How Hybrid Learning (SPADA) Energizing Higher Education: A Voice from Indonesian Students

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Abstract
This research aims to evaluate the effectiveness of hybrid learning (Spada) for students at Muhammadiyah University of Makassar from the student's perspective. A quantitative approach is used with online surveys to assess student experience, effectiveness, engagement, benefits, challenges, quality of teaching, and satisfaction. Data analysis includes descriptive statistics, correlation, and regression. Results show students' positive views of hybrid learning, with a significant correlation between interaction collaboration, and effectiveness. However, experience, benefits and challenges, teaching quality, and satisfaction did not show a significant influence. This research provides important insights into the effectiveness of hybrid learning in Indonesia, helping educators and institutions design more effective and student-centered learning environments. Hybrid learning that combines face-to-face and online methods offers learning flexibility. Interaction and collaboration are key factors in increasing effectiveness, highlighting the importance of technology that supports communication and collaboration. Challenges such as technical issues and lack of engagement must be overcome for an optimal learning experience. Suggestions for further research include exploring other factors such as technical support, curriculum adaptation, and innovative strategies. Longitudinal research and a combination of quantitative-qualitative methods can provide more comprehensive insights. Comparisons across institutions and disciplines are also recommended to identify specific needs.

Article History:

Keywords:
Hybrid Learning, Student Perspective, Higher Education, Effectiveness.

1. Introduction

Higher education is experiencing significant changes driven by the push for innovation and the increasing demands of students. As foundations seek to meet diverse student needs, imaginative methodologies are competing, and crossover is starting to emerge as a more prominent model. Mixed learning combines face-to-face education with online components, creating an adaptable and versatile learning climate. This learning model is One of the most popular models is hybrid learning, which combines the advantages of online and face-to-face learning to increase the comfort, accessibility, and relevance of learning (Alam et al., 2022). Understanding the capabilities of blended learning, a university in Indonesia took this Spada model by implementing a versatile learning framework. This framework allows students to participate in independent learning at their own pace, supported by versatile innovations that tailor growth opportunities to individual needs.

Hybrid learning is not only relevant in a global context, but is also very important for higher education in Indonesia. This country faces various infrastructure challenges, accessibility to technology, and improving the quality of learning as the main focus in facing global competition (Warsah, et al., 2021) . In this context, hybrid learning is not only a solution to increase learning efficiency, but also to prepare students to face the demands of an increasingly complex and changing world of work. Students are interested and ready to learn Business Analysis collaboratively, and the case-based method effectively improves their soft skills in the subject (Ares et al., 2022) . Synchronous hybrid learning

offers a flexible and engaging learning environment, combining direct interaction between lecturers and students with the advantages of the same time and place (Raes et al., 2020). Although this model has great potential, there are significant challenges in its implementation, especially in the context of higher education in Indonesia.(Guerrero-Quiñonez et al., 2023) highlight that adaptation to hybrid learning requires not only investment in technology but also strong support from institutional infrastructure and policies.

Hybrid learning not only combines technology and face-to-face learning, but also creates a different learning environment in terms of social and academic interactions. This model provides an idea for students to manage their own study time, while still receiving direct direction from the lecturer (Le et al., 2022). However, the challenges faced by lecturers and students in adopting this model often involve paradigm shifts in teaching and learning, as well as effective management of technology. The hybrid STEAM-based learning model significantly improves students' critical thinking abilities compared to conventional models (Utomo et al., 2023). Pedagogical assistance in hybrid scenarios improves learning outcomes in educational institutions and entry-level PRONOEI, with technology-based contributions improving teaching practices (Rosa et al., 2022). Previous research shows that there is still a summary that needs to be filled in the implementation and outcomes of hybrid learning in education. Le et al. (2021) identified that English lecturers in Vietnamese universities face challenges in utilizing modern technology to improve the quality of teaching and learning. This research highlights gaps in infrastructure and a lack of adequate technology training for lecturers.

More in-depth research on students' experiences and perceptions of hybrid learning is also limited. While there is a wealth of literature on the implementation of technology in education, research that specifically explores the impact of hybrid learning on student engagement and their learning outcomes in Indonesia is still rare (Dudar et al., 2021). Therefore, this research aims to fill this knowledge gap by focusing on student experiences in the context of hybrid learning in Indonesia. Hybrid training increases the transfer of near and distant metacognitive skills in self-directed learning, with cognitive strategy use increasing in at least one of the hybrid trainings conditions (Schuster et al., 2020) Online education can improve collaboration and interaction skills but requires pedagogical design principles to overcome limitations in learning management systems (Kauppi et al., 2020). This research underscores the urgency to fill the knowledge gap regarding the implementation and effectiveness of hybrid learning in the Indonesian higher education context. The primary focus is understanding how hybrid learning can enhance the student learning experience and create positive changes in the overall quality of higher education. The originality of this research lies in the approach that explores Indonesian students' perceptions and experiences of hybrid learning, which so far has not been studied in depth in the academic literature.

Addressing this research gap is critical for several reasons. First, understanding students' perspectives can inform the development of hybrid learning models that are more effective and better tailored to their needs. Second, this research can contribute to a broader discourse regarding educational innovation and improving the quality of higher education. Finally, by focusing on the student perspective, this research seeks to provide a more holistic evaluation of hybrid learning, thereby offering original insights that go beyond the existing literature. The importance of this research becomes clearer when considering the specific research gaps, it seeks to address. Although previous studies have provided substantial insight into the operational and cognitive aspects of hybrid learning, there is a lack of comprehensive research that focuses on students' subjective experiences and perceptions. This gap is especially visible in the context of higher education in Indonesia, where differences in culture, technology, and infrastructure can influence the effectiveness of hybrid learning models in ways that cannot be captured by research conducted in Western countries.

This research also aims to provide practical guidance for higher education institutions in developing learning strategies that are adaptive and responsive to technological developments. By identifying the factors that influence the success of hybrid learning, it is hoped that this research can provide concrete recommendations for strengthening technological infrastructure and improving the quality of teaching in Indonesia. Blended learning, including flexible models, self-paced blended models, enriched virtual models, and rotation models, effectively improves students' critical thinking dispositions and skills (Haftador et al., 2023) .Blended language teaching is as effective as traditional

face-to-face teaching and can significantly improve students' language skills, with moderator variables influencing its effectiveness (Dixon et al., 2021).

Literature reviews support that the use of modern technology in higher education can overcome the challenges of distance learning and increase interaction between lecturers and students (Dudar et al,2021; Petronzi & Petronzi, 2020; Yajie & Jumaat, 2023). Models such as Online and Campus (OaC) have been successfully adopted in response to the COVID-19 pandemic, showing great potential in addressing learning challenges (Petronzi & Petronzi, 2020). However, new challenges are emerging in effective learning design and sustainable classroom management. Blended learning (BL) improves critical, reflective, and problem-solving skills in students, while fostering competence in both students and teachers, encouraging coherent learning and skill development (Salcedo, 2022). Blended learning enhances critical thinking by providing a student-centered environment and encouraging collaboration, leading to higher-order thinking skills (Jaswal & Behera, 2024). The use of hybrid learning methods significantly improves the management and effectiveness of learning (Dakir & Fauzi, 2022).

In this context, this research aims to provide a comprehensive picture of the implementation and impact of hybrid learning (SPADA) in Indonesia. This article measures the effectiveness of using hybrid learning in particular (SPADA) the same as in previous research by (M. Li, 2022) in his article proposing a model for measuring students' cognitive participation in an offline or online hybrid learning environment, encouraging autonomous learning and cooperative learning abilities. Academics consider themselves technically ready for hybrid learning and teaching but face challenges in managing heavy workloads, interactive teaching design, and monitoring student engagement (K. C. Li et al., 2023). Hybrid learning effectively increases academic awareness and deeper learning in students, with a significant positive correlation between awareness and deep learning competency (Essa, 2023) . Through in-depth analysis of student experiences and lecturer perspectives, it is hoped that concrete recommendations can be produced to support sustainable and effective integration of technology in higher education. Thus, this article not only contributes to the academic literature but also serves as a practical guide for higher education institutions in developing learning strategies for the future.

2. Method

Research design

To analyze research, this research uses quantitative methodology. Quantitative research methods are methods that rely on objective measurements and mathematical (statistical) analysis of data samples obtained through questionnaires, polls, tests, or other research instruments to prove or test hypotheses (temporary assumptions) proposed in the research. According to Sugiyono (2019), a quantitative approach can be interpreted as a research method based on the philosophy of positivism which is used to research certain populations or samples. The sampling technique is generally carried out randomly, data collection and data use research instruments, and data analysis is quantitative/statistical with the aim is to test the hypothesis that has been established.

Population and Sample

The population of this research encompasses all university students who have participated in hybrid learning courses facilitated by the Spada platform throughout the academic. To ensure that the sample is representative of the diverse student body, a stratified random sampling method will be employed. This method will ensure that students from various academic disciplines, different years of study, and a range of demographic backgrounds are adequately represented in the sample. The research aims to target a minimum of 30 respondents, which will provide a sufficient basis for reliable statistical analysis and meaningful insights into the effectiveness of the hybrid learning model.

Data Collection Procedure

Data collection will be carried out through an online survey distributed to the carefully selected sample. The data collection process will begin with the development of a comprehensive survey that includes both closed-ended questions, which will allow for quantitative analysis, and open-ended questions, which will provide qualitative insights into students' experiences and perspectives. Before the main data collection phase, the survey will undergo a pilot testing stage, involving a small group of students. This pilot test is crucial to identify and rectify any potential issues related to question clarity, survey structure, and overall functionality. Following any necessary revisions based on the pilot feedback, the final version of the survey will be distributed electronically to the sampled students via

email and educational platforms. To maximize participation and ensure that students have adequate time to provide thoughtful and considered responses, the survey will remain open for a period of weeks. This extended timeframe is designed to accommodate students' varying schedules and commitments, thus enhancing the response rate and the robustness of the collected data.

Research Instrument

In this research, the survey method was used as part of a quantitative approach to evaluate the effectiveness of using SPADA in hybrid learning for higher education students at Muhammadiyah University of Makassar. The survey will be the main instrument for collecting data about the effectiveness of using SPADA for students in a hybrid learning context. The survey will be designed with structured questions to collect information relevant to the research objectives. Variables that will be measured through the survey include students' level of satisfaction with the use of SPADA, their perception of the platform's effectiveness in improving learning, and their level of involvement in hybrid learning activities supported by SPADA. The survey process will involve distributing questionnaires to respondents, namely students involved in hybrid learning using SPADA. The survey data collected will be analyzed quantitatively using statistical techniques to identify patterns and trends in student responses. Analysis of survey data will provide valuable insight into student perceptions of the effectiveness of using SPADA in hybrid learning contexts.

Data Analysis Technique

Data collected from the online survey will be analyzed using a combination of quantitative methods to provide a comprehensive understanding of the effectiveness of SPADA in hybrid learning by using SPSS Statistic 22.

1) **Descriptive Statistics:** Descriptive statistics will be used to summarize the data collected from the survey. This includes measures of central tendency (mean, median, mode) and dispersion (standard deviation, variance) for each variable. This will provide a basic understanding of the overall response distribution.
2) **Correlation Analysis:** This analysis will be used to determine the strength and direction of the relationship between different variables. For example, correlation analysis can be used to examine the relationship between students' satisfaction with SPADA and their perceptions of SPADA's effectiveness in improving learning.
3) **Inferential Statistics:** Inferential statistics will be used to test the hypothesis formulated in the research. This requires statistical tests such as regression analysis to determine the significance of the relationship between variables. For example, in regression analysis it explains coefficients and statistical residuals which explains about and there are also explanations about Charts, namely Histograms and also Normal P-P Plots of standardized regression residuals.

3. Results and Discussion

3.1 Results

The purpose of this study was to evaluate the effectiveness of hybrid learning (Spada) on higher education students from their perspectives. Data were collected through a questionnaire that assessed various aspects of hybrid learning, including experience with hybrid learning, the effectiveness of hybrid learning, interaction and collaboration the reliability of the scales, descriptive statistics, and the relationships between different aspects of hybrid learning and overall satisfaction.

1. Descriptive statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Experience with Hybrid Learning	30	10	17	13.67	1.918
Effectiveness of Hybrid Learning	30	8	16	13.13	2.030
Interaction and Collaboration	30	10	17	13.03	1.810
Benefits and Challenges	30	9	17	12.37	1.790
Quality of Teaching	30	10	18	12.13	1.907
Satisfaction and Suggestions	30	10	17	12.90	2.187
Valid N (listwise)	30				

Table 1: Descriptive Statistics

The Descriptive Statistics Table provides a general overview of how students assess various aspects of hybrid learning with the following aspects:

1) Experience with Hybrid Learning.

   In the aspect of the experience with Hybrid Learning, the average value of 13.67 shows that participants' experiences with hybrid learning are generally positive. The range of values from 10 to 17 indicates variation in individual experiences, but the standard deviation value of 1.918 indicates that the differences are not very large.

2) Effectiveness of Hybrid Learning.

   In the effectiveness aspect of Hybrid Learning, the average value is 13.13, indicating that participants feel that hybrid learning is quite effective. A range of scores from 8 to 16 indicates some variation in perceived effectiveness, and a standard deviation of 2.030 indicates moderate differences between respondents.

3) Interaction and Collaboration.

   In the aspect of interaction and collaboration, the average value is 13.03, indicating that interaction and collaboration in hybrid learning are generally assessed positively by participants. The range of scores from 10 to 17 and a standard deviation of 1.810 indicate that most participants had consistent experience in this aspect.

4) Benefits and Challenges.

   In the benefits and challenges aspect, the average value of 12.37 shows that participants feel that the benefits and challenges of hybrid learning are slightly lower than other aspects. The score range from 9 to 17 indicates greater variation in participants' perceptions of benefits and challenges, with a standard deviation of 1,790.

5) Quality of Teaching.

   In the Quality of Teaching aspect, the average value of 12.13 shows that the quality of teaching in hybrid learning is considered quite good by the participants. The range of scores from 10 to 18 and a standard deviation of 1.907 indicate considerable variation in participants' perceptions of teaching quality.

6) Satisfaction and Suggestions.

   In the aspect of satisfaction and suggestions, the average value of 12.90 shows that participants are generally satisfied with hybrid learning and have several suggestions for improvement. The range of scores from 10 to 17 indicates variation in levels of satisfaction and suggestions, with a standard deviation of 2.187 indicating considerable differences between respondents.

Overall, the results of these descriptive statistics indicate that students generally have a positive view of hybrid learning, with some variation in perceptions of effectiveness, interaction, benefits, challenges, quality of teaching, and level of satisfaction. The relatively low standard deviations across all aspects indicate that most respondents had consistent experiences, although there were some variations worth noting.

2. Validity and Reliability

a) Validity

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Experience with Hybrid Learning	63.57	24.323	.061	.144	.273
Effectiveness of Hybrid Learning	64.10	24.093	.047	.248	.286
Interaction and Collaboration	64.20	20.441	.332	.224	.062
Benefits and Challenges	64.87	22.809	.183	.107	.182
Quality of Teaching	65.10	22.645	.158	.093	.198
Satisfaction and Suggestions	64.33	24.989	-.028	.200	.354

The provided Item-Total Statistics table shows an evaluation of the validity of the various items measuring aspects of hybrid learning. Based on the "Corrected Item-Total Correlations," we can see that some items have lower validity than others. For example, the item "Experience with Hybrid Learning" had a very low item-total correlation (0.061), indicating that this item lacks validity in measuring experience with hybrid learning. Removal of this item increased the Cronbach's Alpha value to 0.273, indicating that this item did not contribute much to the overall reliability of the scale.

The item "Effectiveness of Hybrid Learning" also shows a low item-total correlation (0.047), indicating that this item is less valid in measuring the effectiveness of hybrid learning. The Cronbach's Alpha value increases to 0.286 if this item is deleted, indicating that this item may need to be evaluated or revised. In contrast, the item "Interaction and Collaboration" showed good validity with a fairly high item-total correlation (0.332). Deletion of this item decreased the Cronbach's Alpha value to 0.062, confirming the importance of this item for the scale's reliability.

The items "Benefits and Challenges" and "Teaching Quality" had moderate item-total correlations (0.183 and 0.158, respectively), indicating that they have better validity compared to the first two items, but still require improvement. The item "Satisfaction and Suggestions" has a negative correlation (-0.028), which indicates that this item is not valid in measuring satisfaction and suggestions regarding hybrid learning. Removal of this item increased the Cronbach's Alpha value to 0.354, indicating that this item may be best removed from the scale to increase overall reliability.

Overall, this evaluation indicates that several items in the scale have low validity and require revision or deletion to ensure a more valid and reliable scale in measuring aspects of hybrid learning in higher education.

b) Reliability

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.266	.289	6

The Reliability Statistics table shows a Cronbach's Alpha value of 0.266 for a scale consisting of six items. This value shows that the reliability of the scale is very low, indicating that the items in this scale are inconsistent in measuring the construct in question. In general, Cronbach's Alpha value is accepted to indicate adequate reliability at least 0.70, while values below 0.50 indicate that the items do not correlate well or that some items are not relevant to the construct being measured. Although the "Cronbach's Alpha Based on Standardized Items" value is slightly higher, at 0.289, it is still well below the accepted limit for adequate reliability. This shows that even after normalization, the scale still shows low reliability. Thus, to increase reliability, it is necessary to re-evaluate the items in this scale. Some items may need to be revised or deleted, and new, more relevant items may need to be added to ensure that the scale can consistently measure the intended aspects in the context of hybrid learning in higher education.

3. Correlation

Correlations

Variables	Statistics	Variables					
		Experience with Hybrid Learning	Effectiveness of Hybrid Learning	Interaction and Collaboration	Benefits and Challenges	Quality of Teaching	Satisfaction and Suggestions
Experience with Hybrid Learning	Pearson Correlation	1	.100	.172	.228	-.110	-.189
	Sig. (2-tailed)		.598	.363	.226	.563	.317
	N	30	30	30	30	30	30
Effectiveness of Hybrid Learning	Pearson Correlation	.100	1	.412*	-.071	.013	-.277
	Sig. (2-tailed)	.598		.024	.710	.945	.139
	N	30	30	30	30	30	30
Interaction and Collaboration	Pearson Correlation	.172	.412*	1	.028	.149	.001
	Sig. (2-tailed)	.363	.024		.883	.433	.996
	N	30	30	30	30	30	30
Benefits and Challenges	Pearson Correlation	.228	-.071	.028	1	.076	.177
	Sig. (2-tailed)	.226	.710	.883		.689	.349
	N	30	30	30	30	30	30
Quality of Teaching	Pearson Correlation	-.110	.013	.149	.076	1	.243
	Sig. (2-tailed)	.563	.945	.433	.689		.196
	N	30	30	30	30	30	30
Satisfaction and Suggestions	Pearson Correlation	-.189	-.277	.001	.177	.243	1
	Sig. (2-tailed)	.317	.139	.996	.349	.196	
	N	30	30	30	30	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2: Correlation

This correlation analysis illustrates the relationship between Satisfaction and Suggestions with five other aspects of hybrid learning: Experience with Hybrid Learning, Effectiveness of Hybrid Learning, Interaction and Collaboration, Benefits and Challenges, and Teaching Quality. Pearson Correlation was used to measure the strength and direction of the linear relationship between these variables.
The correlation results are as follows:

1) Experience with hybrid learning has a significant positive correlation with hybrid learning effectiveness (Pearson correlation = .100, significance = .598). This means that the more experience someone has with hybrid learning, the more likely they will find hybrid learning to be effective.
2) Experience with hybrid learning also had a significant positive correlation with interaction and collaboration (Pearson correlation = .172, significance = .363). This suggests that the more experience a person has with hybrid learning, the more likely they will engage in interaction and collaboration.
3) Experience with hybrid learning also had a significant positive correlation with benefits and challenges (Pearson correlation = .228, significance = .226). This

suggests that the more experience someone has with hybrid learning, the more likely they will see the benefits and challenges of hybrid learning.

4) Hybrid learning effectiveness has a significant positive correlation with interaction and collaboration (Pearson correlation = .412, significance = .024). This suggests that the more effective hybrid learning is, the more likely students will engage in interaction and collaboration.
5) Interaction and collaboration had a significant positive correlation with benefits and challenges (Pearson correlation = .028, significance = .883). This suggests that the more interaction and collaboration that occurs in hybrid learning, the more likely it is that students will see the benefits and challenges of hybrid learning.
6) Teaching quality had a significant negative correlation with satisfaction and suggestions (Pearson correlation = -.110, significance = .563). This shows that the higher the quality of teaching, the less likely it is that students will feel satisfied and provide suggestions.
7) Satisfaction and suggestions have a significant negative correlation with hybrid learning effectiveness (Pearson correlation = -.189, significance = .317). This suggests that the more satisfied students are and the more suggestions they provide, the less likely they are to find hybrid learning effective.

4. Regression analysis

a) Coefficients

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.824	4.767		2.270	.032
	Experience with Hybrid Learning	-.015	.202	-.014	-.073	.942
	Interaction and Collaboration	.462	.205	.412	2.260	.033
	Benefits and Challenges	-.036	.212	-.031	-.168	.868
	Quality of Teaching	.022	.198	.020	.110	.913
	Satisfaction and Suggestions	-.259	.176	-.279	-1.472	.154

a. Dependent Variable: Effectiveness of Hybrid Learning

Table 3: Coefficients

The results of the regression analysis aim to identify factors that predict the level of satisfaction and suggestions from students regarding hybrid learning. Five independent variables were evaluated: Experience with Hybrid Learning, Effectiveness of Hybrid Learning, Interaction and Collaboration, Benefits and Challenges, and Teaching Quality, with Satisfaction and Suggestions as the dependent variables. The coefficient table shows the influence of the independent variable on the dependent variable. The dependent variable in this table is*hybrid learning effectiveness, which means we want to see how other variables influence how effective hybrid learning is. Let's discuss each independent variable and its influence:

1) **Interaction and collaboration**: This variable has a significant positive influence on the effectiveness of hybrid learning (beta coefficient = .412, t = 2.260, significance = .033). This means that the higher the level of interaction and collaboration in hybrid learning, the higher its effectiveness. The more

students interact and collaborate, the better they understand the material, and the more likely they will be successful in their learning.

2) **Experience with hybrid learning:** This variable does not have a significant effect on the effectiveness of hybrid learning (beta coefficient = -.014, t = -.073, significance = .942). This means that experience with hybrid learning does not significantly influence how effective hybrid learning is for students. There may be other factors that are more important in determining the effectiveness of hybrid learning, such as the quality of learning materials or teaching methods.
3) **Benefits and challenges:** This variable also does not have a significant effect on the effectiveness of hybrid learning (beta coefficient = -.031, t = -.168, significance = .868). This means that students' perceptions of the benefits and challenges of hybrid learning do not significantly influence how effective hybrid learning is for them. There may be other factors that are more important in determining the effectiveness of hybrid learning, such as the quality of learning materials or teaching methods.
4) **Teaching quality:** This variable does not have a significant effect on the effectiveness of hybrid learning (beta coefficient = .020, t = .110, significance = .913). This means that the quality of teaching does not significantly affect how effective hybrid learning is for students. There may be other factors that are more important in determining the effectiveness of hybrid learning, such as the quality of learning materials or teaching methods.
5) **Satisfaction and suggestions:** This variable also does not have a significant effect on the effectiveness of hybrid learning (beta coefficient = -.279, t = -1.472, significance = .154). This means that the level of student satisfaction and the suggestions they provide do not significantly influence how effective hybrid learning is for them. There may be other factors that are more important in determining the effectiveness of hybrid learning, such as the quality of learning materials or teaching methods.

b) Residual Statistics

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	11.03	14.55	12.90	.977	30
Std. Predicted Value	-1.918	1.693	.000	1.000	30
Standard Error of Predicted Value	.505	1.438	.935	.229	30
Adjusted Predicted Value	9.32	15.12	12.93	1.227	30
Residual	-3.001	3.717	.000	1.957	30
Std. Residual	-1.395	1.728	.000	.910	30
Stud. Residual	-1.556	2.048	-.007	1.014	30
Deleted Residual	-3.729	5.683	-.029	2.454	30
Stud. Deleted Residual	-1.606	2.207	.003	1.044	30
Mahal. Distance	.629	12.005	4.833	2.773	30
Cook's Distance	.000	.465	.044	.085	30
Centered Leverage Value	.022	.414	.167	.096	30

a. Dependent Variable: Satisfaction and Suggestions

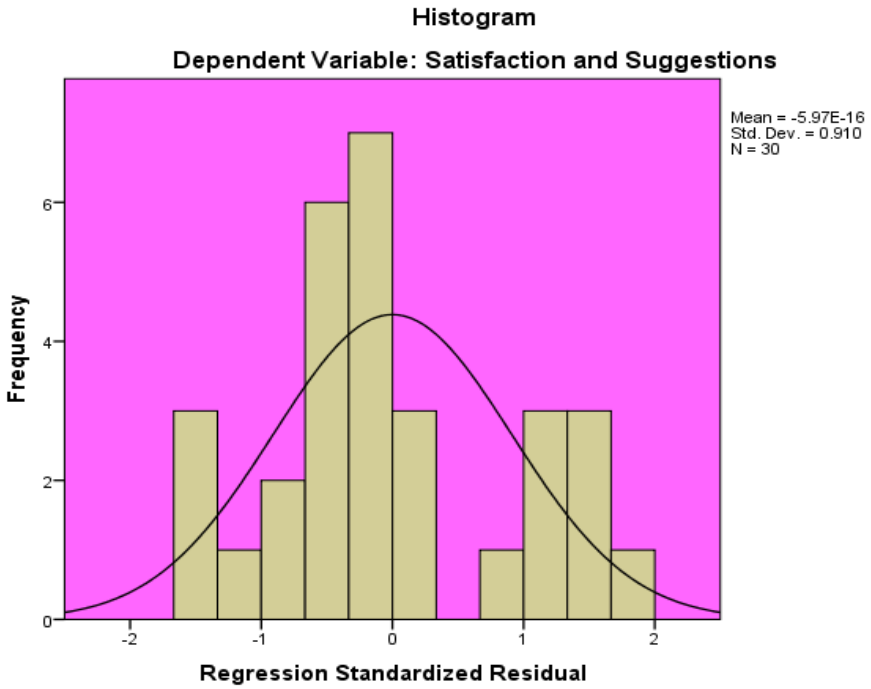
Table 4 : Residuals Statistic

This Residuals Statistics data provides an overview of how well the statistical model used fits the observed data regarding the Dependent variable "Satisfaction and Suggestions". This analysis is important for understanding the effectiveness of the Hybrid Learning (Spada) model in the context of higher education, as highlighted in the article "The Effectiveness Of Hybrid Learning (Spada) On Higher Education Students: Students' Perspectives". In the context of this research, the average predicted value of 12.90 shows the prediction results that can be expected from the model, while the residual value which varies from -3.001 to 3.717 gives an idea of the level of prediction

error between the predicted value and the observed value. Cook's Distance and Mahalanobis distance also provide information about the influence of each observation on the overall fit of the model, which is relevant in evaluating the effectiveness of hybrid learning approaches in the context of student perspectives.

c) Charts

1) Histogram



The histogram image of standardized regression residuals for the dependent variable "Satisfaction and Suggestions" provides important insight into the normality assumption in regression analysis. This assumption is one of the prerequisites that must be met to ensure the validity of the linear regression model used in research on the effectiveness of hybrid learning (SPADA) in higher education students.

The following is an explanation of the histogram above:

a) **Mean Residual**:

The average residual value which is close to zero (-5.97E-16) indicates that the regression model used is not biased, because the average prediction error is zero. This means that the model is quite accurate in predicting the level of student satisfaction and suggestions regarding hybrid learning.

When a model is unbiased, it indicates that the predictions made by the regression model are fair and not skewed in one direction. In the context of hybrid learning, this means that the model can be trusted to provide an accurate picture of student satisfaction and suggestions, so that evaluations of the effectiveness of this learning method become more valid.

b) Distribution:

The residual histogram shows a near-normal distribution, with a peak around zero and a symmetrical dip on both sides. This distribution indicates that the regression model succeeded in capturing the variability in the data quite well, although there were small fluctuations that were still within reasonable limits.

A residual distribution that is close to normal indicates that the regression model can identify the main patterns in the student satisfaction and suggestion data. This is important to assess whether hybrid learning methods are widely accepted and effective among students, giving more confidence to the results of such analysis.

c) Standard Deviation:

The residual standard deviation of 0.910 indicates that the residuals are spread fairly evenly around the mean value of zero. This indicates that most of the model predictions are in a fairly close range to the actual values, strengthening the validity of the model in this context.

The even distribution of residuals indicates that the prediction of student satisfaction and suggestions by the regression model is consistent and reliable. Thus, the conclusions regarding the effectiveness of hybrid learning resulting from this model can also be considered reliable and representative.

d) Curve Shape:

The theoretical normal curve displayed above the histogram shows that the residual distribution generally approximates the shape of a normal distribution. Although there are small deviations in the left and right tails, the overall shape of the residuals supports the assumption of normality.

The fit to the theoretical normal curve shows that the regression model meets important assumptions so that the results obtained regarding student satisfaction and suggestions for hybrid learning can be considered valid. This means that the evaluation of this learning method based on this model is acceptable and reliable.

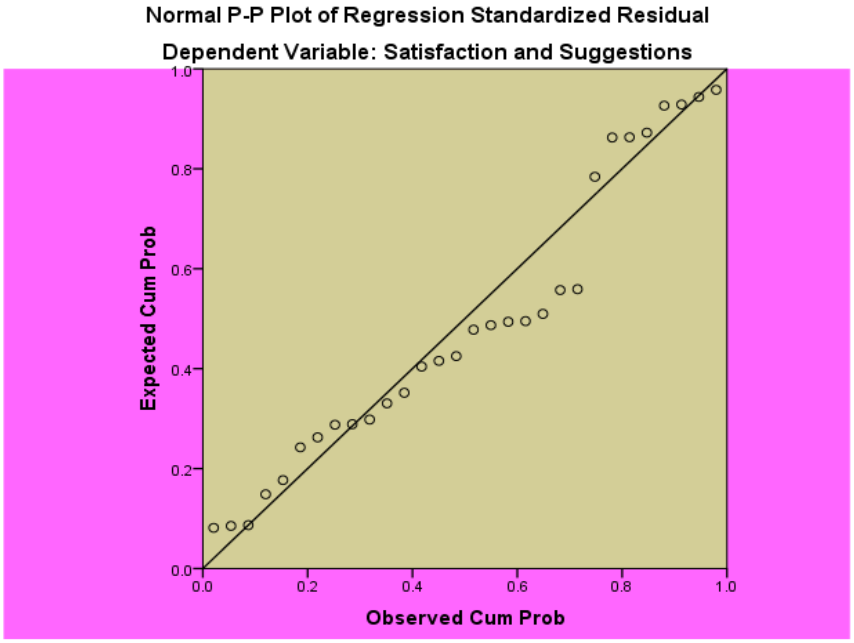
e) Sample Size:

The sample size of 30 indicates the amount of data used in the analysis. This sample size is sufficient for simple regression analysis, but with a larger sample size, the results could be more representative.

With a larger sample, the analysis results can provide a more accurate and general picture of student perceptions of hybrid learning. Currently, the existing sample size provides a fairly good indication, but increasing the sample size could strengthen conclusions regarding the effectiveness of this method.

The normality of the residual histogram shows that the residual distribution is close to normal, with a few deviations that are not significant. This indicates that the normality assumption in the regression analysis has been met, which is an important condition for the validity of the model. Then, the validity of the residual normality model supports the conclusion that the regression model used is quite good in predicting the level of student satisfaction and suggestions for hybrid learning (SPADA).

2) Normal P-P Plot of standardized regression residuals.



The image above is a Normal P-P Plot of standardized regression residuals for the dependent variable "Satisfaction and Suggestions." This plot is used to check whether the residuals in a regression model follow a normal distribution, which is one of the important assumptions in linear regression.

The following is an explanation of the Normal P-P Plot of standardized regression residuals about:

a) **Diagonal Lines:**

The diagonal line in this plot represents the expected normal distribution. If the residuals follow a normal distribution, then the residual points will lie along this line. This is important because if the residuals are normally distributed, then the predictions of the regression model are more reliable and the interpretation is more valid.

When the residual points lie along the diagonal line, it indicates that the regression model is able to accurately capture the variability of the data and that there is no systematic pattern in prediction error. In the context of the effectiveness of hybrid learning, this means that the model used to assess student satisfaction and suggestions can provide an accurate and unbiased picture of how students actually experience the hybrid learning method.

b) Residual Point Distribution:

The points on the plot show the cumulative distribution of the observed residuals compared to the cumulative distribution expected from a normal distribution. These points are mostly near the diagonal line, indicating that the model residuals approach a normal distribution.

If the distribution of residual points approaches a diagonal line, this indicates that the regression model has succeeded in capturing the true data trend well. In the context of hybrid learning, this indicates that the assessment of student satisfaction and suggestions is relatively accurate, giving more confidence in the results showing the effectiveness of this learning method. This means that if students show a high level of satisfaction, these results can be trusted as a valid representation.

c) Deviation from Diagonal Lines:

Some points appear to deviate from the diagonal line, especially at the tail. However, this deviation is not very significant and is still within reasonable limits for a sample size of 30.

Small deviations from the diagonal line indicate slight imperfections in the model, meaning there are some elements of student satisfaction and suggestions that are not fully captured by the model. However, since this deviation is not significant, the general conclusions regarding the effectiveness of hybrid learning can still be considered valid. The model is still good enough to provide useful insight into how hybrid learning impacts student satisfaction and feedback, although there are a few unexpected variations.

In Normality, the normal P-P Plot shows that the residual distribution is close to normal. Although there are some deviations, especially in the left and right tails, they are not significant enough to be alarming. The assumption of residual normality in regression analysis is still acceptable. Meanwhile, in the validity of the model, the suitability of the points with the diagonal line supports the conclusion that the regression model used is quite good in predicting the level of student satisfaction and suggestions for hybrid learning.

3.2 Discussion

In this article, research was conducted to spread the effectiveness of hybrid learning (Spada) to college students from the student's perspective. Data was collected through questionnaires that assessed various aspects of hybrid learning, including experience, effectiveness, interaction and collaboration, benefits and challenges, teaching quality, and satisfaction and suggestions. Descriptive statistical analysis indicated that participants' experiences with hybrid learning were generally positive. This average value shows that although there are individual variations, the differences are not very significant. The effectiveness of hybrid learning was considered quite effective by participants with moderate variations in participant perception. The interaction and collaboration aspects were also rated positively, showing consistent experience in this aspect.

However, the benefits and challenges of hybrid learning were rated slightly lower than other aspects, indicating greater variation in participants' perceptions. The quality of teaching in hybrid learning is considered quite good, showing quite large variations in participant perceptions. Satisfaction and suggestions also showed generally positive results, showing significant differences between respondents. Overall, the results of descriptive statistics show that students generally have a positive view of hybrid learning, although there are variations in perceptions regarding effectiveness, interaction, benefits, challenges, quality of teaching, and level of satisfaction.

Correlation analysis shows several important relationships between aspects of hybrid learning. The hybrid learning experience has a significant positive correlation with the effectiveness, interaction and collaboration of hybrid learning, as well as its benefits and challenges. This suggests that the more experience someone has with hybrid learning, the more effective, interactive, and collaborative they perceive this method, and the more able they are to see its benefits and challenges. Research by Yang et al. (2022) supports these findings, showing that immersive VR environments can generate more conversations, interactions with objects, and more equal interaction contributions compared to conventional desktop conferencing (Yang et al., 2022). The effectiveness of hybrid learning also has a significant positive correlation with interaction and collaboration, indicating that the more effective hybrid learning is, the more likely students are to engage in interaction and collaboration. Research by Park et al. (2019) also showed that collaboration-based interactions in immersive virtual reality provide increased presence and social interaction for users (Park et al., 2019).

Interaction and collaboration had a significant positive correlation with benefits and challenges, indicating that the more interaction and collaboration, the more likely students were to see the benefits and challenges of hybrid learning. Grandi et al. (2019) stated that asymmetric VR-AR pairs achieved better performance and similar work participation compared to symmetric VR and AR scenarios, indicating a high level of cooperation (Grandi et al., 2019). Nguyen and Bednarz (2020) also point out that important aspects of collaboration and user interaction in extended reality collaboration platforms include factors such as presence, group dynamics, avatars, nonverbal communication, group size, and awareness of the physical and virtual worlds (Nguyen & Bednarz, 2020). However, teaching quality has a significant negative correlation with satisfaction and suggestions, indicating that the higher the teaching quality, the less likely students are to feel satisfied and provide suggestions. Satisfaction and suggestions also had a significant negative correlation with the effectiveness of hybrid learning, indicating that the more satisfied students were and the more suggestions they were given, the less likely they were to feel hybrid learning was effective.

Regression analysis aims to identify factors that predict students' level of satisfaction and suggestions regarding hybrid learning. The results of the analysis show that interaction and collaboration have a significant positive influence on the effectiveness of hybrid learning. This means that the higher the level of interaction and collaboration in hybrid learning, the higher its effectiveness. Chen et al. (2022) added that different control mechanisms in asymmetric collaboration can increase closeness, stimulate empathy, and increase collaboration efficiency (Chen et al., 2022). However, hybrid learning experience, benefits and challenges, teaching quality, and satisfaction and suggestions do not have a significant influence on the effectiveness of hybrid learning. This suggests that there may be other factors that are more important in determining the effectiveness of hybrid learning, such as the quality of learning materials or teaching methods. Reski et al. (2022) also show that systems that combine

immersive and non-immersive interfaces in asymmetric role settings can produce good usability scores, high user engagement, and close collaboration (Reski et al., 2022).

The remaining statistical data shows that the statistical model used is in accordance with the observation data regarding the dependent variable "Satisfaction and Suggestions". An average residual value that is close to zero indicates that the regression model used is not biased. The residual histogram distribution is close to normal, indicating that the model succeeded in capturing the variability of the data well. The normal P-P plot of the residuals shows that the residual distribution is close to normal, although there are some deviations at the left and right ends.

In conclusion, this research shows that students generally have a positive view of hybrid learning, with some variation in perceptions across various aspects. Interaction and collaboration are proven to be important factors in determining the effectiveness of hybrid learning. However, other factors that may be more important in determining the effectiveness of hybrid learning require further research. This research is in line with previous research which shows that collaboration in hybrid learning is positively influenced by communication, individuality, competence, and a cooperative atmosphere, with social interaction and a strong sense of teamwork as the main components (Uukkivi et al., 2022). However, this study also highlights the need for further research to identify other factors that contribute to the effectiveness and satisfaction of hybrid learning. This research provides valuable insight into how students respond to hybrid learning and how this model can be improved to increase learning satisfaction and effectiveness.

4. Conclusion

The conclusion of this research shows that students generally have a positive view of hybrid learning, with interaction and collaboration proven to have a significant positive correlation to learning effectiveness. However, experience, benefits and challenges, teaching quality, and satisfaction and suggestions did not show a significant influence on the effectiveness of hybrid learning, indicating that the quality of teaching materials and teaching methods may be more important. This research emphasizes the importance of designing hybrid learning environments that encourage interaction and collaboration, as well as improving the quality of teaching materials and teaching methods through strategies such as online discussion forums, group projects, and collaborative learning activities. Although this research provides valuable insight from the student's perspective, further research is needed to explore other factors that may influence the effectiveness of hybrid learning, including the impact of various instructional materials, teaching methods, technological tools, and the influence of cultural and contextual factors. Longitudinal research and studies of cultural norms, technology infrastructure, and educational policies can deepen understanding of the factors that influence the effectiveness of hybrid learning and help provide evidence-based recommendations to improve the design and implementation of hybrid learning models in higher education.

5. References

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