

Study Engagement Impact on Burnout Prevention in Industrial Engineering Students: A Cross-National Study

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Abstract

Managing workload for Industrial Engineering (IE) students could be a challenge that affects their academic performance and overall well-being. Nevertheless, unmanaged student workloads can lead to burnout. Therefore, this study aimed to measure the students' burnout level through various validated surveys, and to analyze the collected data to determine the burnout prevalence among IE students, also investigate the correlation between burnout and engagement levels, with the aim of understanding the relationship between these two critical factors. An online survey was conducted to undergraduate IE students (63 from Universitas Atma Jaya Yogyakarta, Indonesia and 53 from Bulacan State University, Philippines), that agree to follow all procedures. The survey collected demographic variables, MBIS-S, and UWES-S questions. As the result of correlation test, study engagement level is moderately correlated with emotional exhaustion ($r=-0.407$; $p\text{-value} < .05$), low correlated with depersonalization ($r=-0.327$; $p\text{-value} < .05$), highly correlated with academic efficacy decline ($r=-0.639$; $p\text{-value} < .05$), and moderately correlated with overall burnout index ($r=-0.556$; $p\text{-value} < .05$). There are significant effects of batch to emotional exhaustion, study place to depersonalization and academic efficacy ($p\text{-value} < .05$). By more detailed assessment, was found that IE students' efforts to engage with the academic process may help minimize the occurrence of academic burnout.

Keywords

Burnout, Study Engagement, Academic Efficacy, Depersonalization, Industrial Engineering.

1. Introduction

As an Industrial Engineering (IE) student, managing one's workload can be a major challenge that affects both academic performance and overall well-being. The curriculum of IE is demanding, requiring students to be consistently engaged with their coursework, assignments, and projects (Despeisse 2019), (Loyd and Gholston 2016), (Sánchez et al. 2019). The various fields in IE body of knowledge also potent to increase the student workload (Institute of Industrial and Systems Engineers (IISE) 2023). This can lead to students feeling overwhelmed, stressed, and lacking sufficient time to manage their personal and academic responsibilities.

One of the adverse effects that is resulted from unwell-managed students' workload that can be faced by IE students, is the risk of burnout. The continuous stress and pressure to perform can lead to feelings of exhaustion and disengagement (Chipchase et al. 2017), (Fredricks et al. 2019), taking a toll on students' physical, mental, and emotional well-being (Smith 2019), (Rummell 2015). Burnout can be a severe problem for industrial engineering students, affecting their academic performance (Ghadampour et al. 2016), (Paloş et al. 2019), motivation (Walburg

2014), and overall quality of their study (Salmela-Aro and Read 2017). Delve into the potency of burnout for IE students, then become significant in order to design strategies for preventing and managing student burnout.

On the other hand, engagement levels in the process of study might play a crucial role in burnout prevention. When students are actively engaged in their coursework and have a sense of purpose and direction, they are more likely to maintain their motivation, focus, and avoid burnout (Maricuțoiu and Sulea 2019), (Marôco et al. 2020). Low level of study engagement could serve as a signal for students to identify and address burnout before it becomes a more serious problem (Wei et al. 2021), (Marôco et al. 2020). Therefore, it is important to examine the relation of study engagement and burnout level as a burnout prevention signal and explore strategies for maintaining engagement levels throughout the IE program.

It is possible, however, that the conditions for each nation may vary in terms of burnout and study engagement, especially for students in IE. Therefore, to understand the different behaviors of students from different origin countries, cross-cultural and national (Philippines and Indonesia) study aspects should be included in this study. The results may give insightful meaning to see the relevance in international scope.

1.1 Objectives

Recent developments in IE knowledge have impacted IE students in several ways, including their level of study burnout. On the other hand, the study engagement potent to help the student facing the demanding study workload in IE field. However, to the best of the authors' knowledge, lack of research that investigated burnout and study engagement among IE students, during this decade. Therefore, this study aimed to measure the burnout level of students through various validated scales and surveys (Schaufeli et al. 2002), and to analyze the data collected to determine the prevalence of burnout among IE students. The study also examined the level of student engagement, including their motivation, involvement, and interest in the IE major. Moreover, the study investigated the correlation between burnout and engagement levels, with the aim of understanding the relationship between these two important factors. The findings of this study might provide valuable information for academic institutions, instructors, and policy makers in developing strategies to support students in high-stress academic environments and to promote their well-being, with cross cultural and national insight.

2. Literature Review

2.1 Burnout

Burnout is described as fatigue caused by excessive demands put on a person's energy, resources, and strength instead of their mental capacities (Freudenberger 1974). As a result of the mental health issues associated with burnout, university students are becoming increasingly concerned about burnout (Dyrbye et al. 2008), (Wachholtz and Rogoff 2013). In March-Amengual et al. (2022), burnout symptoms such as anxiety and clinical depression were significantly higher in engineering students than in students from Business Management and Social Education Departments. Although the engineering department's high academic workload has contributed to greater exhaustion risk in other ways, higher academic achievement may be helpful to students in dealing with exhaustion incidents (Velasco 2019). In addition, the adaptation effort resulting from applying hybrid learning to anticipate learning loss has resulted in increased stress levels for students (Smith et al. 2022).

Maslach Burnout Inventory-Student Survey, also known as MBI-SS, has been widely used to measure students' burnout level (Kwan 2022), (Maslach and Jackson 1981). It has been observed that burnout affects students from three angles, including cynicism, loss of academic effectiveness, and emotional exhaustion (Velasco 2019). Students' cynicism or depersonalization is displayed in their impersonal responses to their friends or teammates on certain assignment groups. A sense of emotional exhaustion, symbolized by the feeling of being overburdened with academic work, leads to cynicism. Learning efficiency, on the other hand, identifies student performance. Burnout manifests itself when performance declines (Kumar 2015). By observing these three dimensions of burnout, educators are able measure student's burnout level on their academic journey.

2.2 Study Engagement in Higher Education

Recent years, the study related to students' engagement among higher education become more popular, especially during and after the pandemic era (Fredricks et al. 2016), (Kurt et al. 2022), (Salas-Pilco et al. 2022). Student engagement potent to figure out how students behave and persist to their educational journey (Fredricks et al. 2016).

The high student engagement can lead to better achievement in learning process in an efficient completion time (Wang and Fredricks 2014). Therefore, it becomes the power and effort of students in undergoing the academic process. In the reverse direction, student disengagement is also a good predictor of students' academic failure (Finn and Zimmer 2012). Early on, this phenomenon can lead to a feeling of boredom, and leading to course drop-outs later on (Pham et al. 2022). Students who remain disengaged long-term may receive a lower graduate point average or GPA and have lower employment prospects as a result. Hence, the early investigation on students' disengagement can "save" students academic life and help them to overcome the burdens that lower down their passion on learning process.

The one of standard measurement tools to rate the students engagement is Utrecht Work Engagement Scale-Student (UWES-S) that was proposed by Schaufeli et al. (2002). UWES-S is a modified questionnaire from the original version of UWES that is used to measure the workers' engagement level on their jobs (Demerouti et al. 2001). The tool measures three components that describe students' engagement comprising students' vigor, dedication, and absorption to their study process. A student with vigor will have energetic and mentally resilient behavior, also willing to put effort into what they do. As a result of dedication, the student will have excitement, enthusiasm, proud feeling, and desire of challenging experience in his/her study. Meanwhile in absorption, time passes quickly, and student feels swept away by the study, also fully concentrated and captivated in it (Schaufeli et al. 2002).

3. Methods

3.1 Participants

Participants from the local recruitment were 63 undergraduate students (34 females, 29 males) at Universitas Atma Jaya Yogyakarta from the Department of Industrial Engineering and 53 undergraduate students (28 females, 25 males) at Bulacan State University Philippines from the Major of Industrial Engineering (participants age mean (year) = 20.10), that agree to participate and follow all procedures. The recruitment was done by sending invitation letters through campus email and through social media group chat. These students were also categorized for batch 2022, 2021, 2020, 2019, and before 2019.

3.2 Instrument

The study developed two types of questionnaires according to the language that be used to differentiate student's place of study which are English for Philippines students and Bahasa Indonesia for Indonesian students that each questionnaire consisted of three sections. The first section contained demographic variables comprising student's batch year, year of birth, gender, and accommodation status. The following section consisted of MBI-SS (Faye-Dumanget et al. 2017), (Pérez-Mármol and Brown 2019), (Schaufeli et al 2002). Questions that were constructed for English questionnaire and Bahasa Indonesia translated version for Indonesia questionnaire. The MBI-SS questions were grouped into three categories, consisting of (1) Emotional Exhaustion (six questions), (2) Depersonalization (three questions), and (3) Academic Efficacy (six questions). The value of Academic Efficacy rating then was inverted to get the Academic Efficacy Decline. The order of MBI-SS questions followed the order in Dumanget et al. (2017). Finally, the third section of the questionnaire contained burnout-level related questions. The questions were translated from UWES-S (Roemer 2016), (Schaufeli et al. 2006), (Schaufeli et al. 2002) and consisted of 5 questions categorized to vigor, 5 questions categorized to dedication, and 4 questions categorized to absorption (14 questions total). The order of UWES-S questions follow the order in Schaufeli et al. (2006). Answers to each question were rated on a Likert scale ranging from 0 as never to 6 as always for both burnout and students' engagement sections.

3.3 Data Analysis

The reliability of two questionnaires in this study were tested using Cronbach Alpha analysis separately. Each interest variable was subjected to basic descriptive statistics, including means, standard deviations (SD), and proportions. The Multivariate Analysis of Variance (MANOVA) test was also used in order to evaluate differences that were based on the students' sex (female and male), the year batch (<2018-2022), and accommodation status (with parents, dorm/boarding house, own living place), and origin country where they study (Indonesia and Philippines). After that, using Pearson's correlation coefficient, we examined the relationship between study engagement and student burnout, as well as its components (emotional exhaustion, depersonalization, and academic efficacy decline).

4. Data Collection

The demographic data were collected to understand the participants' baseline by age, sex, batch, accommodation status, and place of study. The collected data from the study engagement section was then calculated to get the study engagement level from the rating average of all UWES-S components. Based on the data collected in the burnout section, the overall burnout component was calculated as the burnout level, which was the average of the ratings. Additionally, the averages of each category in the burnout section were calculated. The baseline characteristics of the participants can be seen in the Table 1.

Table 1. Data Demographic of the 116 Participants

Characteristic	Number			Total Percentage (%)
	Indonesia	Philippines	Total	
Sample Size	63	53	116	100
Age				
Mean (years)	20.02	20.21	20.10	
Sex				
Female	34	28	62	53.4
Male	29	25	54	46.6
Batch				
Before 2019	2	5	7	6
2019	19	11	30	25.9
2020	14	12	26	22.4
2021	15	24	39	33.6
2022	13	1	14	12.1
Living condition				
With Parents	15	32	47	40.5
Dorm/Hostel/Rent/Boarding House	45	17	62	53.5
Own Living Place	3	4	7	6

5. Results and Discussion

5.1 Reliability and Comparison Result

By Cronbach's alpha 0.74 (high consistency) and 0.88 (reliable consistency) are the results for the reliability test for burnout and study engagement sections respectively (Taber, 2018). The overall mean for the ratings from two sections shows low to moderate burnout index ($M = 2.72$, $SD = 0.85$) with moderate study engagement ($M = 3.93$, $SD = 0.78$). In detail to each burnout category, the results show that overall participants had moderate emotional exhaustion ($M = 3.74$, $SD = 1.07$), low academic efficacy decline ($M = 1.74$, $SD = 0.87$), and low to moderate depersonalization ($M = 2.67$, $SD = 1.3$).

The result from MANOVA testing showed significant differences in the test between emotional exhaustion with batch (p -value $< .05$), depersonalization with place of study (p -value $< .01$), and academic efficacy with place of study (p -value $< .05$). Meanwhile, other than those comparison tests had no significant difference (p -value $> .05$) as the result. The overall means and SD of Study Engagement and burnout level components for each group are shown in Table 2. While the significant difference between emotional exhaustion with batch, depersonalization with place of study, and academic efficacy with place of study are shown in Figure 2, Figure 3, Figure 4 respectively. It is shown in the Figure 2 that emotional exhaustion correlated between batch categories. Can be seen that batch of before 2019, 2019, 2020

and 2021 had a high correlation except for batch 2022. Moreover batch 2020 and 2021 have the highest emotional exhaustion level among another batches.

On the other hand, Figure 3 shows the difference of depersonalization rate between Indonesia and the Philippines as participants' study place. Clearly that the depersonalization rate of IE students in the Philippines is higher than in Indonesia. Nevertheless, the academic efficacy decline of Indonesian students is higher compared to Philippines student as can be seen in Figure 4.

5.2 Correlation Analysis

To determine correlations value between study engagement to emotional exhaustion, depersonalization, academic efficacy decline, and overall burnout index we examined the correlation table for each of those variables. Study engagement level is moderately correlated with emotional exhaustion ($r=-0.407$; $p-value <.05$), low correlated with depersonalization ($r=-0.327$; $p-value <.05$), highly correlated with academic efficacy decline ($r=-0.639$; $p-value <.05$), and moderately correlated with overall burnout index ($r=-0.556$; $p-value <.05$). The overall relationship for each burnout component with study engagement are negatively correlated and well described by Figure 1 below.

Table 2. Study Engagement and Burnout Components Comparisons according to Participants' Characteristics

Characteristic	Study Engagement	Burnout			
		Emotional Exhaustion	Depersonalization	Academic Efficacy Decline	Overall Burnout Index
Sex					
Female (62)	3.99 ± 0.81	3.58 ± 1.09	2.51 ± 1.26	1.77 ± 0.88	2.62 ± 0.87
Male (54)	3.7 ± 0.61	4.32 ± 0.8	3.23 ± 1.29	1.63 ± 0.82	3.06 ± 0.66
Batch					
Before 2019 (7)	4.14 ± 0.88	3.43 ± 0.67*	2.86 ± 1.32	1.88 ± 1.1	2.72 ± 0.8
2019 (30)	3.85 ± 0.74	3.64 ± 0.95*	2.56 ± 1.34	1.83 ± 0.85	2.67 ± 0.78
2020 (26)	3.9 ± 0.81	4.04 ± 0.99*	2.68 ± 1.36	1.64 ± 0.88	2.78 ± 0.81
2021 (39)	3.9 ± 0.8	4.05 ± 0.95*	3.02 ± 1.19	1.72 ± 0.92	2.93 ± 0.83
2022 (14)	4.17 ± 0.8	2.71 ± 1.33*	1.79 ± 1.03	1.71 ± 0.69	2.07 ± 0.92
Accommodation Status					
With Parents (47)	3.96 ± 0.81	3.65 ± 1.03	2.57 ± 1.2	1.7 ± 0.81	2.64 ± 0.81
Dorm/Hostel/Rent/Boarding House (62)	3.92 ± 0.79	3.79 ± 1.11	2.76 ± 1.95	1.83 ± 0.92	2.79 ± 0.87
Own Living Place (7)	3.93 ± 0.59	3.98 ± 1.13	2.48 ± 1.33	1.2 ± 0.57	2.55 ± 1.05
Place of Study					
Indonesia (63)	3.94 ± 0.87	3.46 ± 1.15	2.28 ± 1.27**	1.9 ± 0.95*	2.55 ± 0.93
Philippines (53)	3.93 ± 0.67	4.08 ± 0.87	3.13 ± 1.19**	1.54 ± 0.72*	2.92 ± 0.70

* indicates $p-value <.05$; ** indicates $p-value <.01$

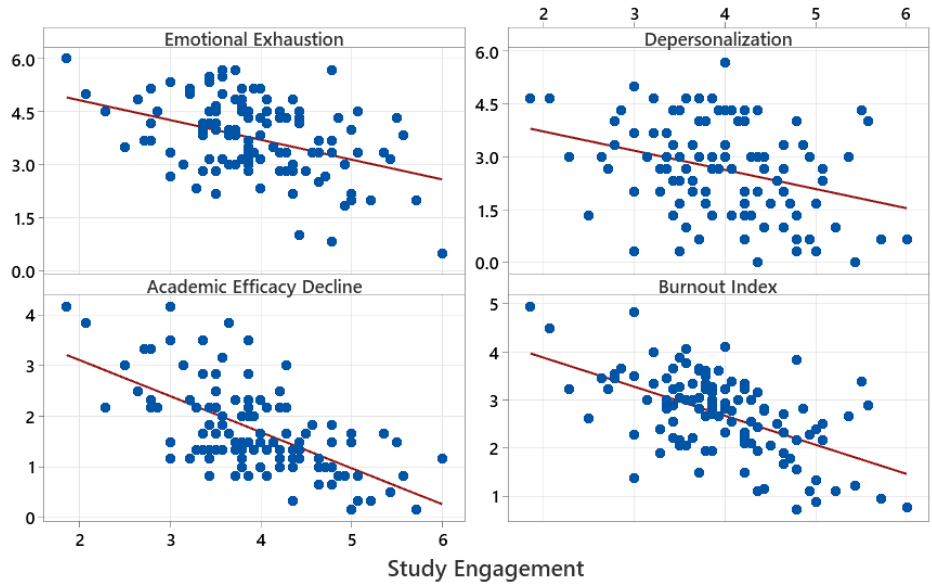


Figure 1. Scatterplot of Emotional Exhaustion, Depersonalization, Academic Efficacy Decline vs Study Engagement

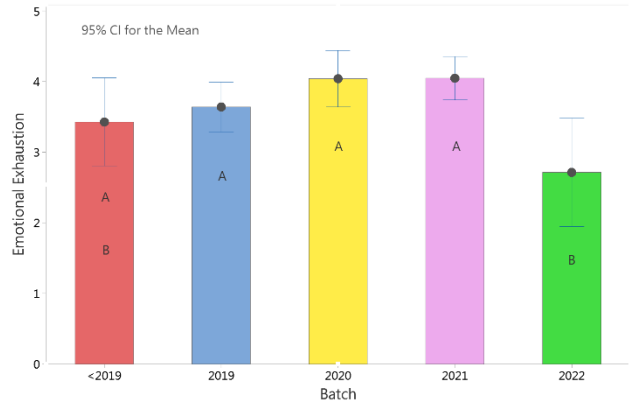


Figure 2. Interval Plot of Emotional Exhaustion (Batch)

On the other hand, Figure 3 shows the difference of depersonalization rate between Indonesia and the Philippines as participants' study place. Clearly that the depersonalization rate of IE students in the Philippines is higher than in Indonesia. Nevertheless, the academic efficacy decline of Indonesian students is higher compared to Philippines student as can be seen in Figure 4.

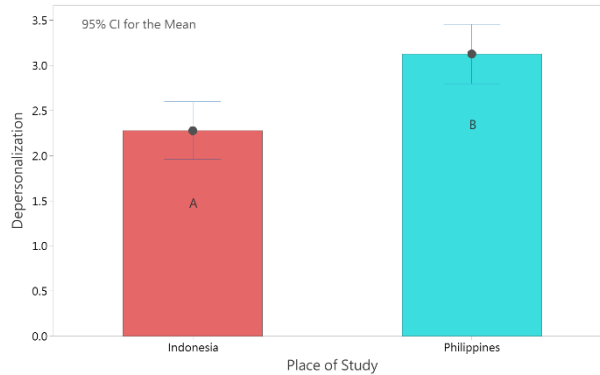


Figure 3. Interval Plot of Depersonalization (Place of Study)

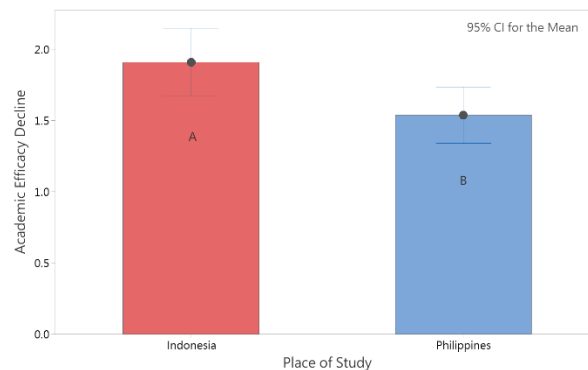


Figure 4. Interval Plot of Academic Efficacy Decline (Place of Study)

5.3 Study Engagement Influence on Industrial Engineering Students' Burnout Component

The finding related to student engagements indicates that the learning process of IE curriculum both in Indonesia and Philippines helps the students to have quite high engagement (3.94 ± 0.78). Through the various elements in IE's body of knowledge (Institute of Industrial and Systems Engineers (IISE) 2023), gave unique experiences to IE students and impacts on tighter bonding between them to their major. The contents of IE knowledge generally meets students expectation as what Marsden et al. (2016) found in their study. This fact also resulted in low to moderate overall burnout of IE students (2.72 ± 0.85). This variation is able to prevent the study tedium despite the fact that students must learn different kinds of knowledge within IE curriculum, such as basic science, statistics, optimization, and engineering skills.

Related to correlation analysis, the results show that student engagement has significantly negative correlation to students' burnout and its components. This finding implies the effort of IE students to engage in their academic process can minimize the emersion of study burnout. Deeper analysis also shows that the most influenced components are academic efficacy decline with high negative correlated with student engagement. This insightful finding signifies the student engagement to benefit the IE students for achieving their academic performances. The vigor, dedication, and absorption on educational journey strengthen IE students to persist on finishing their academic goals. These findings also confirmed certain researches related to how student engagement to their academic achievement (Gunuc 2014), (Lei et al. 2018). The higher students' achievement then indirectly influences the students to have low to moderate burnout.

Regarding to MANOVA test, there are certain interesting findings comprising significant variation on EE among different batch years, depersonalization level and academic efficacy declines among different origin country of place study. It is making sense that the findings show the lowest emotional exhaustion happens to both in early and ends of batch. The workload in those years is lower compared to other year batches.

The characteristics of Philippines IE students are also unique compared to Indonesian students. Most of Philippines students live with their parents even though they need to spend around 2 hours from their house to school, every day. This results in higher depersonalization level on Philippines samples compared to Indonesian. However, this effort impacts on better academic efficacy decline prevention compared in Indonesian students' group.

6. Conclusion

Based on the result and findings of this study, the overall burnout index of IE students was low to moderate burnout index and moderate for study engagement of IE students. A significant difference was found in the comparison between emotional exhaustion and entering batch year which shows a high correlation between the batch before 2019, 2019, 2020 and 2021 except for batch 2022. Significant differences also be found in the comparison between depersonalization and place of study which shows that IE students in the Philippines had higher depersonalization level than students in Indonesia. For the comparison test between academic efficacy decline and place of study also had a significant difference which shows that IE students in Indonesia had a higher academic efficacy decline than students in the Philippines. Nevertheless, study engagement level was found moderately correlated with emotional exhaustion, low correlated with depersonalization, highly correlated with academic efficacy decline and moderately correlated with overall burnout index. This finding means that IE students' efforts to engage with the academic process may help minimize the occurrence of academic burnout. A more detailed analysis also revealed that the most affected factor was poor academic performance or academic efficacy decline, which was strongly negatively correlated with student engagement. This insightful result demonstrates student engagement in helping IE students to achieve their academic achievement.

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Biographies

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