Jurnal Kependidikan:
Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran
https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/index

Vol. 9, No. 2 : June 2023
E-ISSN: 2442-7667
pp. 421-433
Email: jklppm@undikma.ac.id

Academic Motivation, Perceived Creativity Fostering Teacher Behavior, and Student Engagement in Online Statistics Course of Indonesian Undergraduates : An Investigation of Relations and Predictability

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Abstract: This study aims to analyze the relationship and influence of academic motivation and perceived creativity fostering teacher behavior (P-CFTB) on student engagement in Statistics online learning courses in Indonesia. The research used a cross-sectional design study with a quantitative approach. Three standardized scales (academic motivation scale, perceived creativity fostering teacher index, and university student engagement inventory) were filled out by 533 psychology undergraduates who participated. All data were analyzed statistically by descriptive, correlational, and multiple linear regression tests. The results show that academic motivation and student engagement, P-CFTB and student engagement were related moderately and positively ($r = 0.582$, $r = 0.593$; $p < .001$, respectively). Furthermore, academic motivation and P-CFTB simultaneously affected students' learning engagement by 48%. The result shows that when students' academic motivation is combined with creativity fostering teacher behavior, student engagement in online learning increases.

Article History
Received: 28-03-2023
Revised: 29-04-2023
Accepted: 17-05-2023
Published: 16-06-2023

Key Words:
Academic Motivation; Creativity Fostering Teacher Behavior; Student Engagement; Online Learning; Statistic Course.

How to Cite: Setiamurti, A., Agoes Salim, R., Mangunsong, F., Safitri, S., Mufidah, A., & Normawati, M. (2023). Academic Motivation, Perceived Creativity Fostering Teacher Behavior, and Student Engagement in Online Statistics Course of Indonesian Undergraduates: An Investigation of Relations and Predictability. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran, 9*(2), 421-433. doi:https://doi.org/10.33394/jk.v9i2.7511

https://doi.org/10.33394/jk.v9i2.7511

Introduction

Education informatization has been further developed with technology and internet network development. It transformed how individuals learn and teach and facilitated online learning education's development. In contrast to developed countries where online learning has become a common learning method in higher education (HE), in developing countries, this method started massively and was used on a large scale only after the COVID-19 pandemic breakout (Ate et al., 2021). Thus, online learning is still an unfamiliar method for students and university faculties during that time (Nuere & de Miguel, 2021; Nursalim, 2020). One issue often becomes the spotlight of using online learning methods is related to student engagement (Czerkawski & Lyman, 2016).

Student engagement is not only in the form of participation but also involves feelings and active thought processes (Harper & Quaye, 2009). An essential point of student engagement is the process of meaning—learning by connecting things learned to personal life or reflecting lessons into life experiences (Schreiner & Louis, 2006). Student engagement in online learning includes students' behavioral, cognitive, and emotional engagement when using online learning platforms or video conferences applications (Hu et al., 2016). It ranges from low, medium, and high learning engagement. Students with low learning engagement only attend lectures to fulfil attendance, and the learning process only occurs at the surface stage of learning (Primana, 2015). If student learning engagement is low, the ability to apply

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knowledge to more complex situations will also be low (Primana, 2015). On the contrary, high learning engagement will increase the possibility of students achieving their educational and personal goals. This outcome will enable students to acquire the skills and competencies needed in the 21st century (Kuh, 2009).

Many students and researchers comment that online learning courses lack engagement and interaction (McBrien et al., 2009). The lack of student engagement will affect the student's retention of course materials, final grades, and dropout rate (Staikopoulos et al., 2015). Moreover, this method has long been stigmatized as inferior to traditional face-to-face instruction (Mohtar & Yunus, 2022). Some studies showed that students experienced low engagement in online learning during the pandemic. Students found it difficult to follow online classes due to distractions at home (Chen et al., 2021), felt a huge burden to learn independently, and disengaged during learning and doing assignments (Besser et al., 2022).

In contrast, some studies have found that online learning methods increase student learning engagement (Khusniyah & Hakim, 2019; Kuntarto, 2017). Students have high satisfaction with the course (Khalil et al., 2020) and high scores on online tests (Mulenga & Marbán, 2020). Students also positively perceive the learning process, lecturer capabilities, and facilities (Maulana & Hamidi, 2020). Furthermore, student engagement during online learning is linked positively to critical thinking and grades and provides more significant academic benefits to initially weaker students (Carini et al., 2006). Promoting student engagement is believed to enhance students' abilities to perform well academically (Parsons & Taylor, 2011). Due to the newness of online learning applications in HE in Indonesia and differences in the results of previous studies, more empirical research is needed to advance the dynamics of student engagement.

In addition, research supporting online learning affects student engagement positively was focused more on language-based subjects, such as English (Khusniyah & Hakim, 2019) and Indonesian courses (Kuntarto, 2017). Meanwhile, online learning in subjects such as statistics could cause students to experience stress (Maulana & Iswari, 2020). Moreover, Auliani (2010), in her research on psychology undergraduates' statistics course learning experiences (face-to-face method), found that students had to repeat this course because they had trouble understanding the learning materials (Auliani, 2010).

Some psychology undergraduates chose this major because they assumed they would not learn statistics and complicated calculations when in fact, statistics is closely related to psychology majors. This statement is also supported by the results of Google Trends in Indonesia throughout 2022, which show that one of the top related queries from the keyword "*kuliah psikologi*" (psychology major) is "*jurusan kuliah yang tidak ada matematika*" (college majors without mathematics courses). This query has increased by 180% in interest compared to the previous period. Furthermore, Google trend results with the keyword "*psikologi matematika*" (mathematical psychology) show that the top related query is "*apakah kuliah psikologi ada matematika*" (do psychology major learn mathematics). This query has increased by 110% compared to the previous year.

The learning process in online learning involves many elements, leading to many factors affecting student engagement, including the technologies used, the students' factor, and the teachers' factor (Hu et al., 2016). Henrie et al. (2015) found that not all technologies can increase online learning engagement. The complexity and options of the technology used in learning can instead reduce learning enthusiasm and engagement (Henrie et al., 2015). Factors related to students were optimism, a sense of belonging, locus of control, self-efficacy, academic satisfaction, academic performance, academic motivation, perception, and trust in their lecturers (Cayubit, 2022; Dogan, 2015; Milligan et al., 2013; Myint & Khaing,

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2020; Pachler et al., 2019). Meanwhile, factors related to teachers were teaching style, learning design, and feedback (Hu et al., 2016; Kasmaienezhadfard et al., 2015; Pachler et al., 2019).

Of the many factors influencing student engagement, this research focused on academic motivation. Academic motivation is a variable that has been studied concerning student engagement (Dogan, 2015). Academic motivation is defined as the desire of students to improve their academic achievement (Dogan, 2015). Skinner et al. (2009) found that learning engagement results from a motivational process. Learning engagement in challenging subjects such as statistics is also closely related to their academic motivation. Students with high academic motivation tend to be more responsible for solving academic challenges and are more involved in learning (Cayubit, 2022). Furthermore, academic motivation plays a role in perception and self-discipline, which can positively or negatively influence students' behaviors to engage in learning (Lin, 2012). Milligan et al. (2013) also found that learners' motivation and self-confidence were the main factors influencing online learning engagement.

In addition, the present study also investigates how students perceived their lecturers' behavior, particularly their perception of creativity-fostering teacher behavior (P-CFTB). CFTB is a "form of teaching intended to develop students' creative thinking or behavior" (Jeffrey & Craft, 2004, p. 77). This concept was chosen due to its relatedness to students' factors as well as teachers' factors that influence student engagement. Based on the research conducted by Lawton and Taylor (2020), we found that activities in the Statistics course that made students have high learning engagement are closely related to the concept of CFTB. Lawton and Taylor (2020) found that students perceived a high learning engagement when the lecturer applied hands-on-simulation-based activity and made students learn independently or through group discussions (Lawton & Taylor, 2020). On the contrary, students perceived low learning engagement when the lecturer used the didactic teaching method and no hands-on activity (Lawton & Taylor, 2020).

Furthermore, Pachler (2019) found that students' perception and trust in their lecturer will increase their creativity. As we all know, creativity is one of the essential skills to have in the twenty-first century, and one of the teaching goals in HE is to assist students in leveraging their creativity (Jackson et al., 2006; Nissim et al., 2016; World Economic Forum, 2020). Furthermore, one of the critical factors in increasing student creativity is closely related to the lecturer's performance in class (Soh, 2017). Lecturers should understand the opportunities allowing students to be creative and actively engaged in the educational process (Soh, 2017). Their behaviors and responses also need to signal the activation of students' creativity in the learning process (Soh, 2000). We aim to expand these findings by showing that students' P-CFTB will predict student engagement simultaneously with academic motivation.

Based on the explanation above, this study explored the relationship between students' academic motivation, perceived creativity fostering teacher behavior (P-CFTB), and students' learning engagement. Furthermore, this study also aimed to analyze the predictability of the first two factors on students' learning engagement in the online Statistics courses for psychology undergraduates. The findings of this study will provide valuable insights into the factors that contribute to the degree of student engagement in online learning methods and are expected to be a reference for future policies or interventions to increase students' learning engagement in online Statistics courses.

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Research Method

This study used a cross-sectional design study with a quantitative approach. The Ethics Committee of the Faculty of Psychology, Universitas Indonesia, reviewed this study and declared that this study had followed the ethical standards of the Psychology discipline and Research Ethics Code number 136/FPsi.Komite Etik/PDP.04.00/2022. The collection data process was conducted from October–December 2022 using an offline and online questionnaire (*g*oogle form). For the offline questionnaire, the researchers visited several universities in Jakarta and Depok and then asked for the consent of some psychology undergraduates to complete the research questionnaire. Meanwhile, the online questionnaire was disseminated through lecturers, student councils, psychology student associations from various universities, as well as social media (WhatsApp, Instagram, Twitter).

The respondents were psychology undergraduates in Indonesia who passed the Statistics course through online/distance learning methods. Furthermore, the interval between taking the Statistics course and filling in the research questionnaire must be no more than three semesters (study periods from January 2021 to June 2022). This criterion was selected because most higher education institutions used online learning methods during those periods due to COVID-19. It also considered the respondents' ability to remember past learning experiences to ensure that the data collected would be more accurate. Based on the analysis of *Gpower* using effect size at 0.05, α at 0.01, and power at 0.80 in the input parameters, this study's minimal number of respondents was 283.

Three measuring instruments (Table 1) were used in this study, namely (1) University Students' Engagement Inventory (USEI) by Maroco et al. (2016), (2) Creativity Fostering Teacher Index (CFTIndex) by Soh (2000), and (3) Academic Motivation Scale (AMS) Indonesian version by Marvianto and Widhiarso (2018). Because there were no Indonesian versions of USEI and CFTIndex, we adapted those instruments after getting permission from the owners via email. Furthermore, the CFTIndex, which initially measured lecturer creativity fostering from a lecturer perspective, was adapted to a student perspective, later called the Perceived CFTIndex (P-CFTIndex) Indonesian version. We then followed the measuring instrument adaptation procedure from Beaton et al. (2000), namely translation, synthesis, back translation, expert committee review (two experts for each instrument), and pre-testing.

Items in each instrument were measured by using a 6-point Likert scale, ranging from 1 (do not correspond at all) to 6 (corresponds exactly) for AMS and from 1 (never) to 6 (always) for USEI and P-CFTIndex. Each instrument was tested for reliability by examining Cronbach Alpha values and validity through Confirmatory Factor Analysis (CFA) test by using cut-off values: CFI > 0.90, RMSEA < 0.08, and SRMR < 0.08 (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003). Based on the results of this analysis, all three instruments were reliable (Kaplan & Saccuzzo, 2017) and valid (Table 2), noting that USEI and AMS meet the cut-off values of validity after the modification of indices was done once.

The categorization of students' learning engagement, academic motivation, and P-CFTB can be seen in Table 3. This categorization was made based on hypothetic statistics with the following formula: low category ($x \leq$ M – 1SD); medium category (M – 1SD < $x \leq$ M + 1SD); and high category ($x >$ M + 1SD) (Azwar, 2012). The collected data study was processed using Microsoft Excel, JASP version 0.164, and RStudio version 2022.12.0+353. Furthermore, correlational analysis was conducted to examine the relationship between variables before the multiple linear regression test. Statistical analysis techniques used were descriptive, correlational, and multiple linear regression tests.

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Table 1. Research Instruments

Instruments	Dimensions	Total Items	Item Samples
University Student Engagement Inventory (USEI)	1) Behavior 2) Cognitive 3) Emotional	5 5 5	When I read a book, I question myself to make sure I understand the subject I'm reading about.
Academic Motivation Scale (AMS) Indonesian version	1) Intrinsic motivation to know (IMTK) 2) Intrinsic motivation toward accomplishment (IMTA) 3) Intrinsic motivation to experience stimulation (IMTE) 4) Extrinsic motivation identified regulation (IR) 5) Extrinsic motivation introjected regulation (INR) 6) Extrinsic motivation external regulation (ER) 7) Amotivation (AMO)	4 4 4 4 4 4 4	Because I think that a college education will help me better prepare for the career I have chosen.
Perceived-Creativity Fostering Teacher Index (CFTIndex)	1) Independence 2) Integration 3) Motivation 4) Judgment 5) Flexibility 6) Evaluation 7) Questions 8) Opportunities 9) Frustration	3 3 3 3 3 3 3 3 3	The lecturer gives open-ended questions so that I look for the answers myself.

Table 2. Reliability and Validity Results of Instruments Used in The Study

Instruments	Reliability (Cronbach's α)	Validity		
		CFI	RMSEA	SRMR
USEI	0.862	0.905	0.072	0.067
AMS	0.875	0.913	0.057	0.050
P-CFTIndex	0.944	0.904	0.065	0.047

Table 3. The Categorization of Variables

Category	Interval		
	Student Engagement	Academic Motivation	P-CFTB
Low	< 40	$x < 74.7$	$x < 72$
Medium	$40 \leq x < 65$	$74.7 \leq x < 121.3$	$72 \leq x < 117$
High	$x \geq 65$	$x \geq 121.3$	$x \geq 117$

Results and Discussion

A total of 671 respondents filled out the questionnaire, but only 533 respondents' data were used after the data cleaning. This study's respondents were primarily female (69%, n=371), while the rest were male (18.39%, n=98). Most of the respondents were aged 19 y.o. (43.34%, n=232,), followed by 20 y.o. (37.52%, n=199), 21 y.o. (37.52%, n=48), 18 y.o.

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(6.00%, n=32), and >21 y.o. (4.69%, n=22). Figure 1 below depicts the sex ratio of respondents' age.

A total of 322 respondents (60.41%) were students in the 3rd-semester level, while the other respondents were at semester level of 4th (0.56%, n=3,), 5th (34.33%, n=183), 7th (3.94%, n=21,), 8th (0.19%, n=1), and >8th (0.56%, n=3). Furthermore, respondents in this study came from various universities spread across 11 provinces in Indonesia, with the majority coming from universities in DKI Jakarta (41.09%, n=219) and West Java (30.58%, n=163), followed by East Java (11.82%, n=63), Banten (6.75%, n=36), and South Sumatera (4.13%, n=22). Meanwhile, DI Yogyakarta and Central Java each contributed 1.69% (n=9) respondents, South Kalimantan 0.94% (n=5), South Sulawesi and North Sumatra each contributed 0.56% (n=3), and the remaining one (0.19%) came from Aceh. Figure 2 presents the percentages of respondents' semester-level and their location of universities.

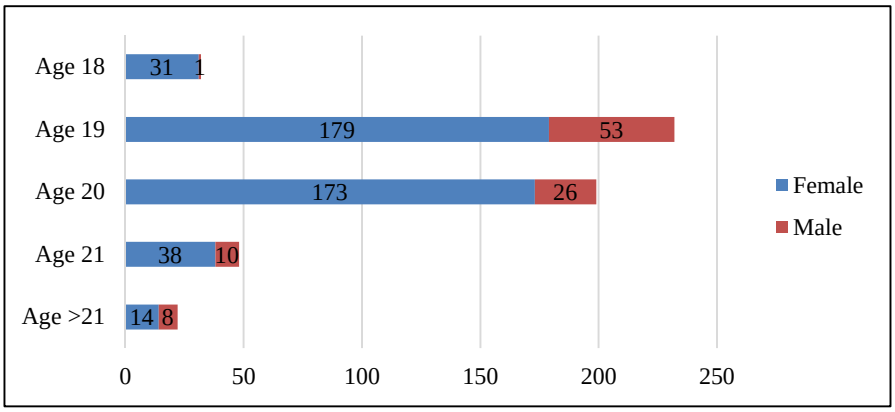

Figure 1. Sex Ratio of Respondents' Age

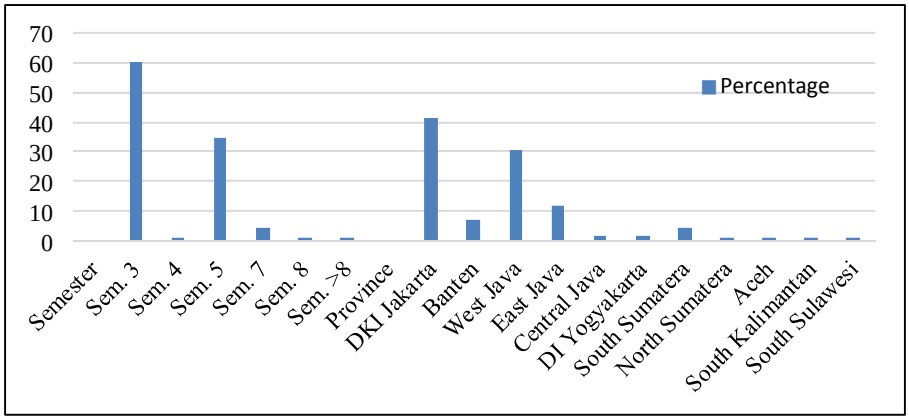

Figure 2. Respondents' Semester-Level and Location of Universities

Table 4 shows the respondents' categorization for each variable. It points out that most respondents were in the high category, and none were in the low category for all three variables studied. There were 70.54% (M = 69.94; SD = 9.17) of respondents who belong to the high student engagement category. It means that most students were highly engaged in learning Statistics courses through online learning methods. Furthermore, 69.61% (M = 126.47; SD = 18.18) of respondents were in the high category of P-CFTB. This result indicates that students perceived their Statistic lecturers were great at fostering their creativity throughout the online learning process. The results also showed that 88.18% of the respondents had high academic motivation. It shows that students' desire for academic functioning and success was determined.

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Table 4. The Categorization Result of Each Variable (n=533)

Variable	Mean	SD	Min	Max	Categorization		
					Low	Medium	High
1. SE	69.46	9.17	45	90	0.00%	29.46%	70.54%
2. AM	140.23	14.77	88	168	0.00%	11.82%	88.18%
3. P-CFTB	126.47	18.18	77	162	0.00%	30.39%	69.61%

Note. SE = Student Engagement, AM = Academic Motivation, P-CFTB = Perceived Creative Fostering Teacher Behavior

A correlation test was performed to see whether each independent variable (academic motivation and P-CFTB) is significantly correlated with the dependent variable (student engagement) (Table 5). According to Dancey & Reidy's (2007) interpretation of Pearson's correlation coefficients, academic motivation had a positive-moderate and significant correlation with student engagement ($r = 0.582$; $p < .001$). This result means the more academic motivation a student obtains, the greater the ability to engage in the learning process, specifically in this study on the online learning method. Meanwhile, P-CFTB also had a positive-moderate and significant correlation with student engagement ($r = 0.593$; $p < .001$). It means the more a student perceived their lecturer fostering creativity in the learning process, the greater the ability of a student to engage in the learning process.

Table 5. The correlation analysis

Variables	1	2	3
1. Student Engagement	—		
2. Academic Motivation	0.582***	—	
3. P-CFTB	0.593***	0.438***	—

*p < .05, **p < .01, ***p < .001

A multiple regression analysis was used to determine whether the participants' academic motivation and P-CFTB degree could predict their learning engagement. To test the multiple linear regression model, at least four assumptions must be met precisely: data linearity, multivariate normality, multicollinearity, and homoscedasticity (Osborne & Waters, 2002). The data linearity assumption was tested with scatterplots. The result indicates that there is a linear relationship between the dependent variable and the independent variable (Figure 3). Figure 4 demonstrates that the residual value is normally distributed, which means this model meets the assumption of multivariate normality. Moreover, a multicollinearity test is carried out. According to Midi et al. (2010), there is no multicollinearity if the tolerance value is > 0.1 and VIF < 10. Table 6 shows that the tolerance value for each variable is > 0.1, and the VIF value for each variable is <10, meaning the model has no multicollinearity. Lastly, to check for homoscedasticity, a scatterplot of residuals versus predicted values was used (Hariyanto et al., 2020). Figure 5 shows no clear pattern in the data distribution, meaning that the assumption of homoscedasticity was met.

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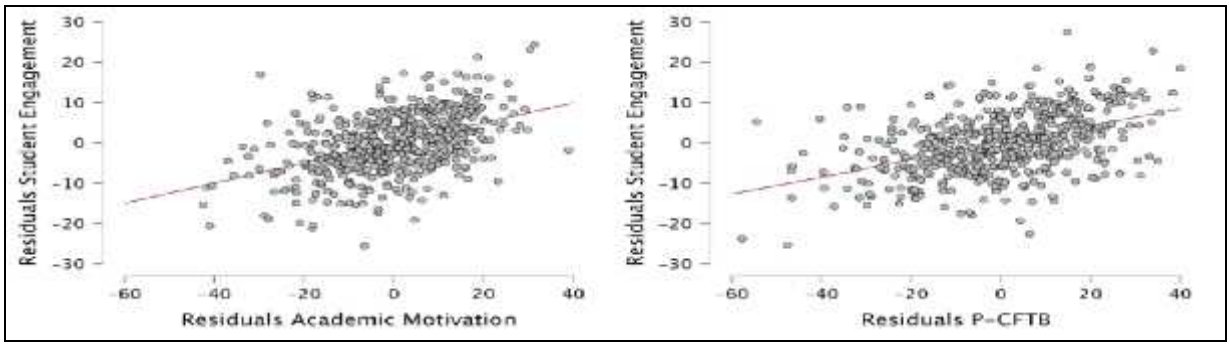

Figure 3. Data Linearity Test Results

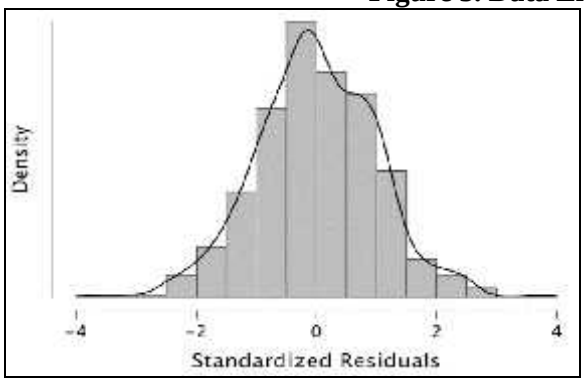

Figure 4. Normal Distribution Curve

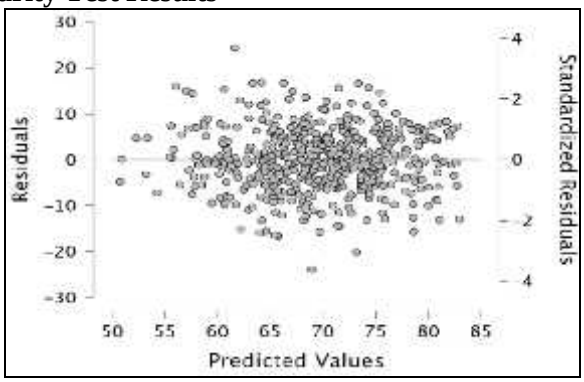

Figure 5. Homoscedasticity Test Result

Table 6. Multicollinearity Test Result

Model		Collinearity Statistics	
		Tolerance	VIF
H_1	(Intercept)		
	Academic Motivation	0.808	1.238
	P-CFTB	0.808	1.238

a. Dependent variable: Student Engagement

According to the result of multiple linear regression analysis, it was found that the participants' degree of academic motivation and P-CFTB could predict their student engagement significantly (F = 244,620, p <.001, and R^2 = 0.480) (See Table 7 and Table 8). Based on the interpretation guidelines of the determination coefficient (R^2) by Sarjana (2020), the results fall into the medium impact category. The results also reveal that academic motivation and P-CFTB affect 48% of student engagement, with the remaining 52% attributed to variables not included in this study.

Table 9 shows the relationship between three variables in which the regression equation is Y (Student Engagement) = 0.248*AcademicMotivation + 0.211*P-CFTB + 8.081. It means if a student lacks academic motivation and does not perceive his lecturers to foster creativity in the classroom, the student engagement score is 8.081. Meanwhile, for every one-point increase in academic motivation, the student engagement score will rise by 0.248, and every one-point increase in the P-CFTB will increase the student engagement score by 0.211. Furthermore, the influence of each variable on student engagement is 23.22% for the academic motivation variable and 24.78% for the P-CFTB variable.

Table 7. Multiple Linear Regression Result

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	21462.158	2	10731.079	244.620	< .001
	Residual	23250.224	530	43.868		
	Total	44712.383	532			

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Table 8. Coefficient of Determination Test

Model	R	R^2	Adjusted R^2	R^2 Change	p
H_0	0.000	0.000	0.000	0.000	
H_1	0.693	0.480	0.478	0.480	< .001

Table 9. Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI	
							Lower	Upper
H_0	Intercept	69.460	0.397		174.919	< .001	68.680	70.240
H_1	Intercept	8.081	2.883		2.803	0.005	2.417	13.745
	AM	0.248	0.022	0.399	11.455	< .001	0.205	0.290
	P-CFTB	0.211	0.018	0.418	11.990	< .001	0.176	0.245

a. Dependent Variable: Student Engagement

The present study analyzed the relationship and the impact of academic motivation and perceived creativity fostering teacher behavior (P-CFTB) on students' learning engagement among psychology undergraduates who took online Statistics courses. The first findings of the research indicated that academic motivation and student engagement in online learning were related moderately and positively. This finding aligns with previous research (Gettle, 2022). The results confirm that students with high academic motivation will be more engaged in online learning courses. The results also show that P-CFTB and student engagement have a positive and moderate relationship. It means that students will be more engaged when they positively perceive their lecturers' behavior in fostering creativity during online courses.

Furthermore, this study also discovered that academic motivation and P-CFTB simultaneously affected students' learning engagement by 48%. The result shows that when students' academic motivation is combined with P-CFTB, student engagement in online learning increases, specifically in Statistics courses. A study by Mulenga (2020) demonstrated online learning in mathematics could promote student engagement and maximize students' potential, noting that lecturers carry out differentiated instruction, which can later foster creativity. Moreover, Milligan et al. (2013) and Cayubit (2022) also found that academic motivation is a crucial predictor of student engagement. Students with high academic motivation tend to be more responsible for solving academic challenges and are more involved in online learning (Cayubit, 2022).

Additionally, student engagement is affected separately by academic motivation and P-CFTB at percentages of 23.22% and 24.78%, respectively. It shows that P-CFTB is slightly stronger in influencing student engagement than academic motivation. This result is supported by previous studies that found that teachers' roles and competence still influence student engagement in the higher education context (Almarghani & Mijatovic, 2017; Soh, 2000). Moreover, the results also confirm that students have a high learning engagement when the lecturers use an instructional design that can promote the development of students' creativity.

The findings could help lecturers better manage their online courses by designing learning methods and class activities that increase students' learning engagement instead of traditional-dictated teaching methods, such as applying hands-on-simulation-based learning, group discussions, and promoting independent learning. In addition, this study has enriched the scholarly understanding of the student engagement of higher education students in the online learning environment, specifically in Statistics courses. Students' academic motivation and perception of the lecturer's CFTB are essential for the further application of online teaching strategies.

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Conclusion

The results of this study conclude that academic motivation and student engagement, P-CFTB and student engagement were related moderately and positively ($r = 0.582$, $r = 0.593$; $p < .001$, respectively). Furthermore, academic motivation and P-CFTB simultaneously affected students' learning engagement by 48%. The result shows that student engagement in online learning increases when students' academic motivation is combined with creativity fostering teacher behavior. Students with high academic motivation and who are perceived as their lecturers' fostering creativity positively will be able to engage themselves to learn in the online learning environment and thereby help them achieve academic success.

Recommendation

Based on the results of this study, the following recommendations are offered: (a) The results showed that academic motivation and P-CFTB worked favorably to predict student engagement in online learning. As a result, students should obtain experiences and information about boosting their academic motivation and fostering their creativity. (b) To enhance student engagement in the online learning environment, faculty members should design an instructional method that facilitates the development of students' creativity and academic motivation. (c) Higher education leaders should provide support through training or facilities that can encourage faculty members to use learning methods that promote students' creativity.

Acknowledgement

This research was funded by HIBAH PUTI PASCASARJANA 2022, Universitas Indonesia, grant number NKB-297/UN2.RST/HKP.05.00/2022.

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