a more pivotal role. Further research incorporating larger sample sizes and mixed method is recommended to elucidate the underlying mechanisms that shape students' learning approach preferences over time.

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INTRODUCTION

One of the central challenges in contemporary higher education is preparing students to become lifelong learners equipped with essential skills such as critical thinking, problem-solving, and adaptability (Asikainen & Gijbels, 2017; Dolmans et al., 2016). In response, institutions are continuously refining pedagogical strategies to enhance learning outcomes and graduate competencies (Parpala et al., 2022). Among these strategies, Students' Approaches to Learning (SAL) have emerged as a significant framework for understanding and improving the quality of educational experiences (Zain et al., 2013).

SAL originally conceptualized by Marton and Säljö, SAL is broadly categorized into two approaches: deep and surface approach (Gamage et al., 2021; Lindblom-Ylänne et al., 2019; Negash et al., 2022; Puteh et al., 2018; Rollnick et al., 2008); it refers to the motivation, strategy or approach used by learners to achieve maximum learning outcomes (Du et al., 2019; Negash et al., 2022; Villalobos Díaz et al., 2024; Ziaei et al., 2021). Students adopting a surface approach tend to focus on memorization and reproduction of information, often driven by extrinsic motivations such as passing exams. This approach typically results in fragmented knowledge and limited long-term retention. In contrast, the deep approach is characterized by intrinsic motivation, critical engagement with content, and the integration of new knowledge with prior understanding, fostering meaningful learning and reflective thinking (Brown et al., 2015; Du et al., 2019; Kok et al., 2024; Obadeji et al., 2023; Smarandache et al., 2022; Villalobos Díaz et al., 2024).

Building on Marton and Säljö's work, Biggs expanded the SAL framework by introducing strategic components, distinguishing between surface and deep strategies (Clack & Dommett, 2021; Puteh et al., 2018). The deep approach involves deep strategies and motives, while the surface approach involves surface strategies and motives. Meanwhile, the achievement subscale consists of achievement strategies and motives (Gamage et al., 2021). Surface strategy is defined as rote learning or memorizing learning material. In other words, when learners adopt a surface strategy, the goal is to memorize or recall information without understanding its meaning. This is different from a deep strategy, which is learning to make meaning. When learners adopt a deep strategy, they focus on understanding what they are learning and forming meaning from the various information and materials they are studying (Chiou et al., 2013; Hattie & Donoghue, 2016; Isik et al., 2018). Meanwhile, deep motives are related to internal motivation, while surface motives are similar to external motivation (Chiou et al., 2013; Yang et al., 2019).

The significance of SAL in shaping educational outcomes has made it a central theme in contemporary educational theory, practice, and research (Clack & Dommett, 2021; Lindblom-Ylänne et al., 2019). Empirical studies have revealed varied outcomes across different populations and contexts. For instance, learning approaches have been linked to self-directed learning (Barros et al., 2013), interest and motivation (Smarandache et al., 2022), and academic performance (Negash et al., 2022; Puteh et al., 2018). These mixed findings reflect the complexity and contextual sensitivity of SAL research, highlighting the need for localized investigations that consider institutional, cultural, and curricular factors.

In the context of Universitas Pendidikan Mandalika, Indonesia, there is a noticeable gap in research concerning the learning approaches adopted by prospective teacher students. This gap is significant, as prospective teachers' learning approaches may influence not only their academic success but also their future teaching practices and ability to foster deep learning in their students. Recent literature highlights the need for innovative strategies in biology education that promote cognitive, social, and emotional competencies, yet few studies have directly examined SAL within this context. Therefore, this study aims to investigate the learning approach tendencies among prospective biology teachers across different academic years. By examining the tendency of SAL adoption among prospective teachers, this study will provide theoretical contributions to SAL, offer basic data for future SAL-related research, and offer insights into how teacher education programs can better support the development of effective learning approaches. To achieve these aims, the study is guided by the following research questions: (1) What learning approaches do prospective biology teachers tend to adopt? (2) Do prospective biology teachers' learning approaches differ based on their year of study?

METHODS

Research Design

This study adopted a descriptive-quantitative approach to analyze trends in the learning approaches used by prospective biology teachers. It specifically focused on identifying the dominant types of learning approaches adopted by these prospective teachers and investigating whether there were variations in their learning approach patterns based on their year of study.

Population and Samples

A total of 80 prospective biology teacher students were actively registered at Universitas Pendidikan Mandalika, Indonesia in the 2024/2025 academic year. This cohort, aged 18 to 23 years, comprised 75% female and 25% male students. The prospective biology teacher students participated in this study voluntarily. Of the 80 students, 62 returned the questionnaires, comprising 24 first-year students, 17 second-year students, 16 third-year students, and 5 fourth-year students. Due to the small number of participating fourth-year students, they were excluded from the analysis. Similarly, students who did not return the questionnaires were also excluded. Thus, the total number of participants in this study was 57.

Instrument

The SAL measurement used in this study is an adoption from the Study Process Questionnaire (SPQ) developed by Biggs. The SPQ encompasses two main approaches: the deep approach (deep strategies and deep motives) and the surface approach (surface strategies and surface motives). Each subscale consists of five statements.

The SPQ and its derivatives (such as the SPQ-2F) are well-validated instruments across a variety of educational settings, contexts, and cultures. Adopting established and validated instruments offers several advantages, such as saving time and resources needed to develop new instruments and scales and increasing the credibility of research results, as the psychometric properties of the measuring instrument (reliability and validity) are already known and accepted within the academic community, eliminating the need to measure its validity. Rather, the results obtained serve as evidence of its reliability. In essence, the SPQ provides a validated and theoretically grounded method for categorizing and measuring the fundamental ways in which students interact with their learning materials.

However, adjustments were made in this adoption, limited to sentence construction. This was done so that respondents or participants could easily understand each statement, and participants responded to each statement using a 4-choice Likert scale. For example, the deep motive subscale (*I spend a lot of time finding out more about the topics discussed in lectures*); deep strategy (*in understanding lecture material and new ideas, I often relate them to practical or real-life contexts*); surface motive (*the lecture material I study is not related to everyday life*); and surface strategy (*whatever the lecturer explains during lectures, I simply accept without question*).

Procedure

Participants were informed two days before the distribution of the questionnaire. They had the option to complete it either on campus or at home. For those who chose to complete the questionnaire at home, it was mandatory to return it no later than three days after its receipt.

Data Analysis Techniques

Descriptive statistical analyses were conducted, encompassing the calculation of means and standard deviations for each subscale, to elucidate the general tendencies in respondents' learning approaches. Subsequently, to address the second research question, a non-parametric Kruskal-Wallis test was employed at a 0.05 significance level. The choice of statistical test technique is due to the relatively small number of samples and refers to the nature of the data being analyzed.

RESULTS AND DISCUSSION

Table 1 summarizes the mean scores for each SAL subscale across years of study. Second-year students reported the highest mean score on the DS subscale (14.41), whereas third-year students achieved the highest mean score on the DM subscale (15.12). Although these differences exist, they are relatively minor, suggesting that the scores are broadly comparable and form an almost linear trend (Figure 1). This pattern may indicate that both decision-making and decision strategies remain relatively stable as students' progress through their academic years, with only slight variations in emphasis.

In contrast, the SM and SS subscales display a downward trajectory. First-year students recorded the highest mean scores for both subscales (12.88 and 12.58), while third-year students reported the lowest (12.56 and 11.44). This gradual decline may reflect increased familiarity with academic demands or a shift toward more autonomous learning strategies. While the decline is not significant, the trend line shows a subtle but consistent decline (Figure 1).

Table 1

Descriptive Statistics of Learning Approach Sub-scales by Year of Study

SAL sub-scale	Year of study	n	Mean	Str. deviation
Deep Strategy	1st year	24	14.33	1.09
	2nd year	17	14.41	2.81
	3rd year	16	14.37	1.75
Deep Motive	1st year	24	14.71	1.76
	2nd year	17	14.76	2.54
	3rd year	16	15.13	1.89
Surface Strategy	1st year	24	12.88	1.62
	2nd year	17	12.77	3.09
	3rd year	16	12.56	1.71
Surface Motive	1st year	24	12.58	2.06
	2nd year	17	12.53	2.09
	3rd year	16	11.44	1.67

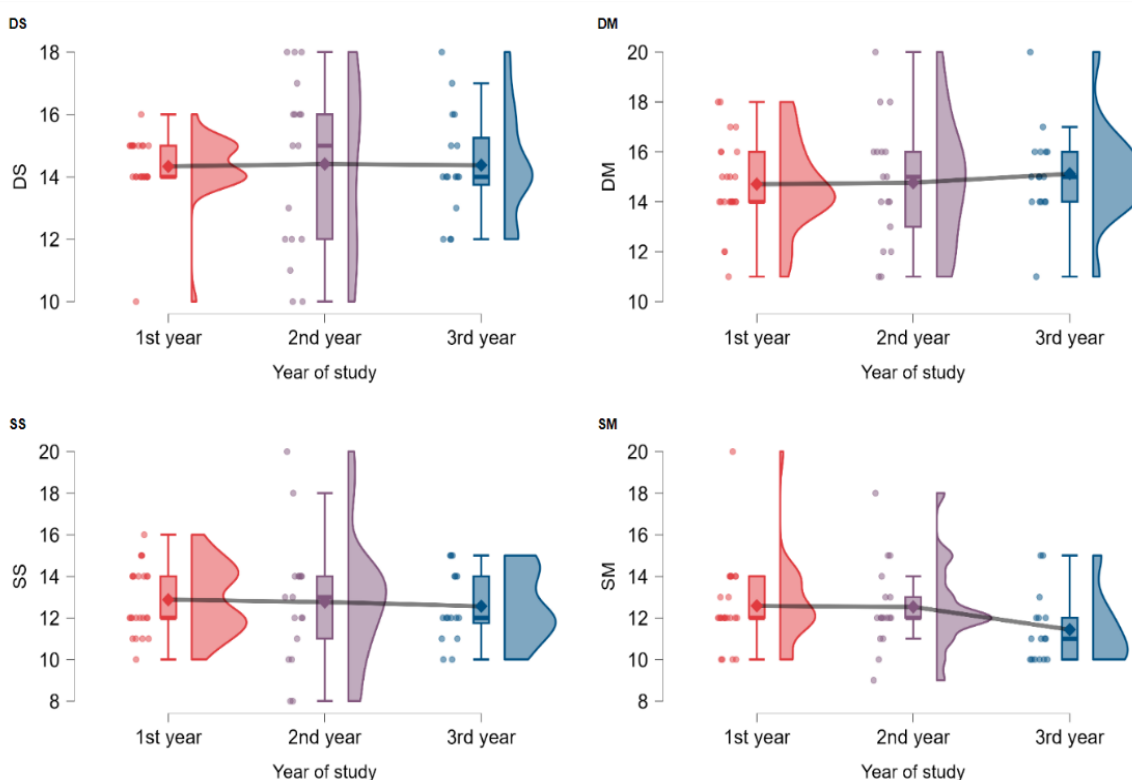


Figure 1. Distribution of SAL Scores by Year of Study

This can be seen in Figure 2, where some third-year students tend to choose a deep learning approach (DM and DS), while first- and second-year students tend to adopt a surface approach (SM and SS). However, overall, the adoption of learning approaches based on the year of study did not show a significant difference, where the score of DS = 0.418; $p = 0.812$; DM = 0.531; $p = 0.767$; SS = 0.308; $p = 0.857$; and SM = 5.186; $p = 0.075$ (Table 2).

Table 2

Kruskal-Wallis Test for Student Learning Approach by Year of Study

Statistical testing	Deep Strategy	Deep Motive	Surface Strategy	Surface Motive
Kruskal-Wallis H	0.418	0.531	0.308	5.186
df	2	2	2	2
Asymp. Sig.	0.812	0.767	0.857	0.075

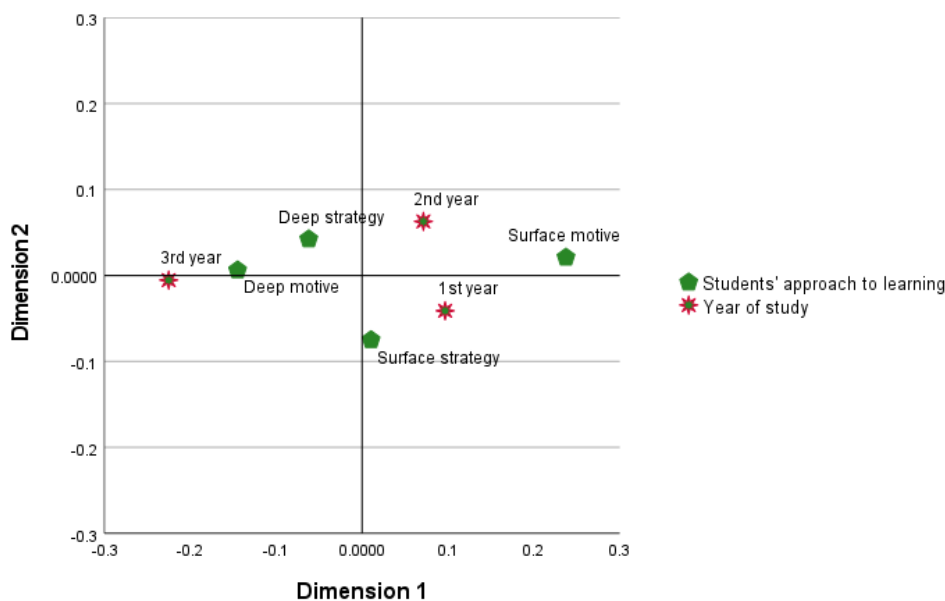


Figure 2. SAL Adoption Trends by Year of Study

Our findings align with previous studies by Mirghani et al. (2014), and Alsayed et al. (2020), which reported no significant differences in students' approaches to learning (SAL) based on gender and year of study. However, contrasting evidence exists. Barros et al. (2013) observed that students often avoid deep learning approaches Chong Teoh (2015) and Chonkar et al. (2018) found that social science and medical students tend to adopt deep and strategic approaches.

In this study, a distinctive pattern emerged: first- and second-year students predominantly used surface approaches (SM and SS), whereas some third-year students adopted deep approaches (DM and DS). This tendency among early-year students likely reflects prior schooling habits, where memorization is emphasized (Mirghani et al., 2014). Conversely, third-year students may shift toward deep learning due to two factors: some students naturally prefer deep approaches, and advanced coursework involves complex tasks requiring higher-order thinking (McDaniel et al., 2022). This is influenced by the learning context (including teaching strategies and assessment practices) (Chong Teoh, 2015; Duff et al., 2004).

As we know, prospective biology teachers face two primary tasks: achieving a solid understanding of biological concepts and developing pedagogical skills to support their future careers. Inquiry-based and problem-based learning (PBL) methods can foster a deep approach by emphasizing how scientific knowledge is constructed (Avraam et al., 2025; Dolmans et al., 2016). PBL not only influences learning approaches but also shapes students' beliefs about learning (Schumacher & Wilde, 2021). Thus, our findings suggest that rote-focused instruction persists, limiting opportunities for in-depth learning. While factual knowledge is necessary, it must be complemented by critical thinking to foster intellectual maturity. However, PBL is not a guaranteed solution. Its inherent complexity and contextual nature can overwhelm students, leading to stress (Smarandache et al., 2022; Smith et al., 2022). To mitigate this, PBL should begin with well-structured problems before progressing to open-ended tasks (Akçay, 2009). A carefully designed teaching program is essential for successful implementation (Smith et al., 2022).

In addition, several experts state that the assessment process is a significant factor that influences the use of learning approaches (Gijbels et al., 2005). It is understandable given that lecturers' assessments are often limited to factual knowledge, leading students to rely on a surface-based approach (Dolmans et al., 2016). In other words, the conditions they face remain the same throughout their studies, and lecturers' assessments are limited to memorization, leading them to use a surface-

based approach, regardless of their year of study (Negash et al., 2022). In addition, assessments that do not encourage students to take responsibility for their learning thus hinder the development of deep learning approaches (McDaniel et al., 2022; Xie et al., 2022). Ultimately, this creates an initial impression among students about the assessment they will receive; they tend to estimate their grades based on their lecturers' assessments. As a result, they tend to use surface learning approaches, such as memorizing or ignoring lecture material. Research shows that medical students can complete assignments under high assessment demands (Dolmans et al., 2016). If the assessment is high demand (focused on understanding and thinking processes), they tend to use a deep approach (Xie et al., 2022). Therefore, to help students develop their learning approaches, the assessment process must focus on high-demand assessments to encourage responsibility for their learning (Du et al., 2019).

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that there is no significant adoption of differences in learning approaches between academic years. This is due to the continued existence of learning practices that focus on memorization and assessment. It should be noted that this study was limited to a sample drawn from biology education majors only, thus limiting generalizability. Therefore, further research should be conducted by combining a larger sample size with mixed methods to explain the underlying mechanisms that shape students' learning approach preferences over time. The development of students' learning approaches is not only influenced by factors related to themselves, such as their interests, motivations, and habits during school, but more than that, the tendency to adopt learning approaches is more influenced by the learning context (teaching strategies and assessment practices). Related to this, going forward, lecturers are expected to design learning that encourages students to develop their own learning approaches by using inquiry or PBL in stages, starting with structured problems to reduce cognitive load. In addition, assessment practices are shifting from fact-based evaluations to highly demanding assessments that require analysis and synthesis, or assessments with high demands. Thus, students are expected to be responsible for their own learning process, which will ultimately build and shape their beliefs about how they should learn.

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