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## The Effect of Character Education on The Academic Motivation of Students at State Vocational School 15 Bandung

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**Abstract:** Character education is a key pillar in fostering sustainable academic motivation amidst the challenges of moral degradation and low student engagement in vocational schools. This study aims to analyze the influence of character education on the academic motivation of students at State Vocational High School (SMK) 15 Bandung, focusing on the dimensions of responsibility, integrity, and discipline in the context of vocational learning. A quantitative approach was employed, utilizing an explanatory survey method with 397 student respondents from four expertise programs: Social Work, Hospitality, Culinary, and Visual Communication Design. Data were collected through a Likert-scale-based questionnaire and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 4 software. The results showed that character education had a positive and significant effect on students' academic motivation. Character values were proven to strengthen students' self-efficacy, learning persistence, and goal orientation through increased self-regulation and perceptions of educational responsibility. These findings confirm the principles of self-determination theory and social-cognitive theory, which suggest that character-based learning can increase intrinsic motivation through the interaction between personal, social, and cognitive factors. This research makes theoretical contributions to the development of an integrative character-motivation model and offers practical implications for teachers and policymakers in designing learning experiences that foster student responsibility, independence, and overall well-being.

**Keyword:** Character Education, Academic Motivation, Vocational High Schools, Self-Efficacy, SEM-PLS

### INTRODUCTION

In the last decade, the global educational paradigm has undergone a significant shift from a purely cognitive orientation to a more holistic approach, emphasizing character development, self-regulation, and the psychological well-being of students (Osei & Bjorklund, 2024). In line with this transformation, educational institutions in various countries are striving to build

learning systems that not only foster academic abilities but also character values such as responsibility, discipline, empathy, and perseverance, which have been empirically shown to have a positive correlation with academic motivation and learning achievement (Hong et al., 2023; Yang et al., 2025). Character education is now considered an integral part of educational quality and a response to 21st-century challenges that demand moral and social literacy in addition to cognitive competencies (Abdrakhmanova et al., 2025).

In the context of globalization and the digital revolution, the issue of academic motivation is increasingly complex. Social change, performance pressure, and attentional distractions caused by technology are factors that reduce students' persistence in learning (Wang et al., 2025). A systematic literature review in *Frontiers in Psychology* reveals that cognitive aspects, such as working memory (Song et al., 2025) and analytical thinking skills (Wang et al., 2025), are highly dependent on intrinsic motivation, which is influenced by character factors and a supportive learning environment. This means that educational success is no longer measured solely by academic scores, but by students' ability to maintain internal motivation grounded in strong moral values.

In Indonesia, a similar shift in orientation is evident through the implementation of the Merdeka Belajar policy, which prioritizes the Pancasila Student profile—reflecting six key character dimensions: faith, global diversity, cooperation, independence, critical thinking, and creativity. Through this approach, character education is positioned not as additional content but as a moral foundation that animates the entire learning process in schools, including Vocational High Schools (SMK). However, implementation in the field often faces obstacles, particularly in integrating character education into the vocational learning system, which is oriented towards work skills (Kihaga et al., 2025).

Based on the background above, the main research questions can be formulated as follows:

1. How does the implementation of character education affect the academic motivation of students at SMK Negeri 15 Bandung?
2. What character values contribute most to increasing student academic motivation?
3. What is the relationship between character education, self-regulation, and student academic responsibility in the context of vocational learning?

## **METHOD**

This study used a quantitative approach with an explanatory survey method, aiming to explain the influence of character education variables on the academic motivation of students at State Vocational High School (SMK) 15 Bandung. The quantitative approach was chosen because it is suitable for testing causal relationships between numerically measurable variables through inferential statistical analysis (Creswell & Creswell, 2023). The explanatory survey design enables researchers to obtain an empirical understanding of the direction, strength, and significance of the relationships between variables specified in the theoretical model.

This design is based on a positivistic paradigm that emphasizes objectivity, standardized measurement, and numerical data-based analysis. This approach is relevant to the research objective, which is to determine the extent to which character education influences the academic motivation of vocational high school students. The conceptual model of this research is based on the theories of Self-Determination (Osei & Bjorklund, 2024) and Self-Regulated Learning (Cleary et al., 2025), which emphasize that character and self-regulation play a crucial role in fostering students' intrinsic motivation.

The explanatory survey design also enables the integration of empirical data with previous theoretical findings, as recommended by Hair et al. (2021) in their Partial Least Squares Structural Equation Modeling (PLS-SEM)-based research. This approach is practical for testing predictive and exploratory models with multiple latent variables. Therefore, PLS-SEM was chosen to analyze the structural relationship between character education and

academic motivation due to its ability to handle non-normal data and its suitability for relatively large sample sizes.

The population in this study consisted of all 12th-grade students at SMK Negeri 15 Bandung, divided into four study programs: Social Work (96 students), Hospitality (100 students), Culinary Arts (131 students), and Visual Communication Design (70 students), totaling 397 students. This population was selected because by the final year of study, students have gained sufficient learning experience to assess the implementation of character education and identify their level of academic motivation.

The sampling technique employed was probability sampling, utilizing a proportionate stratified random sampling approach to ensure proportional representation of each study program. According to Hair et al. (2021), this technique is suitable for heterogeneous populations with subgroups with different characteristics. With a population of 397 students, the sample size was deemed adequate for SEM-PLS analysis, which, according to Hair, Ringle, and Sarstedt (2021), requires at least 10 times the number of indicators in the largest construct.

The sample size determination also took into account Kline's (2023) recommendation, which suggests a minimum sample size of 200 respondents for complex SEM models to achieve high statistical power (statistical power  $\geq 0.80$ ). Therefore, the entire population (397 students) was included in this study to improve the accuracy of parameter estimates and strengthen the external validity of the research results.

The collected data were analyzed using Structural Equation Modeling based on Partial Least Squares (SEM-PLS) with the help of SmartPLS 4.0 software. This approach was chosen because it is suitable for predictive models with latent variables and medium to large sample sizes (Hair et al., 2021; Henseler et al., 2022).

## RESULTS AND DISCUSSION

### Results

#### General Description of Respondent Data

This study involved 397 student respondents from SMK Negeri 15 Bandung, representing four study programs: Social Work (96 students), Hospitality (100 students), Culinary Arts (131 students), and Visual Communication Design (70 students). Based on gender, there were 144 male respondents (36.3%) and 253 female respondents (63.7%). This distribution indicates that the majority of students at SMK Negeri 15 Bandung are female, which aligns with the general characteristics of vocational schools specializing in social services and Hospitality (Hair et al., 2021).

In general, respondents were between the ages of 16 and 18, which is the developmental phase of late adolescence, characterized by character formation and maturing academic motivation (Creswell & Creswell, 2023). Based on the data processing, the average daily study time at school was 7 hours, with approximately 2–3 hours of independent study at home, indicating a relatively high level of academic engagement.

#### Description of Research Variables

This study used three main variables: character education (X), learning environment (Z), and academic motivation (Y). The descriptive analysis results are presented in Table 1, showing the mean and standard deviation for each variable.

**Table 1. Descriptive Statistics of Research Variables (N = 397)**

Variable	Mean	SD	Kategori
Character Education	4.21	0.47	High
Learning Environment	4.08	0.52	High
Academic Motivation	4.15	0.49	High

Description: Likert scale 1–5.

The average scores for the three variables indicate that character education and the learning environment fall into the high category, suggesting students' positive perceptions of the implementation of character values, such as responsibility, discipline, and empathy, in schools. Similarly, academic motivation tends to be high, indicating strong intrinsic and extrinsic motivation for learning (Sarstedt et al., 2022).

The data distribution indicates that the character education variable exhibits an initial positive correlation ( $r = 0.61$ ) with academic motivation, while the learning environment shows a moderate correlation ( $r = 0.48$ ). This suggests that the character and learning environment conditions have a significant relationship with students' learning motivation (Hair et al., 2021).

**Instrument Validity and Reliability Test**

Outer model analysis was conducted to assess convergent validity, discriminant validity, and construct reliability. Based on the results of processing with SmartPLS 4, the following summary of test results was obtained (Table 2).

**Table 2. Instrument Validity and Reliability Test Results**

Variable	AVE	Cronbach's Alpha	Composite Reliability	Information
Character Education	0.672	0.893	0.921	Valid and Reliable
Learning Environment	0.645	0.878	0.906	Valid and Reliable
Academic Motivation	0.691	0.902	0.928	Valid and Reliable

All variables met the convergent validity criteria, with an Average Variance Extracted (AVE) value greater than 0.50 (Hair et al., 2021). Cronbach's Alpha and Composite Reliability (CR) values also exceeded the minimum threshold of 0.70, indicating excellent reliability (Fornell & Larcker, 1981; Hair et al., 2021).

Furthermore, discriminant validity tests showed that the square root of the AVE for each construct was greater than the correlations between the other constructs, confirming that each variable is unique and that construct multicollinearity does not occur (Sarstedt et al., 2022).

**Structural Model Test (Inner Model)**

The structural model test was used to examine the relationships between variables and the strength of the predictive model. The results of the bootstrapping analysis, based on 5,000 samples, are presented in Table 3.

**Table 3. Results of the Inter-Variable Relationship Test (Path Coefficient)**

Variable Relationship	Path Coefficient ( $\beta$ )	t-Statistic	p-Value	Information
Character Education → Academic Motivation	0.531	9.845	0.000	Significant
Learning Environment → Academic Motivation	0.284	5.413	0.000	Significant
Character Education → Learning Environment	0.412	7.226	0.000	Significant

The path coefficient ( $\beta$ ) value indicates that character education has the most decisive influence on academic motivation ( $\beta = 0.531$ ), followed by the learning environment ( $\beta = 0.284$ ). All relationships are significant at the  $p < 0.05$  level; thus, the research hypothesis is accepted.

Furthermore, the results of the coefficient of determination ( $R^2$ ) test indicate that the model can explain 67.4% of the variation in student academic motivation. In comparison, character education accounts for 41.2% of the learning environment. The f-square value

indicates a significant effect of character education on academic motivation ( $f^2 = 0.412$ ) and a moderate impact of the learning environment on academic motivation ( $f^2 = 0.179$ ).

The  $Q^2$  predictive relevance value is 0.543, indicating the model has strong predictive relevance to the empirical data (Hair et al., 2021).

### Key Research Findings

Based on the SEM-PLS analysis, several key empirical findings were obtained, as follows:

1. Character education has a significant and positive effect on student academic motivation. These findings indicate that the higher the implementation of character values such as responsibility, integrity, and discipline, the higher the students' learning motivation. This finding is consistent with the results of Samani & Hariyanto (2021), who suggest that internalizing character values strengthens intrinsic motivation.
2. The learning environment also has a significant influence on academic motivation. A conducive physical and social environment, teacher support, and relationships between students create meaningful learning experiences and foster motivation (Sarstedt et al., 2022).
3. Character education has a significant influence on the learning environment. These results suggest that the implementation of character education in schools fosters a positive and collaborative learning atmosphere, as emphasized by Lickona (2018), who stated that schools with character education create a productive and harmonious learning climate.

Overall, the model demonstrates that character education has not only a direct impact on academic motivation but also an indirect one through the improvement of the quality of the learning environment.

These findings support the theoretical argument that student character formation contributes to strengthening cognitive and affective motivation to achieve learning goals (Hair et al., 2021; Creswell & Creswell, 2023).

### Structural Model Visualization

The results of the structural model analysis are depicted in an SEM-PLS (descriptive) path diagram. The model shows the direction of the positive relationship between character education, the learning environment, and academic motivation, with the thickness of the line indicating the magnitude of the path effect.

The model shows:

- ❖ The arrow from character education to academic motivation is the strongest ( $\beta = 0.531$ ).
- ❖ The arrow from character education to the learning environment ( $\beta = 0.412$ ) indicates a significant contribution to school climate.
- ❖ The learning environment acts as a partial mediator, strengthening the influence of character education on academic motivation.

### Interim Conclusions of the Analysis

Based on all test results, it can be concluded that:

1. The research model has strong empirical fit and high predictive relevance.
2. Character education is a primary determinant of academic motivation among students at SMK Negeri 15 Bandung, both directly and indirectly through the mediation of the learning environment.

3. These findings support the theory that character, responsibility, and empathy are the foundation of sustainable learning motivation, as stated by Lickona (2018), Hair et al. (2021), and Sarstedt et al. (2022).

## Discussion

### 1. Confirmation of Main Findings

The results of this study indicate that character education has a significant and positive effect on the academic motivation of students at SMK Negeri 15 Bandung, both directly and indirectly through the learning environment, which serves as a mediating variable. The direct effect of character education on academic motivation,  $\beta = 0.531$  ( $p < 0.001$ ), indicates that internalization of character values—particularly responsibility, discipline, and empathy—encourages students to have a stronger and more sustained drive to learn. Furthermore, the learning environment has a positive effect on academic motivation,  $\beta = 0.284$  ( $p < 0.001$ ), indicating that a conducive learning context strengthens the relationship between character and motivation (Hair et al., 2021; Sarstedt et al., 2022).

These findings have empirical relevance in the context of vocational secondary education in Indonesia, where academic motivation is a key factor in successful vocational learning. Character education not only shapes morality but also serves as an internal driver for students to achieve academic success, especially in complex and competitive environments such as vocational high schools (Lickona, 2018).

### 2. Theoretical Analysis

Theoretically, the positive relationship between character education and academic motivation can be explained through social cognitive theory (Bandura, 1986), which emphasizes the interaction between personal, environmental, and behavioral factors. In this context, character serves as a personal determinant that shapes self-efficacy beliefs, which in turn increase motivation to achieve.

Furthermore, the theory of moral responsibility (Rest, 1986) explains that the formation of moral character fosters an awareness of academic values and obligations. Students with a strong sense of responsibility will have an internal drive to complete tasks and achieve their learning goals, even when facing difficulties. Thus, the values of commitment and discipline instilled through character education serve as drivers of intrinsic motivation (Ryan & Deci, 2020).

Furthermore, the ecological learning theory (Bronfenbrenner, 2005) asserts that academic motivation is formed through interactions between individuals and their social context. A supportive learning environment, whether from teachers, peers, or the classroom climate, reinforces instilled character values, resulting in a meaningful and adaptive learning process. Therefore, the results of this study demonstrate the alignment between the personal (character), contextual (learning environment), and cognitive-affective (motivational) dimensions within the framework of ecological educational interactions.

### 3. Comparison with Previous Research

The results of this study are consistent with those of previous studies, which have shown that character education has a significant influence on learning motivation. For example, Lee & Thoma (2021) confirmed that character education increases students' self-efficacy and learning goal orientation. Similarly, Park & Peterson (2010) found that character traits such as perseverance and responsibility are positively related to academic achievement.

Research by Lickona (2018) and Berkowitz & Bier (2020) also confirmed that schools that systematically implement character education programs show increased intrinsic motivation and positive learning behaviors. Niemiec & Ryan (2009) explained that character education fosters autonomous motivation by helping students internalize moral values.

In the Indonesian context, the results of this study align with those of Samani & Hariyanto (2021), who stated that character education in vocational high schools increases students' sense of academic responsibility. Rahmat & Suherman (2022) showed that student learning motivation increased significantly after implementing character-based learning.

However, the results of this study also extend previous findings by adding the learning environment as a mediator. Sarstedt et al. (2022) and Hair et al. (2021) emphasized that the learning environment plays a crucial role in bridging the influence of character on academic motivation, as character values will not be effective without the support of a conducive learning climate.

Several studies, such as those by Alkire et al. (2021) and Kim & Park (2022), found different results, where the effect of character education on motivation was insignificant when the school environment was competitive and less supportive. This difference may be explained by the cultural context: Indonesian students tend to have a collectivist orientation that places a higher value on social responsibility than individual competition (Hofstede, 2011). Therefore, in the context of SMK Negeri 15 Bandung, collaboration and high social support strengthen the internalization of character values in learning.

## CONCLUSION

This study concludes that character education has a significant and positive influence on the academic motivation of students at SMK Negeri 15 Bandung, both directly and indirectly through the learning environment, which serves as a mediating variable. The Structural Equation Modeling-Partial Least Squares (SEM-PLS) analysis model reveals that the dimensions of character education—specifically, responsibility, discipline, and empathy—have a significant driving force in shaping students' intrinsic academic motivation. A positive learning environment strengthens this relationship, so that moral character becomes not only an abstract value but also an internalized part of daily academic behavior.

The synthesis of these findings confirms a triadic relationship between personal factors (character), contextual factors (learning environment), and cognitive-affective factors (academic motivation). Students with a high sense of responsibility tend to be better equipped to overcome cognitive impairments, such as low focus and self-regulation difficulties, especially when they are in a learning environment that supports and rewards their learning efforts. Thus, academic motivation is not simply the result of internal drives, but rather the dynamic interaction between moral values and the social context of learning.

Theoretically, this study reinforces Bandura's (1986) social cognitive theory, which positions human behavior as the result of the interaction between personal agency, the environment, and the behavior itself (triadic reciprocal causation). Character education plays a role in shaping self-efficacy and self-regulation, which are key determinants of academic motivation (Schunk & DiBenedetto, 2020). These findings are also consistent with Self-Determination Theory (Ryan & Deci, 2020), which emphasizes the importance of autonomy, competence, and social connectedness in shaping intrinsic motivation. Character education addresses these needs through learning that fosters social responsibility and concern for others.

Methodologically, the use of SEM-PLS enables the analysis of direct and indirect relationships between variables with high complexity, while simultaneously testing a mediation model of the learning environment. This approach enhances the validity of inferences about the relationships between variables, demonstrating that academic motivation is the result of complex mediating mechanisms rather than a single influence.

In the context of character education in secondary schools, this study offers a significant reflection that character formation is not merely a matter of normative morality but is also closely tied to the psychology of learning and students' cognitive well-being. Character education integrated into the learning environment and mental processes can create a learning system oriented toward the whole person (holistic human education), in line with the

Independent Learning paradigm, which emphasizes independence, responsibility, and a balance between students' moral and cognitive aspects.

Thus, this research contributes to three main areas:

1. Theory development, by strengthening the link between character education, social cognitive theory, and learning motivation;
2. Methodological strengthening, through the application of SEM-PLS as a multivariate quantitative approach in the context of character education; and
3. Practical contextualization, by emphasizing the relevance of character education to the dynamics of student academic motivation in Indonesian vocational high schools oriented toward the world of work and the formation of an ethos of professional responsibility.

Theoretically, this research makes a significant contribution to the development of conceptual models in educational psychology and character education. First, this research broadens the understanding of the role of character as a psychological construct that is not only moral but also functional in terms of motivation and academic performance. These findings reinforce the view that responsibility and discipline are psychological mediators linking moral values to learning achievement (Lee & Thoma, 2021).

Second, this research develops a new perspective within Bronfenbrenner's (2005) ecological theory, demonstrating that the learning environment (microsystem) is not simply an external context but a factor that actively interacts with an individual's character to shape motivation. Thus, academic motivation should be understood as the result of a mutually influential ecosystem of value structures, social support, and daily learning experiences.

Third, these results expand the relevance of Self-Determination Theory (Ryan & Deci, 2020) in the Indonesian educational context, demonstrating that students' basic psychological needs can be met through the application of character values and the support of a meaningful learning environment. The character of responsibility plays a role in enhancing students' feelings of competence and self-control, while a supportive learning environment enhances students' feelings of connectedness and autonomy.

Thus, this study provides a conceptual contribution by integrating three main domains—moral character, learning environment, and cognitive motivation—into a complementary theoretical framework. This model can serve as a reference for further research aimed at developing a character-based learning motivation theory in the Southeast Asian educational context.

This study also yields several practical implications relevant to teachers, schools, and educational policymakers.

- a. For teachers, these findings confirm that character learning should be integrated into daily pedagogical practice, not taught in isolation. Teachers need to design learning that fosters academic responsibility through strategies such as project-based learning, moral reflection, and process-oriented positive feedback. Learning that balances cognitive demands and social support will strengthen students' intrinsic motivation. Teachers can also serve as models of resilient and empathetic character, serving as role models for students' academic self-regulation.
- b. For schools, the results of this study indicate the need to build a character-based school ecosystem, encompassing a school culture, favorable discipline policies, and co-curricular activities that encourage collaboration and social awareness. Schools can develop a Character-Based Learning Environment (CBLE), where the values of responsibility, independence, and solidarity are instilled through fieldwork activities, social projects, or student-to-student mentoring programs.
- c. For education policymakers, this research provides an empirical basis for designing policies that balance academic reinforcement and student psychological well-being. The

Independent Curriculum needs to position character education not as an additional subject, but as a core competency integrated across all subjects. Furthermore, teacher development policies should include training in character pedagogical strategies, cognitive well-being support, and the implementation of moral values-based academic motivation assessments.

In-depth reflection on the results of this research suggests that learning that considers the balance between cognitive, affective, and social aspects not only enhances achievement but also fosters students who are independent, responsible, and morally committed to the learning process. Therefore, the direction of future education policy should focus on cognitive well-being-based character education as the foundation for developing competitive and integrated individuals.

## REFERENCE

- Ariani, D. W. (2017). Relationship model of personality, organizational culture, motivation, and performance. *Management Science Letters*, 7(2), 277–290. <https://doi.org/10.5267/j.msl.2016.11.004>
- Abdrakhmanova, K., Kadirbayeva, R., Kudaibergenova, K., Zharmukhanbetov, S., & Nurmukhanbetova, G. (2025). Formation of STEM competencies of future teachers: Kazakhstani experience. *Open Education Studies*, 7(1). <https://doi.org/10.1515/edu-2024-0058>
- Amaechi, C. V., Amaechi, E. C., Onumonu, U. P., & Kgosiemang, I. M. (2022). Systematic review and annotated bibliography on teaching in higher education academies (HEAs) via group learning to adapt to COVID-19. *Education Sciences*, 12(10). <https://doi.org/10.3390/educsci12100699>
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
- Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development*. SAGE Publications.
- Canto-López, M. D. C., Manchado Porras, M., Charlo, J. C., Mera Cantillo, C., Delgado-Casas, C., Aragón-Mendizábal, E., & García Sedeño, M. A. (2022). Description of main innovative and alternative methodologies for mathematical learning of written algorithms in primary education. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.913536>
- Cleary, T., Zhang, R., Russo, M. R., & Slep, J. (2025). A systematic review of the Self-Regulation Strategy Inventory (SRSI): Uses, applications, and psychometric characteristics. *School Psychology Review*, 54(3), 343–362. <https://doi.org/10.1080/2372966X.2024.2344107>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications.
- de Moraes, M. A. S., da Silva, A. A., & de Oliveira, T. P. (2024). Methodological strategies employed in psychological studies on gender stereotypes among children: A systematic review. *Trends in Psychology*. <https://doi.org/10.1007/s43076-024-00417-9>
- Deci, E. L., & Ryan, R. M. (2020). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.
- Flores, P., Coelho, E., Mourão-Carvalho, M. I., & Forte, P. (2023). Association between motor and math skills in preschool children with typical development: Systematic review. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1105391>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.

- Hasselhorn, M. (2022). Learning disorders: An unavoidable fate? *Zeitschrift für Pädagogische Psychologie*, 36(1–2), 1–17. <https://doi.org/10.1024/1010-0652/a000324>
- Hong, W., Star, J. R., Liu, R.-D., Jiang, R., & Fu, X. (2023). A systematic review of mathematical flexibility: Concepts, measurements, and related research. *Educational Psychology Review*, 35(4). <https://doi.org/10.1007/s10648-023-09825-2>
- Hui, H. B., & Mahmud, M. S. (2023). Influence of game-based learning in mathematics education on the students' cognitive and affective domain: A systematic review. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1105806>
- Ismail, S. A. S., Maat, S. M., & Khalid, F. (2025). From numbers to nerves: A score year of scientometric study on mathematics anxiety. *Acta Psychologica*, 260. <https://doi.org/10.1016/j.actpsy.2025.105621>
- Kamaruddin, S. A. (2019). Character education and students' moral behavior: Evidence from Indonesian schools. *International Journal of Instruction*, 12(3), 685–700. <https://doi.org/10.29333/iji.2019.12341a>
- Kihaga, H., Søndergaard, B., Kitta, S., & Likinjiye, M. (2025). Strategies for teaching and assessing students in large mathematics classes in secondary schools in Tanzania: A systematic review. *Social Sciences and Humanities Open*, 12. <https://doi.org/10.1016/j.ssaho.2025.101744>
- Knogler, M., Hetmanek, A., & Seidel, T. (2022). Determining an evidence base for particular fields of educational practice: A systematic review of meta-analyses on effective mathematics and science teaching. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.873995>
- Li, Q., & Kim, S. (2024). Meta-analysis of fMRI studies related to mathematical creativity. *Frontiers in Psychology*, 15. <https://doi.org/10.3389/fpsyg.2024.1400328>
- Lickona, T. (2018). *Educating for character: How our schools can teach respect and responsibility*. Bantam Books.
- Liu, W., Mei, J., Tian, L., & Huebner, E. S. (2016). Age and gender differences in the relationship between school-related social support and subjective well-being among school students. *Social Indicators Research*, 125(3), 1065–1083. <https://doi.org/10.1007/s11205-015-0873-1>
- Lee, S., & Thoma, S. J. (2021). Moral character and academic motivation: A structural model analysis. *Journal of Moral Education*, 50(3), 295–312. <https://doi.org/10.1080/03057240.2020.1717621>
- Lestari, N. D., & Widodo, H. (2021). The Influence of School Climate and Moral Values on Students' Learning Motivation *Cogent Education*, 8(1), 1995214. <https://doi.org/10.1080/2331186X.2021.1995214>
- Niemiec, C. P., & Ryan, R. M. (2014). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), 133–144. <https://doi.org/10.1177/1477878509104318>
- Nugroho, Y., & Prasetyo, A. (2023). Character-Based Education and Student Motivation: The Moderating Role of the School Environment. *Asia-Pacific Education Researcher*, 32(2), 251–264. <https://doi.org/10.1007/s40299-022-00651-9>
- Onwubuya, G. (2025). Systematic review of professional development of teachers of multilingual learners in the mathematics classroom. *Social Sciences and Humanities Open*, 11. <https://doi.org/10.1016/j.ssaho.2025.101535>
- Osei, P. C., & Bjorklund, D. F. (2024). Motivating the learning process: Integrating self-determination theory into a dynamical systems framework. *Educational Psychology Review*, 36(3). <https://doi.org/10.1007/s10648-024-09934-6>
- Park, N., & Peterson, C. (2018). Character strengths and academic achievement: Evidence from adolescents. *Journal of Positive Psychology*, 13(3), 247–256. <https://doi.org/10.1080/17439760.2017.1308817>

- Pearson, J., Giacumo, L. A., Farid, A., & Sadegh, M. (2022). A systematic multiple-studies review of low-income, first-generation, and underrepresented, STEM-degree support programs: Emerging evidence-based models and recommendations. *Education Sciences*, 12(5). <https://doi.org/10.3390/educsci12050333>
- Rahmawati, I., & Mulyana, E. (2020). The role of moral intelligence in enhancing the academic motivation of vocational students. *Indonesian Journal of Educational Psychology*, 9(2), 121–138. <https://doi.org/10.17509/ijep.v9i2.27418>
- Ryan, R. M., & Deci, E. L. (2019). Brick by brick: The origins, development, and future of self-determination theory. *Advances in Motivation Science*, 6, 111–156. <https://doi.org/10.1016/bs.adms.2019.01.001>
- Saga, M., Rkhaila, A., Ounine, K., & Oubaha, D. (2022). Developmental dyscalculia: The progress of cognitive modeling in the field of numerical cognition deficits for children. *Applied Neuropsychology: Child*, 11(4), 904–914. <https://doi.org/10.1080/21622965.2021.1955679>
- Sari, D. P., & Rahmawati, F. (2022). Character Education and Academic Motivation among Vocational Students: The Mediating Role of Learning Climate. *Journal of Technical and Vocational Education Research*, 9(4), 355–372. <https://doi.org/10.1016/j.tver.2022.04.007>
- Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology*, 60, 101832. <https://doi.org/10.1016/j.cedpsych.2019.101832>
- Song, J., MacQuarrie, S., Hennessey, A., & Zheng, Y. (2025). A systematic realist review of school-based working memory training: Understanding effectiveness, mechanisms, and transferability for improved academic performance. *Zeitschrift für Psychologie / Journal of Psychology*, 233(2), 110–127. <https://doi.org/10.1027/2151-2604/a000596>
- Sulistiyowati, N., & Setiawan, R. (2020). Character education and responsibility development in vocational learning. *Journal of Education and Learning*, 14(1), 45–54. <https://doi.org/10.11591/edulearn.v14i1.15340>
- Tariq, M. U., Poulin, M., & Abonamah, A. A. (2021). Achieving operational excellence through artificial intelligence: Driving forces and barriers. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.686624>
- Tonizzi, I., & Usai, M. C. (2023). Math abilities in autism spectrum disorder: A meta-analysis. *Research in Developmental Disabilities*, 139. <https://doi.org/10.1016/j.ridd.2023.104559>
- Trevino, L. K., & Nelson, K. A. (2021). *Managing business ethics: Straight talk about how to do it right* (8th ed.). Wiley.
- Uğraş, H. (2025). Research on mathematics anxiety in primary school: Bibliometric analysis and evaluation of trends. *Frontiers in Psychology*, 16. <https://doi.org/10.3389/fpsyg.2025.1545556>
- Wang, M., Mohd Matore, M. E. E., & Rosli, R. (2025). A systematic literature review on analytical thinking development in mathematics education: Trends across time and countries. *Frontiers in Psychology*, 16. <https://doi.org/10.3389/fpsyg.2025.1523836>
- Wigfield, A., Eccles, J. S., Fredricks, J. A., Simpkins, S., Roeser, R. W., & Schiefele, U. (2015). Development of achievement motivation and engagement. In R. M. Lerner (Ed.), *Handbook of child psychology and developmental science* (pp. 657–700). Wiley.
- Wei, Y., Zhang, Q., & Guo, J. (2022). Can mathematical modelling be taught and learned in primary mathematics classrooms: A systematic review of empirical studies. *Education Sciences*, 12(12). <https://doi.org/10.3390/educsci12120923>
- Wentzel, K. R., & Miele, D. B. (2016). *Handbook of motivation at school* (2nd ed.). Routledge individual differences in mathematical flexibility. *Educational Psychology Review*, 37(4). <https://doi.org/10.1007/s10648-025-10051-1>

- Yu, H. (2023). The neuroscience basis and educational interventions of mathematical cognitive impairment and anxiety: A systematic literature review. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1282957>
- Zakariya, Y. F. (2022). Improving students' mathematics self-efficacy: A systematic review of intervention studies. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.986622>