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Effects of academic performance on students

This section delves into the specifics of how this study was conducted, including what data was used, the procedures followed, and the methods employed for analysis. Details regarding data sources, experimental setup, data collection and processing, as well as statistical tools used are provided below. The data utilized in this research comes from secondary sources obtained from Kaggle.com, a renowned platform in the data science and machine learning communities. It serves as a hub for data enthusiasts offering a wealth of datasets and hosting various projects related to data. The study population consists of 10,000 students enrolled in a school with the aim to examine factors influencing academic performance. Each record contains information about various predictors and a performance index, detailed in Table 1. Table 1 provides an overview of the dataset description. Table 2 shows the actual dataset details. This section outlines the experimental settings for predicting students' academic performance through linear regression application. These settings include critical elements defining the environment and conditions under which our research was conducted: The data used comes from secondary sources obtained from Kaggle.com, a platform renowned in the data science and machine learning communities. It encompasses comprehensive data on students including their academic records and study habits. Before applying the linear regression model, we preprocessed the dataset to ensure data quality and integrity using open-source software like Jupyter Notebook. During preprocessing, ordinal data were nominalized for successful implementation. Feature selection was crucial in our experimental settings where we carefully selected a subset of independent variables (predictors) considering their anticipated influence on academic performance. Features encompassed prior academic achievements and study habits. To evaluate the model's predictive performance, we split the dataset into training and testing sets. The training set was used to train the linear regression model, while the testing set was kept separate for model validation and performance assessment. Twenty percent of the data was used for testing, and the remaining eighty percent was used for training. The independent variables are Hours Studied, Previous Score, Extracurricular activities, Sleep Hour, and Sample Question Paper Practiced, and the dependent variable is Performance Index. These variables were selected because each one has a strong correlation with the target variable. To assess the model's performance, we used mean squared error (MSE), R-squared, and mean absolute squared error (MAE). Once the model is trained, it's essential to evaluate its performance on test data to ensure reliability and effectiveness. Our proposed model uses a linear regression approach, assuming a linear relationship between the dependent variable and independent variables. The general form of the linear regression model can be expressed as Y = β0 + β1X1 + β2X2 + … + βnXn. Predicting Academic Performance through Linear Regression Analysis Predicting Academic Performance: A Linear Regression Model and testingThis crucial step enables us to validate our model's performance on new data, ensuring it generalizes well. By evaluating predictive accuracy and safeguarding against overfitting, we can make informed decisions. Prediction and applicationOnce validated, the linear regression model is applied to predict future academic performance. This empowers educational institutions, educators, and policymakers to make data-driven choices about students' needs. Flowchart of proposed modelThe flowchart illustrates our model's input selection and output procedure (performance index). It highlights the initial step as selecting parameters, processing them, and completing training, testing, and prediction for accurate outputs. Fig. 1 visualizes the sequential steps leading to a performance index prediction. Prediction (performance index)As a library, NLM provides access to scientific literature. Inclusion in an NLM database does not imply endorsement of or agreement with contents by NLM or the National Institutes of Health. The success or failure of a student depends on factors like self-esteem, academic engagement, and motivation. Self-esteem influences emotional and behavioral disengagement, while motivation affects academic engagement, which contributes to performance. Our study shows that metacognitive engagement predicts students' academic performance. Promoting such strategies can enhance learning and performance. Keywords: self-esteem, academic engagement, academic performance, motivation, higher education Academic engagement is highly dependent on context [3]. Commitment is key, pushing students to participate actively during classes [4,5]. Not only does it ensure completion of studies but also protects against challenges faced by young people [6]. Academic engagement consists of emotional, behavioral, and cognitive elements [7,8,9] and analyzing how motivation affects this is crucial for understanding student involvement in the learning process. Research shows that motivation significantly influences academic achievement as well [10]. Self-esteem plays a vital role too; closely related to motivation and academic success it's defined by students' positive or negative perception of their self-worth [12,13], impacting ability to complete tasks. Focusing solely on grades as a measure of success is also prevalent, with psychosocial self-esteem influencing these results [15,16]. Analyzing the effect of self-esteem will provide strategies for motivation, enhancing educational performance positively. This research proposes a model exploring how self-esteem, motivation, and academic engagement affect student performance. It offers empirical evidence on self-esteem's influence on engagement levels and subsequent academic performance. In education, motivation has been studied as an outcome influenced by context, study field, and task [3,18]. Expectancy-value theory by Pintrich and de Groot [19] is one such framework; it considers motivation in achieving goals or tasks. Two elements underpin this theory: students' belief in their ability to perform educational tasks and sense of control over performance. The concept of expectancy involves self-efficacy and students' beliefs about controlling their learning process, similar to Bandura's work [20]. Another element is value, comprising extrinsic motivation, intrinsic motivation towards an objective, and the importance a student assigns to the task. The self-determination theory by Ryan and Deci [21] proposes that students possess psychological needs fulfilled by motivational factors showing strong commitment to their academic activities [22]. This theory serves as the foundation explaining self-esteem-related components and linking engagement, motivation, and academic achievement. Research suggests that academic achievement is a well-established goal encompassing emotional, behavioral, and cognitive involvement [8]. Emotional engagement refers to students' positive and negative emotional responses to learning environments and tasks [8], including enjoyment, enthusiasm, interest, satisfaction, and vitality. Conversely, lack of interest, characterized by disaffection or detachment, results in negative emotions like boredom, frustration, depression, anxiety, or rage. When unhappy students are submissive, they rarely face challenges [7]. Behavioral engagement involves students' participation in academic activities, tasks, homework, and the learning environment, as well as time and attention spent on educational tasks [9]. Behavioral commitment refers to the degree of student participation in academic, social, or extracurricular activities, encompassing actions like starting an action, making efforts, attempting, persisting, working intensely, attentively, concentrating, and participating [6]. On the other hand, behavioral disengagement includes negative behaviors indicative of lack of interest, such as passiveness, forsaking, distraction, or being mentally disconnected and unprepared. Cognitive involvement implies students' psychological investment in their learning process, characterized by moving from simple cognitive strategies with low commitment to more sophisticated strategies like self-regulation or metacognition [25]. Understanding the issue at hand and controlling learning are crucial components of the learning process [8,29]. Researchers have consistently shown that student engagement is directly linked to academic achievement [4,6,30]. Self-esteem refers to a person's positive or negative attitude towards themselves and their capabilities. In an educational setting, it represents students' perception of their self-worth and ability to succeed [12,13]. Self-evaluation encompasses various characteristics, including self-esteem and self-efficacy, which play significant roles in determining student motivation, behavior, performance, and overall well-being [17]. Both self-esteem and self-efficacy are essential components that contribute to explaining individual differences in motivation, attitudes, and academic performance among students. Self-efficacy is the trust individuals have in achieving their objectives, enabling them to attain their educational goals and make informed decisions throughout their lives [32]. Studies have found that self-esteem, self-efficacy, and expectations significantly influence student engagement, affecting the quality and level of involvement [33]. Researchers have also discovered that self-esteem is closely related to affective processes, while self-efficacy is associated with motivational processes [17]. These findings suggest that students' motivational and affective states mediate the relationship between self-esteem and educational performance. Therefore, self-esteem affects academic performance through emotions (affective states) and motivation. The proposed conceptual model in Figure 1 has been supported by empirical evidence from previous research [20,34,35]. Motivation is a key component of understanding student involvement in educational activities, with many researchers confirming its impact on academic engagement [19,36]. Self-efficacy is a factor that comprises the construct of motivation. The effects of motivation on students' emotional, behavioral, and cognitive involvement have been confirmed, as observed in the conceptual model of Figure 1. Additionally, the influence of motivation on academic performance has been demonstrated to be significant. Self-efficacy has been consistently shown to be a key factor in determining student motivation and academic performance. Research by Sun and others has demonstrated a positive correlation between self-efficacy and academic success, with students exhibiting higher levels of self-efficacy tend to perform better academically. Studies have also found that students who are more confident in their abilities and have a stronger sense of self-worth tend to be more engaged in the learning process. For example, Pellas's research has shown that students who have high levels of computer self-efficacy and metacognitive self-regulation are more likely to use these strategies to improve their academic performance. Moreover, the relationship between self-esteem and academic engagement is complex. While some studies have found a positive correlation between self-esteem and emotional and behavioral engagement, others have shown that unstable self-esteem can lead to academic disaffection. Additionally, research has consistently shown that self-esteem is related to metacognitive engagement, with students who have high levels of self-esteem being better able to regulate their own learning. Previous research suggests that academic self-esteem is a crucial construct that should be further explored. Studies have demonstrated that behavioral engagement significantly impacts academic performance [8,48,49], while emotional engagement also has an effect on it [50,51]. A meta-analysis conducted by Tze et al. [52] found that class-related boredom had more adverse effects on academic performance than studying-related boredom. Some studies have examined the influence of cognitive engagement on academic performance [19,53,54], with Broadbent's study [54] showing that students using cognitive strategies achieved better grades. Chen and Wu's research [55] confirmed a link between metacognitive engagement and student academic performance. The relationships proposed in Figure 1 are supported by the evidence from these studies. The sample consisted of 243 university students who voluntarily participated after being informed about the study's objectives; they could withdraw at any time, and agreed to have their answers used [56]. Students from various semesters and departments (industrial management, computer science, or industrial engineering) at a public university were surveyed online during the second semester of the 2020 school year. Participants' ages ranged from 19 to 21; 108 males and 134 females took part, with their teachers reporting their final grades after the last exam, which served as a measure of academic performance (AP). Grades ranged from 1 to 10. To analyze causal relations in the theoretical model, Structural Equation Modeling (SEM) was employed using the partial least squares method with SmartPLS version 3 [57]. Wang and Wang suggest that sample size depends on the number of indicator variables; since there were five cases per variable, the sample size of 243 was sufficient for model quality. The Rosenberg self-esteem scale [12] was used to measure how individuals evaluate their worth as human beings. This scale has been tested in various studies showing good psychometric characteristics and validated in the Mexican context [58,59]. It contains an equal number of positive and negative questions, such as "overall, I am satisfied with myself" or "I often feel useless." I'm not satisfied with my achievements; I feel like I don't have much to be proud of. On a scale from 1 to 5, items were evaluated using the Likert scale where 5 equals totally agree and 1 means totally disagree. The Motivated Strategies for Learning Questionnaire (MSLQ) assessed students' motivational, cognitive, and metacognitive factors using two components: expectation and value. Expectation included self-efficacy, control learning beliefs, and test anxiety. Value consisted of intrinsic goal motivation, extrinsic goal motivation, and task value. The instrument also measured help-seeking, peer learning, organization, elaboration, rehearsal, self-regulation, critical thinking, emotional engagement, and disengagement, as well as behavioral engagement and disengagement. Emotional engagement comprised enjoyment, enthusiasm, fun, pride, and interest, while emotional disengagement included boredom, disinterest, frustration, sadness, and anxiety. Behavioral engagement was characterized by involvement, effort, and attention, whereas behavioral disengagement featured being distracted, mentally withdrawn, and passive. Both the SED and MSLQ instruments were applied mid-semester, with self-esteem measured at the end of the semester. Reliability was verified using Cronbach alpha values, while convergent validity was checked through composite reliability and average variance extracted. Discriminant validity was established by comparing the square root of the AVE values to the correlation among constructs. After analyzing the theoretical model using SEM, construct validity was confirmed; therefore, enthusiasm and pride were removed from emotional engagement, and test anxiety was found to be a significant factor. 1.00 MO 0.411 0.856 EE 0.335 0.335 0.88 ED 0.535 0.336 0.382 0.863 BE 0.424 0.627 0.694 0.339 0.821 BD 0.521 0.438 0.481 0.744 0.525 0.827 ME 0.269 0.8 0.578 0.293 0.638 0.456 0.925 CE 0.324 0.79 0.596 0.257 0.576 0.435 0.836 0.909 LE 0.269 0.525 0.355 0.096 0.496 0.264 0.603 0.53 0.920 AP 0.091 0.221 0.128 0.114 0.180 0.167 0.219 0.216 0.082 1.00 The relationship between self-esteem and academic performance was not directly correlated in a recent study. However, research has shown that students with high self-esteem tend to perform better academically and exhibit more engagement in their school activities. This study also found that motivation played a significant role in students' emotional, behavioral, cognitive, and metacognitive engagement, as well as their disengagement from classes. The results indicate a strong correlation between motivation and emotional commitment, suggesting that motivated students are more interested and enthusiastic about their classes. Furthermore, the study revealed that motivation had a positive impact on cognitive engagement, with motivated students applying more complex strategies such as organization and elaboration. Additionally, the research demonstrated a relationship between motivation and learning strategies, which were found to be mediators between motivation and vocabulary acquisition. The findings of this study coincide with previous research, which has shown that motivation is essential for explaining academic engagement. Overall, the results suggest that motivation is a crucial factor in determining students' emotional, behavioral, cognitive, and metacognitive engagement, as well as their performance in academics. The study explored the connection between metacognitive engagement and academic performance, revealing that students who use critical thinking and self-regulation strategies tend to achieve better grades. Motivated students are more likely to plan, monitor, and self-regulate their learning process, which enhances their understanding of the material and overall academic performance. The results also showed that students with lower self-esteem and motivation may exhibit emotional and behavioral disinterest, such as boredom or anxiety, which negatively impacts their academic achievement. However, teachers can play a crucial role in promoting student motivation by providing successful academic experiences and teaching coping strategies for stress and anxiety. Further research is needed to analyze the impact of self-esteem and self-concept on academic performance in different university settings. The study was supported by the Instituto Politécnico Nacional and found no conflict of interest, with informed consent obtained from all participants. The following studies and research papers explore various aspects of student motivation, engagement, and well-being in educational settings. * A 1997 study published in the Netherlands examined cognitive science perspectives on personality and emotion. * In 2020, Mayer developed an integrated approach to personality assessment based on the Personality Systems Framework. * Linnenbrink-Garcia et al. (2016) investigated adaptive motivation and emotion in education, highlighting their implications for instructional design. * Astin's 1984 study introduced a developmental theory for higher education, focusing on student involvement. * Tinto's 1975 research reviewed the theoretical synthesis of dropout from higher education, emphasizing the importance of engagement. * Skinner et al. (2008) explored engagement and disaffection in classrooms, identifying reciprocal effects between teacher behavior and student motivation. * Additional studies examined the relationship between teacher behavior, student engagement, self-esteem, and academic achievement. Some key findings include: * Student engagement is a critical factor in academic success and well-being. * Teacher-student relationships play a significant role in fostering motivation and reducing disaffection. * Self-esteem and perceived academic control are essential predictors of students' overall well-being. * Strategies for maintaining self-esteem, such as promoting positive self-concept and self-esteem, can help students experiencing academic failure. Overall, these studies contribute to a deeper understanding of the complex interplay between student motivation, engagement, and well-being in educational settings. This collection of references explores the relationships between self-esteem, motivation, engagement, and academic performance. Some studies suggest that high self-esteem can lead to better performance, interpersonal success, happiness, and healthier lifestyles (Campbell et al., 2003). Others argue that self-efficacy (Bandura, 1997) and self-determination theory (Ryan & Deci, 2000) play a crucial role in motivating individuals to engage in learning activities. Researchers have also investigated the differences between self-esteem and self-efficacy (Chen et al., 2004). Additionally, studies have examined the relationship between motivation and engagement (Martin et al., 2017), as well as the role of emotions and cognition in learning (Sinatra et al., 2014; Winne, 2018). Furthermore, this collection includes references that explore factors affecting student learning performance, such as anxiety (González et al., 2016), personality traits (Kuśnierz et al., 2020), and self-concept (González et al., 2016). Some studies also examine the effectiveness of interventions aimed at enhancing academic engagement (Reschly, 2020). Overall, this collection highlights the complex relationships between self-esteem, motivation, engagement, and academic performance, emphasizing the importance of considering individual differences and contextual factors in understanding these phenomena. A series of studies (2020-2018) explored the relationship between school grades, self-esteem, and internalizing problems in students from grade 4 to 7. The research suggested that school grades can predict changes in self-esteem and internalizing problems over time. The concept of self-efficacy was also examined in various studies, with findings indicating that it plays a significant role in academic achievement, beyond intelligence, personality traits, and self-esteem (2013). Positive parenting styles were found to have a positive impact on self-regulated learning in Chinese adolescents, mediated by self-esteem (2021). In contrast, online behavior engagement and achievement in flipped classrooms were explored in another study, highlighting the importance of technology-supported learning environments (2017). Emotions were identified as drivers of learning and cognitive development, with implications for academic achievement and psychological well-being (2011). Longitudinal studies also investigated the trajectories of student emotional engagement and school burnout, revealing associations with academic and psychological development (2015). The relationship between boredom and academic outcomes was evaluated in a meta-analysis, suggesting that boredom can have negative consequences for students' academic performance (2016). Finally, online technologies self-efficacy and self-regulated learning were found to predict final grade and satisfaction in college-level online courses (2008). Please note that this paraphrased text aims to convey the main ideas and findings of the original research studies, but it is not a comprehensive or detailed summary. If you need a more accurate representation of the original research, I recommend consulting the actual papers. The study of self-regulated learning strategies and their impact on academic performance was explored in several research articles. Chen et al. (2012) investigated the interplay between cognitive and motivational variables in an online learning system for secondary physical education. British Educational Research Association published guidelines for ethical research practices in education. Structural Equation Modeling was also discussed, with Wang et al. (2012) providing a comprehensive guide to applying Mplus software. The Rosenberg Self-Esteem Scale was validated by Robins et al. (2001), and its use in university students was examined by Jurado et al. (2015). Motivation plays a significant role in learning, as highlighted by Pintrich's (1991) manual for the Motivated Strategies for Learning Questionnaire (MSLQ). Acosta-Gonzaga and Ramirez-Arellano (2022) explored the importance of scaffolding in motivation, engagement, and learning achievements. Reliability and validity were also topics of discussion, with Cronbach's Alpha being evaluated by Tavakol and Dennick (2011), and Bonett and Wright (2015) providing a more comprehensive analysis. Multivariate Data Analysis was discussed by Hair et al. (2006). Furthermore, the impact of self-esteem on learning strategies and attitudes was examined by Weisskirch (2018). Hyseni Duraku et al. (2018) investigated the effects of self-esteem, study skills, self-concept, social support, and coping mechanisms on test anxiety and academic performance. Lastly, Acosta-Gonzaga and Walet (no publication found) explored the role of attitudinal factors in motivation and learning achievements. 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Med. Educ. 2011;2:53–55. Weisskirch R.S. Grit, Self-Esteem, Learning Strategies and Attitudes and Estimated and Achieved Course Grades among College Students. Curr. Psychol. 2018;37:21–27. Wang J., Wang X. Structural Equation Modeling: Applications Using Mplus. John Wiley & Sons; Hoboken, NJ, USA: 2012. This study references several academic papers that investigated the factors influencing student motivation and success in STEM fields. The articles reviewed include research on pre-college and institutional influences on degree attainment, as well as studies examining the impact of intrinsic versus extrinsic goal framing and autonomy-supportive communication styles on early adolescents' academic achievement. Additionally, the authors draw from a study analyzing the relationship between motivation, strategy, and English language vocabulary learning. These references are utilized to inform a comprehensive understanding of the complexities surrounding student retention and academic success in STEM programs.