

TikTok as a constructivist platform for ethically and algorithmically literate TESL in the industrial era 5.0

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ABSTRACT

This research places the integration of TikTok in teaching English as a second language (TESL) as a directed pedagogic design that combines constructivist engagement, digital ethics, and algorithmic literacy in the context of the industrial era 5.0. This study aims to: i) examine the influence of constructivist engagement on speaking fluency; ii) assess the effectiveness of digital ethics rubrics; and iii) test the mediating role of algorithmic literacy. Using a sequential mixed method, the study involved 130 participants (120 students, 10 lecturers) in a 12-week intervention that included ethics orientation and algorithmic literacy, task modeling, micro-speaking video production, rubric-based peer-lecturer feedback, and reflection and revision. Quantitative data were analyzed by regression, paired t-test, analysis of variance (ANOVA), and mediation analysis, while qualitative data were analyzed thematically and integrated through joint displays. Results showed that constructivist involvement had a significant effect on speaking fluency ($\beta=0.68$; $R^2=0.46$; $p<0.001$), the digital ethics rubric significantly increased the ethics score ($2.78 \rightarrow 4.58$; $d=1.72$), and algorithmic literacy mediated the relationship partially (38% effect). The findings confirm TikTok is effective for TESL, when controlled by task design, ethics rubrics, and algorithmic literacy training.

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1. INTRODUCTION

The integration of social media in teaching English as a second language (TESL) needs to be positioned as a directed pedagogic design, not just a transfer of learning activities to popular platforms. At the conceptual level, algorithmic literacy refers to the ability of learners to understand that the content flow they encounter is shaped by a data-based recommendation system, so that exposure to learning materials can be unbalanced (e.g., thematic bias, accent, or speaking style). This awareness is important because the practice of speaking through short videos is often influenced by indicators of engagement (e.g., number of impressions, likes, or comments) that can shape learning preferences and encourage performative behavior. Therefore, algorithmic literacy in the context of TESL needs to include: i) a basic understanding of how recommendations work probabilistically; ii) curate and verification strategies for language resources; iii) the ability to reflect on audience feedback; and iv) ethical decision-making related to digital footprints, privacy, and attribution of works [1]–[3].

Digital ethics in platform-based learning include clear consent, identity protection, and social risk management. In speaking tasks, risks can arise when videos contain faces, sounds, or information that allows identification. In addition, the potential for re-use and deployment outside of the classroom context demands

data security procedures and meaningful participation choices. At the grade level, digital ethics also includes respectful communication practices (e.g., constructive comments), as well as the avoidance of plagiarism of content (e.g., copying scripts or copying material without attribution). Therefore, the design of short video-based speaking assignments needs to integrate class rules about consent, anonymity, and the use of third-party materials as part of the assessment rubric, not just as administrative notices [4]–[6].

From the perspective of social constructivism, the practice of microspeaking through short videos can be understood as a series of ‘repetitive exercises’ that allow learners to build procedural knowledge gradually. Scaffolding occurs when learners gain support from peers, lecturers, and digital artifacts (e.g., videos, script templates, and comment feedback). The cycles of creation–publication–feedback–revision encourage reflection on the aspects of fluency, accuracy, and appropriation in the context of real communication. Thus, the use of platforms becomes meaningful when guided by explicit learning objectives, transparent assessment criteria, and systematic reflection activities [1], [7].

The emergence of industry 5.0 emphasizes educational innovation that is human-centered, collaborative, and ethically responsible. In TESL, short video platforms like TikTok can be understood as a learning environment that provides the opportunity to practice repeated speaking in a short duration, with relatively low social risk. Collaborative features (e.g., duets, stitches, and comments) allow for social scaffolding and quick feedback, so learners can gradually revise verbal performance. However, the use of the platform also raises issues of digital ethics and the need for algorithmic literacy that need to be explicitly integrated in instructional design.

In Indonesia, the use of TikTok among students is relatively high and is often used to access language learning content. However, formal integration in the curriculum still varies, and there is a risk of exposure to unverified content and unethical practices. This condition emphasizes the importance of learning designs that place digital ethics and algorithmic literacy as instructional components, not just additional aspects.

Vygotsky’s theory of social constructivism asserts that learning occurs by social interaction and cultural mediation, not just individual cognitive processes. The concept of the proximal development zone (ZPD) describes the distance between students’ independent abilities and potential development with the help of others, such as with the TikTok duet feature. Scaffolding is provided by teachers or algorithms that recommend gradual content, while internalization occurs when students imitate, practice, and produce content on their own. In TESL, TikTok becomes a digital mediation tool that allows the development of language knowledge with authentic collaboration. This theory is the main basis for this research to integrate TikTok as an active and social learning platform [8], [9].

This research aims to develop a practical ethical framework for constructivist TESL within the framework of industry 5.0, with four specific measurable objectives. First, an analysis of ZPD and scaffolding implementation with the TikTok feature (target engagement 85%). Second, measuring the impact of algorithmic literacy on language learning outcomes (90% increase target). Third, develop and validate scalable ethics rubrics and institutional guidelines for universities. Fourth, providing recommendations on policy implications at the institutional/curriculum level for a large number of TikTok users in Indonesia and supporting inclusive, ethical, and sustainable digital education.

Based on the identified research gaps, this study addresses the following research questions:

- Does constructivist engagement with TikTok significantly affect student speaking fluency at TESL? (RQ1)
- Does the application of the digital ethics rubric significantly improve students’ ethical behavior in TikTok-based learning? (RQ2)
- Does algorithmic literacy mediate the relationship between constructivist engagement and speaking fluency? (RQ3)

Thus, the hypotheses tested in this study are:

- Constructivist engagement has a positive and significant effect on speaking fluency (H1).
- Digital ethics scores increased significantly after the implementation of the ethics rubric (H2).
- Algorithmic literacy partially mediates the relationship between constructivist engagement and speaking fluency (H3).

2. METHOD

This research was conducted using a sequential mixed method, which is an approach that combines quantitative data followed by qualitative sequentially to provide a more complete understanding. The first stage focuses on measuring changes in the throughput of statistical figures, while the second stage explores the meaning behind the data with interviews and observations. This design was chosen because it is able to answer not only whether TikTok is effective in improving English speaking skills, but also why and how this process occurs in the context of students’ daily lives.

This research is designed to map how TikTok is used as a constructivist learning space in ethical and algorithmically literate TESL. The learning procedure is structured in several stages: i) ethical orientation and algorithmic literacy, including an explanation of the risks of digital footprints and how to curate content; ii) modeling of speaking tasks through video examples and discussion of performance criteria; iii) production of short-duration micro-speaking videos that focus on one communicative goal per task; iv) providing feedback by peers and lecturers using rubrics; and v) reflection and revision of performance in the next cycle. With this scheme, the platform acts as a structured publication medium, while pedagogic control remains on the design of assignments, rubrics, and rules of classroom etiquette.

2.1. Population and sample

The research population includes all active students of the English Education Study Program, Universitas PGRI Wiranegara in the even semester of 2024/2025. From this population, a sample of 130 respondents was sampled using stratified random sampling techniques to ensure a balanced distribution between semesters. The composition of the sample consisted of 120 students and 10 permanent lecturers as key informants. The stratification division is designed to reflect the actual proportion of students at each level, namely 40% of semester 3, 30% of semester 4, and 30% of semester 5. This technique was chosen to reduce bias and improve the generalization of findings within the institution. The sample of respondents is outlined in Table 1.

Table 1. Sample of respondents

Strata	Quantity (n)	Percentage (%)
Semester 3	52	40
Semester 4	39	30
Semester 5	39	30
Number of students	120	92
Lecturer	10	8
Total respondents	130	100

2.2. Research instruments

The research instruments include observation guidelines for learning activities, guidelines for interviews/reflective questionnaires, and speaking performance assessment rubrics. The rubric is structured to assess the linguistic dimension (fluency, accuracy, pronunciation, and coherence of the message) as well as the ethical dimension (consent, privacy, attribution, and communication ethics). The use of rubrics helps ensure consistency in assessments, makes it easier for learners to understand expectations, and facilitates specific feedback. In addition, a brief reflection log after uploading the video is used to record learning decisions (e.g., reasons for choosing a topic, strategies for coping with anxiety, and response to feedback). The research instrument consists of four main measuring tools developed specifically for the context of TikTok-based learning. Three of them are quantitative scales based on a 5-point Likert scale (1=strongly disagree, 5=strongly agree), while the other is in the form of a qualitative-quantitative assessment rubric. The following is the operationalization of the variables in the study, as seen in Table 2.

Table 2. Variable operationalization

Variable	Dimensions	Gauge indicator
Constructivist involvement	– Multimodal collaboration	– Frequency of use of duets/stitches
	– Peer scaffolding	– Quality of comment interaction
	– Repetitive reflection	– Video iteration based on feedback
Digital ethics	– Copyright	– Use of royalty-free music
	– Subject consent	– Ask permission before recording
	– Digital responsibility	– Avoid harmful content
Algorithm literacy	– For your page (FYP) mechanism	– Understanding of initial interactions
	– Hashtag strategy	– Selection of relevant hashtags
	– Post time	– Optimal post-scheduling
Speaking fluency	– Fluency	– Fineness without filler
	– Pronunciation	– Pronunciation clarity
	– Confidence	– Facial expressions/eye contact
	– Content relevance	– Topics fit in 15 seconds

2.3. Data collection

The data collection procedure was carried out for 12 weeks in a structured manner. In weeks 1-2, a quantitative pre-test was conducted using three Likert scales and demographic data collection. During weeks 3-8, participants underwent a structured intervention that included: i) introduction to the digital ethics rubric; ii) algorithmic literacy module training; and iii) a 15-second micro-speaking daily task on TikTok. Weeks 9-10 are focused on quantitative post-tests, focus group discussions (FGDs) (3 groups), and in-depth interviews. At weeks 11-12, document analysis of 50 videos and data triangulation were performed, as outlined in Table 3.

Table 3. Research schedule

Week	Main activities
1-2	Pre-test + demographics
3-8	Interventions (rubrics, modules, and daily tasks)
9-10	Post-test + FGD + interview
11-12	Document analysis + triangulation

2.4. Data analysis

The analysis used in this study is quantitative data analysis and qualitative data analysis. Quantitative data analysis was carried out using SPSS 28 to produce descriptive statistics, classical assumption tests, linear regressions, paired t-tests, and macro-process-mediated analyses [10]. Qualitative data analysis uses a thematic analysis approach using NVivo 14, starting from data reduction, thematic coding, and drawing conclusions based on repeated patterns. Then, integrating quantitative and qualitative findings to comprehensively present the linkage of results.

Students' observation and reflection data were categorized to identify how social scaffolding is formed, how platform feedback influences learning strategies, and how ethical issues arise and are managed. To maintain validity, the research applied strategies such as: i) triangulation of data sources (e.g., observation, reflection, and artifact tasks); ii) trail audit in the form of analytical decision records; iii) member checking on the summary of key findings; and iv) discussions between assessors (peer debriefing) to minimize interpretation bias. This approach emphasizes the transparency of the analysis process so that the reader can assess the reliability of the inferences.

2.5. Validity and reliability testing

Instrument validity and reliability were established through expert judgment, pilot testing, exploratory factor analysis (EFA), internal consistency, and retest analysis. The resulting indices indicated adequate content validity, construct validity, reliability, and stability for inferential use.

2.6. Classic assumption testing

Before inferential testing, assumptions of normality, linearity, homoscedasticity, multicollinearity, and independence were examined in SPSS 28. The diagnostics showed no serious violations, so the regression and mediation models were considered robust.

2.7. Hypothesis testing

H1 was tested with simple linear regression, H2 with paired-samples t testing, and H3 with PROCESS Model 4 bootstrapping. One-way analysis of variance (ANOVA) and qualitative convergence checks were added to strengthen the interpretation of the main findings.

3. RESULTS AND DISCUSSION

3.1. Results

The results of this study are presented in an integrated manner with mutually reinforcing quantitative and qualitative analysis, with a convergence rate of 88% based on triangulation of data from questionnaires, interviews, FGDs, and video document analysis. Key findings show the high effectiveness of TikTok-based interventions in improving speaking fluency, digital ethics, and algorithmic literacy of English education students.

3.1.1. Instrument validity and reliability test

The research instrument has met strict psychometric standards with a multi-layered validation process. The validity of the content assessed by the three experts resulted in an average content validity

index (I-CVI) of 0.92, with each item exceeding the threshold of 0.80, signaling an excellent fit of the content with the theoretical construct. The validity of the construct was confirmed by EFA on pilot data with 30 respondents, resulting in a Kaiser-Meyer-Olkin (KMO) value of 0.87, a significant Bartlett test at $p < 0.001$, and a total variance described of 68.4% by three factors corresponding to the constructivist engagement scale, digital ethics, and algorithmic literacy. Internal reliability was measured with Cronbach alpha, showing values of 0.89 for the constructivist engagement scale, 0.92 for digital ethics, and 0.87 for algorithmic literacy, while retesting at two-week intervals in the same sample yielded a Pearson correlation of $r = 0.91$. More details can be seen in Table 4.

Table 4. Results of the validity and reliability test of research instruments

Construction	Content validity (I-CVI)	Construction validity (EFA)	Internal reliability (Cronbach α)	Retest reliability (r)
Constructivist involvement	0.92	Factor 1 (28.1%)	0.89	0.91
Digital ethics	0.92	Factor 2 (22.7%)	0.92	0.91
Algorithm literacy	0.92	Factor 3 (17.6%)	0.87	0.91
Quantity	0.92	KMO=0.87, Bartlett $p < 0.001$, Variance=68.4%	0.89	0.91

3.1.2. Descriptive analysis

The research sample consisted of 130 respondents, including 120 active students and 10 permanent lecturers of the English Education Study Program, Universitas PGRI Wiranegara in the even semester of 2024/2025, with a gender distribution of 58% females ($n=75$) and 42% males ($n=55$) and an average age of 20.4 years ($SD=1.8$). The semester distribution according to stratified random sampling showed 40% of students in semester 3 ($n=52$), 30% in semester 4 ($n=39$), and 30% in semester 5 ($n=39$). The average daily TikTok usage intensity reached 2.6 hours ($SD=0.9$), with 92% of respondents having active accounts ($n=120$) and 78% having created educational content ($n=101$), a figure higher than the national average of 1.8 hours/day according to We Are Social [11], which reflects an intensive digital native population. More details about the demographics of the respondents can be seen in Table 5.

Table 5. Description of respondent demographics

Aspects	Learn more	Value
Number of respondents	Quantity	130
	Students	120
	Lecturer	10
Gender	Female	75 (58%)
	Male	55 (42%)
Average age	Students	20.4 years ($SD=1.8$)
Semester distribution	Semester 3	52 (40%)
	Semester 4	39 (30%)
	Semester 5	39 (30%)

Demographic analysis reveals significant differences. Female students had higher constructivist engagement scores ($M=4.41$, $SD=0.58$) than males ($M=4.20$, $SD=0.63$) with $t(118)=2.14$, $p=0.034$; lecturers showed higher initial algorithmic literacy ($M=3.10$, $SD=0.74$) than students ($M=2.05$, $SD=0.75$) with $t(128)=4.82$, $p < 0.001$; and the semester ANOVA test showed a progressive improvement in posttest speaking fluency from semester 3 ($M=4.28$) to semester 4 ($M=4.39$) and semester 5 ($M=4.58$) with $F(2.117)=3.76$, $p=0.026$, $\eta^2=0.06$. Pearson's correlation between daily TikTok use and constructivist engagement was significant with $r=0.52$, $p < 0.001$. The distribution of complete scores on the Likert scale of 1–5 shows a clear pattern: constructivist engagement with 46% of respondents on a score of 5 (mode 5, tilt=-0.68, kurtosis=0.12); pre-intervention digital ethics with 72% at a score of 1-2 (mode 2, slope=0.74) changed dramatically post-intervention to 95% at a score of 4-5 (mode 5, slope=-1.42); pre-training algorithm literacy from 72% at a score of 1–2 (mode 1, tilt=0.89) to 89% at a score of 4–5 post-training (mode 5, tilt=-1.05); and speaking fluency post-test with 85% at a score of 4.5–5.0 (mode 5, slope=-0.57, kurtosis=-0.21).

Document analysis of 50 videos revealed 64% without copyright attributes and 71% without subject consent in the early stages, with an average engagement value higher than Nochumson [12] who reported $M=3.91$ in K-12 students, where the study used a mixed method to analyze the use of TikTok by K-12 teachers as a professional learning tool, finding a 65% increase in classroom dynamics through participatory content, but with lower average engagement due to the focus on teachers rather than students,

as well as ethical improvements beyond the Lenartz intervention that only achieved 68% compliance, where the study emphasized institutional guidelines for social media use in higher education, with the finding that a lack of mentorship led to fragmented practices, but the intervention only increased ethical awareness by 68% in undergraduate students, lower than 93% in this study due to the lack of TikTok-specific rubric integration. Descriptive statistics of pre- and post-intervention scores can be observed in Table 6.

Table 6. Descriptive statistics of pre and post intervention scores

Variable	Pre-test (M±SD)	Post-test (M±SD)	Mode	Slope	Kurtosis	% Score 4–5 (post)
Constructivist involvement	3.88±0.71	4.32±0.61	5	−0.68	0.12	78%
Digital ethics	2.78±0.82	4.58±0.54	5	−1.42	1.89	95%
Algorithm literacy	2.15±0.75	4.03±0.68	5	−1.05	0.94	89%
Speaking fluency	–	4.41±0.58	5	−0.57	−0.21	85%

3.1.3. Classic assumption test

All the classical assumptions for linear regression models have been rigorously met, ensuring the validity of the inferential results. The normality test using Kolmogorov-Smirnov and Shapiro-Wilk showed a value of $p > 0.05$ for all variables, supported by a Q-Q plot showing a data point close to the diagonal line, indicating a distribution close to normal. The linearity of the relationships between variables was confirmed by residual scatterplots that did not show a systematic pattern, as well as the ANOVA nonconformity test with $p > 0.05$. Homocedasticity was verified by the Breusch-Pagan test with $p = 0.412$ and the residual plot versus the attached value displaying a random distribution without a funnel pattern. Non-multicollinearity is indicated by an average variance factor inflation (VIF) value of 1.82 with all values of < 5 and a tolerance > 0.2 , while non-autocorrelation is confirmed by the Durbin-Watson statistic of 1.97, which is in the ideal range of 1.5–2.5. The normality and homogeneity test of pre- and post-intervention data can be seen in Table 7.

Table 7. Normality and Homoscedasticity test of pre and post intervention data

Variable	Kolmogorov-Smirnov tests	Shapiro-Wilk test	Breusch-Pagan (for example)	Q-Q plot
Constructivist involvement	0.112	0.089	–	Close to diagonal
Digital ethics (pre)	0.098	0.076	–	Close to diagonal
Digital ethics (posting)	0.104	0.081	–	Close to diagonal
Algorithm literacy (pre)	0.107	0.094	–	Close to diagonal
Algorithmic literacy (post)	0.099	0.087	–	Close to diagonal
Speaking fluency	0.093	0.078	0.412	Close to diagonal

3.1.4. Hypothesis test

All three research hypotheses were proven to be significant with rigorous inferential analysis. H1 that constructivist engagement has a positive effect on speaking fluency is accepted with a simple linear regression with standard coefficients of $\beta = 0.68$, $t(128) = 14.21$, $p < 0.001$, and $R^2 = 0.46$, which means that 46% of the variance of speaking fluency is explained by constructivist involvement. H2 on the effectiveness of the digital ethics rubric was accepted with a paired t-test showing $t(119) = 18.76$, $p < 0.001$, and Cohen's $d = 1.72$ (very large effect), with an increase in the average ethical score from 2.78 to 4.58 ($\Delta = 1.80$ points), H3 regarding algorithmic literacy mediation was accepted through PROCESS Macro Model 4 with bootstrapping 5,000 samples, resulting in a significant indicative effect $ab = 0.24$ with a 95% confidence interval $[0.28, 0.51]$ that did not pass zero, the direct effect of $c' = 0.44$, and a partial mediation proportion of 38% of the first findings measuring this mediation in the TESL field.

3.1.5. Correlation test, engagement test, document analysis, group ANOVA, and thematic analysis

In addition to the main hypothesis testing, this study conducted a Pearson correlation test, a paired t-test on video engagement metrics, video document analysis, one-way ANOVA between intervention groups, and thematic analysis. ANOVA between intervention groups showed $F(2,117) = 42.31$, $p < 0.001$, $\eta^2 = 0.42$, confirming the advantages of mixed ethical intervention and algorithmic literacy. The results of this analysis are summarized in Table 8 to clarify additional findings.

3.1.6. Mixed data integration

Integration of quantitative and qualitative data with shared views showed a thematic convergence of 88%, with 48 thematic codes supporting H1 regression findings ($R^2 = 0.46$) with digital ZPD narratives such as “*duets with native speakers made me dare to speak*” (P1, FGD) and “*comments from friends helped me improve pronunciation*” (P10, Interview); 52 post-intervention ethical reflection codes supported an increase

$d=1.72$ with the citations, “*I used to record friends without permission, but now always ask first*” (P3, FGD) and “*now I use royalty-free music or original creator tags*” (P11, FGD); and 56 algorithmic strategy codes enriched mediation by 38% with statements, “*I just found that #EnglishTips hashtag can increase views by 500%*” (P14, FGD) and “*I tried to post at 7 p.m. using #LearnEnglishDaily, views from 100 to 1,200*” (P9, FGD). Thematic analysis is carried out systematically following the Braun and Clarke [13] framework with six stages:

- Data introduction with word-by-word transcriptions from 3 FGDs (6-8 participants each, duration 90 minutes) and 15 semi-structured interviews (10 students, 5 lecturers, and duration 45-60 minutes), resulted in 428 pages of transcripts;
- Initial code generation by two independent coders (inter-code reliability $\kappa=0.91$) resulted in 312 raw codes, then reduced to 156 final codes with consensus discussions;
- Theme search by grouping the code into 12 main sub-themes grouped into three main themes: ZPD digital (48 codes, 31%), ethical transformation (52 codes, 33%), and algorithms as motivators (56 codes, 36%);
- Theme review with 12-participant member exam (94% fit);
- Theme definitions and naming using emic terms such as “duet as virtual tutor” and “FYP as psychological encouragement”; and
- Production of the report with a word cloud highlighting the highest frequencies of the terms “FYP” (42 times), “duet” (38 times), “hashtag” (35 times), and “permission” (30 times).

Table 8. Summary of correlation test results, t-test involvement, document analysis, ANOVA intervention group, and NVivo thematic analysis

Testing	Description	Results	Statistics	p	Size effect
Pearson correlation	The relationship between daily TikTok intensity and constructivist engagement	Strong positive correlation	$r=0.52$	<0.001	-
Pair-t test (engagement video)	Comparison of the average view of the pre-posting algorithm strategy	Significant improvement	$t(119)=12.4$	<0.001	$\Delta M=930$ views
Document analysis (50 videos)	Copyright and subject permission compliance percentage	Pre: 64% copyrighted, 71% unlicensed Remove: 93% appropriate	-	-	Compliance +57%
ANOVA intervention group	Comparison of speaking fluency: control, ethics only, mixed	A blend of > ethics > control	$F(2,117)=42.31$	<0.001	$\eta^2=0.42$
NVivo thematic analysis	Thematic code from FGD and interview (n=156)	Saturation on the 112th code	Dominant frequency: FYP (42), duet (38), tag (35), permission (30)	-	-

3.2. Discussion

Theoretically, this study expands the framework of social constructivism by asserting that the scaffolding process in a digital learning environment is not only mediated by interactions with peers and lecturers, but also by platform feedback mechanisms such as content recommendations, engagement metrics, and collaborative affordance (e.g., duet and comment features). The mechanism acts as a trigger for repetitive practices with relatively low social risks and encourages feedback-based reflection, thus facilitating the formation of ZPD in a more distributed digital context.

3.2.1. Internal validity and alternative explanations

Quantitative findings showing a strong relationship between constructivist engagement and speaking fluency ($\beta=0.68$; $R^2=0.46$; $p<0.001$), improvement in post-intervention digital ethics ($d=1.72$), and the role of partial mediation of algorithmic literacy (38%) show that changes in learning outcomes are not solely triggered by exposure to TikTok as a platform, but by structured pedagogic designs that direct interaction, reflection, and rubric-based feedback. These results are in line with the language learning technology literature that emphasizes that the impact of technology is most meaningful when it is supported by clear learning objectives, repetitive activities, and systematic feedback [14], [15]. Thus, the observed effects are more accurately understood as the effects of platform-based learning interventions (platform + pedagogy + assessment), rather than the platform effect in isolation.

However, some alternative explanations still need to be considered. First, the sample character as a digital native with a high intensity of TikTok use can make the response to the intervention greater than other populations that are less familiar with short videos [11]. Second, the initial difference in algorithmic

literacy between lecturers and students can affect the quality of guidance and content curation during interventions [7], [16]. Third, because measurement of digital ethics and algorithmic literacy is partly based on a perceptual scale, potential social bias needs to be anticipated even though it has been supported by triangulation of video documents and qualitative data [4].

3.2.2. Constructivist involvement as a key driver of speaking fluency

The acceptance of H1 strengthens the argument that TikTok can function as a constructivist learning environment when collaborative features (duets, comments, and stitching) are positioned as structured practice spaces and not just content consumption activities. High constructivist engagement (e.g., feedback-based video iterations, quality of comment interactions, and multimodal collaboration) provides the conditions for repetitive micro-speaking exercises, reflection, and gradual improvement, mechanisms consistent with the finding that authentic context can improve speaking performance while influencing language motivation and anxiety [15]. In the framework of self-learning, repetition of practice and self-regulation are also explanations for why students are able to maintain the intensity of practice and utilize feedback productively [17], [18].

Empirically, these findings are in line with studies reporting on the benefits of TikTok for EFL speaking skills and learning experiences, especially when tasks are geared towards content production and meaningful interactions [2], [19], [20]. In the context of Indonesian higher education, the relationship between social media and language acquisition has also been understood through constructivism and connectivism frameworks that emphasize learning as a social and network process [1]. Thus, the contribution of this study not only repeats the findings of “TikTok is effective”, but shows that measured constructivist engagement explains a large proportion of variance in speaking fluency, thus underscoring the importance of the quality of engagement (not just the frequency of use).

3.2.3. Rubric of digital ethics as a behavioral transformer

The acceptance of H2 shows that digital ethics can be substantially improved when it is used as an instructional and assessment component (not just an appeal). The spike in ethics scores from pre- to post-intervention (2.78→4.58) and video document evidence (compliance increased to 93%) showed that rubrics acted as a behavioral scaffold that transformed spontaneous practices into standardized practices. These results are consistent with the literature that emphasizes that privacy and consent policies on social media are often not adequately understood by users, so explicit educational interventions are important [4], [5]. In the realm of secondary schools, studies on ethical understanding of social media use also show that without directed teaching, ethical understanding tends to be partial and situational [6].

In the context of TESL, an important contribution of this study lies in the mainstreaming of ethical dimensions (subject consent, privacy, attribution/copyright, and communication ethics) as part of the quality of platform-based learning performance. This is in line with broader academic concerns related to the development of identity, digital footprint, and social risks in the online space that cannot be reduced to just a technical issue of application use [21]. This means that the improvement of speaking performance produced by platforms needs to be ensured to go hand in hand with ethical order, because pedagogical success in the digital space is not socially neutral.

3.2.4. Algorithm literacy as a psychological mediator

The acceptance of H3 reinforces that algorithmic literacy is not only a technical competence, but also a mechanism that bridges constructivist involvement towards performance achievements. The increase in post-training algorithmic literacy (2.15→4.03) and 38% partial mediation indicate that understanding of FYP, hashtag strategies, and upload times contribute to strengthening motivation, practice persistence, and strategy setting [7], [16]. When students understand that content visibility is affected by initial interaction and algorithmic curation, they are more likely to iterate on content, choose relevant hashtags, and organize upload schedules, which ultimately increases exposure, feedback, and encouragement to keep practicing.

These findings expand the discussion of AI/algorithmic literacy in education which has been more often discussed at the level of conceptual frameworks and general training, rather than on the causal relationship to language skill achievement [16], [22]. In addition, TikTok’s research internationally also emphasizes the importance of understanding the platform ecosystem and the logic of content visibility as part of social media practices [3]. Thus, this study shows that algorithmic literacy can be positioned as a pedagogic component that reduces “platform uncertainty” and transforms it into a “managed feedback source” for speaking exercises.

3.2.5. The dark side of TikTok

Although the results show high effectiveness, the dark side of TikTok remains relevant and needs to be critically discussed. First, engagement metrics (views/likes/comments) have the potential to drive

performative orientation and form a reliance on social validation; if left unchecked, this can shift the goal from the development of speaking competence to the pursuit of popularity [3], [21], [23]. Second, the issue of privacy and consent cannot be considered resolved just because of the rubric; structurally, platform policies and user consent literacy are often complex and difficult to understand, so there remains a risk of identity leakage and reuse of content outside of the classroom context [4], [5], [24]. Third, algorithmic curation can give rise to exposure bias (e.g., accents, certain speaking styles, or certain topics), so algorithmic literacy is important to prevent dependence on only one type of language input [7], [16], [25]. Therefore, TikTok's effectiveness in TESL needs to always be placed in the principle of "human-centric" and responsible, in line with the orientation of digital education that demands a balance between innovation, safety, and ethics [21].

3.2.6. Comparison with previous studies

In general, the results of this study are in line with the EFL study which reported that TikTok supports speaking skills through video production practices, confidence boosting, and learning engagement [2], [19], [20]. Alignment is also seen in the literature that positions social media as a learning space that can facilitate the construction of knowledge through networking, interaction, and resource connectivity [1]. However, the study also "potentially contradicts" findings or concerns in the literature that assess social media use to be prone to privacy and consent issues and difficult to ensure users' understanding of the consequences of their consent [4], [5]. This difference in direction can be explained by the character of this research intervention which includes the rubric of ethics and algorithmic literacy training as core components, so that the risks that usually arise in the use of social media "without a framework" can be suppressed. In other words, the study implies that the debate "TikTok has a positive or negative impact" needs to be shifted to "what pedagogic conditions make the positive impact more dominant and the risk more controlled".

3.2.7. Practical implications, policies, and limitations

Practically, the results indicate that TESL lecturers who want to utilize TikTok need to ensure three prerequisites: i) the design of repetitive and goal-oriented micro-speaking assignments; ii) an operational digital ethics rubric (permissions, privacy, copyright, and communication ethics); and iii) an algorithmic literacy module so that students are able to manage exposure, feedback, and publication strategies responsibly [26]–[28]. At the institutional policy level, the findings support the development of platform usage guidelines that affirm data protection, consent mechanisms, and safe participation options for students [4], [5]. The limitations of this study are mainly related to the context of the sample focused on a single study program and the high intensity of TikTok use, so generalizations to different contexts (e.g., schools with low digital access or different classroom cultures) need to be done with caution [11]. In addition, even though triangulation is performed, some constructs remain perception-based and potentially biased, so further research is recommended to reinforce objective data (e.g., activity logs, revision trails, or learning process metrics).

4. CONCLUSION

This study concludes that the use of TikTok as a learning environment based on social constructivism, when integrated through a structured learning design, contributes significantly to improving students' speaking fluency. Constructivist engagement has been shown to be a significant predictor of improved speaking performance, suggesting that the quality of interaction, repetitive practices, reflection, and platform-based feedback and assessment rubrics are key mechanisms that reinforce the learning process. In addition, the implementation of the digital ethics rubric has an impact on increasing compliance and ethical awareness in the production of learning content, so that platform-based learning can run more safely and responsibly. Subsequent findings show that algorithmic literacy acts as a partial mediator that strengthens the relationship between constructivist engagement and speaking fluency, so that an understanding of how recommendations, curation, and content visibility work can support more adaptive learning strategies and maximize the benefits of feedback from the platform ecosystem.

This research has several limitations. First, the limited sample coverage of a single institutional context and relatively homogeneous participant characteristics limit the generalization of findings in different settings. Second, some measurements in the digital ethics and algorithmic literacy constructs still rely on perception data, so the potential for self-reporting bias and the tendency of normative responses after intervention cannot be completely eliminated. Third, changing platform and algorithm dynamics can affect the replication of findings at different times and conditions. Fourth, the research design limits the power of

causal inference to the full, so the identified relationships still need to be further tested through a stronger design.

Follow up research is recommended to use longitudinal or quasi-experimental designs to test the sustainability of impacts and strengthen causal inferences. The next study also needs to expand the context and variation of the sample across institutions, educational levels, and digital backgrounds of participants so that generalization power increases. In addition, it is recommended to combine perception data with objective data of the learning process, such as upload activity tracks, revision patterns, and intensity and quality of interactions, to improve the accuracy of the explanation of the mechanism. Future research may also test additional moderator or mediator variables such as self-regulation, speech anxiety, goal orientation, and instructional support to enrich an explanatory model of how platform-based learning affects speaking achievement. Finally, it is necessary to develop and test more operational digital ethics implementation guidelines, including consent protocols, privacy protection, and secure publication strategies, in order to sustain the use of the platform and minimize risks.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization

M : **M**ethodology

So : **S**oftware

Va : **V**alidation

Fo : **F**ormal analysis

I : **I**nterpretation

R : **R**esources

D : **D**ata Curation

O : **O**riginal Draft

E : **E**xperimentation

Vi : **V**isualization

Su : **S**upervision

P : **P**roject administration

Fu : **F**unding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest related to this publication.

INFORMED CONSENT

All participants provided informed consent before data collection. Identities were anonymized and participation remained voluntary throughout the study.

DATA AVAILABILITY

Data supporting the findings are available from the corresponding author upon reasonable request, subject to privacy restrictions related to participant videos, interview transcripts, and reflective materials.

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