Ann PUBLISHER
Journal of Education Sciences (Edusci)
e ISSN 3074-2296
p ISSN 3032-7393

Path Analysis Of Academic The University of Islam Bandung Performance Blended Learning

Yani Ramdani[1], **Nia Kurniati Syam**[2], **Erwin Harahap Hamdani**[3]
[1] University of Islam Bandung, West Java, Indonesia, Email yaniramdani66@gmail.com
[2] University of Islam Bandung, West Java, Indonesia, Email nia_syamday@yahoo.com
[3] University of Islam Bandung, West Java, Indonesia, Email erwin2h@gmail.com
Corresponding Author Email yaniramdani66@gmail.com

Abstract: This study aims to investigate the relationship between self-regulated learning, creative performance, and early mathematical proficiency in the academic success of college students. The methods of this study are to compare the assessments and surveys conducted before and throughout the educational process. Learning activities are executed through both in-person and online formats. In-person instruction is performed according to the university's established lecture timetable. E-learning is conducted via organized tasks and autonomous assignments. Data were collected from college students in the University of Islam Bandung calculus course. The findings indicated that self-regulated learning and early mathematics aptitude significantly influenced student academic achievement, whereas the impact of creative performance was comparatively less pronounced. Self-regulated learning influences academic success by 38.76%, while early mathematical competence affects academic performance by 30.96%. Consequently, self-regulated learning significantly influences academic performance more than initial mathematical competence.

Keywords: blended learning, path analysis, academic performance, creative performance,

INTRODUCTION

Blended learning is one of the innovations applied in education. This model combines face-to-face learning in the classroom with online or distance learning. Learning includes not only formal but also informal lessons. Blended learning is one solution widely used during the COVID-19 pandemic worldwide. Initially, learning was only done online, but after the pandemic subsided, learning was gradually carried out using blended learning.

DOI: 10.62885/edusci.v2i3.468

Blended learning is used not only in education but also in developing human resources in the world of work. This development improves performance individually and as a team. The concept is the same, namely face-to-face and online.

John Oversby, (2019); Sun et al., (2020); Baris, (2015), stated that blended learning cultivates metacognitive skills such as autonomous learning and creativity while producing divergent and convergent questions that improve students' higher-order thinking skills and concurrently assist teachers in managing learning and engaging with numerous students. Consequently, more studies are still required to enhance blended learning as a viable educational approach in the future.

This study aims to investigate the effects of self-regulated learning (SRL), creativity (C), and initial mathematical ability (IAM) on student academic performance (AP) in the setting of blended learning in integral calculus education. Self-regulated learning is contentious because it depends on students' active participation.

LITERATURE REVIEW

Implementing Blended Learning seeks to educate learners in comprehending concepts, resolving problems, constructing and articulating information, and discussing and defending their arguments based on the veracity of mathematical principles. The constructivism idea posits that learners acquire information by actively constructing it through interaction, conflict, and re-equilibration, engaging with mathematical concepts, peers, and diverse challenges. The instructor manages engagement to facilitate essential problem selection (Gasaymeh, 2018).

Blended learning alleviates the challenges of online education, enhancing learning in the twenty-first century and post-COVID context, especially in developing countries like India. Blended learning signifies the future of international education. The varied pedagogical approaches and learning modalities in blended learning significantly enhance any discipline or study (Singh et al., 2021; Agarwal, 2021); (Rachmadtullah et al., 2020).

This type has the advantage that learners can allocate their study time based on their desired effort and schedule. Students can review the content and access it electronically as required. The drawbacks of online learning include: (1) Learners lack immediate feedback;

DOI: 10.62885/edusci.v2i3.468

(2) Instructors deliver feedback only after the conclusion of instruction; (3) Learners must self-motivate, as most studies are unidirectional, leading to feelings of isolation. The in-person element of blended learning can enhance social contact, fostering an engaged learning environment that addresses deficiencies in online learning.

The adoption of blended learning improves academic performance, enhances engagement, provides students with skills for lifelong learning, assists in self-assessment of educational requirements, facilitates the identification of suitable knowledge sources, offers adaptability and flexibility in learning, fosters an interactive academic environment, allows students to manage their learning process, and is preferred by students. Blended learning fortifies the stability of instructors' and assistants' positions. It facilitates the enhancement of instructional and evaluative strategies through autonomous education, proactive learner-centered approaches, and the creation of a learning environment where educational resources are developed based on robust pedagogical concepts.

METHOD

This study employs Blended Learning through indirect E-Learning (Asynchronous E-Learning), utilizing video to deliver learning materials. Simultaneously, independent and structured assignments are dispatched by email. The research steps are as follows: Instructors provide materials, assignments, and tests online; Create online discussion forums; Students must construct and submit five questions and answers weekly via email.

To prevent student misconceptions, instruction proceeds in person, specifically:

1. The lecturer initiates and aggregates student responses;
2. The outcomes of the dialogue are recorded on the blackboard without assessing the veracity of the statements;
3. A statement is returned to students for reflection and discourse.
4. Subsequently, students provide feedback after discussion, ensuring each response is substantiated through many avenues, including arguments, evidence, and refutations supported by counterexamples. Statements are substantiated by referencing applicable theorems or rules. Conversely, confident fabricated assertions are labeled as "false statements," one of which pertains to a counterexample (Ramdani, 2019).

DOI: 10.62885/edusci.v2i3.468

The intended audience was second-year undergraduate students enrolled in Calculus courses at Bandung Islamic University. The preliminary mathematical proficiency among the sample ranges from the lowest to the most significant group. All students provided their consent to engage in the research.

Students are afforded limitless time to complete and improve cognitive, emotional, and psychomotor development assignments. Assignments are distributed weekly and categorized in a designated portion of the learning management system, enabling students to obtain a comprehensive picture of the activities. After the semester, students must submit a questionnaire regarding autonomous learning and creativity to assess skill development, in addition to the Integral Calculus competency test to gauge academic progress.

This research was conducted in two phases. Prototype tools, rubrics, and instructional materials were employed to investigate the relationship between self-regulated learning, creativity, and foundational mathematical ability and children's academic achievement.

Self-regulated learning encompasses (1) initiating learning activities; (2) assessing learning requirements; (3) establishing learning objectives; (4) overseeing, structuring, and managing the learning process; (5) perceiving obstacles as challenges; (6) utilizing and seeking pertinent resources; (7) choosing, identifying, and implementing learning strategies; (8) appraising learning processes and results; (9) self-efficacy. Creativity encompasses (1) a high tolerance for ambiguity, (2) unrestricted thinking, (3) varied thought processes, (4) a willingness to embrace risks, (5) imaginative capabilities, and (6) heightened sensitivity. The pretest score is utilized to determine initial maths aptitude.

The research instruments employed consisted of tests and questionnaires. This assessment evaluates the correlation among SRL, C, and IAM concerning students' AP. The questions are designed as Integral Calculus competency assessments in essay format to evaluate advanced learning outcomes. The rationale for employing the description form test is that it enables the assessment of students' proficiency in mastering the content through the procedural steps taken to solve the presented tasks. Only students who have accurately grasped it may provide exceptional and suitable responses. All components of the study instrument exhibit validity, evidenced by a Pearson correlation coefficient (r) exceeding

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0.25, and the reliability coefficient, as determined by Cronbach's Alpha, falls within the high range.

RESULTS AND DISCUSSION

Bandung Islamic University's calculus curriculum focuses on cultivating competencies in calculus, which encompass conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and creative disposition.

Ramdani (2013) asserts that the learning process of Calculus in traditional classrooms is predominantly delivered via concepts and procedures, elucidated through examples and problem-solving exercises. The learning process typically involves comprehending concepts and processes via the presenting formats in reference materials. Acquiring the capacity to formulate and implement ideas and methods in mathematics, other disciplines, and daily life is uncommon. This educational approach fosters reproductive thinking through the development of analogical reasoning processes. This scenario does not allow for the cultivation of integrated mathematical competence, autonomous learning, or critical and creative thinking abilities. Students often approach integral problems by examining examples, resulting in challenges when formulating and executing their problems.

Table 1 categorizes the relationship between SRL-C and C-AP as essential. SRL-IAM, SRL-AP, C-IAM, C-AP, and IAM-AP exhibit robust classifications. The correlation matrix displays the route coefficients for SRL, C, IAM, and AP.

Table 1. Correlation matrix

Variable	SRL	C	IAM	AP
SRL	1.000	0.676	0.858	0.811
C	0.676	1.000	0.756	0.677
IAM	0.858	0.756	1.000	0.798
AP	0.811	0.677	0.798	1.000

The computational results demonstrate that SRL, C, and IAM collectively account for 70.5% of AP, see Figure 1.

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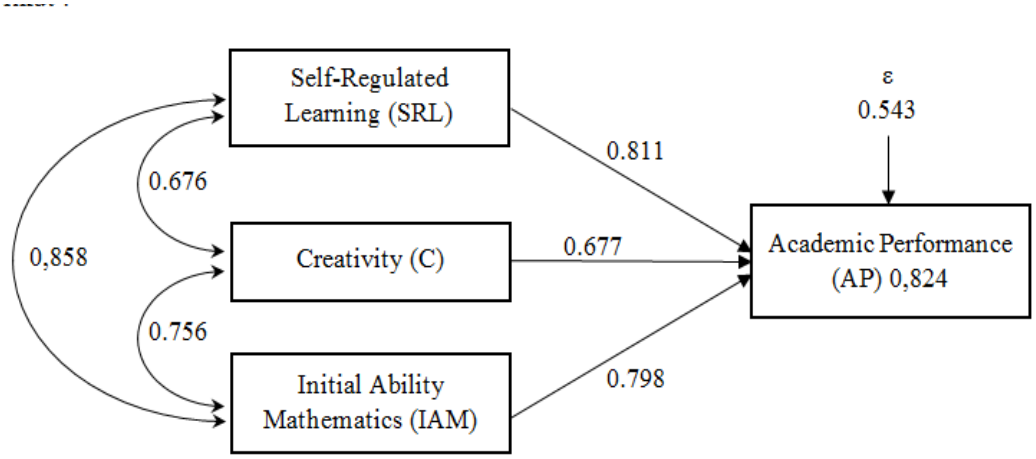

Figure 1. Test results of path analysis

Figure 1 demonstrates that all variables display correlations with path coefficients, with self-regulated learning (SRL) correlated with creativity (C) and creativity with initial ability mathematics (IAM). SLR with IAM. SLR, C, and IAM correlated with Academic Performance (AP) on Path Analysis.

Table 2. Determination coefficient

Model	R	R Square	Adjusted R Square	Std. An error in the Estimate
dimension0	0.840[a]	0.705	0.693	7.82492

a. Predictors: (Constant), SRL, C, dan IAM

The path coefficient analysis in Table 2 indicates that the path coefficients from SRL to AP and IAM to AP are statistically significant. The route coefficient C to AP is insignificant.

DOI: 10.62885/edusci.v2i3.468

Table 3. Hypothesis testing results

Path Coefficient	Hypothesis	*p-value*	Inference
ρAP-SRL	H_0 : ρAP-SRL = 0 H_1: ρAP-SRL ≠ 0	0.000	Rejected
ρAP-C	H_0 : ρAP-C = 0 H_1 : ρAP-C ≠ 0	0.157	Accepted
ρAP-IAM	H_0 : ρAP-IAM = 0 H_1 : ρAP-IAM ≠ 0	0.042	Rejected

Path coefficient academic performance and self-regulated learning were rejected; academic performance and creativity were accepted; academic performance and initial ability mathematics were rejected.

P value of academic performance and self-regulated learning 0.000 rejected see in Table 4. Also, the same case of p-value academic performance and initial ability mathematics was rejected with p-value of 0.003.

Table 4. Test of path coefesient ρAP-SRL and ρAP-IAM

Path Coefficient	Hypothesis	*p-value*	Inference
ρAP-SRL	H_0 : ρAP-SRL = 0 H_1: ρAP-SRL ≠ 0	0.000	Rejected
ρAP-IAM	H_0 : ρAP-IAM = 0 H_1 : ρAP-IAM ≠ 0	0.003	Rejected

The implementation of blended learning suggests a theoretical proposition that a correlation exists among self-regulated learning (SRL), collaboration (C), and intrinsic academic motivation (IAM), together impacting student academic performance (AP), which is considered valid. All path coefficients are statistically significant based on the testing findings. This research combines e-learning with face-to-face education. E-learning is a network application-based educational technique for material delivery, resource acquisition, student learning experience management, and discussion facilitation within learning communities (Chen et al., 2013).

E-learning promotes engagement, nurtures responsibility, expands educational alternatives, allows flexibility, and enables rapid information distribution. A correlation exists between technical proficiency and students' attitudes toward e-learning, suggesting that individuals with adequate technology skills demonstrate heightened enthusiasm for e-

DOI: 10.62885/edusci.v2i3.468

learning. The online learning environment optimizes time, enhances efficiency, and cultivates trust and independent learning. This study amalgamates e-learning with traditional classroom pedagogy. In-person education and digital learning resources can enhance students' knowledge-construction skills. Blended learning increases student engagement and fosters a beneficial connection between collaborative learning motivation and academic achievement. Blended Learning provides insights into students' cognitive processes regarding knowledge, evaluates the level and accuracy of their understanding, and can reveal misconceptions.

Blended learning allows educators to optimize time for content delivery and provide feedback on student performance. It improves student access to learning, aiding in assignment completion and resource acquisition (Guspatni, 2018).

Subsequent statistical analyses demonstrate that SRL and IAM significantly affect AP. C simultaneously affects academic achievement and is grounded on a weaker basis. The calculation findings permit the following assertion: The SRL rank directly affects the AP change by 22.85%, and its association with C is 15.91%. Thus, SRL explains a 38.76% variation in AP. In general, 30.96% of the variations in AP are attributed to IAM, with 15.05% reflecting a direct effect and 15.91% through its association with SRL. SRL and IAM collectively influence AP by 69.72%.

The core abilities assist students in retaining information, improving comprehension, and synthesizing newly learned knowledge with prior knowledge. The early identification of skills is essential as it supplies evidence for developing policies that advantage all children (Thompson & Zamboanga, 2004).

The significance of pupils' prior mathematical proficiency for their success in advanced mathematics (Fiona et al., 2014). Globally, competence in second-grade mathematics within higher education forecasts academic and developmental success. Subsequent study indicates that pre-college academic performance substantially influences problem-solving abilities and academic success during the initial year of college (Liu et al., 2008).

High-ability students possessing prior knowledge of behavioral objectives outperformed their peers missing this knowledge; likewise, high-ability students with prior

DOI: 10.62885/edusci.v2i3.468

knowledge excelled over low-ability students without such knowledge of behavioral goals (Osuafor et al.; C., 2016).

Familiarity with behavioral objectives allows students to focus their efforts and comprehend the expectations for lesson fulfillment more effectively. Technology-driven education will be increasingly embraced owing to its efficacy, active student participation, equitable access to learning opportunities, broadened educational prospects, heightened awareness of the importance of learning, enhancement of academic performance, and development of lifelong skills.

Implementing blended learning poses issues for both educators and learners. There are four principal challenges: Incorporating adaptability about time, location, and educational progression; physical involvement and virtual interaction; and the ability of teachers to assess and oversee student performance results. Educators establish an enabling learning atmosphere to foster motivation, empathy, and self-regulated learning (Tong et al.; P. T., 2022).

This circumstance will impose considerable pressure on educators. Furthermore, professional development is deficient and focused on enhancing communication techniques, learning methodologies, and information technology competencies crucial for executing blended learning (Sanchez-Gomez et al., 2019; Attard & Holmes, 2020). Students exhibit an absence of enthusiasm for online education (Poon, 2013). Students encounter challenges in knowledge acquisition through blended education (Nakamura et al., 2018).

CONCLUSION

The proposed argument on implementing blended learning indicates a correlational relationship among learning independence, creative performance, and early mathematical ability, suggesting that these three qualities collectively influence student academic achievement. This assertion indicates that autonomous learning and fundamental mathematical skills significantly impact academic success. Although creative vision influences academic success, it is fundamentally grounded in a more solid foundation. The cumulative impact of independent learning variables on academic accomplishment is

DOI: 10.62885/edusci.v2i3.468

38.76%, whereas the influence of early mathematical aptitude variables on academic success is 30.96%.

Implementing blended learning in calculus education can enhance student academic performance. Nonetheless, this study's findings are confined to the proficiency attained by students of average capability. Future studies should thoroughly examine students' conceptual comprehension by employing research methods such as interviews or portfolios to identify students' challenges and enhance their creative insights, which are now insufficient.

Acknowledgement:

This research was funded by the Institute for Research and Community Service at University of Islam Bandung. We are grateful to all respondents and to Universitu of Islam Bandung for their time and support.

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DOI: 10.62885/edusci.v2i3.468