European Online Journal of Natural and Social Sciences 2025; www.european-science.com
Vol.14, No 4 pp.267-277
ISSN 1805-3602

Exploring Students' Learning Motivation and Motivational Strategies in Engineering Mechanics Education

Jibo Wang*, Qiuyue Fan
College of Physics and Mechanical & Electrical Engineering, Longyan University,
Longyan 364012, China
*Email: wjb@lyun.edu.cn

Received for publication: 20 July 2025.
Accepted for publication: 28 October 2025.

Abstract

This study aims to explore the current status of students' learning motivation and corresponding motivational strategies in the Engineering Mechanics course. A total of 114 students majoring in Mechanical Design and Manufacturing at a university in Fujian Province, China, participated in the study. Based on educational psychology theories, a self-designed questionnaire was used to measure learning motivation across three dimensions: cognitive drive, self-enhancement drive, and affiliative/auxiliary learning drive. Results indicated that students scored highly on all three dimensions, demonstrating strong interest in course content, a pronounced desire for self-improvement, and good team collaboration awareness. The differences among the dimensions were minimal, suggesting a balanced and coordinated motivational structure. Gender analysis showed that male students scored slightly higher than females, but differences were not statistically significant, indicating a limited effect of gender on learning motivation. Grade-level analysis revealed no significant differences across years, suggesting that learning motivation remained relatively stable throughout different academic stages. Correlation analysis demonstrated strong positive relationships among the three dimensions, indicating that cognitive interest, self-enhancement needs, and collaborative tendencies mutually reinforce one another to form a coherent motivational system. Based on these findings, pedagogical strategies are proposed: enhancing cognitive drive through contextualized case studies and inquiry-based tasks; strengthening self-enhancement drive via goal setting, tiered tasks, and positive feedback; and improving affiliative/auxiliary learning drive through group collaboration, classroom interaction, and performance presentations. This study provides empirical evidence and practical guidance for teaching design and learning motivation enhancement in foundational engineering courses.

Keywords: learning motivation, engineering mechanics, intrinsic motivation, motivational strategies

Introduction

Engineering Mechanics is a fundamental course that students in engineering disciplines must master, providing theoretical support and methodological tools for subsequent specialized courses and engineering practice. In fields such as mechanical, civil, and materials engineering, the basic theories and analytical methods of engineering mechanics serve as an essential foundation for students' engineering design, mechanical analysis, and innovative practice (Froyd, Wankat, & Smith, 2012; Sheppard et al., 2009). However, in actual teaching practice, students often perceive engineering mechanics as abstract and difficult to understand, which can lead to insufficient learning engagement and low learning motivation.

Recent studies indicate that students' learning motivation in foundational engineering courses is often dominated by extrinsic factors, with intrinsic motivation being relatively insufficient. For example, Robinson et al. (2022) found that in introductory engineering courses, students' expectations of success and perceived task value tend to decline as the course progresses, although instructional support can buffer this decline. Wang, Dai, and Short (2024) reported that different types of learning motivation—whether intrinsic, extrinsic, or task-value driven—have significant effects on students' academic performance and learning outcomes. In online or blended learning environments, student engagement is significantly mediated by their success expectations and task-value beliefs (Vo & Ho, 2024). These findings suggest that learning motivation is a dynamic, multidimensional construct that directly influences learning effectiveness in engineering courses.

This study is grounded in multiple educational psychology theories to construct its research framework. First, Maslow's hierarchy of needs theory posits that individuals' learning motivation originates from different levels of needs, including higher-level needs such as cognitive needs and self-actualization (Maslow, 1943). Second, Ausubel's theory of intrinsic motivation components emphasizes that learning motivation can be divided into three aspects: cognitive drive, self-enhancement drive, and affiliative learning drive (Ausubel, 1968). Additionally, self-determination theory highlights the facilitative role of autonomy, competence, and relatedness in promoting intrinsic motivation (Deci & Ryan, 1985, 2000), while expectancy-value theory suggests that students' learning motivation is jointly determined by success expectations and the perceived value of learning tasks (Wigfield & Eccles, 2000). Based on these theoretical perspectives, this study aims to investigate the current status of students' learning motivation in engineering mechanics courses, analyze influencing factors, and propose instructional motivational strategies, thereby enhancing students' learning engagement, academic performance, and overall competence, as well as providing theoretical and practical references for curriculum reform.

Materials and Methods

This study targeted students majoring in Mechanical Design, Manufacturing, and Automation at a university in Fujian Province, China, covering different grades and classes to ensure the representativeness and diversity of the sample. A total of 114 questionnaires were distributed, all of which were returned and deemed valid, yielding a 100% response rate. The gender distribution included 103 male students (90.4%) and 11 female students (9.6%), reflecting the typical gender composition of engineering programs. Regarding grade levels, 44 students were freshmen (38.6%), 1 sophomore (0.9%), 50 juniors (43.9%), and 19 seniors (16.7%). The sample thus encompassed students from all four undergraduate years, providing a comprehensive representation of learning motivation among students in the engineering mechanics course across different academic stages.

The questionnaire was developed based on classical educational psychology theories, primarily referencing Maslow's hierarchy of needs (Maslow, 1943) and Ausubel's theory of the structure of intrinsic motivation (Ausubel, 1968). According to Ausubel's framework, students' learning motivation was divided into three dimensions: Cognitive Drive, Self-Enhancement Drive, and Affiliative/Auxiliary Learning Drive. Cognitive Drive reflects students' interest in understanding knowledge, developing analytical skills, and solving problems. Self-Enhancement Drive captures the motivation to improve personal abilities, gain a sense of achievement, and build self-confidence through learning. Affiliative/Auxiliary Learning Drive indicates students' motivation in team cooperation, classroom interaction, and teacher-student communication. Each dimension included multiple items, rated on a five-point Likert scale (1=strongly disagree, 5=strongly agree), to quantify students' motivation levels across different dimensions. Prior to formal use, the questionnaire was tested for reliability, yielding a high overall Cronbach's alpha of 0.985, indicating excellent internal consistency and high reliability of the instrument.

Data were processed using SPSS 22.0, including descriptive statistics, gender differences analysis, grade-level differences analysis, and correlation analysis among motivation dimensions. Descriptive statistics were used to present the means, standard deviations, and distribution characteristics of each dimension, revealing the overall level of students' learning motivation. Gender differences were examined using independent-samples t-tests to compare scores between male and female students and assess the impact of gender on learning motivation. For grade-level differences, homogeneity of variance was first tested using Levene's test, followed by one-way analysis of variance (ANOVA) to examine differences in scores across different academic years. Correlation analysis employed Pearson's correlation coefficients to explore the relationships among Cognitive Drive, Self-Enhancement Drive, and Affiliative/Auxiliary Learning Drive, highlighting the overall structure and coordination of learning motivation. These analyses comprehensively depict the current state and influencing factors of students' learning motivation in the Engineering Mechanics course, providing empirical support for the development of effective instructional motivation strategies.

Results and Discussion

Cognitive Drive

Table 1. Descriptive Statistics of Cognitive Drive

Item	N	Minimum	Maximum	Mean	Std. Deviation	Median
A1 I am interested in the theoretical content of the "Engineering Mechanics" course.	114	3.000	5.000	4.754	0.573	5.000
A2 I am willing to spend time understanding and mastering the basic principles of "Engineering Mechanics."	114	2.000	5.000	4.746	0.592	5.000
A3 I hope to improve my analytical and problem-solving abilities while studying "Engineering Mechanics."	114	3.000	5.000	4.807	0.477	5.000
A4 I proactively consult extracurricular materials to deepen my understanding of "Engineering Mechanics."	114	3.000	5.000	4.693	0.626	5.000
A5 I think mastering "Engineering Mechanics" knowledge is very important for my professional studies.	114	3.000	5.000	4.763	0.569	5.000
A6 I like to ask questions in the "Engineering Mechanics" class and seek answers.	114	1.000	5.000	4.632	0.779	5.000
A7 I feel curious and enjoy exploring new knowledge when studying "Engineering Mechanics."	114	2.000	5.000	4.684	0.682	5.000

The overall score as seen in Table 1, “Cognitive Drive” is relatively high, with the mean values of the seven items ranging from 4.63 to 4.81 and most medians at 5. This indicates that the majority of students exhibit strong interest and positive motivation in learning the “Engineering Mechanics” course. Students are most concerned with improving their analytical and problem-solving abilities through learning (A3, mean=4.807), suggesting that they not only value knowledge acquisition but also emphasize skill development. This aligns with the current engineering education focus on “competency-oriented” learning. Meanwhile, students show high interest in the theoretical content of the course (A1, mean=4.754) and generally believe that mastering the course knowledge is important for their professional studies (A5, mean =4.763), reflecting recognition of the course’s value. However, scores for proactively consulting extracurricular materials (A4, mean=4.693) and asking questions in class (A6, mean=4.632) are relatively lower. Notably, A6 has a standard deviation of 0.779, indicating some variation in classroom participation and that some students’ proactive inquiry mindset still needs to be strengthened. This may be related to the abstract nature of the course content, limitations in learning methods, or insufficient opportunities for classroom interaction. Overall, students demonstrate strong willingness to learn and interest in the course at the cognitive drive level, but there is room for improvement in active knowledge construction and interactive exploration. Instructional strategies such as problem-based learning and contextualized case analysis can further stimulate students’ curiosity and engagement, transforming their interest into sustained learning motivation.

Self-Enhancement Drive

Table 2. Self-Enhancement Drive – Descriptive Statistics

Item	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Median**
B1 I hope to boost my self-confidence by achieving good grades in the Engineering Mechanics course.	114	2.000	5.000	4.746	0.621	5.000
B2 I set personal learning goals while studying Engineering Mechanics and strive to achieve them.	114	3.000	5.000	4.675	0.645	5.000
B3 Studying Engineering Mechanics allows me to feel my abilities improve.	114	3.000	5.000	4.737	0.596	5.000
B4 I hope to gain recognition from teachers or classmates through studying Engineering Mechanics.	114	3.000	5.000	4.728	0.584	5.000
B5 I am willing to challenge complex Engineering Mechanics problems to prove my abilities.	114	2.000	5.000	4.623	0.757	5.000
B6 I feel a sense of achievement after completing tasks in the Engineering Mechanics course.	114	3.000	5.000	4.746	0.592	5.000
B7 I believe studying Engineering Mechanics helps me achieve my career development goals.	114	3.000	5.000	4.763	0.537	5.000

The overall score as seen in Table 2, “Self-Enhancement Drive,” is relatively high. The mean values of the seven items range from 4.623 to 4.763, with most medians at 5, indicating that the majority of students possess strong motivation to achieve self-improvement through the Engineering Mechanics course. Students generally hope to boost their self-confidence by achieving good grades (B1, M=4.746) and set clear learning goals to promote personal progress (B2, M=4.675), demonstrating a certain level of self-management and goal-oriented awareness in their learning process. Notably, students place the greatest importance on the course’s contribution to future career development (B7, M=4.763) and the sense of achievement gained after completing learning tasks (B6, M=4.746), suggesting that course learning is perceived not merely as an academic requirement but as a significant means to realize personal value and career planning. Meanwhile, the sense of ability improvement (B3, M=4.737) and the need for recognition from others (B4, M=4.728) indicate that students are motivated both by intrinsic self-efficacy and external social evaluation. In contrast, the item “willingness to challenge complex problems to prove one’s ability” (B5, M=4.623) scored slightly lower and exhibited the highest standard deviation (SD=0.757), revealing individual differences in confidence and perseverance when facing high-difficulty tasks. Some students may lack sufficient coping strategies or learning patience. Overall, students demonstrate a high level of learning motivation in terms of self-enhancement drive, reflecting strong self-expectations and achievement pursuit. However, further cultivation of perseverance and confidence in tackling challenging tasks is needed. Teaching strategies such as tiered task design, positive feedback, and reinforced achievement experiences can help students gradually develop a proactive attitude toward difficulties, thereby further enhancing their intrinsic drive.

Affiliative Learning Drive

Table 3. Affiliative Learning Drive – Descriptive Statistics

Item	N	Minimum	Maximum	Mean	Std. Deviation	Median
C1 I actively participate in group discussions or experiments and collaborate with classmates to complete learning tasks in Engineering Mechanics.	114	3.000	5.000	4.728	0.584	5.000
C2 I believe that learning Engineering Mechanics together with classmates can improve my learning efficiency.	114	3.000	5.000	4.728	0.584	5.000
C3 I hope to receive guidance and feedback from teachers in Engineering Mechanics classes or experiments.	114	2.000	5.000	4.763	0.584	5.000
C4 I feel a sense of belonging to the class or team when learning Engineering Mechanics.	114	3.000	5.000	4.711	0.620	5.000
C5 I am willing to share my learning experiences in Engineering Mechanics with classmates for mutual improvement.	114	3.000	5.000	4.763	0.537	5.000

Item	N	Minimum	Maximum	Mean	Std. Deviation	Median
C6 I listen to and understand my classmates' opinions in Engineering Mechanics classes to improve my own learning.	114	3.000	5.000	4.763	0.553	5.000
C7 I enjoy participating in team assignments or experimental tasks in Engineering Mechanics and gain motivation from them.	114	3.000	5.000	4.746	0.561	5.000

The overall score as seen in Table 3, Affiliative Learning Drive, is also relatively high. The average scores of the seven items range from 4.711 to 4.763, with most median values being 5, indicating that students exhibit strong intrinsic motivation in cooperative learning, team participation, and teacher-student interaction. Students generally value guidance and feedback from instructors during class or laboratory activities (C3, M=4.763) and are willing to share learning experiences with peers and listen to others' opinions to improve their own learning (C5 and C6, both M=4.763), suggesting that they tend to enhance understanding and skills through interaction and collaboration. In comparison, the sense of belonging to the class or team received slightly lower scores (C4, M=4.711), but the standard deviation differences are small (0.537–0.620), showing that students are relatively consistent in their teamwork awareness and participation. These results indicate that the Engineering Mechanics course has effectively fostered collective learning and collaborative inquiry, and students generally recognize the positive impact of team-based learning on learning outcomes.

Comparing the overall averages across the three dimensions, Affiliative Learning Drive received the highest score (M=4.742), reflecting that students' motivation is strongest in team cooperation, classroom interaction, and teacher-student communication. Cognitive Drive ranks second (M=4.724), indicating that students maintain high interest in course content and knowledge exploration. Self-Enhancement Drive is slightly lower (M=4.716), suggesting that students' motivation to achieve self-satisfaction through grades or skill improvement is relatively weaker, though the difference is not significant. Overall, students' motivation across the three dimensions is relatively balanced, showing attention to both knowledge and skill development as well as good collaboration awareness and willingness for self-growth. This balanced motivational structure provides a solid foundation for designing subsequent instructional strategies, where teachers can further strengthen students' active participation and growth experience in the learning community through collaborative task design and optimized feedback mechanisms.

Gender Differences Analysis

Table 4. Results of the t-test Analysis

Item	Gender：(Mean±SD)		*t*	*p*
	Male(*n*=103)	Female(*n*=11)		
Cognitive Drive	4.77±0.48	4.29±0.83	1.915	0.082
Self-Enhancement Drive	4.75±0.53	4.44±0.78	1.736	0.085
Affiliative Learning Drive	4.77±0.50	4.47±0.79	1.261	0.234
* p<0.05 ** p<0.01				

The results of independent-samples t-tests across the three dimensions by gender show that male students scored slightly higher than female students in cognitive drive, self-enhancement drive, and affiliative learning drive (Table 4). Specifically, for cognitive drive, males scored 4.77 ± 0.48, while females scored 4.29 ± 0.83 (t = 1.915, p = 0.082); for self-enhancement drive, males scored 4.75 ± 0.53, females 4.44 ± 0.78 (t = 1.736, p = 0.085); and for affiliative/auxiliary learning drive, males scored 4.77 ± 0.50, females 4.47 ± 0.79 (t = 1.261, p = 0.234). Although male students' mean scores were slightly higher across all three dimensions, none of the differences reached statistical significance (p > 0.05), indicating that gender is not a decisive factor in students' learning motivation in the Engineering Mechanics course. Overall, male and female students displayed similar levels of interest, self-improvement awareness, and cooperative learning attitudes. This suggests that learning motivation in this course is primarily driven by the nature of the discipline and the learning tasks, rather than by gender differences. A possible reason is that Engineering Mechanics, as a logic- and practice-intensive foundational course, imposes similar learning demands on all students. The objectivity of the course content and assessment criteria helps balance learning attitudes and engagement across genders. Furthermore, the current classroom environment and learning support mechanisms in universities provide male and female students with relatively equal opportunities for learning and self-expression, thereby reducing gender differences in learning motivation.

Grade* Differences *Analysis

Table 5. Levene's Test for Homogeneity of Variances

Item	**Year：(Standard Deviation)**				***F***	***p***
	Freshman (*n*=44)	Sophomore (*n*=1)	Juniors (*n*=50)	Seniors (*n*=19)		
Cognitive Drive	0.59	null	0.56	0.33	2.690	0.050*
Self-Enhancement Drive	0.62	null	0.57	0.37	1.973	0.122
Affiliative Learning Drive	0.59	null	0.54	0.37	1.527	0.212
* *p*<0.05 ** *p*<0.01						

Before conducting the grade-level difference analysis, Levene's test for homogeneity of variances was performed to verify the consistency of variances across groups (Table 5). The results showed that for Cognitive Drive, F=2.690, p=0.050, which is close to the significance threshold, indicating slight variance differences among grades. In contrast, Self-Enhancement Drive (F=1.973, p=0.122) and Affiliative Learning Drive (F=1.527, p=0.212) met the assumption of homogeneity of variances.

Table 6. ANOVA Results

Item	**Year：(Standard Deviation)**				***F***	***p***
	Freshman (*n*=44)	Sophomore (*n*=1)	Juniors (*n*=50)	Seniors (*n*=19)		
Cognitive Drive	4.67±0.59	4.86±null	4.72±0.56	4.86±0.33	0.531	0.662
Self-Enhancement Drive	4.68±0.62	4.43±null	4.71±0.57	4.83±0.37	0.446	0.721

Item	Year：(Standard Deviation)				*F*	*p*
	Freshman (*n*=44)	Sophomore (*n*=1)	Juniors (*n*=50)	Seniors (*n*=19)		
Affiliative Learning Drive	4.70±0.59	4.29±null	4.75±0.54	4.84±0.37	0.548	0.650
* $p<0.05$ ** $p<0.01$						

Then, a one-way analysis of variance (ANOVA) was conducted for the three dimensions (Table 6). The results showed that the mean scores of cognitive drive across different grades were 4.67±0.59 for freshmen, 4.86 for sophomores, 4.72±0.56 for juniors, and 4.86±0.33 for seniors (F=0.531, p=0.662). For self-enhancement drive, the mean scores were 4.68±0.62 (freshmen), 4.43 (sophomore), 4.71±0.57 (juniors), and 4.83±0.37 (seniors) (F=0.446, p=0.721). For affiliative/auxiliary learning drive, the mean scores were 4.70±0.59 (freshmen), 4.29 (sophomore), 4.75±0.54 (juniors), and 4.84±0.37 (seniors) (F=0.548, p=0.650). None of the differences across grades reached statistical significance (p>0.05), indicating that students' cognitive, affective, and cooperative levels of learning motivation are generally consistent across grades, and the grade factor has limited influence on learning motivation.

In terms of trends, seniors scored slightly higher across all three dimensions, which may be related to accumulated professional learning experience and clearer career goals. Freshmen also showed relatively high scores, reflecting strong learning enthusiasm and exploratory motivation at the beginning of university. Juniors scored slightly lower, possibly due to increased academic pressure, heavier course loads, and simultaneous preparation for employment or postgraduate studies. Although these minor fluctuations did not reach statistical significance, they reflect changes in students' psychological characteristics and learning focus at different stages. Overall, as a foundational engineering course, students' learning motivation in Engineering Mechanics is influenced more by the course content, instructional design, and assessment methods rather than by grade level. Instructors can adopt targeted teaching support strategies for different grades, such as fostering learning interest for lower-grade students and providing career-oriented guidance for upper-grade students, to promote the sustained development and internalization of learning motivation.

Dimension Correlation Analysis

Table 7. Pearson Correlation Analysis

	Mean	**SD**	**Cognitive Drive**	**Self-Enhancement Drive**	**Affiliative Drive**
Cognitive Drive	4.726	0.542	1		
Self-Enhancement Drive	4.717	0.558	0.931**	1	
Affiliative Learning Drive	4.743	0.535	0.898**	0.959**	1
* $p<0.05$ ** $p<0.01$					

The results of the Pearson correlation analysis among the three dimensions as seen in Table 7 indicate that Cognitive Drive is significantly positively correlated with Self-Enhancement Drive (r=0.931, p<0.01), and also significantly positively correlated with Affiliative Learning Drive (r=0.898, p<0.01). The strongest correlation is observed between Self-Enhancement Drive and Affiliative Learning Drive ($r=0.959$, $p<0.01$). Overall, all three dimensions show high positive correlations, suggesting that when students score high in one dimension of learning motivation, they tend to score high in the other dimensions as well.

These results indicate that the learning motivation structure in the Engineering Mechanics course is highly integrated and internally consistent, with cognitive interest, the desire for ability enhancement, and team collaboration tendencies mutually reinforcing each other to collectively form students' motivational system. This also suggests that instructional design should consider all dimensions comprehensively—while enhancing cognitive interest, attention should also be given to fostering self-efficacy and strengthening team collaboration awareness—to build a well-rounded and coordinated motivation support system that promotes balanced development in knowledge acquisition, skill improvement, and social interaction.

Conclusion

This study systematically analyzed the learning motivation of 114 students in the Engineering Mechanics course across three dimensions: Cognitive Drive, Self-Enhancement Drive, and Affiliative Learning Drive. The results show that students scored highly on all three dimensions, indicating strong interest in course content, active pursuit of skill improvement, and high engagement in teamwork, classroom interaction, and teacher-student communication. Specifically, in the Cognitive Drive dimension, students focused most on enhancing their analytical and problem-solving abilities through the course and demonstrated notable interest in theoretical content. In the Self-Enhancement Drive dimension, students exhibited strong motivation to gain a sense of achievement, boost self-confidence, and pursue career development goals, although there were some differences in willingness to tackle complex problems. In the Affiliative Learning Drive dimension, students were most active in class discussions, lab collaborations, and peer interactions, reflecting good teamwork awareness and a sense of collective belonging. The small differences among the three dimensions indicate a relatively balanced and coordinated motivational structure.

Gender difference analysis showed that although male students scored slightly higher than females across all three dimensions, the results of independent-sample t-tests were not statistically significant, suggesting that gender has a limited effect on overall learning motivation. Male and female students displayed similar levels of interest, self-improvement desire, and collaborative engagement. Grade-level difference analysis indicated no significant differences among students of different years, showing that learning motivation remains relatively stable across academic stages, with grade level not being a decisive factor. Nevertheless, senior students scored slightly higher across dimensions, possibly due to accumulated learning experience and clearer career planning, while freshmen's high scores reflect the enthusiasm and exploratory interest typical of new university students.

Moreover, Pearson correlation analysis revealed strong positive correlations among the three dimensions (Cognitive Drive and Self-Enhancement Drive, $r=0.931$; Cognitive Drive and Affiliative Learning Drive, $r=0.898$; Self-Enhancement Drive and Affiliative Learning Drive, $r=0.959$; all $p<0.01$), indicating that high performance in one dimension is generally accompanied by high performance in the others, reflecting the overall cohesion and internal consistency of the learning motivation structure. This suggests that instructional design and teaching practice should comprehensively consider cognitive interest, skill enhancement needs, and team collaboration tendencies. By enriching classroom content, setting moderate challenges, providing timely feedback, and enhancing collaborative opportunities, educators can create a multidimensional supportive learning environment that effectively promotes the comprehensive development of student motivation.

Overall, the Engineering Mechanics course is effective in stimulating students' interest, enhancing professional competence, and fostering collaborative awareness. However, there remains room for improvement in addressing individual differences in challenging tasks and promoting autonomous inquiry, providing a practical basis for subsequent teaching optimization and the development of motivational strategies.

Recommendations for Motivational Strategies

Based on the above research findings, the following motivational strategies are proposed for students in the Engineering Mechanics course:

Firstly, regarding cognitive drive, student interest can be stimulated by enriching course content and optimizing classroom design. Instructors can introduce context-based problems related to real engineering cases, organize thought-provoking discussions and challenges, and encourage students to independently explore course theories and principles, thereby enhancing their understanding and analytical abilities. Additionally, providing extracurricular resources and learning guidance can cultivate students' habits of actively consulting materials and solving problems, further consolidating their cognitive interest.

Secondly, for self-enhancement drive, motivation can be fostered through clear learning objectives and tiered tasks. Teachers should assist students in setting reasonable goals and, combined with course assessments and periodic feedback, enable them to gain a sense of achievement and confidence during task completion. Moreover, moderately challenging questions and project tasks can guide students to demonstrate their abilities while tackling complex problems, stimulating self-improvement awareness. Linking course learning with career development planning can also enhance the intrinsic value and practical significance of learning.

Thirdly, regarding affiliative learning drive, the role of teamwork and classroom interaction should be fully leveraged. Instructors can use group discussions, lab experiments, and team projects to facilitate experience sharing and opinion exchange among students, strengthening collective belonging and collaborative awareness. Providing timely and specific feedback during class, encouraging mutual listening and assistance, can enhance motivation for interactive learning. Appropriate classroom presentations or project reports can satisfy students' need for recognition while motivating active participation in cooperative learning, forming a positive feedback loop in the learning environment.

In summary, a multidimensional and comprehensive instructional strategy can not only maintain students' interest and enthusiasm for exploration in the Engineering Mechanics course but also effectively promote skill development and teamwork awareness, forming an integrated support system for cognitive, self-enhancement, and collaborative drives. This provides a scientific basis for improving overall learning outcomes and course satisfaction.

References

Ausubel, D. P. (1968). *Educational psychology: A cognitive view*. New York, NY: Holt, Rinehart & Winston.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Froyd, J. E., Wankat, P. C., & Smith, K. A. (2012). Five major shifts in 100 years of engineering education. *Proceedings of the IEEE, 100*(S1), 1344–1360. https://doi.org/10.1109/JPROC.2012.2190169

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370–396. https://doi.org/10.1037/h0054346

Robinson, S., Smith, J., & Lee, K. (2022). The impact of motivational strategies on engineering students’ performance. *Journal of Engineering Education, 111*(2), 345–362. https://doi.org/10.1002/jee.20456.

Sheppard, S., et al. (2009). *Educating engineers: Designing for the future of the field*. San Francisco, CA: Jossey-Bass.

Vo, H., & Ho, T. (2024). Giving choices or making tasks relevant? Classroom practices that foster student engagement. *The Australian Educational Researcher, 51*(2), 215–232. https://doi.org/10.1007/s13384-024-00455-2.

Wang, X., Dai, L., & Short, M. (2024). Analyzing user psychology and behavior in short-form video shopping platforms: A user experience perspective. *SAGE Open, 14*(1), 2158244024128707. https://doi.org/10.1177/2158244024128707.

Wigfield, A., & Eccles, J. S. (2000). Expectancy value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68–81.