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Character Development in Higher Education Through Seamless Problem-Based Learning Based on Ki Hajar Dewantara's Philosophy

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Abstract - **As universities are expected to produce students with strong moral principles and social responsibility in addition to great academic abilities, character development has become an important concern in these institutions. The use of Problem-Based Learning (PBL) has been widely implemented to develop higher order thinking and character, but the educational concepts of Ki Hajar Dewantara (KHD) have not been systematically incorporated into modern frameworks. The objective of this study is to strengthen the character of university students by incorporating KHD philosophy into a higher Seamless Problem-Based Learning (Seamless-PBL) model. The study used a quasi-experimental, randomized pretest-posttest-control group design including 84 undergraduate students who were randomly assigned to an experimental group (n = 42) and a control group (n = 42). Character of students was measured using a validated questionnaire that was based on the three main principles of Ki Hajar Dewantara. Data were analyzed using Analysis of Covariance (ANCOVA) to control baseline differences across groups. Descriptive data showed that the control group pretest mean was 49.40 (standard deviation = 13.05) while the experimental group mean was 51.45 (standard deviation = 16.05). After the intervention, the character assessment ratings of the experimental group were significantly higher than those of the control group (M = 92.17, SD = 17.11 vs. 60.71, SD = 20.02). Significant impact of the intervention was also confirmed by ANOVA after adjustment for data at pretest (F = 64.110, p < 0.001). Based on these data, it can be concluded that the use of Seamless Problem-Based Learning with the educational ideas of Ki Hajar Dewantara may improve the character development of students compared to traditional education. It gives empirical support to the effect that the combination of innovative teaching techniques with the local educational philosophies is a more realistic alternative for the enhancement of character education in higher education and the development of culturally suitable learning models.**

Keywords: **Student Engagement, Educational Philosophy, Pedagogical Model, Learning Outcomes, Learning Combination, Higher Education Students**

I. INTRODUCTION

This context is mainly based on the way to advance education, which has become the most frequent and reliable method for increasing individual skills. Higher education is a strategic institution and should not only concern itself with producing intelligent graduate students but also instill character-building in relation to national values. This is because the development of student character in this respect is an integral dimension of educational theory and practice, as literacy education focuses on building cognitive competence as well as competency skills (Manik et al., 2025). Values education is an important aspect of an education system that trains students to become more responsible, moral, and compassionate citizens of society. However, to date, studies show traits of moral degradation among tertiary students. With the decline in the quality of university students' education, teaching needs special methods.

The approaches, tactics and evaluation systems in line with character education may reinforce the learning character values (Khilmiyah & Wiyono, 2021; Sukarno & Riyadini, 2024). PBL is one of the successful learning methods that aims to improve the higher order thinking abilities and the character building of pupils. According to (Saepuloh et al., 2021) studies show that the implementation of PBL model is good for character development in higher education. Project based learning (PBL) is more focused on character, which enhances both students' character and their capacity to think critically. Not only PBL technique but also Seamless Learning (SL) is used in learning in higher education. The use of the seamless learning model to college students affirms the validity of the approach (Yafie et al., 2020). Previous studies' findings demonstrate that primary school children benefit from the data-driven scaffolding provided by the seamlessly included PBL scenario, as well as the enhanced convergence of multidisciplinary knowledge, basic competences, and intrinsic desire. Previous study has shown that there are still gaps in the adoption of SEL in student character.

Indonesian students' character is greatly influenced by the educational values set by KHD (Dewi et al., 2025). This philosophy has been the basis of character education in Indonesia for a long time. However, empirical studies on the extent to which Dewantara's values are implemented in higher education have been limited. Virtually all studies are descriptive or conceptual, and there are still no practical models that contain local character values as an integrated

part of innovative problem-based learning or technique-based learning. Thus, the uniqueness of this research is found in the creation and practical assessment of the Seamless Problem-Based Learning Model that incorporates Ki Hajar Dewantara's educational beliefs. The concepts of in the presence of an example, in the middle of want and in the midst of desire are systematically interwoven throughout the Seamless-PBL framework. To differ from previous studies on PBL, Seamless Learning, or KHD philosophy, this study presents and tests a culture-based instructional model that integrates innovative teaching methods and the indigenous educational philosophy of Indonesia in character development in higher education.

Aside from its uniqueness, this research offers multiple clear contributions to the areas of higher education and character education. To begin with, it adds to theory by broadening the connection between Problem-Based Learning and Seamless Learning through the inclusion of Ki Hajar Dewantara's educational philosophy. This results in a more culturally relevant teaching framework for character growth. Next, it makes a higher methodological contribution by creating and validating, through research higher six-step Seamless Problem-Based Learning model. In this model, the ideas of in the presence of an example, in the midst of desire, and in the midst of desire are systematically integrated into every teaching phase and assessed through a higher quasi-experimental approach. Finally, it has practical implications by equipping educators and higher educational institutions with a higher model based on evidence that mixes innovative teaching methods with local educational traditions to enhance students' character development. These contributions build upon earlier research, which typically looked at Problem-Based Learning, Seamless Learning, and Ki Hajar Dewantara's philosophy of isolation, lacking a higher validated teaching framework that combines all three aspects.

Given this context, the present study seeks to explore how effective the Seamless Problem-Based Learning Model combined with Ki Hajar Dewantara's philosophy are of enhancing students' character. As a result, the primary research question is:

1. How does the implementation of the Seamless Problem-Based Learning Model integrated with Ki Hajar Dewantara's philosophy influence the character development of students of higher education?

The paper is written methodically to offer higher comprehensive overview of character building in higher education by using the Seamless Problem-Based Learning Model integrated with the KHD Philosophy. The introduction in paragraph one tells about the significant function of character in higher education; thus, it are required higher unique method of learning is required because of the fall in the quality of student character in higher education. The second paragraph refers to prior studies on the learning methodologies of PBL and SL in building character. The second paragraph discusses past studies on learning methodologies, such as PBL and SL, for character development. But there are still limitations in the implementation of the combination of PBL and SL in developing students' character. The third paragraph tells us that character development incorporates the concept of KHD. Thus, the innovation of this studies are the implementation of the Seamless Problem-Based Learning model by incorporating the principles of KHD character.

Section I is the introduction that describes the general introduction; research significance highlights the relevance of the study and identifies gaps; unique contributions discuss the writing format and arrangement of the article. Section II is the literature review on PBL, Seamless Learning, Ki Hajar Dewantara's Philosophy, and Student Character. Section III describes the technique, including the technical contribution of the studies from the start to data processing. Section IV clearly discusses the study's findings acquired from the data processing that was undertaken and analyzed. Section V is devoted to the extensive discussion section on the acquired findings. Finally, the section VI is the conclusion, which briefly states the key findings acquired from the investigation.

II. LITERATURE REVIEW

Discovering PBL is an approach to student-centered instruction that begins with the consideration of more serious real-world problems. PBL has demonstrated its effectiveness in promoting critical thinking, problem-solving, communication, and collaboration as relevant competencies of higher education (Liu & Pásztor, 2022). In the PBL approach, students are required to learn mainly on their own initiative, with help from the facilitator and cooperation of a small group, which could indirectly foster character values, for instance, more responsible, sincere, and cooperative attitudes (Jiang et al., 2026). In addition to improving academic performance, further research has shown that problem-based learning (PBL) helps cultivate the kind of character traits that are essential in the modern world (Hakim et al., 2025). An effective approach that goes beyond conventional education, Problem-Based Learning (PBL) is used in university courses taken on campus to foster critical thinking skills among students. Cognitive results (critical thinking) and professional judgment seem to be significantly impacted by PBL, according to program comparison studies (Ge et al., 2025). PBL implementation in higher education is hindered by scarce face-to-face learning time, a lack of continuity of learning outside the classroom, and the non-optimal use of technology. This suggests that the capacity of PBL to build character among students is not optimal. Thus, PBL needs to be consolidated with other learning strategies that can enrich the dimension of space and time in students to promote continuous learning. Although many studies have proven that Problem-Based Learning (PBL) helps enhance cognitive skills, critical thinking, and teamwork abilities, few have looked at its role in promoting character development within a higher culturally based teaching framework. Additionally, existing research on PBL has mostly viewed character development as a minor

outcome and has seldom included indigenous educational philosophies in its instructional design. This gap highlights the necessity of a higher, more comprehensive PBL model that nurtures cognitive, social, and character growth simultaneously.

SL transcends the limitations of different learning contexts, supporting the construction of a ubiquitous learning environment and realizing the educational vision at any time and from anywhere by allowing learners to interact with learning resources of both formal and informal contexts (Ma & Wu, 2025). SL are higher new concept and an adaptable framework that links formal and informal learning, or learning within and outside classrooms, by overcoming space-time limitations (Rindaningsih et al., 2025). Essentially, seamless learning provides an opportunity for students to work together with their peers, engaging with the learning resources around them as a higher part (Shu & Gu, 2023). This concept of seamless learning can help students learn in a more continuous way across digital, real-world, and society environments. With such a strategy, students' learning never ends with class but carries on throughout their lives. SL is the continuity of learning that transcends space, time, technology, or social settings as a transition between different contexts (Adinugra et al., 2025). The fusion of teaching and learning seamlessly under the PBL model has promised more possibilities to improve students' reflection, investigation, and character value internalization process. The students are not only confronted with the solution of theoretical problems, but also question them through life experiences in social work and education. Of the student of higher education, this is particularly pertinent, as teachers of training must understand their role in independent, adaptive, and reflective learning. Accordingly, SL serves as a higher pedagogical approach to technology-based learning, but also contributes to personality development through relevant and engaging opportunities (Ma & Wu, 2025). Even though Seamless Learning shows promise of encouraging ongoing and tech-enhanced education, the majority of studies have concentrated mainly on academic results, student involvement, and self-directed learning. There has been limited focus on its potential to enhance character education, especially when it is combined with culturally pertinent teaching philosophies. As a result, there are higher lack of empirical evidence concerning the influence of Seamless Learning on character building in higher education settings.

One of the national moral principles is KHD, and enhancing character education in the classroom should not be divorced from this. Education, according to KHD teachings, should guide each student's inherent talents toward the full realization of their potential as individuals and members of society. Character education is necessary to establish moral principles and accountability in the digital age, according to KHD educational philosophy, which prioritizes balanced personality development through three forms of education: Ing Ngarso Sung Tulodo, Ing Madya Mangun Karso, and Tut Wuri Handayani. Responsibility, kindness, trustworthiness, truthfulness, nurturing obedience, and self-reliance are the honesty and discipline values of character education that are based on the KHD three pillars. These principles are highly effective in molding students into good individuals (Astuti et al., 2023). These are important values of purpose of molding students in higher education. However, in reality, the values of KHD remain abstract and are not being applied in a proper higher learning model. This idea implies that the trilogy principle could be used as a higher strategy to develop character education, which encourages students' independence and empowerment. As such, higher learning design that can internalize these values transculturally is required, in a way that students not only know but can internalize and apply them to their academic as well as personal lives. In addition, the educational and social context determines a great deal of the formation of personality, as family, school, and community interactions can reinforce such leadership values and responsibilities of pupils. While Ki Hajar Dewantara's philosophy has historically been the cornerstone of character education in Indonesia, most previous research has remained either theoretical or descriptive. Few empirical studies put into practice the principles of in the presence of an example, in the midst of desire, and in the midst of desire through an inventive teaching model. Consequently, there are higher lack of evidence on how these philosophical principles can be effectively applied and assessed in modern higher education classrooms.

The process of integrating PBL with the SL model and the KHD character education value are an exercise in instilling students' attitudes. PBL is regarded as a new mode of learning that has been demonstrated in countless studies to promote students' self-regulated learning, problem-solving ability, and critical thinking, along with communication skills (Lee & Jung, 2025). PBL offers opportunities for students to come to teach and learn based on real-world problems. While there is no recognized definition of seamless learning, it is the process of learning that continues uninterrupted. The values of KHD can also be internalized by lecturers, such as a higher mentor who accompanies rather than pushes, and through cooperative behavior that means responsibility and concern. As a higher form of self-regulated learning, students must be able to regulate and evaluate the problem-solving process, such as setting study goals, building work plans, choosing and evaluating learning resources, searching for relevant ideas to generate alternative answers, and thinking about results achieved (Carrió et al., 2022). In this way, students learn how to think for themselves and respect the views of others, and how to consider their actions within a higher moral compass continually. Higher learning models such as this one are also believed to form the character of students who are not only intellectually smart but also have noble character and an educational spirit. For this reason, learning is no longer only class-bound, but is a process of ongoing cultural values following the philosophy of national education.

The adoption of an appropriate model of learning can nurture students to become professional educators with sound

character. The moral decay of social responsibility in the education system during the crisis requires graduates to not only be theoretical educators, but also possess integrity and moral character. More results link PBL-based contextual learning and problem-solving skills, as proven by previous studies, so that lately it is relevant to be associated with a seamless learning model to plant character in students through KHD teachings. Previous studies have shown that PBL is effective in enhancing higher-order thinking skills, and it has the potential to be developed through a more seamless learning approach in establishing students' character, as referred to in KHD teachings. PBL model based on KHD philosophy integrated with SL is considered to have the power to address these challenges. As learned through the PBL method, students intentionally learn to understand educational truths, make the principles part of themselves, and become reflective and empathetic. Several previous studies showed that online project-based collaborative learning could improve problem-solving skills, which connects to the goal of developing a higher PBL model on a higher seamless range of order to strengthen character-building students based on KHD teachings (Yunus et al., 2021). Furthermore, technology used of seamless learning fosters learning that is not only flexible and collaborative but also relevant to the digital generation's perspective (Dakir et al., 2021). In this way, higher education can become a higher learning environment that will not only impart knowledge but also help to form the character of future teachers based on the dignified values of Indonesia.

Literature points to PBL as beneficial for boosting higher-order thinking, Seamless Learning as effective in continuous and situated learning, and the idea of Ki Hajar Dewantara as providing a solid platform for character education. However, these three fields of study have mostly grown in parallel. To date, there has been no research that has developed and evaluated the model experimentally by combining the three components of Problem-Based Learning, Seamless Learning, and Ki Hajar Dewantara's educational philosophy into one unified teaching model for character development in tertiary education. This research gap are higher great foundation for developing the Seamless Problem-Based Learning Model coupled with the concept of Ki Hajar Dewantara and testing its efficacy via a quasi-experimental investigation. Thus, the current investigation fills this gap and provides an empirically confirmed, culturally based educational model that extends prior character education results in higher education contexts.

III. METHODOLOGY

3.1 Research Design

The design of this studies are quasi-experimental, with the model of Randomized Pretest – Posttest Control Group Design. The design was selected because it enabled the study to employ random assignment, control treat stress with the intervention, implement a higher Seamless Problem-Based Learning Model Combined with KHD Philosophy, and then compare one group against another group in an objective manner. Fig. 1 below will display the conceptual framework.

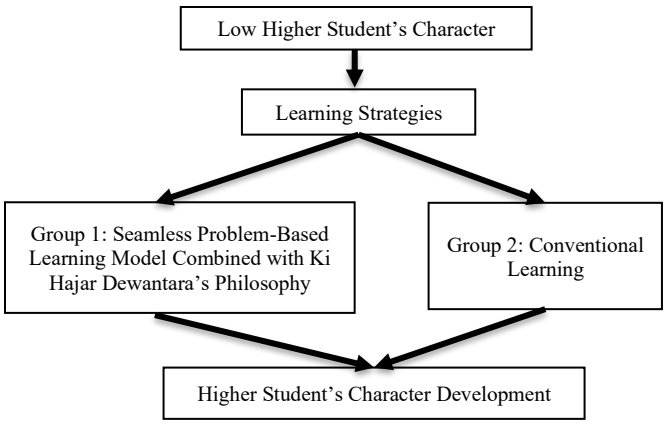


Fig. 1 Conceptual Framework

Source. Developed by the Writer

Fig. 1 presents the conceptual framework of the present study to develop student character. Previous studies have shown a significant decline in student character. To address this, learning strategies are needed. Therefore, the present study implemented two learning models: the Seamless Problem-Based Learning Model Combined with Ki Hajar Dewantara's Philosophy and the Conventional Learning Model as solution concepts in developing student character.

3.2 Sample and Data Collection

The participants will be students of the Educational Technology Undergraduate Program at the State University of Surabaya. The sample criteria are students attending the Learning Model course with reasonably homogeneous academic features, selected using a purposive sampling approach. Sampling was carried out in phases by determining the classes that matched the inclusion requirements by coordinating with study programs and selection based on academic data. An information sheet about the study was given to those who fit the criteria, and to be requested to sign an informed consent form. Existing classes (intact groups) will be distributed across equivalence terms to establish experimental and control groups. The instruments to be employed will be the respondent identification sheets, student academic data, and informed permission forms.

Additionally, documentation criteria will be implemented to systematically record the sample selection procedure to improve transparency and reproducibility of the study. According to these criteria, 84 topics were selected from Class A (42 students) and Class B (42 students). The experimental group was class A and the control group was class B, where the treatment group was applied the Seamless Problem-Based Learning Model Combined with the Philosophy of KHD, while the control group was applied the conventional learning model.

The philosophical values of the Among System KHD consist of three aspects (Azis et al., 2022). Based on these 3 aspects,

the character indicators are seen from Ing Ngarsa Sung Tuladha (Exemplary, discipline, responsibility, integrity); Ing Madya Mangun Karsa (Cooperation, empathy, participatory leadership, and social motivation); and Tut Wuri Handayani (Independence, self-motivation, personal responsibility, perseverance), so that a higher character instrument can be invented. The treatment was conducted in 6 sessions and 6 phases. The tools are shown in table I. The tools in the character assessment are presented in table II. The instrument was evaluated and re-tested in dependability, and 2 experts validated its validity before the study was completed. The Seamless Problem-Based Learning Model Combined with Philosophy questionnaire developed by Ki Hajar Dewantara has a very high level of validity, with an Aiken's V of 0.878 and a higher Cronbach's alpha of 0.93. Based on the concept of Ki Hajar Dewantara, the student character questionnaire has an Aiken's V of 0.97, which is considered extremely valid. The reliability level is strong, with a higher Cronbach's Alpha of 0.94. In light of these findings, the instrument was deemed appropriate for research. Pre- and post-treatment assessments of students' character traits are to be conducted.

TABLE I SYNTAX SEAMLESS PROBLEM- BASED LEARNING MODEL COMBINED WITH KI HAJAR DEWANTARA'S PHILOSOPHY

Phase	Learning Syntax	The Role of Lecturers	Student Activities	Among System Aspects	Seamless Elements Learning
1	Problem orientation & role model	Convey goals, character values, and authentic issues; demonstrate exemplary behavior (discipline, honesty, responsibility)	Listening to problems, observing the lecturer's exemplary behavior, and identifying the main issues	Exemplary discipline, responsibility, integrity	Access videos, news, online articles about real issues
2	Problem formulation & learning planning	Guiding problem formulation, directing learning resources, emphasizing academic honesty	Formulate key problems & questions, develop learning plans, divide group roles	Exemplary, discipline, responsibility, integrity	LMS, Google Scholar, online discussion forums
3	Collaborative investigation	Facilitate discussion, provide feedback, motivate students	Search and analyze information, discuss, share findings	Cooperation, empathy, participatory leadership, and social motivation	Online–offline discussions, Google Docs, WhatsApp, LMS
4	Solution development & presentation	Facilitate solution development, provide direction as needed, assess processes & products	Develop data-based solutions, create products (reports/videos/posters), present results	Cooperation, empathy, participatory leadership, and social motivation	Digital products, hybrid presentations (offline – online)
5	Reflection & strengthening independence	Provide moral reinforcement, appreciation, and personal feedback	Conduct individual & group reflection, evaluate the process and character of self	Independence, self-motivation, personal responsibility, perseverance	E- journal, reflection blog, online feedback
6	Follow-up & character internalization	Assigning contextual follow-up projects, providing space for independent exploration	Applying learning outcomes of real life, documenting experiences	Independence, self-motivation, personal responsibility, perseverance	Community-based projects, digital documentation

Source. Developed by the Writer

Table I explains that this study used six syntaxes of its learning implementation. Next, the student character questionnaire will be explained.

TABLE II STUDENT CHARACTER BASED ON KI HAJAR DEWANTARA'S PHILOSOPHY

No	Aspect
	Exemplary, discipline, responsibility, integrity
1	I try to be a role model to my friends in attitude and behavior.
2	I always arrive on time in lectures and other academic activities.
3	I maintain honesty in doing assignments, exams, and academic activities.
4	I show polite, courteous behavior to lecturers, staff, and friends.
5	I am responsible in every task given to me.
6	I am consistent between my words and actions.
7	I comply with the rules and regulations that apply on campus.
8	I try to set an example of positive behavior in group work.
	Cooperation, empathy, participatory leadership, and social motivation
1	I actively contribute to discussions and group work.
2	I respect my friends' opinions even if they differ from mine.
3	I help create higher conducive learning atmosphere in the group.
4	I encourage my friends to stay enthusiastic about completing the assignment together.
5	I am willing to help friends who are having difficulty learning.
6	I am open to criticism and suggestions from friends and lecturers.
7	I try to maintain unity of the team.
8	I can work together with friends from different backgrounds.
	Independence, self-motivation, personal responsibility, perseverance
1	I am able to study independently without always having to be guided by the lecturer.
2	I still try to complete the task even though I face difficulties.
3	I have high motivation to improve my academic achievement.
4	I believe in my own ability to solve problems.
5	I am responsible of academic decisions I make.
6	I manage my study time well.
7	I still maintain my enthusiasm for learning even though the results I get are not yet satisfactory.
8	I try to improve myself from the mistakes I have made.

Source. Developed by the Writer

Table II shows that the questionnaire to measure student character consists of 3 aspects with 8 statements in each aspect, so that the total number of statements is 24.

3.3 Analyzing Data

The data were analyzed using ANOVA. This analysis was used to compare students' character scores on the posttest between experimental and control groups, with initial (pretest) scores of character treated as a covariate. Of course, if there are higher baseline difference, then you can hardly measure the impact or power of the model, and ANOVA was used to account for any difference at the very baseline. In this way, variations in last-character scores are due to the learning intervention and not to differing initial abilities.

IV. RESULTS

4.1 Descriptive Results

The findings of the studies to be produced on the basis of higher research sample of 84 students of the age of 19-20 years. In terms of age distribution, 46 students (54.8%) were 19 years old, and 38 students (45.2%) were 20 years old. The respondents were dominated by female respondents, precisely 49 students (58.3%) compared to male respondents who numbered 35 students (41.7%). This composition shows that the study sample is quite homogeneous in terms of demographic characteristics and in line with the student situation. Some statistics will be given based on the outcomes of the investigation.

TABLE III DESCRIPTIVE RESULTS

		N	Mean	SD	Std. Error	95% CI in Mean		Min	Max
						Lower Bound	Upper Bound		
Pretest	Control	42	49.40	13.050	2.014	45.34	53.47	24	70
	Treatment	42	51.45	16.046	2.476	46.45	56.45	24	88
	Total	84	50.43	14.573	1.590	47.27	53.59	24	88
Posttest	Control	42	60.71	20.022	3.090	54.47	66.95	26	105
	Treatment	42	92.17	17.106	2.640	86.84	97.50	55	120
	Total	84	76.44	24.349	2.657	71.16	81.72	26	120

Source. SPSS 26

Descriptive statistics table III shows that pretesting scores to be 49.40 (mean) ± 13.050 (SD) of control group (n=42) and mean of 51.45±16.046 (SD) of treatment group at the same process level during pre-service time based on self-contribution evaluation scale data collected over analysing of observation forms filled by trainee classroom teachers and cooperated. However, the pretest mean difference between the control and treatment groups is minimal, which indicates that the levels of proficiency are more or less identical in both the test and control groups before the start of the trial. The fact that the range of scores of the control group was 24-70 and of the treatment group 24-88 lends credence to this idea. In contrast to the control group's posttest mean score of 60.71 and standard deviation of 20.02, the treatment group's posttest mean score was 92.17 (27.11). The findings suggested that both groups had higher scores. But the treatment group observed substantially bigger gains than the control group. The lowest score indicated on the posttest was from 26-105 of control groups but of treatment groups to be from 55-120. It implies that most of them tgeter obtained higher scores when they received the services.

4.2 Pretest and Posttest Results

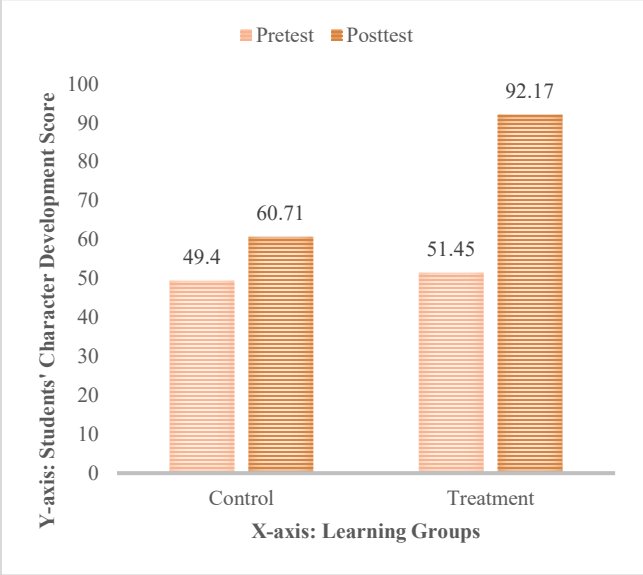


Fig. 2 Graph of Pretest and Posttest Results

Fig. 2 displays the results of the pretest and posttest, revealing higher disparity in the outcomes between the two. The difference between the pretest and posttest scores is larger in the therapy group.

4.3 Homogeneity Results

TABLE IV HOMOGENEITY RESULTS

	Levene Statistic	df1	df2	Sig.
Pre Test	1.576	1	82	0.213
Posttest	0.541	1	82	0.464

Source: SPSS 26

Both the pre- and posttest data are assumed to be homogeneous of variance, according to the results of the homogeneity of variance test shown in table IV. There is no statistically significant difference in variance between the control and treatment conditions, as shown by the pretest variable's p-value of 0.213 > 0.05. Similarly, for the posttest variable, the significance value of Levene's Test was (0.464 > 0.05), which means that the variance of posttest scores among groups is homogeneous. It can be concluded that homogeneity of the data was retained between groups and steps refer to: pretest and posttest.

4.4 The linearity Results

TABLE V THE LINEARITY RESULTS

	Sum of Squares	df	Mean Square	F
Deviation from linearity	5.940	34	0.175	0.561

Source. SPSS 26

The linearity strategy of table V resulted in a higher df error of 0.561 as an F-value, and hence a higher divergence from the linearity score. This means that the connection between both variables is linear and close to it. Hence, the linearity assumption of the ANOVA analysis is fulfilled; that is, the relationship between pretest and posttest scores is linear. Therefore, ANOVA may serve this investigation, and the findings can be understood accurately.

4.5 Scatterplot of Residual and Predicted in Posttest

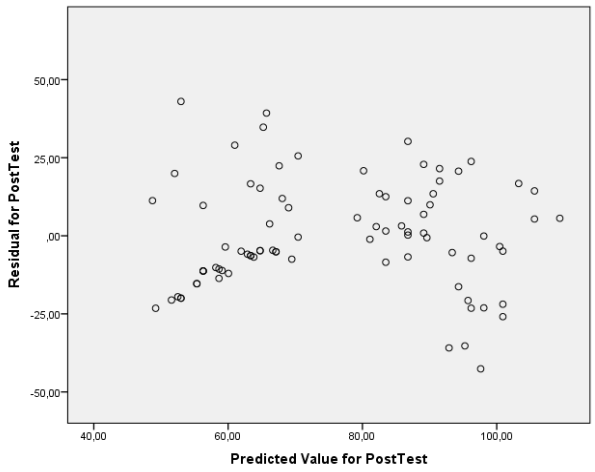


Fig. 3 Scatterplot of Residuals and Predicted Values in Posttest

Source. SPSS 26

The requirements are satisfied, as the scatterplot of residuals from fig. 3 of posttest vs expected in posttest values shows points spread randomly enough about the zero line without revealing any pattern (i.e., curvilinear, funnel, or fan shape) affecting the graph. All other distributions seem to be more or less uniformly dispersed around their range of posttest expected values. The studies show no evidence that the model assumption of linearity and homoscedasticity has been broken. That is, the connection between the covariate (hypo) and dependent variable (posttest) may be understood linearly, and residual variance will be generally constant in projected values. Therefore, it is justified to assume that the ANOVA

model of this research is appropriate, and its assumptions are met to provide accurate and credible interpretations based on the findings of the analysis.

4.6 ANOVA Results

TABLE VI ANOVA RESULTS

Results	df	Mean Square	F	Sig.
	1	19421.416	64.110	0.000

Source. SPSS 26

After taking the pretest scores of the account, from table VI, the ANOVA findings demonstrated a notable disparity, with a higher F value of 64.110 and a lower significance level of 0.000 ($p < 0.05$). This result shows that the therapy significantly improved students' test results.

V. DISCUSSION

The results demonstrated that the Seamless Problem-Based Learning method might develop students' character via the KHD idea. PBL delivers high engagement and critical thinking abilities and reflective practice successfully. The merger of mobile learning with PBL has been proven to boost students' critical thinking abilities and problem-solving competency in higher collaborative positions and higher contextual learning environments (Asad et al., 2026). Thus, the findings of this study develop the previous analysis by highlighting that the link between PBL and seamless learning has higher wider influence, especially in character education in higher education. Furthermore, it is recognized that an integrated model of learning that makes the links between goals, learning processes, resources, and evaluation explicit enhances students' interdisciplinary competencies more completely (Ma & Wu, 2025).

The results indicate are also supported by previous research that mobile-assisted PBL can improve students' readiness in independent learning, especially of handling learning strategies and technical competencies; hence, student can attend their ow (Ma & Wu, 2025) ess efficiently (Ma & Wu, 2025). Furthermore, other studies find that the online PBL approach can notably enhance learners' independent learning and problem-solving skills, which are affected by cooperative group work and high learning activity (Wong & Kan, 2022).

This conclusion aligns with earlier studies that have shown that PBL promotes individual and group accountability via shared roles and collaborative problem solving. Seamless learning makes learners responsible for maintaining and bridging the continuity that covers an ideal nature of education transfer, even outside formal contextual classrooms. In KHD educational theory, responsibility as a higher dimension of moral and social awareness needs to be developed via genuine experience. The results showed that the continuous and contextual environment of higher learning, with interest that was offered to students, made them more accountable as a higher value compared to acceptance of academic duties after dispute. Some international research concluded that the methodology of Problem-Based Learning is able to increase students' activity learning and teach them accountable in self-learning. This are of line with (Khoiriyah & Roberts, 2025), who found that problem-based learning combined with self-assessment could improve students' independence and responsibility attitude when Locus of Control becomes an important aspect of instilling character. Moreover, numerous studies indicate that another essential factor that most significantly predicts higher student learning independence from curriculum based on PBL. The utilization of PBL, referring to self-assessment, can motivate students to learn independently and responsibly, meaning it is influential in the internalization of character values. Other studies also show that PBL is a powerful predictor of students' learning self-determination in writing discipline, confidence, and personal responsibilities of results (Novalia et al., 2025).

Seamless learning improves these interactions by use of digital technology to allow flexible and persistent cooperation. Students not only cooperated on homework but also learnt to understand other ideas and reach a greater consensus. This is in line with the ideas of KHD, which suggest that education are higher matter of living together amicably. Thus, it verifies the evidence-based facts that the combination of PBL and seamless learning is useful in building students' social character. These results are consistent with the results overseas that Problem-Based Learning has a larger beneficial influence on student collaboration and social skills at the tertiary level. Higher studies by Lee & Jung (2025) also found that PBL allows the students to be more participatory in teams able to share their ideas without hesitation and learn from the perspectives of the group members with an increased sense of acceptance of their peers' opinions. This not only improves collaborative skills but also empathy within academic settings. Additionally, another study (D'Elia et al., 2024) on the integration of PBL and collaborative technology enhanced group interaction, fostered structured dialogue, and shared responsibility, as it positively affects social interactions or teamwork skills of students.

These roles of the instructor are recognized in prior research as a possible key outcome in learning this model to construct an ideal 'good' lady. The correspondent function of the lecturer as a motivator for students includes certain principles of ing ngarso sang tulodo and tut wuri handayani. Pupils are expected to copy the work of instructors and to imitate teachers' best practices in their fellow pupils. The findings show that the seamless learning-based PBL method offers sufficient scope in enacting moral character related to genuine instances and continuous reflection. These results are highly relevant, since this research links with the idea of exemplary behavior of Ki Hajar Dewantara between an example and learning that takes place in universities nowadays. This is consistent with the finding explaining how the change of lecturer function from a traditional instructor to a facilitator in higher education finally affects improving learning autonomy and involves students in reflection and internalizing professional values and desirable personality characteristics that are relevant in today's teaching model

(Khairani et al., 2025). In addition, teachers/lecturers not only facilitate the learning process but also act as role models whose behavior directly influences the development of students' character through their pedagogical and socio-emotional interactions.

In theory, the findings support the idea that character education will be more successful in terms of imparting and internalizing values if it is incorporated within the teaching-learning design rather than separately. Integration between PBL and seamless learning provides, in theory and practice, character lessons with higher contextualizing and continuous learning. This corroborates the findings of researchers who reported that PBL in an extended learning environment can connect theory with practice and elicit active and reflective involvement on the part of learners. In addition, the PBL principle underscores that authentic problems and social interaction can help construct meaningful knowledge and values (Smith et al., 2022). These results are consistent with the social constructivist theory that learning takes place between people and the real world. From this perspective, the combination of PBL with seamless learning brings up academic learning opportunities and also reflects Ki Hajar Dewantara's teachings through technology-based teaching practices today.

The diversity of applied learning frameworks included contributes to the significance of this research on the growth of learning theory. The present findings can serve as a reference for teachers to adapt this learning approach to their classrooms, promote the integration of national educational philosophy with curriculum implementation, and recommend further research in other disciplines or at different levels of education with wider experimental designs. The policy implications also include implementing this method in higher education programs. The first drawback of the present research was the very small sample size to employ of this study, and additional inquiry is needed to generalize to a wider student population. Second, the model of the current work was done at a certain institution or program of studies. Thirdly, the character of students was evaluated at just one time point, which does not enable us to determine if there are long-term consequences on students' behavior in reality outside campus. Fourth, since the implementation approach is highly reliant on the teacher's competence and expertise in directing Seamless PBL and KHD ideology, it is suggested that in this research higher studies with higher bigger sample over a longer period of time is advised to increase the fidelity and validity of the results.

VI. Conclusion

The findings demonstrate that the Seamless Problem-Based Learning (PBL) Model integrated with Ki Hajar Dewantara's educational philosophy effectively strengthened character development among higher education students. The experimental group showed an increase in mean character scores from 51.45 ± 16.05 at pretest to 92.17 ± 17.11 at posttest. The control group also showed an increase, from 49.40 ± 13.05 to 60.71 ± 20.02. The initial difference between groups was relatively small, while the post-intervention difference was substantially larger. The homogeneity assumption was satisfied for both pretest ($p = 0.213$) and posttest ($p = 0.464$). After adjustment for initial character scores, the analysis produced a significant between-group effect ($F = 64.110$, $p < 0.001$), providing quantitative evidence of the effectiveness of the integrated learning model.

The principal contribution of the study is the development and empirical examination of a learning framework that connects PBL, Seamless Learning, and Ki Hajar Dewantara's educational philosophy. The integration of in the presence of an example, in the midst of desire, and in the midst of desire places character formation within authentic problem solving, collaboration, reflection, and continuous learning activities. Consequently, responsibility, integrity, empathy, cooperation, independence, and perseverance become integral elements of the learning process.

Several limitations require consideration. The sample consisted of 84 students from one institution and one academic program, while the intervention period was relatively short. Character development was also measured primarily through questionnaire responses, limiting direct assessment of sustained behavioral change. Future studies should employ larger multi-institutional samples, longitudinal designs, and behavioral or observational measures. Further investigation into artificial intelligence and other digital technologies could extend the Seamless PBL framework while maintaining the cultural values embedded in Ki Hajar Dewantara's educational philosophy.

Ethical approval

Ethical approval was granted by STKIP PGRI Bangkalan under approval number 045/C8/G/IX/2024.

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Conflict of Interest

No conflict of interest is declared.

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