

Burnout and study engagement among medical students at Sun Yat-sen University, China

A cross-sectional study

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Abstract

This study aims to investigate burnout and study engagement among medical students at Sun Yat-sen University, China.

A cross-sectional survey was conducted among undergraduate medical students of Sun Yat-sen University, China. A total of 453 undergraduate students completed a self-administered, structured questionnaire between January and February, 2016. Burnout and study engagement were measured using the Maslach Burnout Inventory-Student Survey (MBI-SS) and the UTRECHT Work Engagement Scale-Students (UWES-S), respectively. Subjects who scored high in emotional exhaustion subscale, high in cynicism subscale, and low in professional efficacy subscale simultaneously were graded as having high risk of burnout. Independent sample *t* tests and chi-square tests were used to compare the differences in burnout and work engagement between genders, majors, and grade levels.

The means (standard deviations) of the MBI-SS subscales were 3.42 (1.45) for emotional exhaustion, 2.34 (1.64) for cynicism, and 3.04 (1.30) for professional efficacy. The means (standard deviations) of the UWES-S subscales were 3.13 (1.49) for vigor, 3.44 (1.47) for dedication and 3.00 (1.51) for absorption. Approximately 1 in 11 students experienced a high risk of burnout. There were no statistically significant gender differences in burnout and study engagement. There were also no statistically significant differences in burnout and study engagement subscales according to student major. Students in higher grades displayed increased burnout risk, higher mean burnout subscale score of cynicism, lower mean burnout subscale score of professional efficacy, and decreased mean study engagement subscale scores of dedication and absorption. There were strong correlations within study engagement subscales.

Chinese medical students in this university experience a high level of burnout. Students at higher-grade level experience more burnout and decreased study engagement compared with students in lower level.

Abbreviations: CY = cynicism, EE = emotional exhaustion, MBI = Maslach Burnout Inventory, MBI-SS = the Maslach Burnout Inventory-Student Survey, PE = professional efficacy, SD = standard deviation, UWES = the UTRECHT Work Engagement Scale, UWES-S = the UTRECHT Work Engagement Scale-Students.

Keywords: burnout, epidemiology, Maslach Burnout Inventory, medical students, study engagement

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1. Introduction

Burnout is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment. It represents a response to the chronic emotional strain of dealing extensively with others in the work environment.^[1,2] A systematic review reported that the prevalence of burnout among medical residents ranged greatly from 18% to 82% due to the different instruments and calculation methods used.^[3] Burnout contributes to physical exhaustion, insomnia, increased drugs, or alcohol usage in the general population.^[1] In medical students and residents, burnout could undermine their professional development through unprofessional conduct or less altruistic view regarding physicians' responsibility to society^[4] and place patients at risk. Burnout may bring about many undesirable personal consequences including increased alcohol abuse^[5] and suicidal ideation.^[6]

Burnout was initially investigated among employees and restricted to those who work inhuman services and educational institutions.^[1,2] Maslach Burnout Instrument (MBI) was developed and used to evaluate burnout within working populations.^[1] In recent years, burnout research has not only been expanded to a wide range of occupations, but has also sought to include students. The core duties of students are structured,

coercive, and directed to specific goals, such as passing examinations and degree obtainment. They may feel exhausted and have a cynical attitude toward studies, which may lead to increases in burnout.^[7] As a result, an MBI-Student Survey (MBI-SS) was developed, which considers the unique circumstances confronted by students in an academic environment.^[8] In the MBI-SS the subscale for emotional exhaustion (EE) evaluates fatigue due to studies, the subscale for cynicism (CY) assesses the indifference in student attitudes toward their studies and the subscale for professional efficacy (PE) focuses on the broader social and nonsocial aspects of accomplishment. The MBI-SS has been used to measure student burnout across a number of countries and has experienced both acceptable performance and usability.^[9–11]

Unlike burnout that addresses weakness and dysfunction, engagement focuses on human strength and optimal functioning.^[8,12] Engagement is a positive, fulfilling work-related state of mind that includes 3 subscales: vigor, dedication, and absorption.^[12] The concept of engagement was initially considered to be used in the work setting; however, researchers found it applicable to the academic setting as well.^[8] The engagement questionnaire for students (UTRECHT Work Engagement Scale-Students (UWES-S)) was utilized to investigate study engagement in different student populations across the world.^[8] A study among Chinese baccalaureate nursing students reported that a moderate level of study engagement which differed across grade groups, with comparable higher mean scores in dedication and absorption, and lower mean scores in vigor.^[13] In the Netherlands, highly engaged resident physicians reported fewer errors in their work.^[14] Work engagement of nurses was reported to be correlated with their clinical learning experience in a study, and the subscales of absorption and dedication mostly enhanced clinical learning.^[15]

Students majoring in medicine are special, in that they are trained to be doctors, through completing a large number of medical courses during a short period of time. The exploration of burnout and study engagement could provide key insights in understanding the psychological state of these students. Therefore, the purpose of this study was to investigate burnout and study engagement among medical students at Sun Yat-sen University in China and explore the potential relationship between the subscales and factors that may influence them.

2. Methods

2.1. Study design and study sample

The data follow a cross-sectional study design. The study protocols and questionnaire were approved by the institutional review board at Guanghua School of Stomatology, Sun Yat-sen University, Guangzhou, China, and were in accordance with the World Medical Association Declaration of Helsinki. This study was carried out among medical students who were currently studying at the Faculty of Medical Sciences, Sun Yat-sen University, Guangzhou. In each grade there are about 800 students in this university. They are majoring in clinical medicine (500 students), basic medicine (30 students), forensic medicine (30 students), public health (120 students), nursing (60 students), and dentistry (60 students). We disseminated the survey mainly among first-year and third-year students.

The survey was disseminated to the medical students between January and February 2016. The medical students were informed of the study purposes and told that their participation was voluntary, any information collected would be kept confidential

and their survey responses would not contain any information that could reveal their identity. The survey questions were put in an online website (sojump.com). Participants were asked to give their informed consent attesting to their willingness to participate, complete the questions and submit their completed survey.

The survey included questions about burnout, study engagement as well as demographic information. Students also delivered background information on variables such as age, gender, study major, and year in school (grade). All the items on burnout and study engagement were scored according to a reported frequency on a seven-point Likert scale from 0 to 6: 0=never; 1=a few times a year or less; 2=once a month or less; 3=a few times a month; 4=once a week; 5=a few times a week, and 6=every day.

2.2. Burnout measurement

Burnout was measured using MBI-SS, which has been previously validated in a study among Chinese university students.^[9] The measurement consists of 15 items grouped into 3 dimensions: emotional exhaustion (e.g., “I feel emotionally drained by my studies”), cynicism (e.g., “I have become less enthusiastic about my studies”) and professional efficacy (e.g., “I can effectively solve the problems that arise in my studies”). The internal consistency for the total items in the MBI-SS was 0.89 (Cronbach’s $\alpha = 0.89$ for 15 items). The internal consistency for the subscales were 0.89 (Cronbach’s $\alpha = 0.89$) for the 5 items measuring emotional exhaustion, 0.9 (Cronbach’s $\alpha = 0.9$) for the 4 items measuring cynicism, and 0.85 (Cronbach’s $\alpha = 0.85$) for the 6 items measuring professional efficacy. Tertiles were created in the burnout subscales.^[16,17] Subjects who scored high in emotional exhaustion subscale, high in cynicism subscale and low in professional efficacy subscale simultaneously were graded as having high risk of burnout.^[8–10]

2.3. Study engagement measurement

Study engagement was measured using the UTRECHT Work Engagement Scale-Students (UWES-S).^[8] UWES-S has been validated in Chinese university students.^[18] The measurement consists of 14 items grouped into 3 dimensions: vigor (e.g., “When I am studying, I feel mentally strong”), dedication (e.g., “I find my studies to be full of meaning and purpose”) and absorption (e.g., “Time flies when I am studying”). The internal consistency for the total items in the UWES-S was 0.93 (Cronbach’s $\alpha = 0.93$ for 14 items). The internal consistency for the subscales were 0.87 (Cronbach’s $\alpha = 0.87$) for the 5 items measuring vigor, 0.91 (Cronbach’s $\alpha = 0.91$) for the 5 items measuring dedication, and 0.81 (Cronbach’s $\alpha = 0.81$) for the 4 items measuring absorption.

2.4. Statistical analysis

All statistical analyses were performed using SPSS 18.0 (SPSS Inc., Chicago, IL). We calculated the sample size using the following equation: $N = t^2 P(1 - P) / d^2$. For a 95% confidence interval, t is 1.96. With a 5% margin of error, d is 0.05. By assuming a P value of .5, the calculation yielded the highest result of 384 subjects.^[19] There is recommended 10:1 ratio for the number of subjects to the number of test items as a construct validity evaluation criterion.^[20] We exceeded both sample size calculation and recommended ratio for the number of subjects to the number of test items.

Table 1
Demographic characteristics of the medical students (n=453) at Sun Yat-sen University, China in 2016.

Age, Mean (SD)	20.21 (1.46)	
Gender, n (%)		
Male	199	43.93
Female	254	56.07
Grade, n (%)		
Lower	156	34.44
1	129	28.48
2	27	5.96
Upper	297	65.56
3	280	61.81
4	16	3.53
5	1	0.22
Major, n (%)		
Clinical medicine	374	82.56
Other disciplines	79	17.44
Dentistry	31	6.84
Basic medicine	24	5.3
Public health	11	2.43
Nursing	4	0.88
Forensic medicine	9	1.99

n (%) = number (percentage), SD = standard deviation.

To determine the differences in burnout and work engagement between genders, majors, and grade levels, independent sample *t* tests were conducted. The differences between genders, majors, and grades in burnout risk distribution were analyzed using chi-square tests. Pearson’s correlation tests were used to examine the relationships between 3 subscales of burnout and 3 subscales of study engagement. Binary logistic regression was used to assess the relationships between burnout risk measured by gender, grade, and major. All tests are 2 sided and the level of significance was set at 5%.

We ran the Benjamini–Hochberg procedure to decrease the number of false positives.^[21] We took all 21 tests from the tables, ranked them from the smallest to the largest *P* value and found the largest *P* value that was smaller than the critical Benjamini–

Hochberg value. Those with lower *P* values were considered significant.

3. Results

Altogether 780 medical students were invited to take part in the survey and 453 of them completed the survey. The response rate of the survey was 58.08%. The demographic characteristics of the students who completed the survey were described in Table 1. The final sample consisted of 129 first-year students, 280 third-year students, 27 second-year students, 16 fourth-year students, and 1 fifth-year student. We categorized the first and second year students as lower grade students; the third, fourth, and fifth year students as upper grade students. The average age was 20.21 ± 1.46 and age range was from 17 to 24. The proportion of females to males (56.07%–43.93%) was close to that of the overall students (about 1.1:1) in this university. Most of the students were in grade 1 (28.48%) and grade 3 (61.81%). There were 6 majors in this university including clinical medicine, basic medicine, public health, dental medicine, forensic medicine, and nursing specialty. The majority of students (82.56%) were engaged in the major of clinical medicine. We categorized the other 5 specialties as other disciplines.

Table 2 describes the comparisons in the burnout subscales between genders, grades, and majors. There were no statistically significant differences between genders in all 3 subscales of burnout measurements. There were also no statistically significant differences in all 3 subscales of burnout measurements according to student major. However, students in upper grades had higher CY and lower PE than students in lower grades (*P* < .001 and *P* = .001, respectively).

Table 3 describes the prevalence of high-risk burnout cases among the participants. 9.27% of the students were categorized as high risk of burnout. There was no statistically significant difference between genders in terms of prevalence of high burnout risk cases (*P* = .14). There was also no statistically significant difference between students who majored in clinical medicine and other disciplines in term of high burnout risk (*P* = .32). However, there was statistically significant difference in high burnout risk between students from lower and upper grades

Table 2
Mean MBI-SS scores of the medical students at Sun Yat-sen University according to sociodemographic feature in 2016.

Variables	n	Burnout subscales		
		EE Mean (SD)	CY Mean (SD)	PE Mean (SD)
Entire sample	453	3.42 (1.45)	2.34 (1.64)	3.04 (1.30)
Gender				
Male	199	3.57 (1.49)	2.48 (1.70)	3.09 (1.35)
Female	254	3.30 (1.40)	2.22 (1.59)	3.01 (1.26)
<i>P</i> between groups*		.05	.09	.53
Grade				
Lower	156	3.23 (1.32)	1.96 (1.55)	3.32 (1.23)
Upper	297	3.52 (1.50)	2.53 (1.65)	2.90 (1.32)
<i>P</i> between groups*		.04 [‡]	<.001 [†]	.001 [†]
Major				
Clinical medicine	374	3.49 (1.45)	2.39 (1.65)	3.01 (1.29)
Other discipline	79	3.09 (1.41)	2.08 (1.61)	3.18 (1.36)
<i>P</i> between groups*		.03 [‡]	.13	.29

CY = cynicism, EE = exhaustion, MBI-SS = the Maslach Burnout Inventory-Student Survey, PE = professional efficacy, SD = standard deviation.

* *t* test.

[†] *P* value was significant after adjusted by Benjamini–Hochberg procedure.

[‡] *P* value was not significant after adjusted by Benjamini–Hochberg procedure.

Table 3**Prevalence of burnout in the medical students at Sun Yat-sen University, China in 2016.**

Variables	n	High burnout risk		P between groups*
		Yes n (%)	No n (%)	
Entire sample	453	42 (9.27)	411 (90.73)	–
Gender				
Male	199	23 (11.56)	176 (88.44)	.14
Female	254	19 (7.48)	235 (92.52)	–
Grade				
Lower	156	7 (4.49)	149 (95.51)	.011 [†]
Upper	297	35 (11.78)	262 (88.22)	–
Major				
Clinical medicine	374	37 (9.89)	337 (90.11)	.32
Other disciplines	79	5 (6.33)	74 (93.67)	–

* Chi-square test.

[†] P value was significant after adjusted by Benjamini–Hochberg procedure.

($P=.011$). While 11.78% of the students in the upper grades displayed high risk of burnout, only 4.49% of the students in the lower grades displayed high risk of burnout.

Table 4 describes the comparisons in the study engagement subscales between genders, grades, and majors. There were no significant differences between genders in all 3 subscales of study engagement measurements ($P=.99$, $P=.79$, and $P=.63$, respectively). There was also no statistically significant difference in vigor subscale between students from lower and upper grades ($P=.05$). However, there were statistically significant differences in dedication and absorption subscales between students in lower and upper grades (both $P<.001$). Besides, there were no statistically significant differences in vigor, dedication, or absorption between students who majored in clinical medicine and other disciplines ($P=.53$, $P=.28$, and $P=.74$, respectively).

Table 5 describes the correlations between the subscales of burnout and study engagement. It shows a strong positive correlation between EE and CY. There were negative weak correlations between PE and EE and between PE and CY. There

Table 4**Study engagement subscales of the medical students at Sun Yat-sen University, China in 2016.**

Variables	n	Study engagement subscales		
		Vigor Mean (SD)	Dedication Mean (SD)	Absorption Mean (SD)
Entire sample	453	3.13 (1.49)	3.44 (1.47)	3.00 (1.51)
Gender				
Male	199	3.13 (1.54)	3.42 (1.53)	2.96 (1.59)
Female	254	3.13 (1.46)	3.45 (1.42)	3.03 (1.45)
P between groups*		.99	.79	.63
Grade				
Lower	156	3.31 (1.37)	3.84 (1.38)	3.36 (1.46)
Upper	297	3.03 (1.55)	3.22 (1.48)	2.81 (1.51)
P between groups*		.05	<.001 [†]	<.001 [†]
Major				
Clinical medicine	374	3.11 (1.49)	3.47 (1.48)	3.01 (1.53)
Other disciplines	79	3.23 (1.54)	3.27 (1.43)	2.95 (1.42)
P between groups*		.53	.28	.74

SD = standard deviation.

* t test.

[†] P value was significant after adjusted by Benjamini–Hochberg procedure.**Table 5****Correlations between subscales of burnout and study engagement in medical students at Sun Yat-sen University, China in 2016.**

Variables	EE	CY	PE	Vigor	Dedication	Absorption
EE	1.00					
CY	0.63	1.00				
PE	−0.20	−0.38	1.00			
Vigor	−0.31	−0.47	0.67	1.00		
Dedication	−0.29	−0.53	0.67	0.74	1.00	
Absorption	−0.22	−0.41	0.61	0.67	0.71	1.00

Pearson's correlation test.

CY = cynicism, EE = exhaustion, PE = professional efficacy.

were strong positive correlations between vigor, dedication, and absorption. There were strong positive correlations between 3 subscales of study engagement and PE. There were negative weak to moderate correlations between 3 subscales of study engagement and EE, CY.

Logistic regression was used to analyze the effects of the gender, grade, and major on burnout risk variable. Only grade had statistically significant influence on burnout risk [$P=.017$, OR = 0.36 (0.16, 0.84)].

4. Discussion

Burnout was introduced in the 1970s to depict the gradual emotional depletion and loss of motivation among individuals who had volunteered to work for aid organizations.^[22] It has been researched among different professions and groups of people across the world. However, to our knowledge this is the first study among Chinese medical students using the MBI-SS instrument to assess the burnout and explore potential associations with study engagement and different factors. It was found that approximately 1 in 11 (9.27%) students experienced high risk of burnout, which implied that the medical students were highly vulnerable to burnout syndrome. Moreover, the prevalence of burnout was related to grade levels but not gender or choice of major. Students in higher grades displayed increased burnout risk, higher mean burnout subscale score of cynicism, lower mean burnout subscale of professional efficacy and decreased study engagement subscale scores of dedication and absorption. These findings provided understanding of the factors that influenced burnout and study engagement, which could provide valuable insight into potential interventions. Future studies could be implemented on how to improve the situation of high burnout risk and low study engagement students in advanced grades.

The burnout risk level in our study was found to be related to grades and shown to be higher in upper class students; and not related to gender. The burnout risk level relating to grades is consistent with a Columbian dental student survey which used the same MBI-SS instrument and burnout risk calculation method.^[10] A study among Spanish medical students confirmed similarly by reporting that the prevalence of burnout risk was significantly higher in sixth-year students compared with third-year students, and the burnout subscales were not related to gender.^[11] Other studies among medical students also suggested that burnout prevalence was higher for students in final stages of medical school.^[23,24] In our study, the increase in burnout levels among upper class students was mainly due to the increase of CY, which is consistent with other study.^[23] In our study, there were also no statistically significant gender differences in all 3 burnout

subscales. However, in a study of Chinese high school students, males manifested lower mean score in EE than females.^[9] In the Colombian dental student survey, male students displayed lower mean scores in EE and PE, and higher mean score in CY than female students.^[10]

One possible explanation for the higher risk of burnout observed among students in upper class grades is that the emotional exhaustion accumulated during the process of medical training damages the original physician idealism.^[25] Removal of causal factors to emotional exhaustion such as fatigue, lack of resources and support, and work overload is beneficial to the reduction of burnout.^[25,26] There is scattered evidence on some specific strategies used to prevent burnout, such as coping, recovery and compensation strategies, job crafting to alter the characteristics of the job such that it becomes less hindering and more motivating, creating boundaries between the work and nonwork domains to experience actively detaching from work.^[27] Nevertheless, the effectiveness of each strategy has not been fully investigated. Based on the results from the present study, specific and applicable strategies focused acutely on the high burnout risk in upper class students could be implemented and evaluated to see if improvements could be triggered in the future.

There are several different burnout instruments and risk calculation methods across the studies.^[4,9-11,28,29] In a study among Chinese students who attended high school, university and nursing school the MBI-SS was used. The study reported that mean MBI-SS scores in EE, CY, and PE were 2.05, 2.48 and 2.47, respectively, for male university students, while our corresponding scores were 3.42, 2.34, and 3.04, respectively. Our scores for EE and PE far exceeded theirs but our mean scores for CY was lower than theirs.^[9] Currently, no widely accepted criteria have been used to define “high” scores for the MBI. In our study, we followed the convention described in the original MBI manual,^[1] students with high manifestation of the tertiles in mean EE and CY scores, low manifestation of the tertile of mean PE score simultaneously were categorized as high risk burnout. This similar method was used in a Colombian dental student burnout study,^[10] which makes the comparison between the 2 studies possible. The percentage of students who met the criteria for burnout in our study was 9.27% which was higher than that (7%) in Colombian dental students. However, a systematic review demonstrated that the burnout prevalence among healthcare professionals in intensive care units ranged from 0% to 70.1%.^[28] Most studies used MBI as the measuring instrument, few studies used other instruments such as the Professional Quality of Care-Revision IV and the Posttraumatic Diagnostic Scale. The studies within the systematic review, categorized subjects experiencing burnout according to diverse cut-off scores in one burnout subscale or combinations of 2 or all of the subscales. Besides, in the studies carried out in United States, burnout was defined as having high EE (≥ 27) or depersonalization (≥ 10) using MBI, and was reported to affect 45% to 56% of the medical students.^[4,29]

Study engagement was reported in studies using UWES (the UTRECHT Work Engagement Scale). Our study found lower study engagement in higher-grade students and study engagement was not associated with gender or major. In a study engagement was compared among university students in the Philippines and Argentina.^[30] The influences of gender, major, or grade were not considered, yet it was reported that Argentinean students scored higher on vigor, dedication, and absorption (3.41, 4.65 and 3.39, respectively) than their Philippine

counterparts (3.19, 3.93, and 3.38, respectively). The mean scores of the 3 subscales (3.13, 3.44, and 3.00, respectively) of study engagement in our study were lower than those in the above 2 populations, but exceeded those of Chinese nursing students (2.97, 3.26, and 3.12, respectively) except in absorption.^[31] The relationship between study engagement and gender varied across studies.^[31,32] A study in psychiatry residents of Illinois demonstrated that gender was not correlated with engagement or its subscales which is consistent with our study.^[31] However, in a Netherland resident study, engagement was different between genders. More men (almost 30%) than women (25%) were found to be highly engaged and men scored significantly higher on vigor than women.^[32]

The relationships between burnout and other factors were also reported. A multicenter study among medical students found that burnout was associated with learning environment and personal life events.^[33] In a US study among internal medicine residents, it was found that emotional exhaustion and depersonalization increased as educational debt increased and moonlighting was not statistically significantly associated with burnout.^[25] Our study did not investigate the influences of factors such as educational debt or moonlighting, as parental support was afforded to most medical students in the university as is standard in China. According to China Economy Information NET Statistics Database, the average per capita disposable income in 2016 in China was 23,821 RMB.^[34] The annual education expenditure per medical student in this university is about 20,000 RMB, which includes tuition, accommodation, living expenses and etc. Medical students enter college right after high school and do not get married until they graduate. There are few students from poor family who could not afford, while the government provides financial assistance that covers their expenditure. Therefore, in China medical students typically do not have educational debt or rarely moonlight to gain additional income. This is in part because the educational fees for degrees in all majors are about the same, contrary to Western countries where educational fees for medical degrees are among the highest. However, the economic situation of the student's family and parental support may influence students' burnout risks, which are factors we did not include in this study. In the future, we hope to investigate the relationship between burnout and other potentially relevant factors.

There are some limitations in this study. To begin with, this study used the cross-sectional design, which makes it impossible to build up a causal relationship between burnout/study engagement and various influential factors. Then, we did not do stratified sampling. Although the proportion of females to males in the subjects was close to that of the overall students, most of the subjects were first-year and third-year students. We categorized grades into lower grade (including 129 first-year and 27 second-year students) and upper grade (including 280 third-year students, 16 fourth-year students, and 1 fifth-year student). Therefore, the comparisons between grades were mainly between students from first year and third year grades. There were more students majored in clinical medicine than in other disciplines (374 versus 79), which made the comparisons between the majors less representative of the actual situation. Finally, the response rate of 58.08% in our study is low, but similar to those in other burnout studies in medical or dental students.^[10,11,33] In a systematic review, the response rates ranged from 29% to 96% in 40 studies examining medical student depression and anxiety.^[35] We do not know the reasons for the students to decline. In one study, the authors suggested that it was unknown that students

suffering from burnout were more or less concerned that influenced their acceptance or rejection of the survey.^[36] While the information we gathered was subject to self-report questionnaires, the participants may also exaggerate or reduce their burnout symptoms and study engagement in some circumstances.

5. Conclusion

Chinese medical students in this university experienced a higher-than-normal level of burnout in comparison with similar studies using the same methodologies. Students at higher grade levels experienced more burnout and showed decreased study engagement compared with students in lower grades. Students in higher grades of this university may need more self-compassion resources such as mindfulness or relaxation exercises. Additional research is needed to investigate how the different factors affecting student burnout and study engagement interact with each other and with academic performance.

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