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The Effect of Blended Problem-Based Learning on Financial Literacy and Critical Thinking among Economics Education Students

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ABSTRACT

Financial literacy and critical thinking are essential competencies in economics education, yet university learning is often still dominated by theoretical and teacher-centered instruction that is weakly connected to real financial decision-making. This study examined the effect of Blended Problem-Based Learning (B-PBL) on students' financial literacy and critical thinking skills. A quasi-experimental pretest-posttest control-group design was applied to 62 undergraduate Economics Education students at Muhammadiyah University of Palangkaraya, consisting of 30 students in the experimental class and 32 students in the control class. The experimental group received five 90-minute B-PBL sessions integrating face-to-face problem solving and Google Classroom-based case exploration, while the control group received conventional instruction. Data were collected through financial literacy scenario tests and critical thinking essay tests and analyzed using N-Gain and Multivariate Analysis of Covariance (MANCOVA). The experimental group achieved higher post-test scores than the control group in financial literacy (88.40 vs. 74.20; N-Gain = 0.69 vs. 0.32) and critical thinking (85.60 vs. 70.50; N-Gain = 0.66 vs. 0.28). MANCOVA also showed significant treatment effects on financial literacy, $F(1, 59) = 23.52$, $p < .001$, $\eta p^2 = .285$, and critical thinking, $F(1, 59) = 15.70$, $p < .001$, $\eta p^2 = .210$. These findings indicate that B-PBL is an effective pedagogical strategy for strengthening functional financial literacy and analytical reasoning in economics classrooms.

Keywords: blended problem-based learning; critical thinking; digital learning; economics education; financial literacy

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INTRODUCTION

Economic education in higher education is expected to help students understand economic concepts and apply them to real financial and professional decisions. In the digital economy, this expectation has become more urgent because students must respond to market volatility, inflation, consumer credit, online financial services, and increasingly complex investment choices (Davies, 2015; Lusardi & Mitchell, 2014; Retzmann & Seeber, 2016; Wahyono et al., 2023). However, economics courses are still frequently delivered through theoretical, teacher-centered instruction, so students may understand concepts at a declarative level but struggle to use them in

contextual decision-making. For this reason, economics learning needs instructional designs that connect theory with authentic problems and train students to evaluate risks, alternatives, and consequences systematically.

Financial literacy is a logical outcome variable in this study because economics students are directly exposed to personal budgeting, consumption choices, savings, investment instruments, credit products, and digital financial services. Financial literacy refers to the integration of financial knowledge, attitudes, and behavior needed to support long-term financial well-being (Lusardi & Mitchell, 2014; Potrich et al., 2016). In the student context, this competency is increasingly relevant because young adults often face practical decisions related to paylater services, online lending, digital wallets, and investment information circulated through social media (Rahmawati & Nuris, 2021; Sukmawati et al., 2025). Therefore, financial literacy is not merely a theoretical construct but a functional life skill that can be strengthened through learning experiences requiring students to analyze real financial scenarios.

Critical thinking is also central to university-level economic education because students must be able to examine evidence, identify assumptions, evaluate alternative solutions, and draw logical conclusions under uncertainty (Ennis, 2018; Facione, 2015). In B-PBL activities, these skills are operationalized through case analysis, peer discussion, argument evaluation, and justification of financial decisions. This connection is important because economics students are expected to interpret market information, evaluate policy or business options, and avoid cognitive bias in financial and professional decision-making (Halpern & Dunn, 2022; Situmorang, 2023). Thus, critical thinking functions as the analytical foundation that enables financial literacy to become more than factual knowledge.

The problem addressed in this study is that conventional economics instruction has not consistently provided opportunities for students to practice contextual financial reasoning. Teacher-centered learning can lead students to memorize economic concepts without sufficiently understanding how those concepts operate in real situations (Allgood et al., 2015; Simanjuntak et al., 2025). This limitation is more apparent when digital platforms are used only to distribute materials rather than to facilitate inquiry, collaboration, and problem-solving. Initial classroom observations also indicated that students tended to give short, descriptive answers when asked to analyze financial-risk cases, suggesting the need for an intervention that could strengthen both functional financial literacy and critical thinking.

Problem-Based Learning (PBL) offers a relevant response because it uses authentic problems as the main trigger for inquiry, analysis, and decision-making. In PBL, students are positioned as active problem solvers who must question assumptions, search for evidence, and compare alternative solutions (Savery, 2006; Yew & Goh, 2016). This model is suitable for financial literacy learning because students can simulate decisions related to budgeting, consumption, saving, investment, and risk management (Lilik & Sulistyowati, 2020). PBL is also compatible with blended learning because complex cases can be introduced and discussed in face-to-face sessions, while digital platforms provide extended time for resource exploration, reflection, and asynchronous argumentation.

Blended learning strengthens PBL by combining direct classroom interaction with digital learning spaces that support flexible access, discussion, and reflective learning. Face-to-face meetings allow immediate clarification and collaborative problem-solving, whereas digital platforms enable students to revisit materials, search for supporting data, submit case analyses, and continue peer discussion beyond class time (Aslamiyah et al., 2019; Graham, 2013; Santi, 2022). In this study, Google Classroom was used not merely as a repository of materials but as a structured space for problem exploration, argument submission, peer response, and lecturer feedback. This integration is expected to create a learning environment that supports both independent inquiry and collaborative reasoning.

Previous studies have shown that PBL can improve active learning, achievement, and analytical reasoning (Astuti & Purnamasari, 2025; Narmaditya & Wulandari, 2017), while blended learning has been reported to support learning independence and critical engagement in higher education (Hikmah et al., 2023; Santi, 2022). Studies on financial literacy and critical thinking have also been widely conducted as separate domains (Ennis, 2018; Lusardi & Mitchell, 2014; Potrich et al., 2016). Nevertheless, empirical studies that integrate blended learning and problem-based pedagogy as a unified B-PBL model in university economics education remain limited, particularly those that simultaneously test financial literacy and critical thinking as outcomes. This gap justifies the need for a quasi-experimental study that examines the joint pedagogical effect of B-PBL on both competencies.

This study contributes to economics education literature by testing B-PBL as an integrated instructional model that combines authentic economic problems, face-to-face inquiry, and digital reflection. The study aims to examine the effect of B-PBL on students' financial literacy and critical thinking skills in economics education. Based on the theoretical and empirical arguments above, two hypotheses were formulated: H1: students taught through B-PBL achieve significantly higher financial literacy post-test scores than students taught through conventional instruction after controlling for pre-test scores; and H2: students taught through B-PBL achieve significantly higher critical thinking post-test scores than students taught through conventional instruction after controlling for pre-test scores.

METHOD

This study employed a quantitative approach with a quasi-experimental pretest-posttest control-group design to determine the effect of Blended Problem-Based Learning on financial literacy and critical thinking among Economics Education students. The design involved two intact university classes: an experimental group that received the B-PBL intervention and a control group that received conventional instruction (Table 1). Full randomization into new classes was not feasible because the participants had already been organized into existing university course sections; therefore, class comparability was maintained by using similar academic backgrounds, comparable course enrolment, and pre-test scores as baseline information (Creswell, 2012; Fraenkel & Wallen, 2006). MANCOVA was planned from the beginning because the study compared post-test outcomes between two groups while statistically controlling for students' initial pre-test scores as covariates.

Table 1. Research Design

Class	Pre-test	Treatment	Post-test
Experimental	Q1	Blended Problem-Based Learning	Q2
Control	Q3	Conventional	Q4

(Sugiyono, 2019)

Note: Q1 = Initial observation (pre-test) of the experimental class; Q2 = Final observation (post-test) of the experimental class; Q3 = Initial observation (pre-test) of the control class; Q4 = Final observation (post-test) of the control class

The participants were undergraduate students enrolled in the Economics Education Study Program at Muhammadiyah University of Palangkaraya. The population consisted of students taking comparable economics courses, and the sample was selected purposively based on similar academic backgrounds, course enrolment, and access to digital learning facilities (Creswell, 2012; Sugiyono, 2019). A total of 62 students participated in the study, consisting of 30 students in the experimental class and 32 students in the control class. The two classes were treated as intact groups to avoid disrupting the academic schedule, while equivalence was strengthened through comparable course content, similar learning duration, and the use of pre-test scores as statistical controls.

The treatment was implemented over five sessions, with each session lasting 90 minutes. The experimental class followed the B-PBL model, which integrated face-to-face problem-solving activities with case exploration through Google Classroom. The control class received conventional instruction through lectures and teacher-centered question-and-answer sessions. The economics topics taught to both groups included budget management, responsible consumption, saving and investment instruments, online lending risk, and risk analysis in economic decision-making. The session-by-session treatment protocol is summarized in Table 2.

Table 2. Session-by-Session B-PBL Treatment Protocol

Session	Face-to-face activity	Google Classroom activity	Student output
1	Orientation to B-PBL, pre-test administration, and introduction to	Access learning materials and submit initial responses to the opening problem.	Pre-test scores and initial financial problem identification.

Session	Face-to-face activity	Google Classroom activity	Student output
	financial decision-making cases.		
2	Group discussion on budget management and responsible consumption.	Analyze a digital budgeting case and respond to peer arguments.	Short case analysis on budget prioritization.
3	Problem-solving session on saving, investment alternatives, and risk-return trade-offs.	Search supporting data and upload evidence-based investment-risk notes.	Evidence-based comparison of financial alternatives.
4	Case discussion on online lending, paylater use, and financial ethics.	Continue asynchronous debate and revise arguments based on feedback.	Revised argument map and ethical-risk justification.
5	Presentation of solutions, lecturer feedback, reflection, and post-test administration.	Submit final reflection and post-test-related learning evidence.	Final case solution, reflection, and post-test scores.

Data were collected using two primary instruments adapted to the higher education economics context. Financial literacy was measured through scenario-based assessment tasks requiring students to make decisions in realistic financial situations, such as comparing consumption priorities, evaluating online lending risks, selecting saving or investment alternatives, and explaining the consequences of inflation or interest. The indicators covered financial knowledge, financial attitudes, and independent financial behavior. Critical thinking was assessed through case-based essay tasks requiring analysis, evaluation, inference, and explanation. Both instruments were scored using analytic rubrics from 1 to 4, and the maximum score for each instrument was determined by multiplying the number of items by the highest rubric score. The assessment was administered during pre-test and post-test sessions under the same time allocation and scoring procedures for both groups.

Before the intervention, the financial literacy and critical thinking instruments were reviewed through expert judgment to examine content and construct validity. The validation process involved three validators with expertise in economic education, educational evaluation, and learning model development. The aspects assessed included the alignment between indicators and items, clarity of wording, suitability of the financial scenarios and case-based questions for undergraduate students, accuracy of scoring rubrics, relevance to B-PBL objectives, and appropriateness for measuring financial literacy and critical thinking skills.

The validation results indicated that both instruments were appropriate for use in the main study. The financial literacy instrument obtained an average validity score of 3.72 out of 4.00 and was categorized as very valid. The critical thinking instrument obtained an average validity score of 3.68 out of 4.00 and was also categorized as very valid. Minor revisions were made based on the validators' suggestions, particularly to improve the clarity of scenario wording, strengthen indicator-item alignment, and refine analytic scoring descriptors.

Instrument reliability was tested before the main study to ensure measurement consistency. The financial literacy instrument obtained a reliability coefficient of 0.87, while the critical thinking instrument obtained a reliability coefficient of 0.89. Because the critical thinking test used essay responses, scoring consistency was strengthened through the use of an analytic rubric and cross-checking of scoring decisions against the rubric descriptors. These values indicate high internal consistency and support the suitability of both instruments for measuring students' financial literacy and critical thinking in the context of B-PBL. Data obtained from the financial literacy scenario tests and critical thinking essay tests were converted into quantitative scores using analytic scoring rubrics, as shown in Table 3 and Table 4.

Table 3. Scoring Rubric for Financial Literacy Scenario Test

Score	Category	Indicator Description
4	Very Good	Students are able to choose the most efficient financial solution, accurately explain risks, and connect various concepts (e.g., interest, inflation, and risk).
3	Good	Students choose the correct solution, but the explanation regarding risks or reasoning is less in-depth.
2	Fair	Students choose an inappropriate solution, or the solution is correct but the reasoning provided is wrong/illogical.
1	Poor	Students fail to identify the problem in the scenario and provide a financially detrimental solution.

(OECD, 2020)

Table 4. Scoring Rubric for Critical Thinking Essay Test

Score	Category	Indicator Description
4	Analytical	Arguments are very strong, data is analyzed deeply, evaluation of the problem is objective, and conclusions (inferences) are highly logical.
3	Descriptive	Students are able to analyze the problem correctly, but the evaluation is still superficial (lacks sharpness).
2	Less Analytical	Students only restate information (descriptive) without performing critical analysis or evaluation.
1	Irrelevant	Arguments are not supported by data, conclusions are a leap of logic (illogical), or do not answer the essence of the problem.

(Facione, 2015)

To facilitate statistical analysis and calculate students' progress, the raw scores from each instrument were converted into a 100-point scale using Eq. 1.

$$\textbf{Score} = \frac{\textbf{obtained score}}{\textbf{maximum score}} \boldsymbol{x}\ \mathbf{100} \qquad (1)$$

These converted scores served as the basis for the categorization presented in Table 5 and Table 6.

Table 5. Financial Literacy Categories

Score	Category	Ability Description
81–100	High	Students demonstrate excellent mastery of financial knowledge, attitudes, and independent behavior.
61–80	Moderate	Students understand basic financial concepts but still require guidance in complex risk analysis.
0–60	Low	Students have limited understanding and are at risk in making economic decisions based on real-world problems.

Table 6. Critical Thinking Categories

Score	Category	Ability Description
81–100	Very Critical	Students are able to provide very strong arguments, conduct in-depth analysis, and draw logical conclusions.
61–80	Critical	Students are able to analyze problems correctly, but evaluations are still superficial.

0–60	Less Critical	Students tend to only restate information without performing critical analysis or evaluation.

Furthermore, N-Gain calculations were performed to determine the effectiveness of the increase in students' abilities in both groups using Eq. 2 (Hake, 1999).

$$\text{N} - \text{Gain} = \frac{\text{post test score} - \text{pre test score}}{\text{maximum score} - \text{pre test score}} \quad (2)$$

The N-Gain results were interpreted based on the categories presented in Table 7.

Table 7. N-Gain Test Categories

N-Gain Score	Category
≥ 0.70	High
0.30 - 0.69	Moderate
< 0.30	Low

(Hake, 1999)

Data analysis was conducted using descriptive and inferential statistics. Prior to hypothesis testing, several prerequisite and assumption checks were considered: normality using the Shapiro-Wilk test, homogeneity of variance using Levene's test, linearity between covariates and dependent variables, homogeneity of regression slopes through group-by-covariate interaction checks, multicollinearity among dependent variables, and equality of covariance matrices using Box's M where applicable. Data were considered suitable for MANCOVA when the assumptions did not indicate serious violations at the predetermined significance criteria.

Hypothesis testing was performed using Multivariate Analysis of Covariance (MANCOVA) at a significance level of 0.05. The independent variable was the learning model (B-PBL versus conventional instruction). The dependent variables were financial literacy post-test scores and critical thinking post-test scores. The covariates were the corresponding pre-test scores for financial literacy and critical thinking. The pre-test scores were entered as covariates to adjust post-test comparisons for students' initial ability before treatment. The magnitude of the treatment effect was interpreted using Partial Eta Squared values based on the categories shown in Table 8 (Cohen, 2013).

Table 8. MANCOVA Effect Size Categories

Partial Eta Squared Value (ηp2)	Effect Size Category
0.01 – 0.05	Small Effect
0.06 – 0.13	Medium Effect
> 0.14	Large Effect

(Cohen, 2013)

Beyond technical aspects, this study prioritized ethical considerations. Institutional permission was obtained from the study program before data collection, and all participants received information about the study purpose, procedures, voluntary participation, confidentiality, and use of data for academic publication. Informed consent was obtained from all participants. No separate ethical clearance number was reported in the manuscript; therefore, the ethical approval statement is presented as institutional research permission and compliance with educational research ethics procedures.

RESULTS AND DISCUSSION

Results

The results are presented based on two primary outcome variables: financial literacy and critical thinking skills. The analysis includes assumption checks, descriptive comparisons of pre-test and post-test scores, N-Gain

values, and MANCOVA results showing the adjusted effect of the B-PBL model after controlling for pre-test scores. This presentation provides a comprehensive overview of the effectiveness of integrating problem-based pedagogy with a digital learning environment among Economics Education students at Muhammadiyah University of Palangkaraya.

Table 9. Summary of Statistical Assumption Checks

Assumption	Procedure	Decision criterion	Decision
Normality	Shapiro-Wilk test	Sig. > .05	No serious normality violation was indicated.
Homogeneity of variance	Levene's test	Sig. > .05	The variance assumption was considered acceptable.
Linearity	Covariate-outcome diagnostic check	Linear relationship expected	The covariate-outcome relationship was considered adequate.
Homogeneity of regression slopes	Group x covariate interaction check	Non-significant interaction	No serious slope heterogeneity was retained in the final model.
Covariance equality	Box's M / covariance diagnostic	No substantial violation	The multivariate covariance assumption was considered acceptable.

After the assumption checks were considered acceptable, descriptive statistics were used to compare the achievements of the experimental and control groups before and after the treatment. The descriptive data focus on mean scores, categories, and N-Gain values because the manuscript file did not provide raw standard deviation output. The mean-score comparison is presented in Table 10 and Table 11.

Table 10. Descriptive Statistics of Financial Literacy

Group	Pre-test (%)	Category	Post-test (%)	Category	N-Gain	Category
Experimental	62.50	Moderate	88.40	High	0.69	Moderate
Control	61.80	Moderate	74.20	Moderate	0.32	Moderate

Table 11. Descriptive Statistics of Critical Thinking

Group	Pre-test (%)	Category	Post-test (%)	Category	N-Gain	Category
Experimental	58.00	Less Critical	85.60	Very Critical	0.66	Moderate
Control	59.20	Less Critical	70.50	Critical	0.28	Low

Table 12. MANCOVA Summary of the Effect of B-PBL on Financial Literacy and Critical Thinking

Source/Effect	Dependent Variable	Covariate Controlled	F	df	Sig.	Partial Eta Squared	Interpretation
Learning model (B-PBL vs conventional)	Financial literacy post-test	Financial literacy pre-test	23.52	1, 59	p < .001	0.285	Large effect
Learning model (B-PBL vs conventional)	Critical thinking post-test	Critical thinking pre-test	15.70	1, 59	p < .001	0.210	Large effect

Based on Table 10 and Table 11, both groups had relatively comparable pre-test mean scores before the intervention. After the treatment, the experimental group showed higher post-test means and greater N-Gain values than the control group for both financial literacy and critical thinking. This pattern indicates that students taught through B-PBL experienced stronger learning progress than students taught through conventional instruction. The analysis then continued with MANCOVA to determine whether the observed differences remained statistically significant after controlling for pre-test scores.

The MANCOVA results showed that the treatment effect on financial literacy was statistically significant, $F(1, 59) = 23.52$, $p < .001$, with a Partial Eta Squared value of .285. This value indicates a large effect, meaning that the B-PBL model contributed substantially to the improvement of students' financial literacy after controlling for pre-test scores. The MANCOVA results also showed that the B-PBL model had a statistically significant effect on critical thinking, $F(1, 59) = 15.70$, $p < .001$, with a Partial Eta Squared value of .210. This value indicates a large effect, showing that the intervention strengthened students' critical thinking skills after controlling for their initial ability.

Discussion

The implementation of B-PBL relied on structured interaction between face-to-face meetings and Google Classroom activities. During the early treatment sessions, students mostly accessed materials and responded briefly to lecturer prompts. As real-world cases were introduced, especially cases on online lending risk, paylater use, consumption priority, and simple investment decisions, the online discussion became more substantive. Observation notes showed that students used the comment feature to ask questions, respond to peers, submit short arguments, and attach supporting information from news, financial regulations, or market data. These activities indicate that the digital platform functioned as a documented learning space for inquiry rather than merely a channel for distributing materials.

The digital platform also functioned as a cognitive incubation space. Unlike face-to-face classes that are limited by meeting duration, asynchronous discussion gave students time to examine information before presenting an opinion. This reflective space was useful for financial literacy because responsible financial decisions require students to compare alternatives, validate risks, and justify their choices. The success of the experimental class in reaching the high category in financial literacy and the very critical category in critical thinking may be associated with the repeated practice of analyzing cases, discussing evidence, and revising arguments across online and offline learning activities. The term "associated" is used here because this study did not conduct a separate correlation analysis between platform engagement and learning outcomes.

The findings indicate that B-PBL had a stronger impact on financial literacy and critical thinking than conventional instruction. This result can be explained by the structure of problem-based pedagogy, which places authentic economic cases at the center of learning and requires students to move from problem identification to evidence-based decision-making (Savery, 2006; Yew & Goh, 2016). The experimental class reached a higher financial literacy post-test mean (88.40) than the control class (74.20), suggesting that repeated exposure to contextual financial problems helped students connect economic concepts with practical decision-making. Similarly, the higher critical thinking post-test mean in the experimental class (85.60) than in the control class (70.50) indicates that inquiry, peer discussion, and argument justification strengthened analytical reasoning.

These results are consistent with studies reporting that PBL improves active engagement and analytical achievement (Astuti & Purnamasari, 2025; Narmaditya & Wulandari, 2017). However, this study extends prior work by showing that when PBL is integrated with a blended environment, learning does not stop at classroom discussion but continues through asynchronous reflection and digital evidence sharing. The findings also support financial literacy literature emphasizing that financial competence develops more effectively when knowledge is linked to personal and professional decision-making (Lusardi & Mitchell, 2014; Potrich et al., 2016). Compared with conventional instruction, B-PBL provided more opportunities for students to test financial reasoning through cases and to refine arguments through lecturer and peer feedback.

Theoretically, these findings reinforce social constructivist assumptions that knowledge is constructed through interaction, language, collaboration, and reflection (Vygotsky, 1978). In this study, face-to-face discussion allowed students to negotiate meaning and test assumptions with peers, while Google Classroom supported delayed

reflection, evidence sharing, and revision of arguments. This combination explains why B-PBL can strengthen both financial literacy and critical thinking: students did not only receive information but also reconstructed economic concepts through collaborative inquiry and case-based reasoning. Practically, the findings suggest that economics lecturers can integrate real financial problems such as digital budgeting, youth investment risk, online lending, and inflation-related consumption choices into blended learning environments.

The main contribution of this study lies in strengthening contextual economics learning in higher education. By using digital platforms to explore current economic cases, lecturers can bridge the gap between university curriculum content and real market realities. The findings also confirm that the lecturer's role should shift from being the primary source of information to becoming a facilitator of inquiry, feedback, and evidence-based reasoning. Nevertheless, the application of B-PBL should be accompanied by clear case instructions, analytic rubrics, and structured online facilitation so that digital learning remains pedagogically purposeful.

Although this study provides significant findings, several limitations should be noted. First, the sample size was relatively small and came from a single university; therefore, generalization to broader populations should be made with caution. Second, the intervention lasted only five sessions, which may not be sufficient to observe long-term financial behavior change. Third, the instruments relied on scenario tests and essays, so the results may not fully represent actual financial behavior in daily life. Fourth, purposive sampling and the use of intact classes may still contain selection bias even though pre-test scores were controlled statistically.

Future research is recommended to involve broader samples across different universities and educational contexts to strengthen external validity. Longer interventions are also needed to examine the sustainability of financial literacy and critical thinking gains over time. Subsequent studies may add variables such as financial self-efficacy, learning motivation, digital literacy, or platform engagement, and may use qualitative or mixed-methods designs to capture students' reasoning processes more deeply during B-PBL implementation.

CONCLUSION

The implementation of B-PBL significantly improved financial literacy and critical thinking among Economics Education students. The experimental class achieved higher financial literacy post-test scores than the control class (88.40 vs. 74.20) and a greater N-Gain (0.69 vs. 0.32). The same pattern appeared in critical thinking, where the experimental class obtained a higher post-test score (85.60 vs. 70.50) and a greater N-Gain (0.66 vs. 0.28). MANCOVA confirmed significant treatment effects on financial literacy, $F(1, 59) = 23.52$, $p < .001$, $\eta p^2 = .285$, and critical thinking, $F(1, 59) = 15.70$, $p < .001$, $\eta p^2 = .210$, both indicating large effects. These findings show that B-PBL can be used as a strategic pedagogical innovation to connect economic theory with authentic financial problems and to strengthen students' analytical decision-making. However, because the study was conducted in one university with intact classes and a five-session intervention, the findings should be generalized cautiously.

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