
The Role of Gender in the Motivation Performance Nexus in Physics Education

Leah C. Navarro
Cavite State University Naic Campus, Teacher Education Department, Philippines
Email: leah.navarro@cvsu.edu.ph

Received: 05/12/2025
Accepted: 28/02/2026
Published: 09/03/2026

Volume: 7 Issue: 2

How to cite this paper: Navarro, L. C. (2026). The Role of Gender in the Motivation Performance Nexus in Physics Education. *Journal of Practical Studies in Education*, 7(2), 19-27
DOI: <https://doi.org/10.46809/jpse.v7i2.161>

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0). <http://creativecommons.org/licenses/by/4.0/>



Abstract

This study examined the motivational variations between genders and how they relate to physics students' performance. Its specific objectives were to (1) identify key motivational constructs that influence students' engagement and academic performance in physics, (2) measure and compare motivation levels among male and female physics students using selected motivational construct, (3) examine whether there are statistically significant differences in motivation between male and female students, (4) analyze the relationship between students' motivation levels and their academic achievement in physics. The study used a descriptive-correlational design, and the Statistical Package for the Social Sciences (SPSS) was used to analyze the data. The statistical methods used were weighted mean, Pearson product-moment correlation, and analysis of variance (ANOVA). The results showed that, in comparison to their male peers, female students showed higher levels of motivation for their grades and careers. The degree of grade motivation varied significantly across the sexes, with female students showing a greater degree of drive. The findings imply that to improve physics performance, more research into gender-specific motivating factors is necessary. A planned intervention to increase physics students' motivation was created based on the results.

Keywords: Gender Differences, Motivation, Academic Performance, Physics Education, Student Achievement

1. Introduction

Gender differences in involvement, self-perception, and academic performance are still a problem in physics education. Female students continue to be underrepresented in advanced physics courses and related career trajectories, even in the face of increased access to science education worldwide. This disparity has been linked not only to historical male dominance in the development of physics but also to learning environments and instructional methods that may unconsciously favor male participation and performance (UNESCO, 2019; Kang et al., 2020). These variances are not just due to differences in aptitude; rather, they are closely linked to sociocultural factors, motivational beliefs, and self-perceptions that influence students' interest in physics. Therefore, it is essential to comprehend the ways in which gender interacts with motivating processes in order to advance equal outcomes in science education.

A key factor in determining academic engagement and achievement is motivation, which is well known, according to the Self-Determination Theory framework, learning for intrinsic interest or enjoyment promotes deeper cognitive processing and

sustained persistence, whereas learning for extrinsic motivation driven by external rewards or pressures may either improve or impair performance depending on the level of internalization (Deci, Edward L. & Ryan, Richard M., 2000). The level of students' motivation is crucial in deciding whether they persevere through conceptual difficulty or disengage in physics classrooms, where abstract reasoning and problem-solving demands are high.

Students' interpretations of academic results and how these interpretations affect their motivation in the future are further clarified by attribution theory. Bernard Weiner (1985) asserts that learners use the concepts of location (internal–external), stability, and controllability to explain success and failure. Students are more likely to maintain adaptive motivation and resilience if they ascribe results to controllable factors like effort. On the other hand, attributing results to fixed ability may discourage perseverance, especially in fields like physics that are stereotyped as requiring natural aptitude.

The concept of self-efficacy, which Albert Bandura (1997) defines as people's beliefs in their abilities to plan and carry out the actions necessary to achieve particular goals, is closely tied to attribution. Self-efficacy predicts academic success in physics education by predicting effort regulation, strategy utilization, and perseverance in the face of adversity. Persistent intrinsic interest and mastery-oriented goals are more likely to be adopted by students who have higher physics self-efficacy.

Dweck's (1986) notion of helpless vs mastery-oriented behavior also influences this research. Learners who are mastery-oriented are resilient and persistent, whereas helpless learners shy away from difficulties and give up easily. In addition, Blackwell et al. (2007) showed that students who believe that intelligence can be improved through incremental thinking are more motivated, put up more effort, and perform better over time. Work relevance is an additional important component: students are more inclined to devote time and effort to a work if they believe it is significant or fits with their personal objectives (Feather, 1998). Ryan and Deci (2000) assert that self-determination theory highlights the role that autonomy plays in promoting intrinsic motivation. Research has demonstrated that when given some control over their education, science students perform better and are more engaged (Glynn & Koballa, 2006).

The motivation performance nexus in physics education is examined in this study in relation to gender. In particular, gender is considered as a moderating element that may influence the direction or intensity of these associations, and motivation (both intrinsic and extrinsic) is conceived as a mediating mechanism connecting attribution patterns and self-efficacy beliefs to academic success in physics. The study develops a thorough model of how motivational processes function in gendered learning environments by combining attribution theory, self-determination theory, and social cognitive viewpoints.

In addition to its theoretical contribution, this study has important implication for global fairness and education goals. The study directly supports Sustainable Development Goal 4 (SDG 4) of the United Nations, which calls for the promotion of opportunities for lifelong learning and inclusive, equitable, high-quality education. SDG 4 calls for more than just guaranteeing educational access; it also calls for addressing the caliber of educational opportunities and the psychological elements that help students succeed in challenging subjects like physics. Through the identification of performance-influencing motivational processes, this study adds evidence to support the design of instruction that promotes fair achievement outcomes and meaningful engagement.

The study is similarly responsive to SDG 5, which aims to empower all women and girls and attain gender equality. In addition to being an educational issue, persistent gender discrepancies in physics education also serve as a structural impediment to equal participation in STEM fields. This study offers empirically supported insights into how gender influences motivational processes, which could help develop gender-responsive teaching methods, refute deficiency myths, and foster inclusive learning environments. Thus, addressing physics motivating gaps becomes a critical area of engagement for promoting gender equality (SDG 5) and educational equity (SDG 4).

This study advances a more sophisticated understanding of the psychological and structural elements that either maintain or lessen inequalities in physics education by combining gender analysis with motivational theory. The research highlights the relevance of evidence-based educational practice in furthering global commitments to gender equity and high-quality education by placing the motivation performance nexus within the larger context of sustainable development.

As a physics instructor committed to promoting equity in science education, the researcher was motivated to examine how gender-related differences in motivational components relate to physics performance. This study seeks to contribute to efforts in advancing SDG-aligned practices by proposing gender-sensitive instructional strategies to improve student motivation and performance in physics.

2. Objectives

Examining gender disparities in motivation and how they relate to physics students' academic achievement is the main goal of this study. It specifically seeks to:

1. Identify key motivational constructs that influence students' engagement and academic performance in physics.
2. Measure and compare motivation levels among male and female physics students using selected motivational constructs.
3. Examine whether there are statistically significant differences in motivation between male and female students.
4. Analyze the relationship between students' motivation levels and their academic achievement in physics.

Based on the research objectives, the study is guided by the following null hypotheses:

H₀₁: There is no statistically significant difference in motivation levels between male and female physics students.

H₀₂: There is no statistically significant relationship between students' motivation levels and their academic achievement in physics.

3. Research Paradigm

The research paradigm of this study demonstrates how student motivation and gender relate to one another and how these factors affect physics academic achievement. The motivational concepts of self-efficacy, goal orientation, internal and extrinsic motivation, and Weiner's Attribution Theory serve as the foundation for this paradigm.

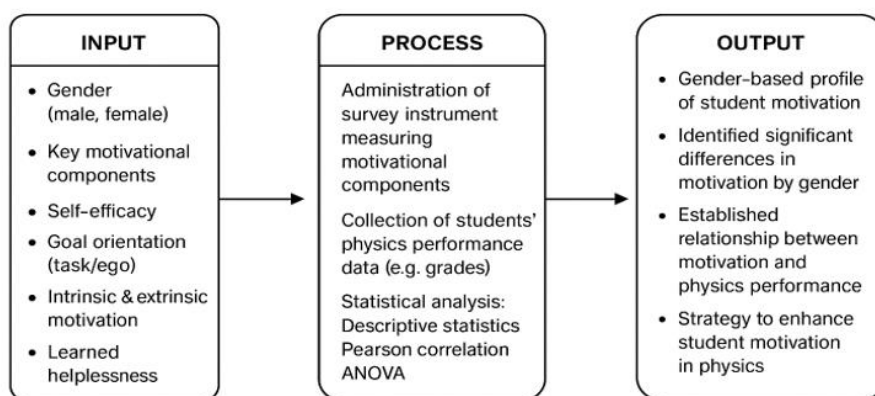


Figure 1. Research Paradigm

4. Methodology

4.1. Research Design

This study employed a descriptive–correlational research design using quantitative methods to examine the relationship between students' motivation and academic achievement in physics, with particular attention to gender differences. The descriptive component assessed students' motivation levels, while the correlational component examined the association between motivation and academic achievement among introductory physics students.

A survey methodology was used to collect data through a standardized questionnaire, enabling the generalization of findings across the target population. Surveys are widely recognized as effective tools for collecting self-reported data on perceptions, attitudes, and behaviors, making them suitable for measuring motivational constructs in educational settings (Angel, 2013).

4.2. Locale of the Study

The study was carried out at Cavite State University–Naic, a public university with twelve academic disciplines. Physics is taught in four of these curricula. Students taking introductory physics classes in three academic departments the information technology department, the teacher education department, and the fisheries and marine sciences department were the subject of the study.

4.3. Participants

Respondents were chosen using a purposive sample technique, which considered their enrollment in physics courses and the gender distribution of each department. By using this sampling technique, the researcher was able to guarantee that programs with a male and female preponderance were represented, enabling a useful comparison of motivational differences depending on gender.

The final sample consisted of 114 students from four curricular programs. The Information Technology Department was selected due to its predominantly male population; the Teacher Education Department, which typically has most female students; and the Fisheries and Marine Sciences Department, where there was a relatively balanced gender distribution. These three departments offered an ideal context for examining motivation and performance across diverse gender compositions.

4.4. Instrumentation

Two primary research instruments were utilized:

1. The 25 items on the Physics Motivation Questionnaire (PMQ), created by Glynn and Koballa (2006), are intended to evaluate five different motivational factors: intrinsic motivation, self-efficacy, self-determination, career motivation, and grade incentive. To measure degrees of agreement and motivating tendencies, responses were recorded using a Likert scale.

2. Physics Performance Data – Students' first-semester final grades in their respective physics courses were obtained from official university records. These grades served as the measure of academic performance in physics.

4.5. Statistical Treatment

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). The following statistical techniques were employed:

1. Weighted Mean – to determine students' overall motivation levels and the degree of agreement with motivational statements.

2. Pearson Product–Moment Correlation Coefficient (r) – to examine the relationship between students' motivation levels and academic achievement in physics.

3. Analysis of Variance (ANOVA) – to determine whether statistically significant differences existed in motivation levels between male and female students.

These statistical procedures were selected for their suitability in correlational analysis and group comparisons, ensuring the validity and reliability of the study's findings.

5. Results and Discussion

This study explored gender differences in motivation and their relationship to students' performance in physics. Five key motivational components were examined: intrinsic motivation, self-efficacy, self-determination, grade motivation, and career motivation. Table 1 presents the comparative levels of motivation between male and female students.

Table 1. Average Motivation Levels by Gender for Physics Learning

Sex	Intrinsic Motivation	Self-Efficacy	Self-Determination	Grade Motivation	Career Motivation
Male	4.14 (Constantly Motivated)	3.50 (Frequently Motivated)	3.63 (Frequently Motivated)	3.95 (Frequently Motivated)	3.98 (Frequently Motivated)
Female	4.20 (Constantly Motivated)	3.50 (Frequently Motivated)	3.73 (Frequently Motivated)	4.26 (Constantly Motivated)	4.15 (Constantly Motivated)

Legend:

0.1–1.0 = Insufficiently Motivated

1.1–2.0 = Seldom Motivated

2.1–3.0 = Infrequently Motivated

3.1–4.0 = Frequently Motivated

4.1–5.0 = Constantly Motivated

The mean levels of motivation for learning physics among male and female students are shown in Table 1 for each of the five main motivational factors: career motivation, self-efficacy, self-determination, intrinsic motivation, and grade motivation. The results show that motivating tendencies vary by gender.

Intrinsic motivation was "Always Motivated" for both male ($M = 4.14$) and female ($M = 4.20$) students, suggesting a high internal interest in learning physics regardless of gender. It would appear from this that both groups find physics interesting and personally fulfilling. Deci and Ryan's (1985) Self-Determination Theory, which highlights the importance of intrinsic motivation in promoting long-term academic engagement, is consistent with this.

In terms of self-efficacy, both males and females reported identical mean scores ($M = 3.50$), categorized as "Often Motivated." This indicates that while students generally believe in their capacity to learn physics, there is room for strengthening their confidence, particularly in overcoming challenging tasks. Bandura (1997) posits that self-efficacy influences students' persistence and resilience in learning; thus, enhancing efficacy beliefs could further boost motivation.

A similar pattern is seen in self-determination, with both males ($M = 3.63$) and females ($M = 3.73$) being "Often Motivated." However, females slightly surpassed males, suggesting a marginally greater degree of autonomous learning motivation among them. This supports earlier findings that female learners may be more self-directed when they perceive relevance in the content (Eccles & Wigfield, 2002).

When it comes to career and grade motivation, the gender gap is most noticeable. Male students scored marginally lower, but still "Often Motivated" ($M = 3.95$ and 3.98 , respectively), whereas female students reported "Always Motivated" levels in both grade ($M = 4.26$) and career motivation ($M = 4.15$). This implies that women might give more weight to academic achievement and the long-term professional advantages associated with physics.

Overall, these findings imply that while both genders show strong motivation in learning physics, female students tend to exhibit higher levels in extrinsic components (grade and career motivation). This underscores the importance of gender-sensitive instructional strategies that sustain high intrinsic motivation while also nurturing self-efficacy and goal-oriented behaviors in physics learning.

Table 2. An Analysis of Variance in Male and Female Students' Motivation Levels

Motivation Component	Source	Sum of Squares	df	Mean Square	F	Sig.
Intrinsic Motivation	Between Groups	0.165	1	0.165	0.478	.491 ns

	Within Groups	38.628	112	0.345		
	Total	38.793	113			
Self-Efficacy	Between Groups	0.003	1	0.003	0.007	.935 ns
	Within Groups	50.816	112	0.454		
	Total	50.819	113			
Self-Determination	Between Groups	0.501	1	0.501	1.295	.258 ns
	Within Groups	43.349	112	0.387		
	Total	43.850	113			
Grade Motivation	Between Groups	3.453	1	3.453	8.601	.004 **
	Within Groups	44.961	112	0.401		
	Total	48.414	113			
Career Motivation	Between Groups	1.142	1	1.142	2.470	.119 ns
	Within Groups	51.783	112	0.462		
	Total	52.925	113			

Note. ns = not significant; $p < .01$

To investigate gender differences in the five elements of student motivation in studying physics—*intrinsic motivation, self-efficacy, self-determination, grade motivation, and career motivation*—an analysis of variance (ANOVA) was performed. The results are shown in Table 2.

In terms of *intrinsic motivation* ($F(1,112) = 0.478, p = .491$), *self-efficacy* ($F(1,112) = 0.007, p = .935$), *self-determination* ($F(1,112) = 1.295, p = .258$), and *career motivation* ($F(1,112) = 2.470, p = .119$), the ANOVA results showed no statistically significant differences between male and female students.

These results imply that *internal motivation, self-confidence in one's capacity to study, learning autonomy, and ambitions for future employment in physics or related sciences* are comparatively similar among male and female students. According to earlier studies, gender may not be the only factor influencing *intrinsic or long-term motivational dispositions in science learning settings* (Eccles & Wigfield, 2002; Schunk et al., 2014).

However, a highly significant gender difference was found in *grade motivation* ($F(1,112) = 8.601, p = .004$), indicating that students differ in their motivation to achieve high academic marks based on their gender. This result implies that one gender may be more driven by *extrinsic academic performance indicators, such as grades, which could reflect socio cultural or contextual expectations related to academic success*. This finding is consistent with studies that have shown *differential performance-related motivation among male and female students, where female students are often reported to exhibit stronger orientation toward grades and achievement benchmarks* (Meece, Glienke, & Burg, 2006; Pajares, 2002).

According to these results, male and female students are comparatively similar in terms of their *internal motivation, self-assurance in their capacity to learn, independence in their education, and goals for future employment in physics or related sciences*. However, *grade motivation* showed a highly significant gender difference ($F(1,112) = 8.601, p = .004$), suggesting that students' *ambition to attain excellent academic grades varies according to their gender*. This finding suggests that one gender might be more motivated by *external measures of academic achievement, like grades, which might represent contextual or social expectations surrounding academic achievement*. This result is in line with research that has demonstrated that male and female students have different motivations for performance, with female students frequently displaying a larger focus on *grades and achievement standards* (Meece, Glienke, & Burg, 2006; Pajares, 2002).

The fundamental causes of the observed gender variations in grade motivation, such as societal influences, teacher expectations, and learning settings, should be further examined in future studies. Further understanding of students' motivational experiences and how gender-related factors influence them may also be possible through qualitative research.

Table 3. Relationship Between Physics Students' Motivation Level and Performance

Motivation Component	Performance in Physics (r)	Sig. (2-tailed)	N
Career Motivation	-.219*	.019	114
Intrinsic Motivation	-.087	.356	114
Self-Efficacy	-.067	.481	114
Self-Determination	-.174	.064	114
Grade Motivation	-.023	.806	114

Note. Pearson r correlation was employed to evaluate the connection between students' physics performance and their motivation level. P is less than .05.

The relationship between the students' motivation levels and their physics performance is seen in Table 3. It was discovered that, out of the five motivational factors, career motivation had a statistically significant negative link with physics performance ($r = -.219, p = .019$). This implies that students who are more driven by their professional goals typically perform marginally worse in the subject.

One possible interpretation is that high career-driven motivation may stem from external pressure or long-term goals, which, while strong, might not directly translate into immediate academic performance. This observation is in line with Ryan and Deci's (2000) assertion that extrinsic motivation can vary in quality, and when it is not fully internalized, it may not effectively enhance performance outcomes.

The other components intrinsic motivation ($r = -.087, p = .356$), self-efficacy ($r = -.067, p = .481$), self-determination ($r = -.174, p = .064$), and grade motivation ($r = -.023, p = .806$)—were not significantly correlated with performance. The absence of significant positive correlations indicates that while students may report high levels of motivation across these domains, such motivation may not be translating directly into measurable academic achievement in physics. This supports the findings of Schunk, Pintrich, and Meece (2008), who point out that desire is a prerequisite for academic achievement but not a sufficient one; it needs to be combined with adequate material knowledge and efficient learning techniques.

Interestingly, the near significance of self-determination ($p = .064$) suggests that autonomous motivation may have an impact on performance. This effect might be more noticeable with a larger sample size or with different metrics used for assessment. A potential hidden association between autonomous motivation and higher-order cognitive achievement in physics is suggested by Deci and Ryan's (1985) contention that self-determined learners are more likely to engage deeply with the material.

The overall weak and negative correlations may also indicate the complexity of learning physics as a cognitively demanding discipline, where motivation alone does not guarantee performance. Other mediating variables—such as prior knowledge, study habits, instructional quality, or test anxiety—could be influencing students' achievement more strongly than motivation per se (Zimmerman, 2000).

In summary, while students demonstrate various forms of motivation, only career motivation shows a significant, albeit inverse, relationship with performance. These findings underscore the need for holistic instructional approaches that not only inspire motivation but also cultivate cognitive and metacognitive strategies to convert that motivation into academic success.

Table 4. Plan for Improvement

Key Area Result	Objective	Strategies/ Activities	Responsible Unit
Enhance the attractiveness and interest of physics classes by presenting them through more captivating and thrilling activities.	<ul style="list-style-type: none"> To present lessons in a more alluring and exciting activities. 	<ul style="list-style-type: none"> Including technologically oriented exercises and activities in the lesson presentations. 	<ul style="list-style-type: none"> Office the Director for Curriculum and Instruction (ODCI)
Motivate learners to participate more in scientific classes.	<ul style="list-style-type: none"> To encourage hands-on learning and student 	<ul style="list-style-type: none"> Adding a skill competition to science classes 	<ul style="list-style-type: none"> ODCI & OSAS Instructors/Professors

	<ul style="list-style-type: none"> ● To give students a platform to demonstrate the knowledge and abilities they have gained 	<ul style="list-style-type: none"> ● Launching of Regular Science Fair ● Introduce students to competitions between colleges. 	
Increase level of motivation	<ul style="list-style-type: none"> ● To enhance level of motivation 	<ul style="list-style-type: none"> ● Offering rewards or reinforcement. ● Not having to take final exams ● An extra point system ● Holding workshops and seminars 	<ul style="list-style-type: none"> ● Course Instructors/Professors

Table 4 outlines a proposed plan aimed at enhancing students' motivation and engagement in learning Physics and other science courses. The first key area focuses on making Physics more appealing and interesting. To achieve this, the objective is to present lessons through engaging and exciting activities. One suggested strategy is the integration of technology-based exercises in lesson presentations, with the Curriculum and Instruction Office and the concerned instructors taking responsibility.

Increasing student involvement in science courses is the focus of the second important topic. The strategy aims to encourage active learning and give students opportunities to use what they have learned. Among the tactics are planning skill contests, starting frequent science fairs, and promoting involvement in intercollegiate activities. The Curriculum and Instruction Office, Student Affairs Office, and teachers will work together to carry out these tasks.

Lastly, the plan aims to improve students' overall motivation. To support this goal, strategies such as giving reinforcements or awards, providing exemptions from final exams, introducing additional point systems, and conducting seminars or workshops are proposed. The subject instructors will be primarily responsible for carrying out these activities.

Overall, the plan emphasizes interactive, rewarding, and experiential learning strategies to boost students' interest and motivation in science education.

6. Conclusions and Recommendations

The study's conclusions demonstrated that intrinsic motivation, self-efficacy, self-determination, grade motivation, and career drive are the main elements of student motivation when learning physics. The findings indicated that, in comparison to their male peers, female students exhibited greater levels of motivation for their grades and careers. This suggests that compared to earlier times, female students are now more focused on their careers. Active participation in scholastic and extracurricular activities as well as increased exposure to a variety of employment choices may have played a role in this change. Women's empowerment appears to have benefited from institutional efforts, especially gender and development (GAD) programs, as seen by the higher motivation levels of female students.

Male and female students' levels of grade motivation also differed significantly, with females showing a greater concern for grades. Perhaps because of more internal or external incentives linked to academic achievement, this shows that female students are more motivated to perform better academically in physics. In contrast, it seems that male students were less affected by their grades.

Nonetheless, the study did not discover any meaningful correlation between the physics performance of students and other motivational factors including grade incentive, self-efficacy, intrinsic motivation, or self-determination. The substantial negative correlation between career motivation and performance in physics is an important finding. It implies that students who have strong career-oriented goals may struggle academically, possibly because of outside pressure or long-term objectives that conflict with present-day teaching methods.

Based on these findings, the following are recommended:

1. Develop and implement targeted strategies to enhance students' academic performance in physics, particularly those that align with their motivational profiles.
2. Explore and innovate instructional methods that promote sustained interest in science-related courses, making them more relevant and engaging for both male and female students.

3. Reinforce GAD programs and provide mentorship opportunities, especially for female students, to further empower them in pursuing science-related careers and academic success.

4. To develop inclusive and responsive teaching methods, more research should be done to determine the unique requirements, passions, and learning styles of male and female students.

5. To make sure that students' long-term goals are in line with their academic pathways, especially in STEM (science, technology, engineering, and mathematics) disciplines, combine academic support with career coaching and counseling.

To sum up, encouraging motivation through student-centered and gender-sensitive methods can greatly enhance students' performance and engagement in physics and other scientific subjects.

Acknowledgement

The author sincerely appreciates the support of Cavite State University–Naic Research, Development, and Extension Services (CvSU Naic–RDES) for funding and facilitating this study. The resources, institutional assistance, and guidance provided were instrumental to the successful completion of this research.

References

- Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2010). “Doing” science versus “being” a scientist: Examining 10/11-year-old schoolchildren’s constructions of science through the lens of identity. *Science Education*, 94(4), 617–639. <https://doi.org/10.1002/sce.20399>
- Bandura, A. (1991). Self-efficacy mechanism in physiological activation and health-promoting behavior. In J. Madden (Ed.), *Neurobiology of learning, emotion and affect* (pp. 229–269). Raven Press.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Blackwell, L. S., Trzesniewski, K. H., & Carol S. Dweck. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, 78(1), 246–263. <https://doi.org/10.1111/j.1467-8624.2007.00995.x>
- Carol S. Dweck. (1986). Motivational processes affecting learning. *American Psychologist*, 41(10), 1040–1048. <https://doi.org/10.1037/0003-066X.41.10.1040>
- Cherney, I. D., Zurbriggen, E. L., Meltzoff, A. N., & Lloyd, B. (2011). Why are some STEM fields more gender balanced than others? *Psychological Bulletin*, 137(5), 845–863. <https://doi.org/10.1037/a0024452>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer.
- 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
- Eccles, J. S. (2009). Who am I and what am I going to do with my life? *Educational Psychologist*, 44(2), 78–89.
- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53, 109–132. <https://doi.org/10.1146/annurev.psych.53.100901.135153>
- Feather, N. T. (1998). Attitudes toward high achievers and reactions to their fall: Theory and research concerning tall poppies. *Advances in Experimental Social Psychology*, 30, 1–73. [https://doi.org/10.1016/S0065-2601\(08\)60375-3](https://doi.org/10.1016/S0065-2601(08)60375-3)
- Glynn, S. M., & Koballa, T. R., Jr. (2006). Motivation to learn in college science. In J. J. Mintzes & W. H. Leonard (Eds.), *Handbook of college science teaching* (pp. 25–32). NSTA Press.
- Hazari, Z., Sonnert, G., Sadler, P. M., & Shanahan, M.-C. (2010). Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice. *Journal of Research in Science Teaching*, 47(8), 978–1003. <https://doi.org/10.1002/tea.20363>
- Meece, J. L., Glienke, B. B., & Burg, S. (2006). Gender and motivation. *Journal of School Psychology*, 44(5), 351–373.
- Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. *Theory Into Practice*, 41(2), 116–125.
- Pintrich, P. R., & Schunk, D. H. (2011). *Motivation in education: Theory, research, and applications* (3rd ed.). Pearson.
- Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th ed.). Pearson.
- UNESCO. (2019). *Cracking the code: Girls’ and women’s education in STEM*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000253479>
- United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.
- Wang, M.-T., & Degol, J. L. (2013). Motivational pathways to STEM career choices: Using expectancy–value perspective to understand individual and gender differences in STEM fields. *Developmental Review*, 33(4), 304–340. <https://doi.org/10.1016/j.dr.2013.08.001>
- Weiner, B. (1978). *The psychology of motivation*. Lawrence Erlbaum Associates.
- Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, 92(4), 548–573. <https://doi.org/10.1037/0033-295X.92.4.548>
- Weiss, M. R., & Williams, L. (2004). The why of youth sport involvement: A developmental perspective on motivational processes. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective* (pp. 223–268). Fitness Information Technology.

- Zeldin, A. L., & Pajares, F. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal*, 37(1), 215–246.
- Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press.