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Comparing Perceived Learning Interest and Perceived Achievement Between Users and Non-Users of Ruangguru: An Exploratory Cross-Sectional Survey

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Abstract

Studies of Ruangguru mostly examine a single group of students and sometimes use causal wording, while comparisons of users and non-users on perceived outcomes within the same survey are scarce. This exploratory study aimed to describe students' perceived learning interest and perceived achievement, to compare them between Ruangguru users and non-users, and to examine their association. A cross-sectional descriptive-correlational online survey was conducted on 9–20 December 2024 using snowball sampling among students in East Java (N = 20 analysed). Respondents who currently or previously used Ruangguru (n = 16) were compared with those who had never used it (n = 4). Seven five-point Likert items measured perceived learning interest (three items; a = 0.776) and perceived achievement (four items; a = 0.892), and data were analysed with the Mann–Whitney U test and Spearman's rank correlation. Users reported higher perceived learning interest (M = 3.67 vs. 2.50; U = 62.5, p = 0.004, |r_rb| = 0.95) and higher perceived achievement (M = 4.03 vs. 2.31; U = 63.0, p = 0.004, |r_rb| = 0.97) than non-users, and the two perceptions were positively correlated (ρ = 0.784, p < 0.001). Interactive features received the lowest agreement (40%). These results indicate associations, not effects of Ruangguru. The sample was small, non-random, and limited to East Java, the non-user group had only four respondents so effect sizes are unstable, and both constructs were self-reported at one time point. The findings are therefore preliminary and call for larger samples, validated instruments, and objective learning outcomes.

Keywords: Teacher's Room; Learning Interests; Perceived Achievement; Digital Learning Platforms; Student Perception

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INTRODUCTION

Digital platforms allow students to access materials, practise exercises, and reach teachers outside fixed schedules and locations, so school is no longer the only place where learning happens (Liriwati, 2023). Learning applications such as

Ruangguru have become part of many students' daily routines. What remains unclear is how students who use such an application perceive their own learning interest and achievement compared with students who do not, and how far those perceptions can be interpreted without claiming that the application produced them.

Studies on the affective dimension of learning with Ruangguru, namely interest and motivation, are largely positive. Khanifah and Pribadi (2022) reported that the application's menu and flexible learning conditions encouraged students' interest during distance learning. Prillya et al. (2021) interviewed 10 ninth-grade students in Banda Aceh, who felt comfortable because the application could be accessed anytime and anywhere and were attracted by its visual animations. Survey studies point in the same direction. Pantow and Korompis (2024), who surveyed 60 high school students at a tutoring institution, reported that Ruangguru use was associated with higher motivation and learning activity, and Fadhillah et al. (2025), who surveyed 102 university respondents, found fairly high learning motivation together with positive ratings of appearance, material presentation, and video quality. A study of another mobile application reported very good ratings from 126 respondents and higher motivation at post-test (Kusuma et al., 2022).

Findings on learning outcomes vary more in design and outcome measures. Ritiauw et al. (2022) examined Zoom-assisted Ruangguru among fifth-grade students and reported classical mastery at a high criterion for 11 of 20 students. Rizqiah et al. (2023) tested Ruangguru e-learning in eleventh-grade biology against conventional learning, and Pratiwi et al. (2021) compared the physics outcomes of vocational school students who did and did not use Ruangguru and reported differences between the two groups. Yendi and Hayati (2020) found that online tutoring and learning interest together accounted for 11% of the variation in senior high school students' economics outcomes, which is a small share. Outside Ruangguru, Baars et al. (2022) noted that students who used gamified learning applications showed higher autonomous motivation, but most used them for only a few sessions, and those who felt they needed no support used them less.

Taken together, this literature consists mostly of small surveys and single-group or single-school studies. Its consistent finding is a positive affective association: students describe Ruangguru as convenient, attractive, and motivating. Its inconsistencies lie in the outcome measures (perceptions, post-test scores, classical mastery, regression estimates) and in the language of effect, because some studies use causal wording although their designs do not always allow causal claims. What remains unresolved is whether students who use Ruangguru differ from students who do not in perceived learning interest and perceived achievement when both groups answer the same items in the same survey and the results are interpreted only as association..

Two theories frame how such perceptions can be interpreted. Hidi and Renninger (2006) describe four phases of interest development: triggered situational interest, maintained situational interest, emerging individual interest, and well-developed individual interest. Attractive features may trigger interest, but interest persists only when learners find meaning in repeated learning experiences. Self-determination theory states that intrinsic motivation grows when the needs for autonomy, competence, and relatedness are met (Ryan & Deci, 2000). In Ruangguru,

flexible access can support autonomy, and materials and practice questions can support competence. Interest theory therefore leads us to expect that students with experience of the application perceive higher learning interest than students without it (H1). Self-determination theory leads us to expect that perceived support for competence appears as higher perceived achievement among users (H2), and that perceived interest and perceived achievement are positively related (H3).

Previous studies generally focus on one grade, subject, or user group, and few compare users with non-users on the same measures. In the literature reviewed by the authors, no study compared Ruangguru users and non-users on perceived learning interest and perceived achievement within one survey while interpreting the results strictly as association. This study addresses that gap. Its contribution is empirical and methodological, namely a same-survey, same-instrument comparison with explicit limits of interpretation, and practical, namely an indication of which application features students agree with least and may need strengthening. Perceptions are not report card grades or test scores, but they show how the application is experienced by students, which is useful for teachers and developers.

The objectives are (1) to describe students' perceived learning interest and perceived achievement regarding Ruangguru, (2) to compare both perceptions between users and non-users, and (3) to examine the association between perceived learning interest and perceived achievement. The hypotheses are H1: perceived learning interest differs between users and non-users (H0: no difference); H2: perceived achievement differs between users and non-users (H0: no difference); and H3: perceived learning interest is positively associated with perceived achievement (H0: no association). Given the small sample, the study is exploratory and does not test causal effects.

METHOD

Research design

This study used a quantitative cross-sectional descriptive-correlational survey. The design fits the three objectives: description of perceptions (objective 1), comparison between groups (objective 2), and association between two perceptions (objective 3). It examines group differences and associations and does not test treatment effects or causal relationships. A summary is given in Table 1.

Table 1. Summary of research design

Component	Description
Approach and design	Quantitative; cross-sectional descriptive-correlational survey
Data collection	Online questionnaire (Google Forms), December 9–20, 2024
Sampling technique	*Snowball*(nonrandom)
Sample analyzed	N = 20 from East Java (22 entries, 2 excluded)
Groups	Users (current + past, n = 16) vs. non-users (never used, n = 4)
Instrument	Seven five-point Likert items (1-5): perceived learning interest (3 items) and perceived achievement (4 items)
Data analysis	Descriptive statistics, Shapiro-Wilk test, Mann-Whitney U test, Spearman correlation, Fisher's exact test (significance level 0.05, two-tailed)

Subjects and sampling techniques

The target population was students in East Java with varying levels of Ruangguru use, from never used to currently using. Its size is unknown. Non-users were included deliberately as a comparison group. Because no sampling frame was available, we used snowball sampling. The initial respondents (seeds) were students known to the authors at several schools in East Java. The authors selected them by personal acquaintance, and they were asked to forward the questionnaire link to their peers. Eligible respondents were students enrolled in junior or senior high school in East Java. Seeds were not chosen to represent the population, and recruitment was non-random. The results therefore cannot be generalized.

The form received 22 entries. We excluded entries that were blank on all items or that lacked usage status or the perceived achievement items. Two entries met these rules: one blank entry and one without usage status or achievement items. That left 20 respondents for analysis (22 collected, 2 excluded, 20 analyzed). The sample size reflects the responses received during the 12-day collection period. A power analysis did not determine it. The study is therefore exploratory, and the very small non-user group (n = 4) limits the stability of group comparisons.

Instruments and procedures

The questionnaire had five parts: a short identity section, usage status, features used, seven five-point Likert statements (1 = strongly disagree to 5 = strongly agree), and two closed-ended questions on obstacles and on whether Ruangguru improves school performance. It also had two open-ended questions on the impact on achievement and on suggestions. Respondents reported usage status in one of three categories: current user (currently using Ruangguru), past user (used it before but not now), or never used. For analysis, users were current and past users (n = 16). Non-users were respondents who had never used Ruangguru (n = 4). We use these labels in all tables and figures.

The seven statements formed two constructs. Perceived learning interest had three items: learning is more interesting (a trigger of situational interest; Hidi & Renninger, 2006), motivation to learn increases (Ryan & Deci, 2000), and interactive features encourage learning (a feature-based trigger of situational interest). Perceived achievement had four items: understanding of the material, impact on grades, exam readiness, and subject mastery. These items measure perceptions, not objectively assessed learning outcomes. We grouped the items by content and did not test the groups with factor analysis. The interactive features item describes an app feature, so it may reflect perceived usability or design more than interest. We therefore report it at item level and treat it as a limitation of the construct. Each construct score was the mean of its items. We labeled scores low (1.00 to 2.33), moderate (2.34 to 3.66), or high (3.67 to 5.00). We estimated internal consistency with Cronbach's alpha as an indicator for this sample. It is not definitive evidence that the instrument is valid (Taber, 2018). No formal expert review or pilot test was conducted, which limits the evidence of content and construct validity. We collected data with a Google Forms questionnaire during the period shown in Table 1. The authors first sent the link to the seed respondents through school WhatsApp groups. The seeds forwarded it to their peers. We handled incomplete entries under the exclusion rules described above, without imputing missing values.

Data analysis

We assessed the normality of construct scores. We chose nonparametric tests because the scores were ordinal, the sample was small, and perceived achievement was not normally distributed. We tested differences between users and non-users with the Mann-Whitney U test. The effect size was the rank-biserial correlation, r_rb = 2U/(n1 × n2) − 1, using the U value of the user group. We report its absolute value. We tested associations with Spearman's rank correlation, which suits ordinal or non-normal data (Schober et al., 2018). It covered the link between the two constructs and the link between usage status (1 = user, 0 = non-user) and each construct. We used Fisher's exact test for the yes-or-no question on school performance. All tests were two-tailed with α = 0.05 and ran in Python (SciPy). Because the sample is small, all inferential results are exploratory. We grouped the two open-ended questions descriptively by similarity of content.

RESULTS AND DISCUSSION

Respondent characteristics

T There were 20 respondents: 13 females (65.0%) and 7 males (35.0%). Nineteen (95.0%) were in senior high school or equivalent, and one (5.0%) was in junior high school. Twelve (60.0%) were past users, four (20.0%) were current users, and four (20.0%) had never used Ruangguru (Table 2). The user group in later analyses combines past and current users (n = 16). The non-user group has four respondents. Usage status rests on self-report (see Implications and limitations). Respondents could choose more than one feature [ISI: konfirmasi, karena jumlahnya melebihi 20]. Learning videos were used by 17 of the 20 respondents, followed by the UTBK Center (7) and the question bank (5).

Table 2. Respondent characteristics (n = 20)

Characteristics	Category	f	%
Gender	Woman	13	65.0
	Man	7	35.0
Level	High school/equivalent	19	95.0
	JUNIOR HIGH SCHOOL	1	5.0
Usage status	Ever used	12	60.0
	Currently using	4	20.0
	Never used	4	20.0

Source: processed primary data

Perception of learning interest and perception of achievement

Agreement was highest for understanding of the material and lowest for interactive features and motivation to learn (Table 3, Figure 1). No respondent strongly agreed that interactive features encouraged learning, and 40% were neutral.

Table 3. Distribution of answers per statement item (n = 20)

Item	SDA	DA	N	A	SA	M	SD
Learning is more interesting	0 (0%)	1 (5%)	6 (30%)	9 (45%)	4 (20%)	3.80	0.83
Motivation to learn increases	0 (0%)	5 (25%)	6 (30%)	7 (35%)	2 (10%)	3.30	0.98
Interactive features encourage learning	0 (0%)	4 (20%)	8 (40%)	8 (40%)	0 (0%)	3.20	0.77

Item	SDA	DA	N	A	SA	M	SD
Understanding the material	1 (5%)	1 (5%)	3 (15%)	12 (60%)	3 (15%)	3.75	0.97
Positive impact on value	0 (0%)	2 (10%)	5 (25%)	9 (45%)	4 (20%)	3.75	0.91
Preparation for the exam	0 (0%)	3 (15%)	3 (15%)	11 (55%)	3 (15%)	3.70	0.92
Subject mastery	1 (5%)	4 (20%)	1 (5%)	11 (55%)	3 (15%)	3.55	1.15

Note: SDA = strongly disagree; DA = disagree; N = neutral; A = agree; SA = strongly agree; M = mean; SD = standard deviation. Source: processed primary data.

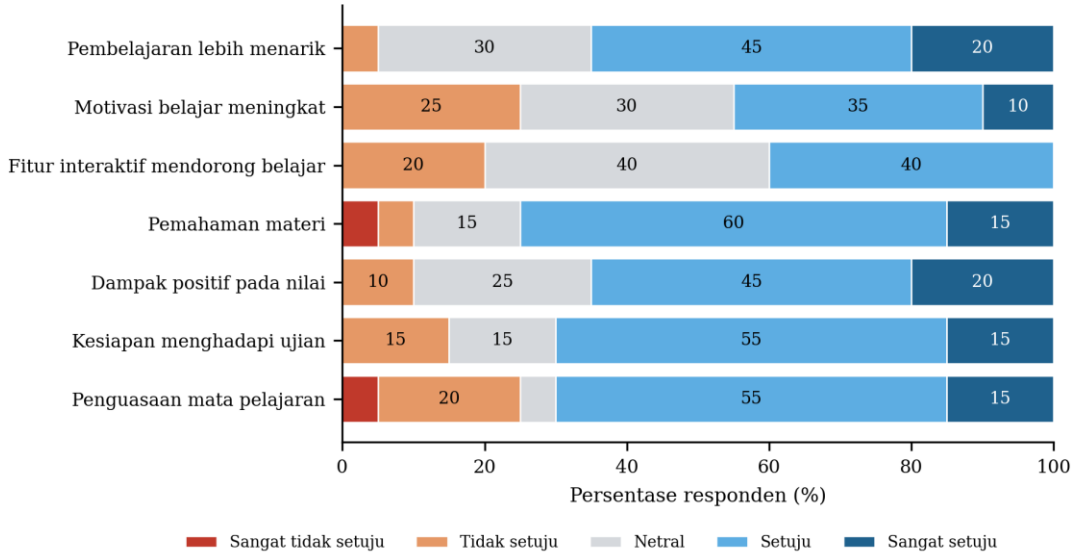


Figure 1. Distribution of respondents' answers to the seven statement items (%)

Perceived learning interest averaged 3.43 (SD = 0.72), with 10 respondents in the moderate category, 9 in the high category, and 1 in the low category. Perceived achievement averaged 3.69 (SD = 0.86), with 13 respondents in the high category, 4 in the moderate category, and 3 in the low category (Table 4). Cronbach's alpha was 0.776 for perceived learning interest and 0.892 for perceived achievement. Shapiro-Wilk tests gave p = 0.081 for perceived learning interest and p = 0.025 for perceived achievement, so we used nonparametric tests.

Table 4. Descriptive statistics and construct reliability (n = 20)

Construct	M	SD	Min	Max	Cronbach's alpha
Interest in learning (3 items)	3.43	0.72	2.00	4.67	0.776
Perception of achievement (4 items)	3.69	0.86	1.75	4.75	0.892

Source: processed primary data

Perceived learning interest was moderate. The item with the lowest agreement was interactive features, which is a single item and not a dimension of interest. Earlier studies report more favorable affective results. Pantow and Korompis (2024) found high agreement that interactive features raised interest among students at a tutoring institution. Fadhillah et al. (2025) reported fairly high motivation among university respondents. Those studies differ from ours in sample, setting, and measures, so we cannot attribute the difference to one cause. One possibility, not tested here, is that 17 of 20 respondents mainly used videos and so had limited contact with interactive features. This resembles Baars et al. (2022), who found that most users of learning apps used them for only a few sessions. In Hidi and Renninger's (2006) model, attractive features can trigger situational interest. That fits the 65% agreement that learning was

more interesting, and it echoes the appeal of visual animation reported by Prillya et al. (2021). The lower agreement on motivation (45%) is compatible with interest that was triggered but not sustained. It does not demonstrate it.

Perceived achievement was higher than perceived learning interest, with the highest agreement on understanding the material (75%). Earlier studies on learning outcomes (Ritiauw et al., 2022; Rizqiah et al., 2023; Pratiwi et al., 2021) also describe Ruangguru as useful for outcomes, so our perceptions point in the same direction. Those studies differ in design, level, and outcome measures and cannot be compared numerically. Our study measured perceptions, not learning outcomes. From a self-determination perspective, videos and question banks support competence more directly than autonomy or relatedness (Ryan & Deci, 2000). Respondents rated the app as more useful for understanding material than for motivation. In this sample, then, Ruangguru was perceived mainly as a learning and practice resource.

The difference between users and non-users

Users had higher perceived learning interest than non-users (M = 3.67, SD = 0.58 vs. M = 2.50, SD = 0.33; U = 62.5, p = 0.004, |r_rb| = 0.95), so we rejected H0 for H1. Users also had higher perceived achievement (M = 4.03, SD = 0.47 vs. M = 2.31, SD = 0.66; U = 63.0, p = 0.004, |r_rb| = 0.97), so we rejected H0 for H2 (Table 5, Figure 2). These effect sizes are very large but unstable, because the non-user group has only four respondents. The comparison is exploratory, not confirmatory. By usage status, past users scored 3.72 (interest) and 4.02 (achievement), current users 3.50 and 4.06, and non-users 2.50 and 2.31. These subgroup means are descriptive only. Among past users, interactive features (3.42) and motivation (3.67) stayed below understanding of the material (4.17).

Table 5. Comparison of scores between users and non-users (Mann–Whitney U test)

Construct	Users (n = 16) M (SD)	Non-users (n = 4) M (SD)	U	p	|r rank-biserial|
Interest in learning	3.67 (0.58)	2.50 (0.33)	62.5	0.004	0.95
Perception of achievement	4.03 (0.47)	2.31 (0.66)	63.0	0.004	0.97

Note: Users = current + past users; non-users = never used. Exploratory comparison; the non-user group is small (n = 4). Two-tailed test, α = 0.05. r_rb = rank-biserial correlation (absolute value)

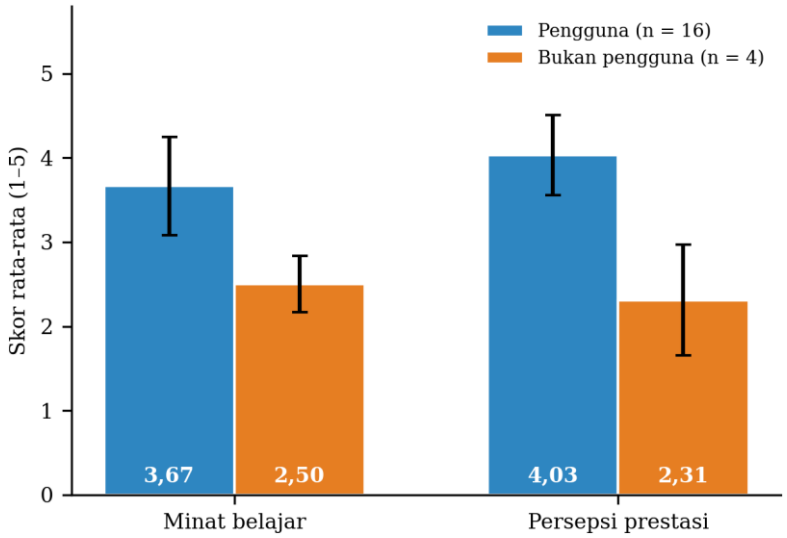


Figure 2. Mean scores of learning interest and perceived achievement by usage status (error bar = SD)

Users scored higher than non-users on both constructs. This is consistent with the positive associations reported by Pantow and Korompis (2024), Kusuma et al. (2022), and Pratiwi et al. (2021). The result does not show that Ruangguru raised interest or achievement. The four non-users rated an app they had not used, so their low scores may reflect little experience or a prior attitude. We did not measure pre-use conditions, so the data cannot separate any effect of the app from the tendency of already motivated students to choose learning apps. Yendi and Hayati (2020) found that Ruangguru tutoring and learning interest together accounted for only 11% of the variation in learning outcomes. A strong perceptual difference need not point to a main determinant of outcomes. Past and current users scored almost the same, and the groups are too small for firm conclusions. Thirteen of 16 users (81.3%) and 2 of 4 non-users (50.0%) believed Ruangguru improves school performance. This difference was not significant (Fisher's exact p = 0.249), so the large difference in scale scores did not fully repeat in the yes-or-no question.

Learning interest and perception of achievement

Perceived learning interest and perceived achievement were strongly and positively correlated (ρ = 0.784, p < 0.001), so H3 was supported. An approximate 95% confidence interval runs from about 0.47 to 0.92 [ISI: verifikasi dengan software Anda]. Usage status was also moderately to strongly correlated with perceived learning interest (ρ = 0.681, p = 0.001) and with perceived achievement (ρ = 0.678, p = 0.001) (Table 6).

Table 6. Spearman's correlation coefficient (n = 20)

Variable pairs	rho	p
Usage status – Interest in learning	0.681	0.001
Usage status – Perception of performance	0.678	0.001
Interest in learning – Perception of achievement	0.784	< 0.001

Note: Usage status is coded as 1 = ever/currently using and 0 = never. Source: processed primary data

The strong correlation is consistent with the idea that interest and a sense of competence reinforce each other (Hidi & Renninger, 2006; Ryan & Deci, 2000). The

correlation itself does not show that. Both scores came from the same respondents, at the same time, in one self-report questionnaire. Common-method bias, such as a general tendency to agree, may inflate the association. Spearman's coefficient describes a monotonic association and gives no direction of effect. With n = 20, the confidence interval is wide.

Obstacles to use and open-ended responses of respondents

This subsection is an exploratory descriptive summary. Six of the 20 respondents reported obstacles: 4 of the 16 users (25.0%) and 2 of the 4 non-users. Among users, those who reported obstacles (n = 4) had a lower mean perceived learning interest (3.00) than those without obstacles (n = 12; 3.89). The gap in perceived achievement was smaller (3.81 vs. 4.10). With groups this small, these figures are descriptive only and need cautious reading. We did not test them. The questionnaire did not ask about the type of obstacle, but two open answers give clues. One respondent asked for downloadable materials so study would not depend on an internet connection. One non-user called the service too expensive. This matches Pradana and Syarifuddin (2021), who reported that about 70% of their respondents still had internet problems while studying online, and that data subsidies reached rural areas unevenly. Our respondents all lived in East Java and almost all were in high school, so we cannot extend this picture to other groups. Access and cost remain plausible reasons why perceived benefits are not shared equally.

Summarized the two open-ended questions descriptively, without a formal coding scheme. Fifteen of 20 respondents (75%) answered that Ruangguru can improve school performance. Of the answers on impact on achievement, four mentioned ease of understanding through videos, quizzes, or varied materials, and three mentioned better grades. Three said the impact depends on usage, discipline, or individual behavior, and the rest were brief statements. This fits the high score for understanding the material. It also fits Baars et al. (2022), who found that learning apps are often used for only a few sessions, and less by students who feel they need no support. For suggestions, two respondents asked for more engaging video animation, two asked for quick feedback or live Q&A with mentors, and three urged students to study consistently or use tutoring services. Requests for quick feedback are noteworthy. A meta-analysis of 435 studies found a moderate effect of feedback on learning (d = 0.48), larger for cognitive and skill outcomes than for motivational or behavioral outcomes (Wisniewski et al., 2020). We did not measure feedback, so this link is speculative.

Quality of measurement and meaning of numbers

The meaning of these figures depends on the quality of the measurement. The alpha coefficient of 0.892 on the construct of perceived achievement is considered high, butTaber (2017)It is important to note that alpha only reflects consistency across a given data set, and a high value is not sufficient evidence that the items measure a single concept validly. The four perceived achievement items in this study also overlap in content, such as understanding the material and mastery of the subject, so a high alpha may also reflect item similarity.

Sixth, the measurement has limits that affect how we should read the findings. We grouped items by content and ran no factor analysis, expert review, or pilot test, so neither construct is validated and we treat both scores as provisional measures of

perceptions. Perceived learning interest has only three items, and one of them, interactive features, assesses a feature, not interest. That item had the lowest mean (3.20) and pulls the construct mean down, so the moderate level of perceived learning interest may say as much about app features as about interest. The same item may also bias the group comparison, because non-users judged features of an app they had not used, and part of the gap may reflect this lack of contact. Because all data come from one self-report questionnaire, a general tendency to agree may raise both scores at once and inflate the correlation between them ($\rho = 0.784$). We therefore read that correlation as an upper bound of what the data can support, not as evidence that interest and competence reinforce each other. A high alpha for perceived achievement (0.892) does not repair these problems. It may partly reflect overlapping items, such as understanding the material and subject mastery, and it shows only consistency within this dataset, not valid measurement (Taber, 2018). The tests of H1, H2, and H3 thus concern these two scores and not validated measures of interest and achievement. Stronger evidence of construct validity is needed before readers treat them that way. The results are preliminary.

Implications and limitations

For For teachers, the results support using videos and question banks as a supplement to study outside the classroom. For app developers, interactive features and motivational elements need strengthening, because they received the lowest agreement. This study has several limitations. First, the sample was small, non-random, collected by snowball sampling, and drawn only from East Java, so the findings cannot be generalized. Second, the non-user group had four respondents, which makes effect sizes unstable and the group comparison exploratory. Third, the line between users and non-users was blurred. The four respondents who reported never using Ruangguru also named instructional videos among the features they used. They may have watched free materials without counting it as use. The data cannot confirm this, and it limits how far we can interpret the group comparison. Fourth, all constructs were self-reported at one time point, so common-method bias is possible and the correlation cannot show direction. Fifth, cross-sectional data cannot establish causality, and perceived achievement is not actual academic performance. Sixth, we grouped items by content without factor analysis, and no expert review or pilot test was conducted. The interactive features item assesses a feature, not interest. A high alpha for perceived achievement may partly reflect overlapping items (understanding the material and subject mastery). Cronbach's alpha shows consistency within this dataset. It is not sufficient evidence of valid measurement (Taber, 2018).

CONCLUSION

This This exploratory survey compared perceived learning interest and perceived achievement between Ruangguru users and non-users in one instrument. Respondents rated perceived achievement ($M = 3.69$) above perceived learning interest ($M = 3.43$). Agreement was highest for understanding of the material (75%) and lowest for interactive features (40%) and motivation (45%). Users scored higher than non-users on both constructs ($p = 0.004$ for each), and the two constructs were

strongly associated ($\rho = 0.784$). The study adds a preliminary same-survey comparison to a literature that mostly examines single groups. For developers, the item-level pattern points to interactive and motivational features as the weakest perceived benefits. For teachers, it supports videos and question banks as a supplement to study outside class.

These findings show association only, and they remain preliminary. Perceived achievement is a student's own judgment, not actual academic performance, and the study has no grades or test scores. The sample was small and non-random, the non-user group had four students, and all data were self-reported. We therefore do not generalize beyond this sample. Platform evaluations should pair student perceptions with objective outcomes before drawing conclusions about benefit.

RECOMMENDATION

Future studies should prioritize three steps. First, recruit a larger and more balanced sample of users and non-users, from several regions and school levels, with clear usage criteria such as frequency and duration of use. This would give stable group comparisons and make the user and non-user definitions less blurred. Second, use validated measurement instruments. Separate interest items from feature-evaluation items, then test the structure of the scales with expert review, a pilot test, and factor analysis. Third, add objective academic outcomes, such as report card grades or test scores, and use a pre-post or quasi-experimental design with a comparison group. This would show whether the perceived differences match actual performance and whether use changes outcomes.

A qualitative follow-up, such as interviews or focus groups, should also explore why interactive features received low agreement. For teachers, we suggest combining Ruangguru videos and question banks with guidance on regular use. For developers, offline access to materials, more engaging animation, and faster feedback or live Q&A are worth testing, because respondents asked for them. Only one or two respondents requested each item, so treat these as leads to test, not proven needs

Author Contributions

Initials: AFI = Achmad Faried Irfany; HI = Hendri Irawan; ANN = Ahmad Nabil Nashiri. Conceptualization, initials; methodology, initials; formal analysis, initials; investigation, initials; data curation, initials; writing—original draft, initials; writing—review and editing, initials; visualization, initials; supervision, initials. All authors have read and approved the published version of the manuscript.

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Conflict of interests

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