Enhancing Student Performance during Online Learning with Psychosocial Processes and Information and Communication Technology Competence: The Role of Psychological Engagement as Mediator

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Abstract: Some Indonesians may still regard online education as a novel, although they frequently engage in online-related activities without even realizing it. The quality of learning, satisfaction, achievement, retention, and, more broadly, personal growth are all favorably correlated with student engagement. For students to provide their best effort and succeed in online learning, it is crucial to have good psychological engagement in them. This engagement will help their psychological processes and dispositions to improve. The quantitative research methodology was utilized in this research. In addition, 800 high school students from South Sumatra participated in this research as a sample. The structural equation model is analyzed (SEM). The findings indicated that 85.9 percent of the time, a psychological commitment is influenced by information communications technology (ICT) proficiency, psychosocial processes, and student performance. Thus, the value of .713 indicates that psychological involvement, psychosocial processes, and ICT proficiency all impact student performance. This study demonstrates that every hypothesis has a favorable and significant impact. These circumstances suggest that students who are proficient in ICT and psychosocial processes will be able to enhance their performance through challenging and dry learning. The interaction between students while learning strengthens this condition.

Keywords: *ICT competence, online learning, psychological engagement, psychosocial processes, student performance.*

Introduction

People's daily routines and student participation in the education system are influenced by the Indonesian government's implementation of the Pembatasan Sosial Berskala Besar (PPSB). Schools that have begun to adopt the *school from home* (SFH) system now have a solution in the form of distance learning or an outline platform. SFH is a program that transfers learning from the classroom to the home. According to the Ministry of Education and Culture guidelines, schools conduct online learning to provide students with relevant learning opportunities without putting them under pressure to meet every aspect of the curriculum. In this situation, SFH pays attention to the health and safety of the public, instructors, and students (Al-Kumaim et al., 2021).

In online learning, the competence that students have to use technological tools ethically and productively, namely information search and organization, problem-solving, collaboration, and communication process improvement, is essential and efficient to respond to emerging demands in the teaching context that heavily incorporates information communications technology (ICT) (Guitert et al., 2021). The basic ICT skills students must master are accessing, managing, integrating, evaluating, creating, and communicating. Therefore, students' ability to operate, process, and search for information through ICT helps efficiency in learning activities through an online system. According to Chisadza et al. (2021), in comparison to mobile internet data consumption, student performance was highly related to adequate Wi-Fi connection.

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The student's psychosocial process and good ICT ability will give the student good academic results. The occurrence of good psychosocial processes and adequate ICT abilities in students requires psychological involvement in students. Student performance is influenced by prosocial through psychological involvement (Strelan et al., 2020).

Fang et al. (2021) reported that a study with diverse groups of early education students showed significant and positive influences of psychological (affective, behavioral, and cognitive) engagement on student learning results. Thus, online students' engagement is connected to the quality of their satisfaction, learning, achievement, and sensitivity, as well as their personal development (Farrell & Brunton, 2020). Therefore, it is necessary to have good psychological engagement in students so that the psychological process and the willingness of students to improve their ICT skills in online learning, so that students can provide maximum performance and obtain success in their academics.

Some research has been conducted to determine student performance. First research was conducted by Timms et al. (2018). They stated that psychological engagement engages the academic students' performance. The research from Timms et al. (2018) involves the subject of first-year psychology students in Australia. Other than that, the research also only involves the variables of psychological engagement and students' performance.

The second is research from Ratanasiripong et al. (2022) who stated that psychosocial factors are proven to be factors that engage the academic performance of nursing students in Thailand. This research involves the research subject of nursing students in Thailand. The variables researched in this study are psychosocial factors and academic performance.

Next is the research conducted by Vayre and Vonthron (2017) who stated that during online learning, the self-efficacy affects psychological engagement and psychosocial processes affect the psychological engagement of students. This research involves students of online university courses whose variables are self-efficacy, psychological engagement, psychosocial processes, and engagement of students.

However, the research only involves two or three variables that have been mentioned earlier. To maintain the performance of students, there should be other factors that are related to high school students during their online learning such as psychosocial processes, information and communication technology competence, and psychological engagement. Therefore, this research will involve another variable to determine the strong intervening variable that can strengthen the relationship between the variables which is psychological engagement. The research question developed in this research is "*that is there an affect of psychosocial processes and information and communication technology competence on student performance through psychological engagement during online learning?*". Other than that, this research will conduct research on high school students in Sumatra during online learning implementation.

Literature Review

Psychological Engagement

Psychological engagement is conceptualized as the relationship between customer feelings and intensity with the services offered. Involvement can be described as the intensity of engagement with an activity or service (Tiamiyu et al., 2020). Engagement in Halverson and Graham (2019) model consists of behavior (participation in the classroom and school) and affective components. Psychological engagement is a form of student interest in school (teachers, peers, and learning activities) in the form of acceptance and mutual respect (Archbell et al., 2019). Therefore, students' psychological engagement has a positive role in the effectiveness of the learning process. The statement is supported by Vayre and Vonthron (2017) who stated that psychosocial processes are one of the variables that can affect the psychological engagement of students. It is important to note that academic engagement is a psychological process that plays a major role in students' course of study, and this is true regardless of the sociotechnical organization of the courses considered.

The course outline for teachers should bring up-to-date ICT awareness, employing an all-inclusive psychological strategy. According to (Park & Son, 2022) considering the implementation of technology in the teaching/learning process, teachers must develop the knowledge and competencies required compulsory to utilize ICT in their classroom instruction. Oralbekova et al. (2021) indicate that it is significant to develop the readiness and willingness of pre-service teachers to use Information Technologies in comprehensive pedagogy and learning. Therefore, the hypotheses provided in this research are:

H1: Psychosocial Processes affects Psychological Engagement

H2: ICT Competence Affects Psychological Engagement

Student Performance

A student's ability to perform tasks assigned by the teacher is described as their performance, which can be evaluated using established standards (Strelan et al., 2020). Indicators of performance highlight what specific activities students are expected to undertake due to their involvement within the program. When the program's outcomes are determined, the abilities and knowledge required for mastering these outcomes must be outlined. The intended action must be

identified using observable action verbs such as demonstrating, interpreting, distinguishing, or defining. The three dimensions of student performance have been formulated such as cognitive, affective, and psychomotor (Enneking et al., 2019).

Students' performance can maintain their scores of students in every aspect such as affective, cognitive, and psychomotor (Lidyasari et al., 2022). Several factors that can enhance their performance are psychological processes (Ekpenyong et al., 2023). Psychology is among many things that matter in human day-to-day activities. The success and failure we face in various activities we perform each day most often depend on our everyday psychology. These problems mainly emanate from psychological factors such as stress, anxiety, depression, lack of motivation, loneliness, helplessness, and phobias. These psychological problems can lead students to failure in their academic achievements, test anxiety, poor performance, low self-confidence, unrealistic worry, and fear or uneasiness that interfere with their ability to function normally. This statement is supported by Cobo-Rendón et al. (2020) who stated that psychological processes affect students' performance.

In addition, ICT is often perceived as a catalyst for change, change in teaching styles, change in learning approaches, and in access to information. In learning, the use of multiple information technology systems has become inevitable for learners. Students can recover their appropriate performance during learning. This is stated by Sobreviñas et al. (2021) who stated that ICT performance can enhance the students' academic performance.

Psychological engagement is a multifaceted concept that describes students' behavioral, emotional, and cognitive involvement displayed by students in school. As stated by Muenks et al. (2020) that psychological engagement affects the performance of students. When the psychological engagement of students increases, the performance of students also increases. Therefore, the hypotheses provided in this research are:

H3: Psychosocial Processes affects Student performance

H4: ICT Competence affects Student performance

H5: Psychological Engagement affects Student Performance

Psychosocial Processes

The relationship between a person's social situation and mental/emotional health is known as a "psychosocial" relationship (Mackolil & Mackolil, 2020). Both psychological and social factors are included in psychosocial terms. Erikson was the first to put forward psychosocial theories. According to Erikson, a person will go through eight psychological stages in their life. Crises or urgent problems happen at any stage of growth that needs to be resolved. The term "psychosocial" describes the dynamic interaction and reciprocal effects of mental and social variables. During teaching activities, students may experience psychosocial processes. The psychosocial development of the individual follows the stages of development (Palacios-Barrios & Hanson, 2019).

There have been many psychological processes empirically related to students' performance. These studies focus on the student and are closely linked to the university's performance, which is why some institutions adopt tutoring programs to support their students with personal and academic issues. The research is related to the results from Raza et al. (2021) who stated that psychological processes affect performance. Other than that, research was conducted by Carmona-Halty et al. (2021) who stated that psychological engagement can affect the academic performance of students. Therefore, it is concluded that psychological engagement is predicted to mediate psychosocial processes in enhancing student performance. The hypothesis provided in this research is:

H6: Psychosocial Processes Affects Student Performance Mediated by Psychological Engagement

Information and Communication Technology (ICT) Competence

Technology has become a preferred means of generating and disseminating information, so people are increasingly aware of technological literacy (Choi et al., 2021). Everyone must be able to discover, manage, and develop efficient information and communication skills and improve their position and function in society to use ICT fully. Information is conveyed through communication from the informer to the recipient of the information (Areepattamannil & Santos, 2019). As a result, communication and information are closely interrelated. Information technology and communication (ICT) refer to the development of data processing innovations that produce information and enable faster dissemination and storage (Cassia et al., 2020).

Amriza et al. (2022) stated that students' ICT competence includes the meaningful usage of new abilities for academic work, digital media development through direct involvement in and critical assessment of technological culture, and the utilization of information literacy skills and strategies to academic tasks. Additionally, students having previous experience with ICT-related tasks have established strategies for completing new learning tasks, resulting in improved learning results (Amriza et al., 2022). As a result, student engagement could be one of the important connections between

ICT competence and experience with e-learning effectiveness (Amriza et al., 2022). Therefore, the hypothesis provided in this research is:

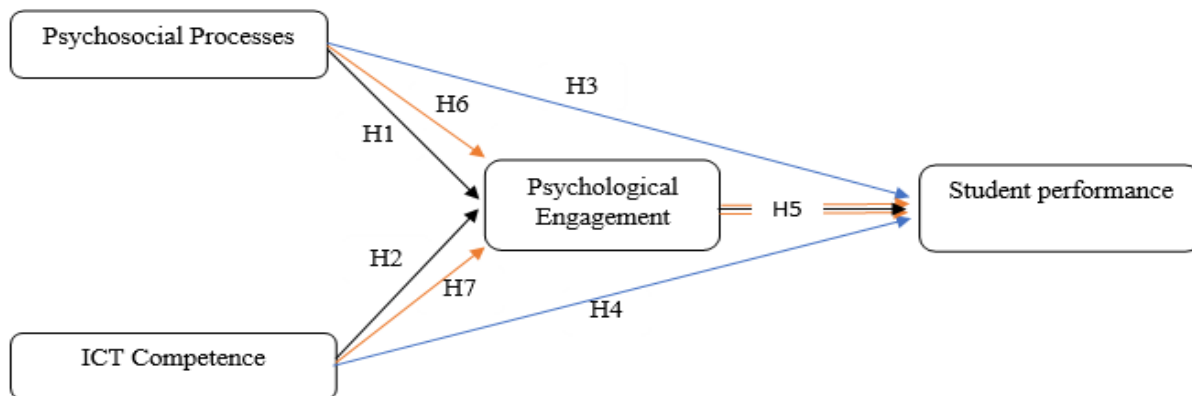*H7: ICT Competence affects Student performance mediated by Psychological Engagement*

Figure 1. Theoretical Framework

Previous Research Analysis

Based on the literature review above, it can be explained that the strengths and weaknesses of previous studies are as follows. In the previous studies that have been mentioned, those have provided a valuable understanding of the factors and interventions that affect students' motivation and engagement during offline learning and used well-established psychological theories and models to guide their research questions and analyses. In addition, those studies have included diverse populations and contexts to enhance the generalizability of their findings.

However, the weakness of the previous studies is regarding the focus, which focuses only on a specific population or context, which limits the generalizability of their findings. Even, some studies have used small sample sizes and the heterogeneity of the samples is limited, which may reduce the statistical power and generalizability of their findings. Therefore, in the upcoming study, all variables will be examined in relation to student performance, with a sufficiently proportional distribution of subjects across all 17 districts and cities in the South Sumatra province. Therefore, the results of the study are expected to be more comprehensive and also show clear differences from previous studies, making this study more interesting.

Methodology

Research Design

This research uses a quantitative approach. According to Uyun and Yoseanto (2022b), a quantitative approach is a method to test an objective hypothesis by looking at how different factors interact or impact each other. This method uses measurement numbers with a scale on the study variable.

The Participants

A sampling of the population was done using the random sampling technique where the number of populations is unknown, so a representative sample of the entire population may be taken. Random sampling is a statistical method used to select a sample from a population so that each member of the population has an equal chance of being selected. This technique involves selecting a sample of individuals from a larger population in a way that minimizes bias and allows for the generalization of the findings to the population as a whole (Berndt, 2020). The respondents in this research were students of high schools in South Sumatra, totaling 800 students with the demographic characteristics defined in the result section.

Data Collection

The data collected in this study used primary data to measure the variables being studied in the form of a Google form, which was delivered to the curriculum department of the school by the vice principal and then distributed by the class teacher to the students, with prior research collaboration with the school. Each student was asked to fill out the Google form, with statement options; SS (5) or strongly agree, S (4) or agree, N (3) or neutral, TS (2) or disagree, and STS (1) or strongly disagree, and vice versa for favorable and unfavorable assessments.

The data collection instrument is a psychological engagement scale in the form of a Google form, where the variable of student performance is measured based on the theory from Enneking et al. (2019) with 12 indicator items, the variable of psychosocial processes is measured based on the theory of Raza et al. (2021) with 11 indicator items, the variable of ICT competencies is measured based on the theory of Choi et al. (2021) with 9 indicator items, and the variable of psychological engagement is measured based on the theory of Tiamiyu et al. (2020) with 11 indicator items. All data

collection instruments are the result of adapted scales that have been adjusted to the conditions and character of Indonesian students through instrument measure trials with validity and reliability testing. Each score of the item and total item validity and reliability has met the requirements.

Data Analysis

This study's analysis uses the Structural Equation Model (SEM). A complete understanding of a model can be obtained using SEM, a multivariate analysis approach, to test interaction patterns among variables and the indicators of those variables and direct measurement errors (Uyun & Yoseanto, 2022a). The software that can be used for SEM data analysis is called the SmartPLS. Therefore, this research utilizes SmartPLS to help analyze the data.

Outer Model Analysis

Validity and Reliability Test

Testing for validity and reliability is done to ensure the data can be used as a measuring tool (valid and reliable), as can be shown from validity and reliability testing.

a. Convergent validity is an indicator assessed based on the correlation between the item/component score and the construct score. The standardized loading factor describes the correlation magnitude between each measurement item (indicator) and its shelf constituents. Individual reflexive measures are said to be high if correlated > 0.7.

b. Discriminant Validity is a measurement model with a reflexive indicator judged based on cross-loading measurements with constructs. Discriminant validity compares the square root of Average Variance Extracted (AVE) values. The instrument is valid if it has an AVE score of > 0.5.

c. Composite reliability is an indicator for measuring a construct seen in the view of latent variable coefficients. In this measurement, if the value achieved is > 0.70, it can be said that the construct has high reliability.

d. Cronbach's alpha is a reliability test that measures a composition's dependability. If a variable has Cronbach's alpha > 0.7, then the variable can be declared reliable.

Table 1. Instrument Testing

Instrument Test	Test Used
Validity Test	Convergent Validity AVE
Reliability Test	Cronbach's alpha Composite Reliability

R-Square Test

The R-squared (or R^2) test is a statistical measure that represents the proportion of variance in a dependent variable that can be explained by the independent variable(s) in a regression model. The r-square for the dependent construct is used to show the influence's strength when assessing a particular independent variable's effect on a latent dependent variable. It is a statistical technique that helps to determine how well the independent variable(s) predict the variation in the dependent variable.

Inner Model Analysis

The deep model analysis is used to determine the causal relationship between the test variables of the model, also known as the structural model. By testing the hypothesis, the inner smartPLS testing model is analyzed. The probability and t-statistical values show how the hypothesis was tested. The beta score determined the direction of the effect of the link between variables, and the t-statistical score used to examine the hypothesis is 1.96 for 5 percent alpha. The following standards will determine whether the hypothesis is accepted or rejected:

a. H_a= t-statistic >1.96 with a p-values score of < 0.05.

b. H_0= t-statistic < 1.96 with a p-values score of > 0.05.

Results

Data Description Analysis

The characteristics of the respondents in this study are based on gender, age, and class. These respondent characteristics were identified based on the collected questionnaire and are consistent with the total sample in this study, which is 800 respondents. The results of descriptive statistical analysis for respondent characteristics are presented as follows.

a. Respondents' Characteristics Based on Gender

The first characteristic of the analyzed respondents is the comparison of the number of respondents based on the gender of high school students in South Sumatra, which can be seen in the following table.

Table 2. Respondents' Characteristics Based on Gender

No	Gender	Total	Percentage
1	Male	264	33%
2	Female	536	67%
	Total	800	100%

Based on the table above, it can be concluded that most of the participants in the study were female, with a total of 536 respondents or 67%. Meanwhile, the remaining 264 respondents or 33% were male.

b. Respondents' Characteristics Based on Age

The second characteristic of the analyzed respondents is the comparison of the number of respondents based on the age of high school students in South Sumatra, which can be seen in the following table.

Table 3. Respondents' Characteristics Based on Age

No	Age	Total	Percentage
1	15-16	264	31.6%
2	17-18	536	40.5%
3	19-20	142	17.8%
4	21-22	81	10.1%
	Total	800	100%

Based on the table above, it can be seen that in order, the percentage of research respondents based on age is as follows: 264 respondents (31.6%) were aged 15-16 years, 536 respondents (40.5%) were aged 17-18 years, 142 respondents (17.8%) were aged 19-20 years, and 81 respondents (10.1%) were aged 21-22 years. It can be concluded that most of the respondents were around 17-18 years old.

c. Respondents' Characteristics Based on Class

The third characteristic of the analyzed respondents is the comparison of the number of respondents based on the age of high school students in South Sumatra, which can be seen in the following table.

Table 4. Respondents' Characteristics Based on Year Class

No	Year Class	Total	Percentage
1	10 (The First Year)	372	46.5%
2	11 (The Second Year)	254	31.8%
3	12 (The Third Year)	174	21.7%
	Total	800	100%

Based on the table above, it is identified that the respondents of this research contains 372 students (46.5%) from the first year, 254 students (31.8%) from the second year, and 174 students (21.7%) from the third year. It is concluded that the most dominant students who participated in this research are from the first year.

Outer Model Analysis

The outer model is part of the model that describes the relationships among the latent variables and their indicators. It is concluded in the following parts: validity test, reliability test, r-square test, inner model analysis, psychosocial process affects psychological engagement, ICT competence affects psychological engagement, psychosocial process affects student performance, ICT competence affects student performance, psychological engagement affects student performance, psychosocial process affects student performance mediated by psychological engagement, and ICT competence affects student performance mediated by psychological engagement
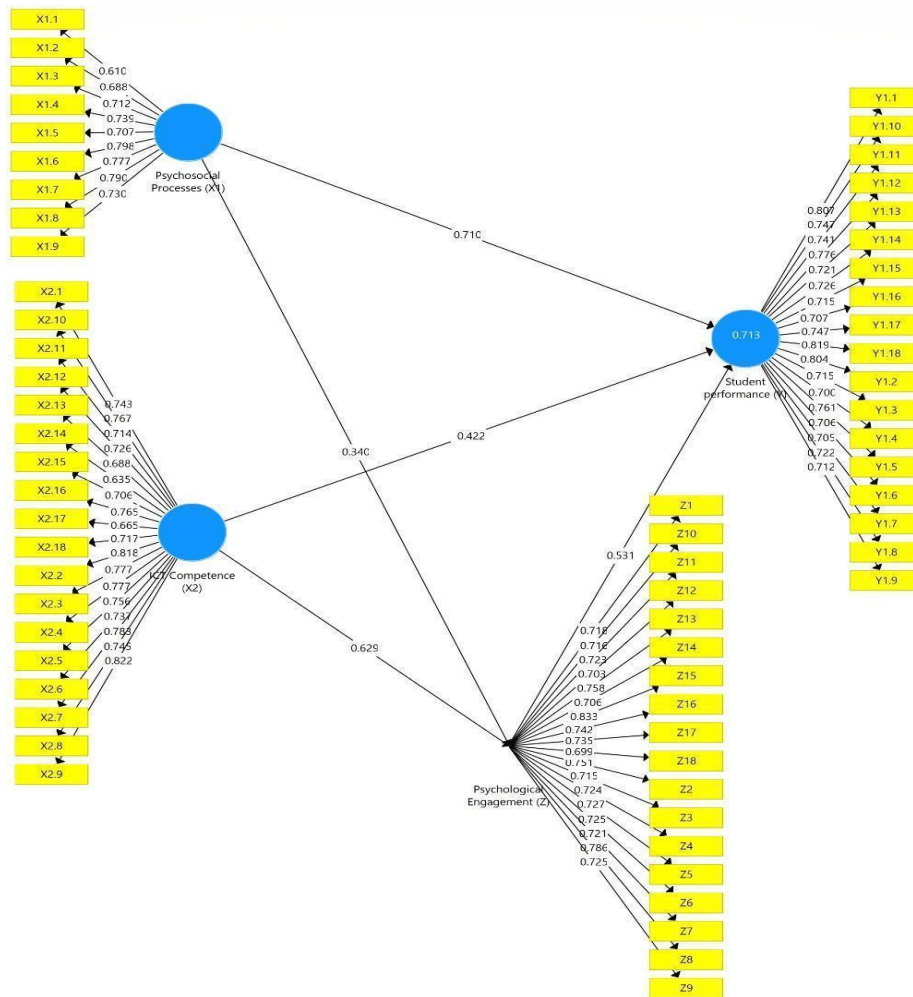
Validity Test

Figure 2. Result of the Validity Test

The scale is evaluated using a validity test. Convergent validity and AVE were used in the assessment of the validity of this study. The instrument is considered authentic if the outer loading value (> 0.6) and the AVE value are more significant than .05.

Table 5. AVE Table of Each Indicator

Variable	AVE
Psychosocial Processes (X1)	.533
ICT Competence (X2)	.552
Student performance (Y)	.550
Psychological Engagement (Z)	.539

Reliability Test

The Cronbach's alpha , as well as the composite reliability test, was both used by the researchers as reliability tests. The reliability with the lowest value (*lower bound*) is calculated by Cronbach's alpha. The data is considered reliable if the Cronbach's alpha data's value is above 0.7. Composite reliability measures the degree of real dependence on a variable. If the data set has a combined reliability score of > .7, it is considered very reliable.

Table 6. Reliability Test Results for Variable Instruments

	Cronbach's Alpha	Composite Reliability
ICT Competence (X2)	.952	.957
Psychological Engagement (Z)	.950	.955
Psychosocial Processes (X1)	.889	.911
Student performance (Y)	.952	.956

R-Square Test

In the evaluation, the Coefficient Determination (R-Square) test was used to assess how much influence external variables have on endogenous variables. R-Square is calculated using data analysis performed with the application, as demonstrated in the following table.

Table 7. R-Square Value Results

	R Square	R Square Adjusted
Psychological Engagement (Z)	.859	.856
Student Performance (Y)	.713	.704

Based on these tests, psychological involvement had an r-square value of .859, which showed that it was influenced by variables outside the scope of this study by 85.9%, which was more significant than student performance, psychosocial processes, and ICT competence. The r-squared grade for student performance was then .713, indicating that ICT proficiency, psychosocial processes, and psychological engagement all impacted student success.

Inner Model Analysis

Inner model analysis or hypothesis testing is an act in statistics whereby an analyst tests an assumption regarding a population parameter. The population test in this research aims to determine whether the relationships between variables exist. If the p-value of each relationship indicates less than 0.05, it is considered acceptable.

Table 8. Hypothesis Test Result

	Original Sample (O)	T Statistics (|O/STDEV|)	P Values
Direct Influence			
ICT Competence (X2) -> Psychological Engagement (Z)	.629	8.185	.000
ICT Competence (X2) -> Student performance (Y)	.422	2.738	.006
Psychological Engagement (Z) -> Student performance (Y)	.531	3.447	.001
Psychosocial Processes (X1) -> Psychological Engagement (Z)	.340	4.075	.000
Psychosocial Processes (X1) -> Student performance (Y)	.710	6.668	.000
Indirect Influence			
ICT Competence (X2) -> Psychological Engagement (Z) -> Student performance (Y)	.334	3.076	.002
Psychosocial Processes (X1) -> Psychological Engagement (Z) -> Student performance (Y)	.180	2.675	.008

Psychosocial Process Affects Psychological Engagement

The results of assessing the psychosocial processes hypothesis on psychological engagement yielded a score (p = .340) with a p-value of .000 (p< .05) and a statistical t of 4.075 (p>1.96), clearly indicating that the variables have a significant positive connection between psychosocial processes and psychological engagement. The higher the psychological engagement level, the better the psychosocial processes.

ICT Competence Affects Psychological Engagement

Testing the ICT Competence hypothesis on psychological engagement yielded a score (p = .629) with a p-value of .000 (p> .05) and a t-statistical of 8.185 (p>1.96), stating a significant positive link between ICT Competence and psychological engagement. The greater the level of ICT competence, the higher the level of psychological engagement.

Psychosocial Process Affects Student Performance

The psychosocial processes hypothesis test on student performance yielded a score (p = .710) with a p-value of .000 (p< .05) and a t-statistical of 6.668 (p>1.96), demonstrating a significant positive correlation between the variable psychosocial processes and student performance. The performance of the learner increases with the efficiency of the psychological processes.

ICT Competence Affects Student Performance

The hypothesis testing's outcome of the ICT Competence on student performance getting (p = .422) with p-values of .006 (p<.05) and a t-statistical of 2.738 (p>1.96) resulting in a substantial favorable connection with the variables of ICT Competence variable and student performance. The greater the ICT competence, the greater the student performance will be increased.

Psychological Engagement Affects Student Performance

Testing the hypothesis of psychological engagement on student performance produced a score (p = .531) with a p-value of .001 (p<.05) and a t-statistical of 3.447 (p>1.96), resulting in a substantial favorable connection with the variables of psychological engagement and student performance. The higher the level of psychological engagement, the greater the level of student performance.

Psychosocial Process Affects Student Performance Mediated by Psychological Engagement

The testing's outcome of the psychological engagement variable hypothesis mediating the relationship of psychosocial processes to student performance getting (p = .334) with p values number of .002 (p<.05) and a t-statistical of 3.076 (p>1.96) showed a connection with the variables of psychosocial processes to student performance mediated by psychological engagement.

ICT Competence Affects Student Performance Mediated by Psychological Engagement

The testing's outcome of the psychological engagement variables mediating with ICT competence on student performance getting (p = .180) with p values' number of .008 (p<.05) and a t-statistical of 2.675 (p>1.96) showed a connection between psychosocial processes variables to student performance that was metabolized by psychological engagement.

Discussion

The findings of all seven hypotheses in this analysis indicate that students with psychosocial can quickly adapt to the environment and have many friends (Altinyelken et al., 2020; Guzal, 2022). The existence of good relations between students and friends and teachers at school can cause interest in the school. Kent et al., 2020 mentioned that students' willingness to participate in interprofessional education decreases as their social superiority orientation increases. When this influence is combined with professional devotion, it is qualified. When professional commitment is higher, the weak orientation of social dominance is related to attitudes toward interprofessional learning. The social support that arises from educators, peers, families, and a sense of learning community can affect academic engagement (Barratt & Duran, 2021).

Students who have the ability in ICT will be able to have a psychological interest in school, especially when schools start implementing an online system (Ma & Qin, 2021; Meng et al., 2019). The attachment between students and teachers or other students will be able to cause comfort to students towards the school so that it can raise academic achievement (Elfaki et al., 2019; Engin, 2020). During the period of conducting online learning, students need to have ICT skills so that they can help improve student performance while in the classroom. This condition will increase students' interest in learning, especially online (Areepattamannil & Santos, 2019).

Learning difficulties produce a significant discrepancy between students' academic performance and what is anticipated of them since instructional tactics for information retrieval, integration, and retention are educational instruments for putting the curriculum into practice; essential aspects of its constituents, and are closely related to its objectives and content (Alenizi, 2019; Hempel et al., 2020). Distance education and online learning over the years have shown that for particular learners, e-learning is an effective medium for learning (Durón-Ramos et al., 2022). According to (Kurtovic et al., 2019), learning challenges have only recently been identified when giving such cases special care. Early identification and intervention services, which should be a desirable step to classify such learners is suited for their successful teaching, are not effectively legislated in Saudi Arabia.

Furthermore, Granić (2022) found that the qualities of the technology and interface, content areas' experiences, the responsibilities of the students, instructional tasks, and the amount of information provided will all affect how well students learn online. In addition, Pham et al. (2019) discovered that several factors affect how well students learn online, including system quality, service quality, material quality, learner views, teacher attitudes, and supportive difficulties. Last but not least, elements like teaching techniques and computer literacy have also been demonstrated to have a substantial impact on e-learning (Tomczyk et al., 2020).

Understanding the technology, information, and communication will make it easier for students to face online school. This condition will be able to continue improving student performance so that they are not left behind and can still receive lessons well (Kim, 2020). Students' interest in school and the learning process will help students be more active, which can improve student performance in learning. Students who feel comfortable with the school's conditions and environment will be able to increase their learning motivation (Austin & Gregory, 2020; Uyun & Warsah, 2021; Wilson et al., 2021). Students will be better at receiving information in teaching and learning when interested in something. In this case, it is the school (Skaalvik, 2020). The psychosocial process can enhance the effectiveness of students in school, and this condition is strengthened by the student's interest in the school. Students interested in school because of the comfort of establishing relationships with peers and teachers will be more enthusiastic about learning activities (Fasey et al., 2022; Rasmitadila et al., 2021).

The research by Saarinen et al. (2021) revealed that in Finland's 2015 PISA test, regular use of digital technology (ICT) was linked to reduced cognitive function, as measured by lower scores in the literacy of science, mathematics, reading, and cooperative problem-solving. Additionally, learners with strong ICT proficiency experience worse learning outcomes than students with low ICT proficiency (Möller et al., 2021; Rubach & Lazarides, 2021). In addition, the frequent use of ICT in schools with weaker cognitive learning outcomes is superior to ICT device availability than low in schools. The findings suggest that the unhealthy relationship between ICT use and cognitive learning outcomes cannot be reduced by improving students' ICT capability or the availability of ICT devices in schools (Siddiq & Scherer, 2019). Also, students' readiness to express learning control, self-directed learning, and engagement during online learning must be considered and promoted (Le et al., 2022).

Teacher practice encourages student autonomy, ensures learning, and engages in human interaction. Teachers can do this to boost student motivation in online and remote learning (Chiu, 2022; Vayre & Vonthron, 2017). During the online learning period, students need to have ICT skills to help improve student performance in the classroom. In addition to students, teachers also need ICT skills to balance students in learning (Pischetola, 2022). This condition will increase students' interest in learning, primarily online (Areepattamannil & Santos, 2019). All variables in this study can affect student learning outcomes and motivation (Realyvásquez-Vargas et al., 2020).

Conclusion

According to the findings of the research results, the research hypothesis has a reasonably favorable impact. All variables in this research are concluded to have a relation between them. The additional information that has contributed to the literature is that there is a relationship between the psychosocial variable processes to student performance mediated by psychological engagement. It can be concluded that students who have good psychosocial processes and ICT skills will be able to improve student performance in conducting online learning. Therefore, it is concluded that this research contributes to the literature on the fact that psychosocial processes and ICT competence can affect student performance with the utilization of psychological engagement as an intervening variable during online learning.

Limitations

Regarding the description above, we note that this study is limited in that the research method involved is quantitative, with 800 participants as a sample. We know that these participants took by simple random sampling, which is not clear enough, so the population is there as a sample for this study.

Recommendations

The research results prove that students' performance can be maximized through the psychosocial process, ICT competence, and psychological involvement. Therefore, information and communication technology competence is significantly important, especially in online learning. Suggestions for further researchers are to add data collection instruments that not only use scales in the form of Google form but also combine them with interview methods with both students and teachers. Moreover, policymakers in the national education department, especially those related to school facilities such as standard information and communication technology, should be aware that this study found inadequate ICT facilities, coupled with the schools' geographically remote locations from the city center. Policymakers can map schools that have good and poor ICT facilities to allocate ICT facilities in the following years.

Authorship Contribution Statement

References

Al-Kumaim, N. H., Alhazmi, A. K., Mohammed, F., Gazem, N. A., Shabbir, M. S., & Fazea, Y. (2021). Exploring the impact of the covid-19 pandemic on university students' learning life: An integrated conceptual motivational model for sustainable and healthy online learning. *Sustainability*, *13*(5), Article 2546. https://doi.org/10.3390/su13052546

Alenizi, M. A. K. (2019). Effectiveness of a program based on a multi-sensory strategy in developing visual perception of primary school learners with learning disabilities: A contextual study of Arabic learners. *International Journal of Educational Psychology*, *8*(1), 72–104. https://doi.org/10.17583/ijep.2019.3346

Altinyelken, H. K., Hoek, L., & Jiang, L. (2020). Improving the psychosocial wellbeing of international students: The relevance of mindfulness. *British Journal of Guidance & Counselling*, *48*(4), 524–536. https://doi.org/10.1080/03069885.2019.1600189

Amriza, R. N. S., Saintika, Y., & Firmansyah, A. Y. (2022). The investigation of student engagement as mediator in ICT readiness and experience on e-learning effectiveness in post-pandemic recovery. In *International Conference on ICT for Smart Society (ICISS)* (pp. 1–7). IEEE. https://doi.org/10.1109/ICISS55894.2022.9915172

Archbell, K. A., Coplan, R. J., Nocita, G., & Rose-Krasnor, L. (2019). Participation in structured performing arts activities in early to middle childhood: Psychological engagement, stress, and links with socioemotional functioning. *Merrill-Palmer Quarterly*, *65*(3), 329–355. https://doi.org/10.13110/merrpalmquar1982.65.3.0329

Areepattamannil, S., & Santos, I. M. (2019). Adolescent students' perceived information and communication technology (ICT) competence and autonomy: Examining links to dispositions toward science in 42 countries. *Computers in Human Behavior*, *98*, 50–58. https://doi.org/10.1016/j.chb.2019.04.005

Austin, Z., & Gregory, P. (2020). Understanding psychological engagement and flow in community pharmacy practice. *Research in Social and Administrative Pharmacy*, *16*(4), 488–496. https://doi.org/10.1016/J.SAPHARM.2019.06.013

Barratt, J. M., & Duran, F. (2021). Does psychological capital and social support impact engagement and burnout in online distance learning students? *The Internet and Higher Education*, *51*, Article 100821. https://doi.org/10.1016/j.iheduc.2021.100821

Berndt, A. E. (2020). Sampling methods. *Journal of Human Lactation*, *36*(2), 224-226. https://doi.org/10.1177/0890334420906850

Carmona-Halty, M., Salanova, M., Llorens, S., & Schaufeli, W. B. (2021). Linking positive emotions and academic performance: The mediated role of academic psychological capital and academic engagement. *Current Psychology*, *40*, 2938–2947. https://doi.org/10.1007/s12144-019-00227-8

Cassia, A. R., Costa, I., da Silva, V. H. C., & de Oliveira Neto, G. C. (2020). Systematic literature review for the development of a conceptual model on the relationship between knowledge sharing, information technology infrastructure and innovative capability. *Technology Analysis & Strategic Management*, *32*(7), 801–821. https://doi.org/10.1080/09537325.2020.1714026

Chisadza, C., Clance, M., Mthembu, T., Nicholls, N., & Yitbarek, E. (2021). Online and face-to-face learning: Evidence from students' performance during the Covid-19 pandemic. *African Development Review*, *33*(S1), S114–S125. https://doi.org/10.1111/1467-8268.12520

Chiu, T. K. F. (2022). Applying the self-determination theory (SDT) to explain student engagement in online learning during the COVID-19 pandemic. *Journal of Research on Technology in Education*, *54*(S1), S14–S30. https://doi.org/10.1080/15391523.2021.1891998

Choi, J. R., Straubhaar, J., Skouras, M., Park, S., Santillana, M., & Strover, S. (2021). Techno-capital: Theorizing media and information literacy through information technology capabilities. *New Media & Society*, *23*(7), 1989–2011. https://doi.org/10.1177/1461444820925800

Cobo-Rendón, R., Pérez-Villalobos, M. V., Páez-Rovira, D., & Gracia-Leiva, M. (2020). A longitudinal study: Affective well-being, psychological well-being, self-efficacy and academic performance among first-year undergraduate students. *Scandinavian Journal of Psychology*, *61*(4), 518–526. https://doi.org/10.1111/sjop.12618

Durón-Ramos, M., Perez, M., & Chacón-Andrade, E. R. (2022). Orientations to happiness and university students' engagement during the COVID-19 Era: Evidence from Six American Countries. *International Journal of Educational Psychology*, *11*(1), 50–67. https://doi.org/10.17583/ijep.9198

Ekpenyong, J. A., Owan, V. J., Mbon, U. F., & Undie, S. B. (2023). Family and community inputs as predictors of students' overall, cognitive, affective and psychomotor learning outcomes in secondary schools. *Journal of Pedagogical Research*, 7(1), 103-127. https://doi.org/10.33902/JPR.202319099

Elfaki, N. K., Abdulraheem, I., & Abdulrahim, R. (2019). Impact of e-learning vs traditional learning on students' performance and attitude. *International Medical Journal*, *8*(10), 76–82. https://bit.ly/3ZTRIeS

Engin, G. (2020). An examination of primary school students' academic achievements and motivation in terms of parents' attitudes, teacher motivation, teacher self-efficacy and leadership approach. *International Journal of Progressive Education*, *16*(1), 257–276. https://doi.org/10.29329/ijpe.2020.228.18

Enneking, K. M., Breitenstein, G. R., Coleman, A. F., Reeves, J. H., Wang, Y., & Grove, N. P. (2019). The evaluation of a hybrid, general chemistry laboratory curriculum: Impact on students' cognitive, affective, and psychomotor learning. *Journal of Chemical Education*, *96*(6), 1058–1067. https://doi.org/10.1021/acs.jchemed.8b00637

Fang, F. C., Benson, C. A., Del Rio, C., Edwards, K. M., Fowler, V. G., Fredricks, D. N., Limaye, A. P., Murray, B. E., Naggie, S., Pappas, P. G., Patel, R., Paterson, D. L., Pegues, D. A., Petri, W. A., & Schooley, R. T. (2021). Covid-19-Lessons Learned and Questions Remaining. *Clinical Infectious Diseases*, *72*(12), 2225–2240. https://doi.org/10.1093/cid/ciaa1654

Farrell, O., & Brunton, J. (2020). A balancing act: A window into online student engagement experiences. *International Journal of Educational Technology in Higher Education*, *17*, Article 25. https://doi.org/10.1186/s41239-020-00199-x

Fasey, K. J., Sarkar, M., Wagstaff, C. R. D., & Johnston, J. (2022). Understanding organizational resilience in elite sport: An exploration of psychosocial processes. *Psychology of Sport and Exercise*, *62*, Article 102236. https://doi.org/10.1016/j.psychsport.2022.102236

Granić, A. (2022). Enhancing online participation in education: Quarter century of research. *Journal of Computers in Education*. Advance online publication. https://doi.org/10.1007/s40692-022-00238-8

Guitert, M., Romeu, T., & Baztán, P. (2021). The digital competence framework for primary and secondary schools in Europe. *European Journal of Education*, *56*, 133–149. https://doi.org/10.1111/ejed.12430

Guzal, N. (2022). Pedagogical-Psychological Aspects of the Formation of Social Consciousness in Preschool Children. *Yosh Tadqiqotchi Jurnali*, *1*(5), 40–46. http://bit.ly/3GuKuHC

Halverson, L. R., & Graham, C. R. (2019). Learner engagement in blended learning environments: A conceptual framework. *Online Learning*, *23*(2), 145–178. https://doi.org/10.24059/olj.v23i2.1481

Hempel, B., Kiehlbaugh, K., & Blowers, P. (2020). Scalable and practical teaching practices faculty can deploy to increase retention: A faculty cookbook for increasing student success. *Education for Chemical Engineers*, *33*, 45–65. https://doi.org/10.1016/j.ece.2020.07.004

Kent, F., Glass, S., Courtney, J., Thorpe, J., & Nisbet, G. (2020). Sustainable interprofessional learning on clinical placements: The value of observing others at work. *Journal of Interprofessional Care*, *34*(6), 812–818. https://doi.org/10.1080/13561820.2019.1702932

Kim, J. (2020). Learning and teaching online during Covid-19: Experiences of student teachers in an early childhood education practicum. *International Journal of Early Childhood*, *52*, 145–158. https://doi.org/10.1007/s13158-020-00272-6

Kurtovic, A., Vrdoljak, G., & Idzanovic, A. (2019). Predicting procrastination: The role of academic achievement, self-efficacy and perfectionism. *International Journal of Educational Psychology*, *8*(1), 1–26. https://doi.org/10.17583/ijep.2019.2993

Le, V. T., Nguyen, N. H., Tran, T. L. N., Nguyen, L. T., Nguyen, T. A., & Nguyen, M. T. (2022). The interaction patterns of pandemic-initiated online teaching: How teachers adapted. *System*, *105*, Article 102755. https://doi.org/10.1016/J.SYSTEM.2022.102755

Lidyasari, A. T., Rachmawati, I., da Costa, A., & Wanyi, P. (2022). How are the Cognitive, Affective, and Psychomotor Levels of Primary School Learners Living in Suburban Area of Yogyakarta based on Career Development? *Jurnal Prima Edukasia*, *10*(2), 130-137. https://doi.org/10.21831/jpe.v10i2.48061

Ma, Y., & Qin, X. (2021). Measurement invariance of information, communication and technology (ICT) engagement and its relationship with student academic literacy: Evidence from PISA 2018. *Studies in Educational Evaluation*, *68*, Article 100982. https://doi.org/10.1016/J.STUEDUC.2021.100982

Mackolil, J., & Mackolil, J. (2020). Addressing psychosocial problems associated with the COVID-19 lockdown. *Asian Journal of Psychiatry*, *51*, Article 102156. https://doi.org/10.1016/j.ajp.2020.102156

Meng, L., Qiu, C., & Boyd-Wilson, B. (2019). Measurement invariance of the ICT engagement construct and its association with students' performance in China and Germany: Evidence from PISA 2015 data. *British Journal of Educational Technology*, *50*(6), 3233–3251. https://doi.org/10.1111/bjet.12729

Möller, S. P., Apputhurai, P., Tye-Din, J. A., & Knowles, S. R. (2021). Quality of life in coeliac disease: Relationship between psychosocial processes and quality of life in a sample of 1697 adults living with coeliac disease. *Journal of Psychosomatic Research*, *151*, Article 110652. https://doi.org/10.1016/J.JPSYCHORES.2021.110652

Muenks, K., Canning, E. A., LaCosse, J., Green, D. J., Zirkel, S., Garcia, J. A., & Murphy, M. C. (2020). Does my professor think my ability can change? Students' perceptions of their STEM professors' mindset beliefs predict their psychological vulnerability, engagement, and performance in class. *Journal of Experimental Psychology: General*, *149*(11), 2119-2144. https://psycnet.apa.org/doi/10.1037/xge0000763

Oralbekova, A., Begalieva, S., Ortaeva, A., Magauova, A., & Suleimen, M. (2021). Teachers' readiness to use ICT in the conditions of inclusive education. *E3S Web of Conferences*, *258*, Article 7021. https://doi.org/10.1051/e3sconf/202125807021

Palacios-Barrios, E. E., & Hanson, J. L. (2019). Poverty and self-regulation: Connecting psychosocial processes, neurobiology, and the risk for psychopathology. *Comprehensive Psychiatry*, *90*, 52–64. https://doi.org/10.1016/j.comppsych.2018.12.012

Park, M., & Son, J.-B. (2022). Pre-service EFL teachers' readiness in computer-assisted language learning and teaching. *Asia Pacific Journal of Education*, *42*(2), 320–334. https://doi.org/10.1080/02188791.2020.1815649

Pham, L., Limbu, Y. B., Bui, T. K., Nguyen, H. T., & Pham, H. T. (2019). Does e-learning service quality influence e-learning student satisfaction and loyalty? Evidence from Vietnam. *International Journal of Educational Technology in Higher Education*, *16*, Article 7. https://doi.org/10.1186/s41239-019-0136-3

Pischetola, M. (2022). Exploring the relationship between in-service teachers' beliefs and technology adoption in Brazilian primary schools. *International Journal of Technology and Design Education*, *32*, 75–98. https://doi.org/10.1007/s10798-020-09610-0

Rasmitadila, Widyasari, Prasetyo, T., Rachmadtullah, R., Samsudin, A., & Aliyyah, R. R. (2021). General teachers' experience of the brain's natural learning systems-based instructional approach in inclusive classroom. *International Journal of Instruction*, *14*(3), 95–116. https://doi.org/10.29333/iji.2021.1436a

Ratanasiripong, P., Wang, C. D. C., Ratanasiripong, N., Hanklang, S., Kathalae, D., & Chumchai, P. (2022). Impact of psychosocial factors on academic performance of nursing students in Thailand. *Journal of Health Research*, *36*(4), 598–606. https://doi.org/10.1108/JHR-07-2020-0242

Raza, S. A., Qazi, W., & Yousufi, S. Q. (2021). The influence of psychological, motivational, and behavioral factors on university students' achievements: The mediating effect of academic adjustment. *Journal of Applied Research in Higher Education*, *13*(3), 849–870. https://doi.org/10.1108/JARHE-03-2020-0065

Realyvásquez-Vargas, A., Maldonado-Macías, A. A., Arredondo-Soto, K. C., Baez-Lopez, Y., Carrillo-Gutiérrez, T., & Hernández-Escobedo, G. (2020). The impact of environmental factors on academic performance of university students taking online classes during the COVID-19 pandemic in Mexico. *Sustainability, 12*(21), Article 9194. https://doi.org/10.3390/su12219194

Rubach, C., & Lazarides, R. (2021). Addressing 21st-century digital skills in schools – Development and validation of an instrument to measure teachers' basic ICT competence beliefs. *Computers in Human Behavior*, *118*, Article 106636. https://doi.org/10.1016/J.CHB.2020.106636

Saarinen, A. I. L., Lipsanen, J., Hintsanen, M., Huotilainen, M., & Keltikangas-Järvinen, L. (2021). The use of digital technologies at school and cognitive learning outcomes: A population-based study in Finland. *International Journal of Educational Psychology*, *10*(1), 1–26. https://doi.org/10.17583/IJEP.2021.4667

Siddiq, F., & Scherer, R. (2019). Is there a gender gap? A meta-analysis of the gender differences in students' ICT literacy. *Educational Research Review*, *27*, 205–217. https://doi.org/10.1016/J.EDUREV.2019.03.007

Skaalvik, C. (2020). School principal self-efficacy for instructional leadership: Relations with engagement, emotional exhaustion and motivation to quit. *Social Psychology of Education*, *23*, 479-498. https://doi.org/10.1007/s11218-020-09544-4

Sobreviñas, M. T. F. S., Falcoto, L. W. B., Espaldon, J. K. M., Encarnacion, S., Molleno, M. G., Lugtu, C. C., Ramos, S. J. L., Comendador, J., & Francisco, C. D. C. (2021). Effects of Students' ICT Competencies on Their Research Capabilities and Productivity. *International Journal of Academic Multidisciplinary Research*, *5*(1), 55-59. https://bit.ly/3mgweLM

Strelan, P., Osborn, A., & Palmer, E. (2020). The flipped classroom: A meta-analysis of effects on student performance across disciplines and education levels. *Educational Research Review*, *30*, Article 100314. https://doi.org/10.1016/j.edurev.2020.100314

Tiamiyu, T., Quoquab, F., & Mohammad, J. (2020). To switch or not to switch: The role of tourists' psychological engagement in the context of Airbnb Malaysia. *International Journal of Tourism Cities*, *6*(1), 175–196. https://doi.org/10.1108/IJTC-09-2019-0158

Timms, C., Fishman, T., Godineau, A., Granger, J., & Sibanda, T. (2018). Psychological engagement of university students: Learning communities and family relationships. *Journal of Applied Research in Higher Education*, *10*(3), 243–255. https://doi.org/10.1108/JARHE-09-2017-0107

Tomczyk, Ł., Potyrała, K., Włoch, A., Wnęk-Gozdek, J., & Demeshkant, N. (2020). Evaluation of the functionality of a new e-learning platform vs. Previous experiences in e-learning and the self-assessment of own digital literacy. *Sustainability*, *12*(23), Article 10219. https://doi.org/10.3390/su122310219

Uyun, M., & Warsah, I. (2021). *Psikologi pendidikan* [Educational psychology]. Deepublish.

Uyun, M., & Yoseanto, B. L. (2022a). *Buku seri metode penelitian: Studi kasus confirmatory faktor analysis untuk penelitian psikologi dengan Amos* [Research methods book series: Confirmatory factor analysis case studies for psychological research with Amos]. Deepublish.

Uyun, M., & Yoseanto, B. L. (2022b). *Seri buku psikologi: pengantar metode penelitian kuantitatif* [Psychology book series: Introduction to quantitative research methods]. Deepublish.

Vayre, E., & Vonthron, A.-M. (2017). Psychological engagement of students in distance and online learning: Effects of self-

efficacy and psychosocial processes. *Journal of Educational Computing Research*, *55*(2), 197–218. https://doi.org/10.1177/0735633116656849

Wilson, J. M., Gheith, R. H., Lowery, R. P., Reber, D. D., Stefan, M. W., Koche, L. S., Rolnik, B. M., Ganz, A. B., & Sharp, M. H. (2021). Non-traditional immersive seminars enhance learning by promoting greater physiological and psychological engagement compared to a traditional lecture format. *Physiology & Behavior*, *238*, Article 113461. https://doi.org/10.1016/J.PHYSBEH.2021.113461