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The relationship between students' perceptions and their engagement through self-regulated learning

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ABSTRACT

The engagement of psychology students in statistics courses requires improvement because the learning material is challenging to understand. This leads to the emphasis on the teaching ability of lecturers, which is one of the external factors to increase student engagement. Internal factors such as self-regulated learning can impact engagement during lectures. Therefore, this study examines the role of self-regulated learning as a mediator in the relationship between students' perceptions of creativity fostering teacher behavior (p-CFTB) and the engagement of psychology undergraduates in the statistics class. A mediation test using RStudio software was utilised to examine the role of self-regulated learning as a mediator, and 533 undergraduate psychology students from different parts of Indonesia participated in this study. The results showed that self-regulated learning partially mediated the relationship between p-CFTB and student engagement with the indirect effect value was greater than the direct effect. Therefore, student engagement is more affected by self-regulated learning in its role as a mediator than when it occurs without a mediator. Consequently, this study found that the role of various actors, such as lecturer behavior to foster creativity is needed to improve student self-regulated learning so that student engagement can function at its most effective.

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1. INTRODUCTION

Due to the COVID-19 pandemic, students experience difficulties with online lectures. These challenges include boredom caused by many assignments [1], difficulty understanding the material, a lack of interaction between lecturers, students, and their peers [2]. Furthermore, students are more likely to experience stress, become passive learners, lose creativity, and feel bored [1]. Due to these various challenges, there has been a tendency for student engagement to decline during lectures [3], [4]. Online learning is also more challenging when the courses studied are difficult. Students in social science clusters especially psychology find statistics to be a challenging topic to study [5]. Students find statistics challenging because they feel confused to understand it [6]. This causes undergraduate psychology students experience anxiety when studying statistics [5].

An important aspect of online learning is the endeavour to boost student engagement [7], especially in learning statistics. Research on declining student engagement is crucial since these effects will impact on motivation and learning success [8], [9]. Student engagement is defined as the motivation and involvement in undergoing lecture

activities [10]. Numerous internal and external factors affect student engagement. The internal factors influencing student engagement include techno-pedagogical skills, self-directed learning [11], self-regulated learning [12], [13], motivation, self-efficacy [14], and student perception [15]. Meanwhile, the external factors are the lecturer's teaching ability [16], parents, friends, technology, and university curriculum [17].

The lecturer's teaching ability is the external factor that has the most significant influence on student engagement [16] because it will greatly influence the level of interaction with students [18]. Interaction between students and lecturers is the factor that most influences online learning compared to the relationship between students and their peers [7]. Students' perceptions of lecturers based on the interaction process will significantly influence student engagement because a positive relationship will increase student confidence in learning [15]. Regarding a qualitative report Setiawan *et al.* [19], creative teaching was highly needed to increase student engagement. It is also widely recognised that creative instruction from lecturers increases student engagement in online courses [20]. The behavior to foster creativity is known as creativity fostering teacher behavior (CFTB) [21]. The creativity fostering teacher index (CFTIndex) [22] was developed to measure teacher behavior in fostering student creativity regarding the nine dimensions of CFTB, namely independence, integration, motivation, judgment, flexibility, evaluation, question, opportunities, and frustration [21]. Previous research explained the correlation between student perceptions of teacher behaviors and student engagement [23], although the teacher behavior did not focus on fostering creativity.

One of internal factors, namely self-regulated learning, affects student engagement. Self-regulated learning is defined as an individual various active efforts to improve academic abilities [24]. Self-regulated learning is one of the strategies used to maintain student engagement in lectures [12]. The learning strategy impacted academic engagement in students [25]. Self-regulated learning is an internal factor chosen in research to become a mediator due to the positive correlation between self-regulated learning and student engagement [12], [17], [25]. Self-regulated learning has also been known to develop learning creativity and academic achievement [26]. Online education also analyzes self-regulated learning due to its essential digital abilities [27]. From this context, online self-regulated learning is students' complete or partial ability to regulate the digital educational process [28]. This leads to the implementating of the online self-regulated learning questionnaire (OSLQ), whose dimensions consist of environmental structuring, goal setting, time management, seeking help, task strategies, and self-evaluation [28].

Research has found a relationship between student perceptions of teacher behavior and self-regulated learning, although the teacher behavior studied did not specifically measure CFTB [29]. Based on the literature review, the relationship between perceptions of creativity fostering teacher behavior (p-CFTB) and student engagement is yet to be highly studied in higher education. Therefore, this study aims to determine the mediation effects of self-regulated learning on the relationship between p-CFTB and student engagement. The hypothesis of the research (H_1) is that the relationship between p-CFTB and student engagement can be mediated by self-regulated learning.

2. METHOD

This study used a quantitative design, with the participants being psychology undergraduates who had completed the statistics course. Data collection was also carried out from october to december 2022, with convenience sampling used by distributing online via social media and offline questionnaires. In addition, offline questionnaires were distributed to undergraduates via the student executive board of the Faculty of Psychology at many universities and asked for lecturer permission to gather data from their students after class. Although 671 participants filled out the questionnaire, only 533 met the criteria and were used in the study. Participation was also voluntary, with the participants filling out informed consent before filling out the questionnaire.

Three measurement tools were implemented in this study, namely the CFTIndex [22], the university student engagement inventory (USEI) [10], and the OSLQ [28]. The students' p-CFTB was also adapted into the Indonesian version of the CFTIndex instrument [22] with 27 items selected using Lee and Kemple [30] procedure. Moreover, confirmatory factor and Cronbach alpha analyses were used to measure validity and reliability, respectively. Maximum likelihood estimation was also implemented because data were normally distributed. Based on the validity and reliability tests, the CFTIndex instrument was valid at comparative fit index (CFI)=0.904, root mean square error of approximation (RMSEA)=0.065, and standardized root mean square residual (SRMR)=0.047 [31], while being reliable at Cronbach α=0.94.

The Indonesian version of the USEI [10] with 15 items was also implemented. From the validity and reliability tests, the instrument was valid at CFI=0.905, RMSEA=0.072, and SRMR=0.064 [31], while being reliable at Cronbach α=0.852. Moreover, the Indonesian version of the OSLQ instrument [20] was adopted to be a total of 21 items [32]. Based on the validity and reliability tests, the OSLQ instrument was valid at

CFI=0.906, RMSEA=0.070, and SRMR=0.055 [31], while being reliable at Cronbach α=0.913. The statistical analysis of the study data was also carried out by using RStudio 2022.07.2+576.

3. RESULTS

3.1. Demographic characteristics

Based on Table 1, the involved 533 participants contained 18.39% male and 81.61% female students. Most participants were 18-20 years old (86.87%) and in the third semester (60.41%), with 61.73% and 38.27% attending state and private universities, respectively. The locations of the institutions were also scattered in various parts of Indonesia, with most of them originating from DKI Jakarta (41.09%), accompanied by the provinces of West Java (30.58%), East Java (11.82%), Banten (6.75%), Sumatera (4.88%), Central Java (1.69%), Yogyakarta (1.69%), Kalimantan (0.94%), and Sulawesi (0.56%).

Table 1. Demographic characteristics

Characteristics		n	%
Age	18-20	463	86.87
	21-25	65	12.19
	>25	5	0.94
Gender	Male	98	18.39
	Female	435	81.61
Semester	3	322	60.41
	4	3	0.56
	5	183	34.34
	≥7	25	4.69
University location	Sumatera	26	4.88
	DKI Jakarta	219	41.09
	Banten	36	6.75
	West Java	163	30.58
	Yogyakarta	9	1.69
	Central Java	9	1.69
	East Java	63	11.82
	Kalimantan	5	0.94
	Sulawesi	3	0.56
University type	State	329	61.73
	Private	204	38.27

3.2. Descriptive analysis and correlation among variables

Table 2 explains the descriptive analysis and Pearson correlation between variables. The correlation analysis between p-CFTB and student engagement showed a value of 0.592. The correlation between the p-CFTB and self-regulated learning provided a moderate relationship. However, a difference was observed in the correlation between self-regulated learning and student engagement, with the strongest relationship of 0.700. In this case, the correlation between p-CFTB and self-regulated learning had the lowest relationship at 0.572, although the value was included in the moderate category.

Table 2. Descriptive analysis and correlation data

Variables	Mean	SD	Min	Max	1	2	3
1. p-CFTB	126	18.18	77	162	1		
2. Self-regulated learning	89	16.17	51	144	0.572*	1	
3. Student engagement	69	9.16	43	90	0.592*	0.700*	1

Note: *p<0.01

3.3. Mediation analysis

Figure 1 presents the mediation analysis of self-regulated learning in the relationship between the p-CFTB and student engagement. The significant direct effect of p-CFTB on student engagement was identified at c'=0.431, p=0.000, and 90% CI [0.308, 0.551]. A significant indirect effect of p-CFTB on student engagement was also found through self-regulated learning at a.b=0.465, p=0.000 [0.381, 0.553]. Moreover, the total effect of mediation through self-regulated learning was c=0.896, p=0.000 [0.778, 1.001]. This proved that p-CFTB indirectly affected self-regulated learning at a greater value than the direct effect. From this context, any increase in p-CFTB predicted an increase in self-regulated learning of a=0.764 (p<0.000). Meanwhile, any increase in self-regulated learning scores was significant in predicting an increase in the student engagement scores of 0.609 (p<0.000).

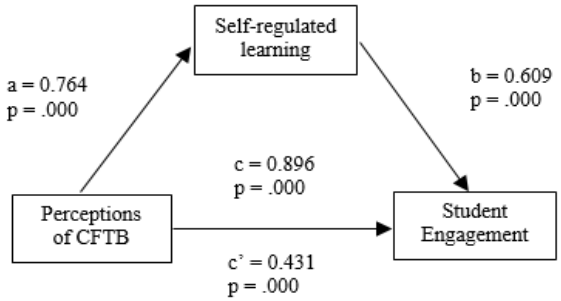

Figure 1. Mediation analysis

4. DISCUSSION

The study found that self-regulated learning can mediate the relationship between p-CFTB and student engagement (H_1 accepted). The mediation analysis showed partial mediation with the value of the indirect effect higher than the direct effect. This shows that although p-CFTB can directly affect student engagement, the effect of the mediator is greater than without going through the mediator (direct effect). The influence of self-regulated learning as a mediator has more impact on the relationship between p-CFTB and student engagement. The following provides an explanation for the examination of why self-regulated learning can function as a mediator with a higher indirect impact value than the direct effect.

First, some dimensions in the p-CFTB are related to mediators. Although no studies had evaluated the relationship between p-CFTB and self-regulated learning, some factors were also found to affect the relationship between these variables due to the p-CFTB dimensions related to self-regulated learning: independence, motivation, evaluation, and flexibility. Several studies have found that lecturer behaviors that encourage student independence are known to have a positive relationship with self-regulated learning [27], [33], [34]. Independence was one of the characteristics possessed by the students having self-regulated learning [27]. The behavior of lecturers when teaching will affect their students' independence [35]. Students with independent characteristics can regulate themselves well [27]. Student independence will be more improved when learning is done online because of the role of self-regulated learning abilities [28]. This indicated that the independence dimension greatly impacted self-regulation and was in line with the study explained students with self-regulated learning abilities could studying independently [36].

Lecturer behavior to increase motivation in the variable p-CFTB is also known to have a positive relationship with self-regulated learning [33]. Lecturer behavior contained in the instrument of p-CFTB explains how lecturers make students more motivated to learn. Students who can regulate themselves will have a strong motivation to improve academic achievement so that these students are more motivated to undergo the learning process [33]. In addition, the main components of self-regulation consist of self-regulation strategies and motivation [34]. Self-regulated learning is also one of factor assisting learning creativity development and academic performance achievement [26]. Lecturers' behavior to train students to do self-evaluation on the variable of p-CFTB [22] is known to have similarities with self-regulated learning behavior, which explains how students evaluate themselves [28]. This can be seen from the similarity of the items on the p-CFTB scale and the self-regulated learning scale [28]. The behavior of lecturers to train students to develop flexible thinking skills in the p-CFTB [22] is also related to the characteristics of students who have self-regulated learning in the form of cognitive and metacognitive abilities [24], [37].

Second, the correlation between self-regulated learning and student engagement shows the strongest correlation. This aligns with several studies that report correlations between these two variables. However, there are some differences in the correlation results between self-regulated learning and student engagement. A study in Indonesia explained there was a positive and significant correlation (r=0.262) [12]. Study in Spain also reported that the correlation between self-regulated learning and student engagement of university students was moderate (r=0.520) [25]. The positive relationship between the two variables is influenced by a person's self-regulation ability which is closely related to their cognitive engagement [17]. Student engagement during online learning is known to increase student engagement in terms of cognitive and behavioral [38].

Online learning that limits interaction between students and lecturers also causes student learning difficulties [2], [4]. Although lecturers provide opportunities to be more independent in doing assignments, if students do not understand the basic concepts of statistics, they will find it challenging to learn statistics, reducing student engagement. Students that use self-regulated learning strategies manage their study time, ask friends and lecturers for help in relearning challenging material, and improve the online learning environment [28]. Therefore, students who use various self-regulated learning strategies in online learning will have more student engagement

despite experiencing difficulties during statistics lectures. This makes the indirect effect through self-regulated learning greater than the direct effect on the relationship between p-CFTB and student engagement. This indicated new information where self-regulated learning mediated the relationship between p-CFTB and student engagement.

Third, the connection between the traits or behaviors included in p-CFTB and student engagement. The relationship between the behavior or characteristics described in CFTB and student engagement. Lecturer behavior to train student independence in the p-CFTB is known to have a positive correlation with student engagement. The dimension was also related to student engagement that the online education instruction containing independent learning increased academic involvement [39]. Giving students the chance to study independently is one of the best methods to meet their needs when it comes to learning based on their characteristics, especially considering the age range of responders in the emerging adult phase [40]. But students may not be able to explore learning if they lack confidence, are uninterested, and have a negative attitude about their capacity to learn statistics [41]. Besides improving independence, the existence of behavior in increasing student motivation in p-CFTB, which has a positive correlation with student engagement [42]. A link was observed between teachers' creative teaching which increased student engagement in elementary school students [19]. The present study closely supported this, where a positive correlation was found between p-CFTB and student engagement in higher education.

5. CONCLUSION

According to the study, self-regulated learning can partially mediate the relationship between p-CFTB and student engagement. The value of the indirect effect through the mediator of self-regulated learning is greater than the direct effect. This demonstrates that student engagement in statistics courses is higher when students have self-regulated learning abilities than when they are not able to do so. Future research is expected to use measurement tools specific to online learning, measurement methods other than self-report, and the need to conduct intervention research to determine the effect of CFTB on student engagement. Researchers also recommend that lecturers help students to develop self-regulated learning skills, particularly in statistics. Lecturers also need to show creativity-fostering behavior that can improve self-regulated learning skills. In addition, universities are expected to be able to pay attention to factors that can influence CFTB in lecturers. This is because lecturers with CFTB will positively correlate with student engagement so that more efficient learning can occur.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
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D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The approval to commence the experiment was obtained from the ethical review team of the Faculty of Psychology, Universitas Indonesia number 136/FPsi.Komite Etik/PDP.04.00/2022.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author, [MN]. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

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