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Research Article

COLLABORATIVE GUIDANCE MODEL IN HIGHER EDUCATION: IMPROVE THE QUALITY AND PRODUCTIVITY OF STUDENT RESEARCH

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Abstract
The low quality and productivity of students' final assignments is a major challenge in higher education. This study aims to develop a collaborative supervision model through a multi-level approach to improve the quality and productivity of student research. The model encourages active collaboration among students, supervisors, and academic staff. Using an explanatory sequential mixed methods design, data were first collected quantitatively via questionnaires and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), followed by qualitative analysis using thematic analysis with NVIVO software. Bibliometric mapping was also carried out using VOSviewer to identify core concepts. Results show that the collaborative supervision model is valid and feasible according to expert validation. Field trials demonstrate a significant impact on increasing students' independence, time management, motivation, and supervision effectiveness. This study provides a novel contribution by integrating individual, mentoring, and institutional levels in one comprehensive model, which has not been widely applied in traditional supervision practices. The findings imply that collaborative and structured academic supervision is crucial for developing high-quality student research outputs. The model developed can be a strategic alternative to enhance scientific literacy and academic productivity, especially in the context of science education, including physics education in higher education institutions.

Keywords: Digital Collaborative, Final Assignment, Research Productivity, Research Quality, Supervision Model

INTRODUCTION

Final assignments represent a form of scientific work that presents research findings in writing, aimed at analyzing specific problems or phenomena in a scientific discipline following academic standards (Bryda & Costa, 2023; Khoa et al., 2023; Qin & Ding, 2024). This phase is not only a requirement for graduation but also a reflection of students' abilities to apply knowledge and produce original, high-quality scientific output (Oparinde, 2021; Suárez-Lantarón et al., 2023; AlQhtani, 2025). As higher education continues to evolve, the quality and productivity of students' final assignments

require serious attention, particularly in response to recent policy changes in Indonesia's higher education system.

Based on higher education regulations in Indonesia, final assignments have undergone significant policy changes with the issuance of *Permendikbudristek* No. 53 of 2023, which replaces *Permendikbud* No. 3 of 2020. In the previous policy, final assignments were only recognized in the form of a thesis, dissertation, or dissertation (Coker, 2022). Universities are required to ensure that students compile their final assignments in a scientific research format that must be uploaded to the university website. However, the latest policy expands the forms of final assignments that are allowed, including projects, prototypes, or other forms that are relevant to the student's field of study (Miller, 2021; Petrakis et al., 2021). This policy aims to provide flexibility to students in completing their final assignments according to their interests and industry needs, as well as reducing the academic burden that often becomes an obstacle to timely graduation in completing final assignments.

Despite this policy advancement, many students still face significant challenges in completing their final assignments. Research shows that these challenges stem from various factors, including ineffective supervision, low student independence, weak motivation, and poor time management (Sugiar et al., 2024). Effective supervision involves the supervisor's ability to guide, support, and provide constructive feedback throughout the research process (Chugh et al., 2022; Weallans et al., 2022). Independence reflects the student's initiative and problem-solving skills without overreliance on external assistance (Sapiro et al., 2025; Yavich, 2025). Motivation both intrinsic and extrinsic plays a key role in determining students' persistence in completing their research (Alamri et al., 2021; Pranitasari & Maulana, 2022; Bandara & Hettiwaththage, 2025). Time management includes the ability to schedule tasks, set priorities, and avoid procrastination (Valente et al., 2024; Calonia et al., 2025). These interrelated factors strongly influence research quality and productivity, which ultimately affect students' academic success and timely graduation.

Quality in final assignments refers to the originality of ideas, methodological rigor, analytical clarity, and relevance of findings to the research problem (Adeoye, 2024). High-quality research not only meets academic standards but also contributes to scientific advancement and practical problem-solving in society (Musendekwa, 2025). Meanwhile, productivity is reflected in students' ability to produce effective and efficient outputs, including publications, conference presentations, or other forms of dissemination (Marson & Ferris, 2023; Sanchez & Abo, 2025). A collaborative mentoring approach offers a promising strategy to enhance research quality and productivity. It involves students, supervisors, and academic staff in an integrated, mutually supportive framework (Suárez-Lantarón et al., 2023). Unlike traditional one-way supervision, this model encourages active student participation in research planning and execution, fostering greater independence and responsibility (Sinaga, 2025).

This study provides a new contribution by exploring the effectiveness of a collaborative mentoring model based on a multi-level approach, which integrates the active roles of students, supervisors, and academic staff in improving the quality and productivity of final project research. This approach is designed to improve time management, encourage student independence and motivation, and strengthen the effectiveness of the mentoring process, so as to create optimal synergy between the various parties involved that has not been widely applied in traditional mentoring approaches. The emphasis on multi-level involvement (involving students, lecturers, and academic staff) provides a new dimension in creating a more productive academic environment, which can produce higher quality scientific work and contribute to publications. Unlike previous studies that tend to focus on only one dimension, be it the role of the supervisor or student independence, this study integrates various factors that influence each other systematically.

Relevant research conducted by Hussein (2021) discusses more about the obstacles faced by students in compiling their final assignments without offering integrated collaborative solutions. Meanwhile, Homaidi's research (2019) highlights the importance of motivation and independence in student success, but does not discuss the role of the supervisor in depth. Research from Saputra et al., (2022) discusses the development of a website-based final assignment guidance information system using the waterfall method. This research focuses on the technical aspects of data management and communication through a web-based system, but does not explore the collaborative approach and interpersonal interaction as a whole. Based on this, this study broadens the scope by analyzing the influence of collaborative guidance in a multi-level context that includes individual aspects, guidance, and institutional support simultaneously. This provides a new perspective on more holistic final assignment management. Based on the description above, the researcher intends to conduct research with

the formulation of the problem, then the researcher describes the research objectives as follows: 1) To find out the collaborative guidance model applied in the implementation of final assignments in higher education; 2) To find out the factors that influence the success of the implementation of students' final assignments; 3) To find out the effect of the collaborative guidance model on the quality and productivity of student research.

RESEARCH METHOD

This study uses a mixed methods research method which is a research method in combining quantitative research methods and qualitative methods to be used together in a research activity so that more comprehensive, valid, reliable, and objective data are obtained. This study uses the Explanatory Sequential Mixed Methods model, where the data collection process is carried out sequentially, starting with a quantitative approach followed by qualitative research (Li et al., 2025). In the initial stage, quantitative data are collected and analyzed to identify significant patterns, relationships, or initial findings. The results of this quantitative analysis then become the basis for further exploration through a qualitative approach, which aims to deepen understanding of the phenomena found, confirm the results, and provide deeper context and meaning. With this approach, research not only produces objective and measurable data but also provides more comprehensive insights into the dynamics that occur.

This research was conducted in seven Study Programs of Jambi University, namely Chemistry Education, Physics Education, Biology Education, Mathematics Education, Master of Chemistry Education, Master of Mathematics Education, and Master of Science Education. The population in this study were students, supervisors, and academic staff from seven Study Programs of Jambi University. The sample of this study will be taken from each of these groups to obtain representative data. Sampling in this study used purposive sampling technique, which is a method of selecting samples based on certain criteria set by the researcher. The criteria for selecting samples for the lecturer group were selected based on the involvement of lecturers in many significant studies in their fields as many as 6 people. Academic staff in each study program as many as 6 people. Meanwhile, for the student group, the sample selected was students who were compiling a thesis or dissertation and already had scientific publications, namely 336 students using factor analysis because the model used was new.

The instruments used in the study were questionnaires, interview sheets, and documentation. This study was conducted using the Explanatory Sequential Mixed Methods approach, which consists of two main stages: the quantitative stage and the qualitative stage. The research process began with the collection of quantitative data by distributing questionnaires to students, lecturers, and academic staff in seven study programs at the University of Jambi. This stage aims to measure research variables such as the effectiveness of guidance, student independence, motivation, time management, research quality, and research productivity. Each variable in this study was adopted from a relevant theory and its indicators were adapted to suit the context of this study. This instrument uses a closed questionnaire with a Likert scale of 5 answer choices to measure respondents' responses to each statement related to each variable. The following are the categories and assessment scores in the Likert scale used.

Table 1. Likert scale for the questionnaire instrument used

Category Evaluation	Assessment Score
Very Suitable / Always	5
Appropriate / Frequent	4
Neutral / Sometimes	3
Not Suitable / Rare	2
Very Disagree / Never	1

Table 1 shows that the assessment score consists of five scores with five assessment categories ranging from very inappropriate/always, to very inappropriate/never. Meanwhile, to determine the category interval.

$$Interval = \frac{Maximum\ Score - Minimum\ Score}{Number\ of\ Categories} \ldots (1)$$

The maximum score used in the Likert scale in this study is 5 and the minimum score is 1. The results of the category interval for each variable are presented in Table 3. As for the research variables, the theories used, and the indicators used in this study, both in the questionnaire instrument and the interview sheet, are presented in Table 2.

Table 2. Theory, and indicators from each variable instrument study

No	Variables	Theories Used	Indicator
1	Motivation	Apuanor et al. (2017), Handoko (2006)	1. Independence from others 2. Own trust self 3. Behave discipline 4. Have a sense of responsibility answer 5. Behave based on initiative Alone 6. Do control self
2	Time Management	Latifa (2018)	1. Setting goals 2. Setting priorities 3. Create a schedule 4. Minimize interference 5. Delegating tasks
3	Independence	Latifah et al., (2024)	1. Inability dependence towards others 2. Own trust self 3. Behave discipline 4. Have a sense of responsibility answer 5. Behave based on initiative Alone 6. Do control self
4	Effectiveness Mentoring	Toifuriah (2021)	1. Academic Advisors encourage and direct students' learning activities Quality bait come back from lecturer 2. Academic Advisors provide information to student For help determine interests , abilities , needs , and development during study on campus 3. Academic Supervisors play a role in increase studies student appropriate time
5	Quality Study	Zirmansyah (2011)	1. Problem Formulation Linking Variables 2. Theory using primary sources 3. At the end of the theoretical study, a synthesis is carried out. 4. Hypothesis answers the problem formulation 5. The population is described 6. Sampling techniques are described 7. Research instruments are derived from theoretical synthesis 8. There is an Instrument grid 9. Validity and Reliability are tested 10. The price of the instrument's reliability coefficient is stated

No	Variables	Theories Used	Indicator
			11. Data analysis requirements are described 12. Conclusion answers the problem formulation 13. Suggestions in accordance with research findings
6	Productivity Study	Kim & Karau (2014)	1. Demographics student 2. Environment Work 3. Support faculty 4. Support family 5. Source Power study 6. Pressure burden Work 7. Peer support

Table 2 explains the research variables, theories used, and indicators used in this study. Each variable is associated with a relevant theory to ensure the suitability of the concept and measurement.

The categorization of the questionnaire instrument used is guided by Table 3.

Table 3. Categorization score questionnaire from each variable study

Variables	Interval	Category
Motivation	24.0 – 43.2	Very Bad
	43.3 – 62.4	Not good
	62.5 – 81.6	Pretty good
	81.7– 100.8	Good
	100.9 – 120	Very good
Time Management	22.0 – 39.6	Very Bad
	39.7 – 57.2	Not good
	57.3 – 74.8	Pretty good
	74.9 – 92.4	Good
	92.5 – 110	Very good
Independence Student	30.0 – 54.0	Very Bad
	54.1 – 78.0	Not good
	78.1 – 102.0	Pretty good
	102.1 – 126.0	Good
	126.1 – 150.0	Very good
Effectiveness Mentoring	22.0 – 39.6	Very Bad
	39.7 – 57.2	Not good
	57.3 – 74.8	Pretty good
	74.9 – 92.4	Good
	92.5 – 110.0	Very good
Quality of Research Results	41.0 – 73.8	Very Bad
	73.9 – 106.6	Not good
	106.7 – 139.4	Pretty good
	139.5 – 172.2	Good
	172.3 – 205.0	Very good
Productivity Study	29.0 – 52.2	Very Bad
	52.3 – 75.4	Not good
	75.5 – 98.6	Pretty good
	98.7 – 121.8	Good
	121.9 – 145.0	Very good

Next, the quantitative data obtained will be analyzed using the Structural Equation Modeling (SEM) method with the help of statistical analysis software. SEM analysis is used to test the relationship between latent variables, identify direct and indirect influences, and evaluate the suitability of the research

model with empirical data. Before conducting SEM analysis, instrument validity testing was carried out through content validity using expert judgment and construct validity using exploratory factor analysis. The criteria met in this analysis are presented in Table 4.

Table 4. Criteria for exploratory factor analysis (EFA)

Criteria	Mark
Keyser Mayer Oikin (KMO) significant	> 0.5
Barlett's Test of Sphericity	< 0.05
Anti image correlation	> 0.5
eigenvalue in Total Variances Explained	> 1.0
Coefficient on Rotated Component Matrix	> 0.4

The next stage is qualitative data collection, which is carried out through in-depth interviews with key informants. Interviews are conducted in a semi-structured manner with an interview guide that has been prepared based on the initial findings of quantitative data. All research procedures are carried out systematically, starting from instrument preparation, instrument validation, data collection, quantitative data analysis, qualitative data mining, to the integration of quantitative and qualitative findings. This approach allows the study to gain a comprehensive understanding of the influence of collaborative mentoring on the quality and productivity of student research in higher education. The data analysis in this study was carried out in stages according to the Explanatory Sequential Mixed Methods approach, which combines quantitative and qualitative methods sequentially to obtain a more comprehensive understanding of the studied phenomenon. The analytical techniques are divided into two main parts: quantitative data analysis and qualitative data analysis, which are then integrated through a data integration process.

Quantitative data, obtained through questionnaire instruments, were analyzed using Structural Equation Modeling (SEM) based on Partial Least Squares (PLS). The PLS-SEM technique was chosen because it is suitable for variance-based data rather than covariance-based data, allowing for more flexible analysis, particularly when dealing with non-normative data and relatively small sample sizes. The SEM-PLS analysis involves three main stages. The first stage is the assessment of instrument validity and reliability. Content validity was evaluated through expert judgment regarding the alignment of indicators with theoretical constructs. Construct validity was tested using Exploratory Factor Analysis (EFA) to ensure that the indicators significantly formed the intended latent constructs. To ensure internal consistency, instrument reliability was tested using Cronbach's Alpha, with a reliability threshold of ≥ 0.70. The second stage involves testing the SEM model. This begins with the evaluation of the measurement model (outer model), which assesses the suitability of indicators to their constructs through loading factor values, Average Variance Extracted (AVE), and Composite Reliability (CR). A good model is indicated by loading factors ≥ 0.70, AVE ≥ 0.50, and CR ≥ 0.70. Subsequently, the structural model (inner model) is evaluated to identify the strength and direction of relationships among latent constructs using path coefficients and their significance, based on t-statistics and p-values. The third stage is hypothesis testing, conducted based on the path coefficients between latent variables. A relationship is considered statistically significant if the p-value is < 0.05. Following the quantitative analysis, qualitative data were analyzed based on in-depth interviews with key informants. This analysis used a thematic approach aimed at uncovering meanings, patterns, and relationships between themes emerging from the interview data. The process consisted of three main steps. First, the data reduction stage, which involved selecting, simplifying, and focusing on data relevant to the research objectives. Irrelevant data were filtered out to ensure that only meaningful information was further analyzed. Second, the data display stage, where the reduced data were organized into thematic matrices, direct quotes from informants, and visual diagrams to facilitate the identification of thematic connections. Third, the conclusion drawing and verification stage, which involved interpreting the emerging themes and patterns and verifying their validity by comparing the consistency of information from various sources or different informants.

This qualitative analysis not only reinforces and deepens the quantitative findings but also provides contextual insights into the relationships among variables and reveals social and academic dynamics not captured by numerical data. After both types of data quantitative and qualitative were analyzed separately, they were integrated to produce more holistic, comprehensive, and meaningful conclusions. The integration was conducted by comparing the results of the SEM analysis with the

findings from the in-depth interviews to identify convergence (consistency of results), divergence (differences or inconsistencies), and elaboration (enrichment of meaning) regarding the studied phenomenon. This process resulted in an integrative narrative that explains in depth the relationships among supervision effectiveness, time management, student independence, motivation, research quality, and research productivity.

RESULTS AND DISCUSSION

Samples of students, lecturers, and academic staff in this study include seven study programs, both undergraduate (S1) and postgraduate (S2) levels. The sample was selected by purposive sampling, namely students who are preparing their final assignments and already have scientific publications. Lecturers who are actively involved in research activities, especially those who have a track record of making many significant scientific publications according to their scientific fields. Meanwhile, academic staff are educational staff from study programs in the MIPA group who have a role in supporting the implementation of academic administration and research services. The following Table 5 is the demographics of the samples involved.

Table 5. Demographics Amount Student Based on Study Program

Study program	Amount Student	Number of Lecturers	Amount Staff
Chemistry Education	80	1	1
Physics Education	48	2	2
Biology Education	119	1	1
Mathematics Education	34	1	1
Postgraduate (Master of Chemistry Education, Master of Mathematics Education, Master of Science Education)	55	1	1
Total	336	6	6

The sample in this study consisted of 336 students, 6 lecturers, and 6 academic staff from seven Study Programs at the undergraduate (S1) and postgraduate (S2) levels. The Biology Education Study Program is the largest contributor with the largest number of students. Overall, the sample distribution is considered to represent active involvement in academic and research activities.

Furthermore, Table 6 presents the results of the distribution of descriptive data from each research variable, including the average value, standard deviation, and minimum and maximum values.

Table 6. Distribution results descriptive data from each variable

Variables	Category			Mean	Min	Max	%
	Interval	Motivation	Total				
Motivation	24.0 – 43.2	Very Bad	1	95.7	33.0	120.0	0.3
	43.3 – 62.4	Not good	1				0.3
	62.5 – 81.6	Pretty good	26				7.7
	81.7– 100.8	Good	206				61.3
	100.9 – 120	Very good	102				30.4
Management time	22.0 – 39.6	Very Bad	0	84.4	42.0	110.0	0
	39.7 – 57.2	Not good	3				0.9
	57.3 – 74.8	Pretty good	30				8.9
	74.9 – 92.4	Good	253				75.3
	92.5 – 110	Very good	50				14.9
Independence	30.0 – 54.0	Very Bad	1	118.6	51.0	150.0	0.3
	54.1 – 78.0	Not good	0				0
	78.1 – 102.0	Pretty good	34				10.1
	102.1 – 126.0	Good	218				64.9
	126.1 – 150.0	Very good	83				24.7
Effectiveness Mentoring	22.0 – 39.6	Very Bad	0	85.9	44.0	110.0	0
	39.7 – 57.2	Not good	4				1.2
	57.3 – 74.8	Pretty good	49				14.6

Variables	Category			Mean	Min	Max	%
	Interval	Motivation	Total				
Quality of Research Results	74.9 – 92.4	Good	191	168.3	122.0	205.0	56.8
	92.5 – 110.0	Very good	92				27.4
	41.0 – 73.8	Very Bad	0				0
	73.9 – 106.6	Not good	0				0
	106.7 – 139.4	Pretty good	32				9.5
	139.5 – 172.2	Good	180				53.6
	172.3 – 205.0	Very good	124				36.9
Productivity Research	29.0 – 52.2	Very Bad	0	114.4	84.0	145.0	0
	52.3 – 75.4	Not good	0				0
	75.5 – 98.6	Pretty good	29				8.6
	98.7 – 121.8	Good	215				64.0
	121.9 – 145.0	Very good	92				27.4

Content validity in this study was conducted by Expert Judgment. Based on the results of content validity, it was obtained that all research variables were declared feasible based on expert assessments with the majority of assessment scores in the good category. In general, all variables are in the "Good" category with the highest percentage in the time management variable, which means that students have the best time management skills compared to other variables that affect the completion of the final assignment.

Furthermore, a construct validity test was carried out with the results obtained presented in table 7.

Table 7. Results of the KMO and Bartlett's Test for every variable

Variables	KMO and Bartlett's Test		
Motivation	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.895
	Bartlett's Test of Sphericity	Approx. Chi-Square	1742.370
		df	276
		Sig.	.000
Time Management	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.861
	Bartlett's Test of Sphericity	Approx. Chi-Square	1315.024
		df	231
		Sig.	.000
Independence	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.869
	Bartlett's Test of Sphericity	Approx. Chi-Square	1753.300
		df	435
		Sig.	.000
Effectiveness Mentoring	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.928
	Bartlett's Test of Sphericity	Approx. Chi-Square	1667.879
		df	231
		Sig.	.000
Quality of Research Results	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.975
	Bartlett's Test of Sphericity	Approx. Chi-Square	9613.055
		df	820
		Sig.	.000
Productivity Study	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.804
	Bartlett's Test of Sphericity	Approx. Chi-Square	1878.305
		df	435
		Sig.	.000

Field validity was conducted by distributing the questionnaire instrument to the trial sample to be analyzed using Exploratory Factor Analysis (EFA), which began with the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity. The results of the analysis showed that the KMO value was in the range of > 0.5, which means that the sample is adequate for factor analysis. Bartlett's Test showed a

significance value of <0.05, which means that there is a correlation between items, so that the data is worthy of further analysis using EFA.

The loading factor value in the EFA analysis is ≥ 0.5 as the minimum limit to state that an item is valid and has a strong enough contribution to the construct formed (Gebremedhin et al., 2022; Husain, H., & Aziz, 2022). The higher the loading factor value, the stronger the item's contribution to the formation of the factor. Items with a loading factor value below 0.5 are considered invalid and need to be considered for removal from the instrument, because their contribution to the factor is inadequate. The following is a presentation of the results of the field validity test of each variable involved in this study.

Field validity analysis on the time management variable obtained that out of 25 statement items, 22 items were declared valid because they had a loading factor value above 0.5 and were distributed into three main components, namely: component 1 contains 10 items, component 2 contains 5 items, and component 3 contains 7 items. Three items (P1, P10, and P20) were invalid because their loading values were less than 0.5. Furthermore, in the guidance effectiveness variable, all 22 items tested were declared valid with a loading factor value above 0.5. These items are spread across two main components, namely 15 items in component 1 and 7 items in component 2. For the student motivation variable, out of a total of 25 statement items, 24 items were declared valid because they had a loading factor value above 0.5. These items are grouped into four main components: component 1 contains 8 items, component 2 contains 6 items, component 3 contains 5 items, and component 4 contains 5 items. Only one item is invalid, namely P24. In the student independence variable, all 30 items are declared valid with a loading factor value above 0.5 and are distributed into four components: component 1 contains 11 items, component 2 contains 6 items, component 3 contains 6 items, and component 4 contains 7 items.

Furthermore, for the research result quality variable, it is known that out of a total of 65 statement items analyzed, there are 41 items that have a loading factor value above 0.5, so they are declared valid and suitable for use. These items are spread into four main components (factors), namely: component 1 consists of 14 items, component 2 consists of 11 items, component 3 consists of 12 items, and component 4 consists of 6 items. Meanwhile, there are 24 statement items that do not appear in any component because they have a loading factor value below 0.5, so they are declared invalid and need to be dropped. The invalid items are: P5, P6, P16, P17, P19, P20, P21, P22, P23, P29, P31, P33, P35, P37, P38, P39, P42, P43, P54, P56, P57, P64, P65, and P52. Finally, it is known that from the total statement items in the student research productivity variable, there are 29 valid items, because they have a loading factor value above 0.5, so they are suitable for use. These items are spread into four main components (factors), namely: component 1 consists of 10 items, component 2 consists of 7 items, component 3 consists of 6 items, and component 4 consists of 6 items. Meanwhile, from a total of 35 statement items tested, there were 6 items that did not appear in the table (invalid) because they did not have a loading factor value ≥ 0.5 or did not provide a significant contribution to any factor, namely: P1, P11, P12, P14, P15 and P25.

Measurement Model Testing (Outer Model)

The outer model testing in this study uses PLS-SEM analysis. The results can be seen in Table 8.

Table 8. Loading Factor, AVE and Cronbach Alpha (Outer Model)

	Item	Loading Factor	AVE	Cronbach's Alpha
Academic Development	EP10	0.754	0.572	0.947
	EP11	0.811		
	EP12	0.752		
	EP13	0.748		
	EP14	0.746		
	EP15	0.772		
	EP16	0.741		
	EP17	0.771		
	EP18	0.759		
	EP19	0.738		
	EP20	0.752		

	Item	Loading Factor	AVE	Cronbach's Alpha
Quality Guidance	EP21	0.742	0.618	0.877
	EP6	0.755		
	EP7	0.750		
	EP9	0.756		
	EP2	0.766		
	EP22	0.775		
	EP3	0.781		
	EP4	0.798		
	EP5	0.804		
	EP8	0.791		
Theoretical Framework	KHP1	0.739	0.566	0.941
	KHP10	0.762		
	KHP11	0.768		
	KHP12	0.770		
	KHP13	0.700		
	KHP14	0.763		
	KHP15	0.770		
	KHP18	0.701		
	KHP2	0.782		
	KHP3	0.758		
	KHP4	0.713		
	KHP7	0.786		
	KHP8	0.770		
	KHP9	0.743		
Sampling Methodology	KHP24	0.755	0.580	0.928
	KHP25	0.708		
	KHP26	0.787		
	KHP28	0.778		
	KHP29	0.770		
	KHP30	0.766		
	KHP32	0.773		
	KHP36	0.761		
	KHP40	0.778		
	KHP41	0.771		
	KHP44	0.726		
Validity and Reliability Instrument	KHP34	0.791	0.610	0.929
	KHP45	0.779		
	KHP46	0.751		
	KHP47	0.777		
	KHP48	0.784		
	KHP49	0.779		
	KHP50	0.761		
	KHP51	0.828		
	KHP53	0.780		
	KHP55	0.778		

	Item	Loading Factor	AVE	Cronbach's Alpha
Implications Study	KHP58	0.768	0.617	0.876
	KHP59	0.789		
	KHP60	0.810		
	KHP61	0.787		
	KHP62	0.772		
	KHP63	0.789		
Autonomy	KM1	0.733	0.678	0.764
	KM3	0.844		
	KM4	0.885		
	KM11	0.780		
Management Resource	KM12	0.760	0.585	0.858
	KM13	0.763		
	KM14	0.765		
	KM15	0.767		
	KM16	0.751		
	KM17	0.790		
	KM18	0.748		
	KM19	0.732		
Self Efficacy	KM20	0.778	0.552	0.910
	KM21	0.734		
	KM29	0.716		
	KM30	0.724		
Initiative	KM7	0.708	0.593	0.831
	KM8	0.745		
	KM9	0.748		
	KM24	0.809		
	KM25	0.750		
	KM26	0.729		
	KM28	0.754		
	KM29	0.804		
Goal Orientation	MM1	0.831	0.603	0.906
	MM2	0.773		
	MM22	0.760		
	MM23	0.808		
	MM25	0.768		
Self Regulation	MM3	0.744	0.571	0.814
	MM4	0.788		
	MM5	0.736		
	MM10	0.726		
	MM6	0.727		
	MM7	0.779		
	MM8	0.765		
	MM9	0.780		
Commitment	MM11	0.750	0.567	0.810
	MM12	0.714		

	Item	Loading Factor	AVE	Cronbach's Alpha
Perseverance	MM13	0.805	0.601	0.867
	MM14	0.782		
	MM15	0.710		
	MM16	0.715		
	MM17	0.818		
	MM18	0.781		
	MM19	0.775		
	MM20	0.762		
	MM21	0.798		
Planning	MW11	0.760	0.513	0.689
	MW14	0.666		
	MW5	0.684		
	MW6	0.750		
Delegation and Collaboration	MW22	0.823	0.625	0.806
	MW23	0.748		
	MW24	0.770		
	MW25	0.819		
Focus and Control disturbance	MW19	0.824	0.550	0.624
	MW7	0.639		
	MW9	0.750		
Support Family and Mentors	PP16	0.790	0.626	0.851
	PP17	0.773		
	PP18	0.820		
	PP19	0.814		
	PP20	0.757		
Workload and Stress Management	PP26	0.786	0.577	0.818
	PP27	0.788		
	PP28	0.741		
	PP29	0.772		
	PP30	0.708		
Peer Support	PP22	0.727	0.567	0.848
	PP31	0.722		
	PP32	0.763		
	PP33	0.783		
	PP34	0.764		
	PP35	0.759		
Academic Capacity	PP6	0.779	0.656	0.740
	PP7	0.835		
	PP8	0.814		

Based on Table 8, it can be seen that all components in the outer model of this study meet the requirements. Where the loading factor value according to Hair (2019) is the loading factor value> 0.7. Outer loading is a table containing loading factors to show the magnitude of the correlation between indicators and latent variables. After seeing the loading factor value, the next is the reliability value, where there are 2 that are seen, namely the cronbach alpha value and AVE, Fornell and Larcker (1981) suggest that the minimum AVE value is 0.5. In Table 8, it can be seen that the cronbach alpha value is> 0.8, which

indicates that it has good reliability (Creswell, 2012). This means that a measuring instrument is said to have a high reliability coefficient when used to measure the same thing at different times the results are the same or close to the same, where the closer to 1, the more reliable the measuring instrument can be said. It is believed here that a test instrument if retested or administered by another tester will produce a relatively constant value.

The AVE value describes the magnitude of the variance or diversity of manifest variables that can be owned by the latent construct. Hair et al. (2019) recommends a minimum AVE value of 0.5 indicating a good measure of convergent validity. Based on Table 8 above, the AVE values for all components are above the minimum value, which ranges from 0.5 - 0.8. Based on the loading factor, Cronbach alpha, and AVE values, it can be concluded that the questionnaire items have good convergent validity.

Structural Model Testing (Inner Model)

After obtaining convergent validity with good results, research hypothesis testing was carried out in a structural model between dimensions that influence the completion of the final assignment as reviewed from student motivation, time management, student independence, effectiveness of guidance, quality of research results, and student research productivity. The results of the processing are as follows.

Table 9. Path Coefficient

	Path Coefficient	T Values	P values	Information
Delegation and Collaboration -> Support Family and Mentors	-0.136	2,487	0.013	Significant
Delegation and Collaboration -> Academic Capacity	-0.146	2,271	0.023	Significant
Efficacy -> Academic Capacity	0.274	2,683	0.007	Significant
Focus and Control Disturbance -> Workload and Stress Management	0.221	2,505	0.012	Significant
Perseverance -> Academic Capacity	0.191	2,014	0.044	Significant
Perseverance -> Workload and Stress Management	0.196	2,097	0.036	Significant
Quality Guidance -> Implications Study	-0.192	2,188	0.029	Significant
Autonomy -> Support Family and Mentors	-0.241	3,652	0,000	Significant
Planning -> Theoretical Framework	0.117	2,085	0.037	Significant

Based on the path analysis results presented in the table, it can be concluded that most of the relationships between variables in this study do not demonstrate statistical significance. However, several significant relationships were identified and warrant further attention.

First, Delegation and Collaboration were found to have a significant negative effect on Family and Supervisor Support ($\beta = -0.136$; $p = 0.013$) and Academic Capacity ($\beta = -0.146$; $p = 0.023$). This suggests that increased delegation and collaboration practices may lead to decreased perceptions of support from family and supervisors, as well as reduced perceptions of academic capacity. It implies that when responsibilities are delegated or shared, individuals may feel less supported personally or may experience a loss of control over their academic development. In contrast, Self-Efficacy shows a positive and significant effect on Academic Capacity ($\beta = 0.274$; $p = 0.007$), indicating that confidence in managing academic tasks strongly contributes to students' perception of their academic abilities. This finding aligns with theories that regard self-efficacy as a key determinant of academic achievement.

Furthermore, Focus and Distraction Control is positively and significantly associated with Workload and Stress Management ($\beta = 0.221$; $p = 0.012$), suggesting that students with higher ability to manage distractions tend to perform better in handling stress and managing academic workload. Perseverance also shows a positive and significant influence on two variables: Academic Capacity ($\beta = 0.191$; $p = 0.044$) and Workload and Stress Management ($\beta = 0.196$; $p = 0.036$). This indicates that persistent students tend to possess stronger academic capacity and better stress management skills.

Another important finding is the negative effect of Mentoring Quality on Research Implications ($\beta = -0.192$; $p = 0.029$). Although counterintuitive, this may suggest a mismatch between the perceived

quality of guidance and the practical outcomes of research, possibly due to high dependency on supervisors, which may hinder students' individual initiative. Interestingly, Autonomy was found to have a significant negative effect on Family and Supervisor Support ($\beta = -0.241$; $p < 0.001$), indicating that the more autonomous a student becomes, the less they perceive the need for or presence of external support. Although most other variables such as Initiative, Commitment, Resource Management, Academic Development, Planning, and Self-Regulation did not show significant effects on outcome variables, Planning was positively and significantly related to the Theoretical Framework ($\beta = 0.117$; $p = 0.037$). This implies that students who engage in effective planning are more likely to construct a stronger theoretical foundation for their research.

Overall, these results suggest that internal variables such as self-efficacy, focus, and perseverance have a more substantial impact on academic outcomes compared to external factors such as social support or the quality of supervision though both still play roles in different contexts. Therefore, interventions aimed at improving academic performance should focus more on strengthening students' internal capacities, including self-motivation, focus, and stress management. The next step is to analyze the effect size (f^2) values of the exogenous variables. The f^2 value interprets whether an exogenous variable has a weak, moderate, or strong structural effect on the endogenous variable. According to Hair et al. (2016), $f^2 < 0.02$ indicates a weak effect, $0.02 \leq f^2 < 0.15$ indicates a moderate effect, $0.15 \leq f^2 < 0.35$ is considered substantial, and $f^2 > 0.35$ indicates a strong effect. The effect size values are presented in Table 10.

Table 10. Variable Effect Size f2 Value Exogenous to Endogenous Variables

	f-square
Delegation and Collaboration -> Support Family and Mentors	0.019
Delegation and Collaboration -> Academic Capacity	0.021
Efficacy -> Academic Capacity	0.023
Focus and Control Disturbance -> Workload and Stress Management	0.039
Perseverance -> Academic Capacity	0.014
Perseverance -> Workload and Stress Management	0.014
Quality Guidance -> Implications Study	0.013
Autonomy -> Support Family and Mentors	0.051
Planning -> Theoretical Framework	0.011

Interpretation of the f-square values in this model provides a deeper understanding of the magnitude of each independent variable's contribution to the dependent variables under investigation. In general, the f-square values in this study tend to show small, even very small, effects on the outcome variables. Based on the criteria by Hair et al. (2016), an f^2 value < 0.02 indicates a weak effect, $0.02 \leq f^2 < 0.15$ indicates a moderate effect, $0.15 \leq f^2 < 0.35$ a substantial effect, and $f^2 > 0.35$ a strong effect. Thus, it can be concluded that most relationships among variables in this model have minimal effect sizes. Nevertheless, some relationships are noteworthy due to their relatively greater contribution.

One of the more prominent relationships is between Autonomy and Family and Supervisor Support, which has an f^2 value of 0.051. While still categorized as a small effect, it is the highest among all relationships in the model, indicating that students' autonomy in conducting their final assignments contributes to their perceptions of support from family and academic advisors. Similarly, the relationship between Focus and Distraction Control and Workload and Stress Management yields an f^2 value of 0.039, suggesting that students' ability to manage distractions positively affects how they cope with academic stress and workload. Self-efficacy also demonstrates a small but significant contribution to Academic Capacity ($f^2 = 0.023$), aligning with previous literature that highlights the role of confidence in academic performance.

In addition, the Delegation and Collaboration variable shows a relatively notable effect on Academic Capacity ($f^2 = 0.021$). However, it is important to note that the effect is negative, implying that over-reliance on delegation or group work may hinder the development of individual academic competence. This highlights the importance of balancing collaboration with the cultivation of personal responsibility in higher education settings. On the other hand, most relationships between other independent variables and outcome variables show f-square values below 0.01, with many approaching zero. For instance, Commitment, Initiative, Resource Management, and Academic Development contribute minimally to outcome variables such as Research Implications, Sampling Methodology, or

Instrument Validity and Reliability. This indicates that, in the current context, these variables do not meaningfully explain the variance in student research outcomes.

Overall, the f-square pattern reflects the multifactorial and interdependent nature of student research success, without any single variable emerging as a dominant predictor. However, variables such as Autonomy, Focus and Distraction Control, Self-efficacy, and Delegation-Collaboration can be prioritized in intervention and instructional design due to their comparatively greater influence. These findings suggest the need for a holistic and integrative approach to student development—one that combines cognitive, affective, and social-environmental aspects to support optimal academic outcomes.

The results of the effect size analysis through f-square values indicate that most structural relationships fall within the small-effect category, and several show negligible or near-zero contributions. This implies that individually, the exogenous variables do not exert a strong influence on the endogenous variables. However, even small effect sizes offer insights into the relational patterns present in students' learning processes, particularly during the development of final assignments or academic research. Specifically, the Delegation and Collaboration variable records the highest f^2 values for Academic Capacity (0.021), Family and Supervisor Support (0.019), and Workload and Stress Management (0.016), suggesting that the ability to share tasks and work collaboratively has a modest influence on academic capacity and stress management. Meanwhile, Self-efficacy exerts the strongest effect on Academic Capacity ($f^2 = 0.023$), affirming the importance of students' confidence in their abilities for fostering scientific thinking and producing quality academic work. This finding supports Shengyao (2024) self-efficacy theory, which posits that individuals with high self-efficacy are more persistent in completing complex academic tasks.

Nevertheless, several relationships such as those between Commitment and almost all outcome variables, or between Academic Capacity and outcomes like Research Implications, Theoretical Framework, Sampling Methodology, and Instrument Validity show near-zero f-square values. This suggests that having good academic capacity alone does not necessarily influence technical aspects of final research projects. Mediating variables such as mentoring quality, self-regulation, or learning strategies may be needed to bridge this gap. Interestingly, the Goal Orientation variable demonstrates a relatively consistent contribution to key research indicators such as Research Implications ($f^2 = 0.008$), Theoretical Framework ($f^2 = 0.008$), and Sampling Methodology ($f^2 = 0.010$). This suggests that students with clear academic goals are more capable of constructing theoretical frameworks, selecting appropriate research methods, and presenting meaningful implications from their findings. This finding aligns with goal orientation theory Ponomariovienė & Jakavonytė-Staškuvienė (2024), which emphasizes that strong learning goals encourage independent thinking and careful academic planning.

In conclusion, although no single variable has a large individual effect size, the combined influence of factors such as autonomy, self-regulation, perseverance, and mentoring quality can build a strong support system for students in completing their final assignments. Thus, reinforcing non-cognitive aspects such as time management, coping strategies for academic stress, and quality of supervisor–student interactions is crucial for improving student academic achievement. The implication is the need for holistic educational interventions, which go beyond content delivery to include character building, intrinsic motivation, and self-directed learning skills.

Interview Coding Results – Student Perspectives

Based on interviews with students from various academic programs, several key themes emerged:

Independence in Completing Final Assignments

Students demonstrated autonomy in organizing, managing, and completing their final assignments systematically: a) "I broke my thesis into manageable stages like topic selection, literature review, data collection, data analysis, chapter writing, and revisions." (Undergraduate, Mathematics Education); b) "I ensured each phase of the final project could be completed independently by developing a detailed work plan." (Graduate, Science Education)

Effective and Disciplined Time Management

Students used various strategies to stay productive and manage time effectively: a) "I created daily and weekly schedules, allocating time for research, supervision meetings, and writing." (Undergraduate, Physics Education); b) "I used the Eisenhower Matrix, Time-Blocking, and Iterative Planning to organize and adjust my schedule." (Graduate, Mathematics Education)

Academic Motivation and Emotional Support

Motivation stemmed from family encouragement, personal aspirations, and the desire to contribute to society: a) "I want to prove to myself that I'm capable of independently completing a research project." (Undergraduate, Biology Education); b) "My main motivation is my mother. I want to repay her sacrifices and love." (Graduate, Science Education)

Supervisory Effectiveness

Guidance was perceived as essential both technically and emotionally: a) "My supervisor helped me understand the writing structure, gave methodological input, and assisted with data analysis." (Undergraduate, Physics Education); b) "Each meeting was full of constructive feedback and emotional encouragement to keep me going." (Graduate, Mathematics Education)

Productivity and Learning Environment

A supportive environment was key to maintaining productivity: a) "I feel more productive working in quiet places like the campus library or a private study space at home." (Graduate, Chemistry Education); b) "I limit phone usage by turning on 'Do Not Disturb' and using social media blocker apps." (Undergraduate, Biology Education)

Commitment and Sacrifice

Students made personal and social sacrifices to complete their final assignments: a) "I cut down on rest and leisure time." (Undergraduate, Mathematics Education); b) "I once declined a part-time job offer because it conflicted with my lab experiment schedule." (Undergraduate, Chemistry Education)

Initiative and Self-Control

Students took initiative to solve problems and manage distractions during the research process: a) "I try to resolve issues on my own first by reading journals and books." (Graduate, Chemistry Education); b) "I use Cold Turkey and Focus Will to manage distractions, along with the Focus Funnel technique." (Graduate, Mathematics Education)

Research Quality and Academic Validity

Some students structured their research with theoretical synthesis and methodological rigor: a) "I developed instruments based on theory and tested them for validity and reliability... My Cronbach's Alpha score was above 0.7." (Graduate, Chemistry Education); b) "I got a Cronbach's Alpha of about 0.87. It shows my instrument had a high level of consistency." (Undergraduate, Chemistry Education)

Peer Collaboration and Support

Collaboration accelerated progress through discussion and technical assistance: a) "Discussions with peers helped me find solutions and speed up the research process." (Graduate, Chemistry Education); b) "We shared tasks like compiling references and assisting with data collection." (Undergraduate, Biology Education)

These findings highlight the importance of a mentoring model that is adaptive and supportive of students' individual characteristics.

Interview Coding Results – Lecturer Perspectives

Lecturer interviews revealed several key themes:

Motivation

Both lecturers expressed strong intrinsic motivation as part of their academic commitment and moral responsibility: a) Lecturer 1: "My main drive is not just academic duty, but also an intellectual and moral calling."; b) Lecturer 2: "Supervision is a contribution to society and a long-term investment in student success."

Role of Supervision in Student Development

Supervision was viewed as a process of guiding students into resilient and independent individuals: a) Lecturer 1: "I feel responsible for accompanying them... so their scientific work becomes

meaningful for themselves and society."; b) Lecturer 2 emphasized the importance of shaping critical and logical thinking through final assignment supervision.

Time Management Strategies

Lecturers demonstrated flexibility and planning: a) Lecturer 1: "I allocate about 6–10 hours per week for supervision, combining individual and group meetings."; b) Lecturer 2 added the use of online media and flexible scheduling based on student needs.

Challenges and Solutions

Lecturers faced challenges such as high workloads, large student numbers, and diverse student needs: a) These were addressed through collaborative problem-solving, technology use, and clear prioritization; b) Lecturer 2 added that revisions are an integral part of the academic process, which students must navigate with emotional support.

Emotional Impact and Personal Fulfillment

Lecturers expressed satisfaction through student progress: a) Lecturer 1: "My satisfaction is not just in the outcome, but in the process they go through."; b) Lecturer 2: emphasized that student success reflects the success of both the institution and the educator.

Interview Coding Results – Academic Staff Perspectives

Academic staff provided administrative and technical support perspectives for student research:

Administrative Support

Staff played a direct role in ensuring students' administrative processes ran smoothly: a) Staff 1: "Sometimes students struggle because they don't know the procedures or miss deadlines. We help them so they can continue with supervision or exams."; b) Staff 2: "We guide them step-by-step from the start to thesis submission, including document checks."

Time Management and Flexibility

Staff adjusted their schedules to assist students, especially near deadlines: a) Staff 3: "When it's close to the defense deadline, we're ready to work overtime or come early so students don't miss their schedule."; b) Staff 4: "Students often come suddenly, so we have to be ready anytime, even outside working hours."

Motivation to Provide Quality Service

Staff were driven by personal satisfaction in helping students succeed: a) Staff 2: "It feels great when the students we helped finally graduate. It's a source of pride."; b) Staff 4: "We may not be involved in the academic content, but helping them finish is part of our responsibility."

Proactive Communication

Staff took initiative in maintaining communication to ease student difficulties: a) Staff 1: "I usually remind them via WhatsApp if something's missing so they don't have to wait long."; b) Staff 3: "Sometimes I explain things one by one so they don't get confused, especially those doing their thesis for the first time."

Challenges in Service Delivery

Challenges included high student volume and lack of understanding of administrative procedures: a) Staff 1: "Close to submission deadlines, everyone comes at once it gets crowded, and the system slows down."; b) Staff 2: "Students are sometimes careless or ask things that were already explained, so we have to be patient and repeat ourselves."

Commitment to Service Quality

Staff recognized that good service supports academic success: a) Staff 3: "If we respond late, they might miss their thesis defense. We try to make sure everything's done on time."; b) Staff 4: "I see this as contributing to graduate quality if the process is smooth, the results will be better too." These findings reinforce that student success in completing final assignments also depends on effective administrative systems and support.

This study uses an explanatory sequential mixed methods approach that combines quantitative and qualitative analysis sequentially. The aim is to reveal the relationship between the effectiveness of guidance, motivation, time management, and student independence towards two important aspects in completing the final project, namely productivity and quality of research results. This approach allows researchers to obtain a comprehensive picture: quantitative data provides empirical evidence of the relationship between variables, while qualitative data deepens understanding of the meaning behind the numbers through narrative exploration of the experiences of students, supervisors, and academic staff.

The results of the quantitative analysis indicate that the effectiveness of guidance has a positive and significant effect on the quality and productivity of student research. This relationship is strengthened by qualitative findings from in-depth interviews, which reveal that the role of the supervisor is not only limited to administrative aspects, but also includes providing constructive feedback, emotional support, and intensive two-way communication. The active involvement of the supervisor is an important factor in increasing student motivation and building self-confidence to complete the final project. Students feel more confident and focused when the supervisor provides clear directions, monitors progress regularly, and is open to questions and discussions.

Student motivation has also been shown to have a significant influence on research productivity and quality. Quantitative findings show that the higher the motivation of students, the more likely they are to complete research with high quality and output. These results are consistent with qualitative data showing that students feel more enthusiastic in undergoing the research process when they receive recognition for their efforts, as well as support from supervisors, peers, and a positive academic environment. This support, both morally and academically, can increase student persistence in facing challenges during the process of compiling a final assignment.

In terms of independence, this study shows that students' ability to work independently, search for data, read references, and develop research ideas without high dependence on supervisors greatly contributes to the success of their final assignments. Quantitative analysis shows a strong relationship between the level of independence and the quality and productivity of research. Interviews with supervisors also confirmed that students who have high initiative tend to undergo a more efficient guidance process, because they do not only wait for direction, but also actively offer solutions and progress in their research. This independence, in many cases, grows from a supportive guidance process, as well as from students' intrinsic motivation to develop.

Time management is another important variable that has been shown to have a significant effect on research results. Students who are able to plan activities in a structured manner, set priorities, and are disciplined in carrying out schedules tend to complete their final assignments with better results, both in terms of quality and productivity (Goss, 2022; He et al., 2022; Oluyisola et al., 2022; Suleiman et al., 2024; Öztaş et al., 2024). This is reinforced by the results of interviews which show that students who prepare a research timeline from the start and consistently evaluate its progress, succeed in completing their research on time and with satisfactory results. Conversely, students who are less skilled in time management often experience obstacles in the form of delays, confusion in setting targets, and stress due to the piling workload (Lovin & Bernardeau-Moreau, 2022; Mehrad et al., 2023; Hared et al., 2025; White, 2025).

Regarding productivity and quality of research results, quantitative data shows that most students are in the "Good" and "Very Good" categories. This reflects that their research is not only successfully completed, but also shows relevant and quality outputs, such as publications, seminar results, and academically accountable written works. This study strengthens the previous theory that academic productivity is not the result of a single factor, but rather the accumulation of a number of internal and external variables that influence each other, including the effectiveness of guidance, motivation, time management, and independence. The synergistic interaction between these variables plays an important role in encouraging students to complete their final assignments optimally.

This study complements and expands the findings of Sitinjak & Canu (2023) regarding the effectiveness of guidance which emphasizes the importance of personal interaction between lecturers and students in the guidance process. In addition, these findings also enrich the study of Kim & Karau (2010) regarding research productivity by adding a more specific context, namely students of the MIPA study program in Indonesia. The multi-level approach used in this study emphasizes the need for collaboration not only between students and lecturers, but also involves the active role of academic staff as facilitators in supporting the smooth running of the final assignment process.

Practically, this study suggests the importance of developing a more structured, systematic, and integrative collaborative mentoring system. The collaborative mentoring model developed can be used as a reference for higher education institutions in designing final project mentoring policies that are more responsive to student needs. In addition, time management training, increasing learning motivation, and strengthening independence need to be included in the mentoring curriculum to support student academic success. Theoretically, this study strengthens the understanding that student success is not solely influenced by individual abilities, but is the result of a complex interaction between personal and environmental factors that shape the learning experience holistically.

CONCLUSION

Based on the results of the research and discussion that has been conducted, it can be concluded that the collaborative mentoring model applied in the implementation of final assignments in higher education involves a multi-level approach that includes the active role of students, supervisors, and institutional support. This model does not only focus on academic aspects, but also on strengthening communication, shared responsibility, and creating a mentoring environment that supports the involvement of all parties. Mentoring is carried out continuously with the principles of openness, dialogue, and systematic mentoring. Factors that influence the success of students' final assignment implementation include the effectiveness of mentoring, time management, motivation, and student independence. The effectiveness of mentoring affects the direction and quality of research, while time management and motivation are related to students' discipline and perseverance in completing each stage of the final assignment. Student independence also plays an important role in determining students' ability to make decisions, plan research, and solve challenges independently. The multi-level collaborative mentoring model has been shown to have a positive and significant effect on the quality and productivity of student research. Students involved in this model show improvements in terms of clarity of problem formulation, use of relevant theories, validity of instruments, and achievements of research outputs such as publications and scientific seminars. In addition, student productivity also increases along with the emotional, academic, and administrative support provided in an integrated manner.

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AUTHOR CONTRIBUTIONS

Authors 1-3 wrote the article and created the instrument and were responsible for the research, author 4 assisted in research data analysis, instrument validation and research data input.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

REFERENCES

Adeoye, M. A. (2024). Mastering the basics: A guide to research methodology for effective writing and publication. *Chalim Journal of Teaching and Learning*, *4*(1), 30-41. https://doi.org/10.31538/cjotl.v4i1.1345.

Alamri, Y., Monasterio, E., Beckert, L., & Wilkinson, T. J. (2021). Intrinsic vs extrinsic motivation as drivers for early engagement in research by medical students. *Advances in medical education and practice*, 189-194. https://doi.org/10.2147/AMEP.S295909.

AlQhtani, F. M. (2025). Knowledge management for research innovation in universities for sustainable development: A qualitative approach. *Sustainability*, *17*(6), 2481. https://doi.org/10.3390/su17062481.

Bandara, K. M. N. T. K., & Hettiwaththage, R. C. (2025). The Interplay of Intrinsic and Extrinsic

Motivation in Academic Achievement: A Comprehensive Review. *Sri Lanka Journal of Social Work*, *9*(2). https://doi.org/10.4038/sljsw.v9i2.24.

Bryda, G., & Costa, A. P. (2023). Qualitative research in digital era: innovations, methodologies and collaborations. *Social Sciences*, *12*(10), 570. https://doi.org/10.3390/socsci12100570.

Calonia, J. T., Pagente, D. P., Desierto, D. J. C., Capio, R. T., Tembrevilla, J. A. P., Guzman, C. A., & Nicor, A. J. S. (2023). Time Management and Academic Achievement: Examining the Roles of Prioritization, Procrastination and Socialization. *Online Submission*, *8*(6), 766-775. https://doi.org/10.5281/zenodo.8115965.

Chugh, R., Macht, S., & Harreveld, B. (2022). Supervisory feedback to postgraduate research students: a literature review. *Assessment & Evaluation in Higher Education*, *47*(5), 683-697. https://doi.org/10.1080/02602938.2021.1955241.

Coker, D. C. (2022). A Thematic Analysis of the Structure of Delimitations in the Dissertation. *Online Submission*, *17*, 141-159. https://doi.org/10.28945/4939.

Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluation Quantitative and Qualitative Research 4th Edition*. Pearson Education, Inc.

Gebremedhin, M., Gebrewahd, E., & Stafford, L. K. (2022). Validity and reliability study of clinician attitude towards rural health extension program in Ethiopia: exploratory and confirmatory factor analysis. *BMC health services research*, *22*(1), 1088. https://doi.org/10.1186/s12913-022-08470-9.

Goss, H. (2022). Student learning outcomes assessment in higher education and in academic libraries: A review of the literature. *The Journal of Academic Librarianship*, *48*(2), 102485. https://doi.org/10.1016/j.acalib.2021.102485.

Hair. (2019). *Multivariate Data Analysis, Eighth Edition*. In Annabel Ainscow.

Hared, K. M., Goje, K., & Haq, F. H. I. U. (2025). Psychological stress and its management in the light of prophetic tradition: a case study of first-year students-university of sharjah. *Al-Bayan: Journal of Qur'an and Hadith Studies*, *23*(2), 155-188. https://doi.org/10.1163/22321969-20250170.

He, C., Liu, M., Alves, T. D. C., Scala, N. M., & Hsiang, S. M. (2022). Prioritizing collaborative scheduling practices based on their impact on project performance. *Construction management and economics*, *40*(7-8), 618-637. https://doi.org/10.1080/01446193.2022.2048042.

Homaidi, A. (2019). Perancangan dan implementasi e-thesis untuk tugas akhir mahasiswa universitas ibrahimy situbondo [Design and implementation of e-thesis for final assignment of Ibrahimy University Situbondo students]. *NJCA (Nusantara Journal of Computers and Its Applications)*, *4*(1), 15–26. https://doi.org/10.36564/njca.v4i1.109

Husain, H., & Aziz, H. (2022). Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to measure the validity and reliability constructs of historical thinking skills, Tpack, and application of historical thinking skills. *International Journal of Education, Psychology, and Counseling*, *7*(46), 608-623. https://doi.org/10.35631/IJEPC.746046.

Hussein, B. (2021). Addressing collaboration challenges in project-based learning: The student's perspective. *Education Sciences*, *11*(8), 434. https://doi.org/10.3390/educsci11080434.

Khoa, B. T., Hung, B. P., & Hejsalem-Brahmi, M. (2023). Qualitative research in social sciences: data collection, data analysis and report writing. *International Journal of Public Sector Performance Management*, *12*(1-2), 187-209. https://doi.org/10.1504/IJPSPM.2023.132247.

Kim, K., & Karau, S. J. (2014). Working environment and the research productivity of doctoral students in management. *Journal of Education for Business*, *85*(2), 101–106. https://doi.org/10.1080/08832320903258535

Kordzanganeh, Z., Bakhtiarpour, S., Hafezi, F., & Dashtbozorgi, Z. (2021). The relationship between time management and academic burnout with the mediating role of test anxiety and self-efficacy beliefs among university students. *Journal of Medical Education*, *20*(1), e112142. https://doi.org/10.5812/jme.112142.

Li, Y., Wei, Y., Liang, X., & Dou, X. (2025). The patients' presupposed distrust to doctors in China: An explanatory sequential mixed methods study. *Patient Preference and Adherence*, 349–359. https://doi.org/10.2147/PPA.S446630.

Lovin, D., & Bernardeau-Moreau, D. (2022). Stress among students and difficulty with time management: A study at the university of Galați in Romania. *Social Sciences*, *11*(12), 538. https://doi.org/10.3390/socsci11120538.

Marson, J., & Ferris, K. (2023). How supervisors can support doctoral students to publish and not perish

in academia. *Encyclopedia*, *3*(4), 1358-1372. https://doi.org/10.3390/encyclopedia3040097.

Mehrad, A., Bouzedif, M., Kodithuwakku, T. K., George, N., Rweramila, S. E. H., & Cheraghsepehr, M. (2023). Managing educational stress and coping with conflicts among undergraduate. *Jurnal Pendidikan*, *11*(04), 146-165. https://doi.org/10.17977/um011v11i042023p146-165.

Miller, D. (2021). The best practice of teach computer science students to use paper prototyping. *International Journal of Technology Innovation and Management (IJTIM)*, *1*(2), 42-63. https://doi.org/10.54489/ijtim.v1i2.17.

Musendekwa, M. (2025). Unveiling the foundations of quality research in higher education: a contemporary perspective. In *Higher Education and Quality Assurance Practices* (pp. 421-454). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6765-0.ch015.

Oluyisola, O. E., Bhalla, S., Sgarbossa, F., & Strandhagen, J. O. (2022). Designing and developing smart production planning and control systems in the industry 4.0 era: a methodology and case study. *Journal of Intelligent Manufacturing*, *33*(1), 311-332. https://doi.org/10.1007/s10845-021-01808-w.

Oparinde, K. (2021). Postgraduate Supervision: A Heuristic Approach to Learning, Unlearning, and Relearning. *Asian Journal of University Education*, *17*(4), 243-250. https://doi.org/10.24191/ajue.v17i4.16202.

Öztaş, G. S., Akçapınar, G., Hasnine, M. N., & Er, E. (2024). Understanding high and low-performing students' time management strategies through assignment submission patterns. *Procedia Computer Science*, *246*, 3503-3511. https://doi.org/10.1016/j.procs.2024.09.206.

Petrakis, K., Wodehouse, A., & Hird, A. (2021). Physical prototyping rationale in design student projects: an analysis based on the concept of purposeful prototyping. *Design Science*, *7*, e7. https://doi.org/10.1017/dsj.2021.6.

Ponomariovienė, J., & Jakavonytė-Staškuvienė, D. (2024). Solutions for independent goal setting and implementation of primary school students fostering the competence of learning to learn. *Education sciences*, *14*(4), 368. https://doi.org/10.3390/educsci14040368.

Pranitasari, D., & Maulana, I. (2022). Intrinsic and extrinsic factors affecting student motivation in completing thesis. *Technium Soc. Sci. J.*, *27*, 527. https://doi.org/10.47577/tssj.v27i1.5473.

Qin, Z., & Ding, M. (2024). Reflections on educational reform supporting build China into a world leader in science and technology. *Engineering Education Review*, *2*(1), 19-27. https://doi.org/10.54844/eer.2023.0503.

Sanchez, W. K., & Abo, C. (2025). Research culture and productivity of STEM teachers and students: Basis for research intervention program. *Journal of Interdisciplinary Perspectives*, *3*(3), 203-215. https://doi.org/10.69569/jip.2025.019.

Saputra, D., Haryani, H., Surniadari, A., Martias, M., & Akbar, F. (2022). Sistem informasi bimbingan tugas akhir mahasiswa berbasis website menggunakan metode waterfall [Website-based student final assignment guidance information system using the waterfall method]. *MATRIK : Jurnal Manajemen, Teknik Informatika Dan Rekayasa Komputer*, *21*(2), 403–416. https://doi.org/10.30812/matrik.v21i2.1591.

Sapiro, B., Shpiegel, S., Ramirez Quiroz, S., Ventola, M., Nwankwo, O. H., & Munyereyi, T. (2025). "It's just hard reaching out": Factors affecting help-seeking behaviors among independent college students. *Journal of College Student Retention: Research, Theory & Practice*, *27*(1), 131-156. https://doi.org/10.1177/15210251231159642.

Shengyao, Y., Salarzadeh Jenatabadi, H., Mengshi, Y., Minqin, C., Xuefen, L., & Mustafa, Z. (2024). Academic resilience, self-efficacy, and motivation: the role of parenting style. *Scientific reports*, *14*(1), 5571. https://doi.org/10.1038/s41598-024-55530-7.

Sinaga, D. (2025). Innovative instructional models: Leveraging independent study in online information ecosystems. *Journal of Information Systems Engineering and Management*, *10*(9), 170-187. https://doi.org/10.52783/jisem.v10i4.8985.

Sitinjak, C., & Canu, Z. (2023). The importance of guidance and counseling in effective school learning. *Jurnal Ilmiah Global Education*, *4*(1), 12-19. https://doi.org/10.55681/jige.v4i1.516.

Suárez-Lantarón, B., Castillo-Reche, I. S., & López-Medialdea, A. (2023). Development and validation of a measuring instrument for the improvement of university guidance and tutoring. *Social Sciences*, *12*(2), 56. https://doi.org/10.3390/socsci12020056.

Suleiman, I. B., Okunade, O. A., Dada, E. G., & Ezeanya, U. C. (2024). Key factors influencing students' academic performance. *Journal of Electrical Systems and Information Technology*, *11*(1), 41.

https://doi.org/10.1186/s43067-024-00166-w.
Sugiar, L., Sukirman, S., & Sanusi, S. (2024). Academic supervision as a strategy for improving teaching and learning quality. *International Journal of Educational Administration, Management, and Leadership*, 31-48. https://doi.org/10.51629/ijeamal.v5i2.205.
Valente, S., Dominguez-Lara, S., & Lourenço, A. (2024). Planning time management in school activities and relation to procrastination: A study for educational sustainability. *Sustainability*, *16*(16), 6883. https://doi.org/10.3390/su16166883.
Weallans, J., Roberts, C., Hamilton, S., & Parker, S. (2022). Guidance for providing effective feedback in clinical supervision in postgraduate medical education: a systematic review. *Postgraduate Medical Journal*, *98*(1156), 138-149. https://doi.org/10.1136/postgradmedj-2020-139566.
White, R. (2025). *The stress management workbook: De-Stress In 10 Minutes or less*. Sourcebooks, Inc.
Yavich, R. (2025). Will the Use of AI Undermine Students Independent Thinking?. *Education Sciences*, *15*(6), 669. https://doi.org/10.3390/educsci15060669.