Educational Interdisciplinary Journal
ILS Scientific Press, an Imprint of **CV. ILS NUSANTARA**
Volume 1, Issue 3, 2026. Pages 63-71
e-ISSN: 3165-3847
https://jurnal.ilsnusa.com/index.php/educatio

Staying Focused: Peer Interaction and Students' Concentration in Online and Face-to-Face Learning

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ARTICLEINFO

Received: 20 October 2026
Revised: 27 October 2026
Accepted: 1 November 2026
Published: 14 November 2026

Keywords:

Concentration; face-to-face learning; online learning; peer interaction, social presence

ABSTRACT

Universities now teach both online and face-to-face, yet it remains unclear whether students concentrate differently in the two modes and whether interaction with peers helps them stay focused in both. Drawing on the community of inquiry framework, which treats social presence as a condition for engaged learning, this study compares university students' concentration in online and face-to-face learning and tests the relationship between peer interaction and concentration in each mode, in order to guide the design of learning modes. A cross-sectional survey was conducted with 59 students who rated nineteen statements on a five-point scale. The data were analysed with reliability coefficients, paired tests with Holm correction, Pearson and Spearman correlations, a test for the difference between dependent correlations, and simple and multiple regression with bootstrap confidence intervals, including a control for a tendency to agree with statements regardless of their direction. Concentration was high in both modes (means of 4.17 online and 4.24 face-to-face), and the difference between them was not significant. Peer interaction was strongly related to face-to-face concentration (correlation of .61), explained about 37.7 percent of its variance, and remained significant after controlling for the other variable, but it was not significantly related to online concentration, and the two relationships differed significantly. The study is novel in separating real mode differences from response style. The findings are indicative because the sample is small and the scales are only moderately reliable.

INTRODUCTION

Higher education now runs on more than one mode of delivery, and concentration is one of the first things students say changes between them. Students are more likely to lose concentration during online learning than in face-to-face classes, as shown by studies that monitor attention with facial and head-pose recognition (Qiao et al., 2024; Vinh & Bang, 2023; Yang et al., 2022), and students themselves report that concentration online depends on the home environment, motivation, and the engagement the platform offers (Nguyen et al., 2025; Dai & Hu, 2025). Many students prefer face-to-face classes because attention and feedback are easier to sustain, while others value the flexibility of online study but struggle with self-discipline (Liu et al., 2024; Tahura et al., 2025). The ideal is a learning arrangement in which students can concentrate and understand the material in whichever mode is used. These differences matter because the choice of mode determines how much of students' attention an institution can realistically expect to secure, and how much support students need to stay focused.

Concentration is threatened by distraction. In online classes, media multitasking and social media use reduce attention control, increase cognitive load, and lower academic

performance (Kokoç, 2021; Cvetković et al., 2025; Wang & Chen, 2026; Zhao, 2023), and the home environment, technical problems, weak self-regulation, and zoom fatigue add to the problem (Dontre, 2021; Robb & Shellenbarger, 2021; Cho & Im, 2024). In face-to-face settings, classroom noise and the learning atmosphere affect the ability to focus and to follow the lecturer (Mealings & Buchholz, 2024; Visentin & Prodi, 2026).

Several other variables influence concentration in both modes. Motivation, self-regulation, the learning environment, interaction, and engagement are linked to concentration online and offline, whereas internet quality and communication barriers are mainly online problems (Wei et al., 2023; Yang & Wang, 2023; Vaszkun & Mihalkov Szakács, 2025; Shrivastava et al., 2021). Teachers also find it harder to judge concentration online and rely on indirect indicators such as head pose and eye movement (Vinh & Bang, 2023; Qiao et al., 2024), which makes students' own reports a practical, if imperfect, source of evidence about how they experience each mode.

Interaction with peers is a promising resource for concentration in both modes. Peer collaboration and group discussion increase engagement, motivation, and learning focus, and they reduce isolation online (Tran & Tran, 2026; Kilinc & Buyuk, 2023; Motz et al., 2022; Peungcharoenkun & Waluyo, 2024). The quality of peer relationships and of teacher support is related to online learning engagement (He & Wen, 2025), and the composition of discussion groups and their engagement matter (Yang et al., 2022; Abou-Khalil & Ogata, 2021; Balve & Manoharan, 2026).

The objective problem is that comparisons of the two modes mostly rely on perceptions of satisfaction and comprehension, which vary with the course, the technology, and the students (Liu et al., 2024; Batra et al., 2021; Thongmak & Ruangwanit, 2021), and communication barriers appear more often online (Shrivastava et al., 2021). It is therefore not clear whether students' own reports of concentration really differ between modes, and whether peer interaction is related to concentration in the same way in each.

Previous studies have examined concentration online with sensors and models (Qiao et al., 2024; Vinh & Bang, 2023), factors of online concentration (Dai & Hu, 2025; Vaszkun & Mihalkov Szakács, 2025), and peer interaction mostly in online or hybrid settings (Tran & Tran, 2026; Motz et al., 2022). Few studies place concentration in both modes, and peer interaction, in the same sample, and fewer still check whether self-report scales mixing positively and negatively worded statements are answered consistently. The present study differs by comparing the two modes within the same students, by testing whether peer interaction is related to concentration differently in each mode, and by controlling for response style.

The community of inquiry framework (Garrison et al., 2000) holds that social presence, the ability of participants to project themselves and connect with others, supports engaged learning. Social presence arises naturally in face-to-face classes and must be created online, which suggests that interaction with peers should be more closely tied to concentration face to face than online. The novelty of the study lies in testing this contrast within one sample while separating substantive relationships from agreement bias. The research is urgent because institutions are deciding how to combine modes, and they need evidence on whether concentration differs and on what supports it in each. Three hypotheses are tested: students' concentration differs between online and face-to-face learning (H1); peer interaction is positively related to concentration in each mode (H2); and the relationship is stronger in face-to-face learning than online (H3).

Accordingly, this study aims to compare students' concentration in online and face-to-face learning, to test the relationship between peer interaction and concentration in each mode, and to determine whether these relationships differ.

METHOD

This study employed a quantitative cross-sectional survey design with a within-subject comparison of two learning modes and a correlational analysis of peer interaction. The participants were 59 active fifth-semester students enrolled in the Educational Office Administration Study Program at Universitas Negeri Makassar, Indonesia, who had experienced both online and face-to-face learning. The study population included 110 students, and researchers recruited participants using accidental sampling. We collected data between September and October 2026. Participation was voluntary, and respondents provided consent to participate. Respondents' names were neither used in the analysis nor reported in the manuscript. The study did not obtain formal approval from an institutional ethics committee.

The questionnaire consisted of 19 first-person statements answered on a five-point Likert agreement scale (1 = strongly disagree to 5 = strongly agree). The source of the instrument and whether it was adopted, adapted, or self-developed should be specified where applicable. Concentration in online learning was measured using five positively worded statements (items 1–5), concentration in face-to-face learning using five statements (items 8–12), and peer interaction using four statements (items 15–18). Five negatively worded statements (items 6, 7, 13, 14, and 19), concerning loss of concentration during online learning, social media distractions, loss of focus during face-to-face learning, engagement in other activities, and passivity in peer interactions, were not reverse-scored. This decision was based on their positive correlations with the positively worded statements within their respective blocks ($r = .24$ to $.61$) and the reduction in reliability coefficients to .11–.30 when reverse-scored. Instead, these items were averaged separately as a response-style indicator reflecting the tendency to agree regardless of statement direction. Item 19 was missing for three respondents; therefore, their response-style scores were calculated using the four available items.

Item validity was assessed using corrected item–total correlations against the critical value of .256 ($n = 59$, $\alpha = .05$), while internal consistency was evaluated using Cronbach's alpha. The reliability coefficients were .74 for online concentration, .55 for face-to-face concentration, .70 for peer interaction, and .74 for the response-style indicator. Although item 12 had a corrected item–total correlation below the critical value (.00), it was retained in the analysis.

Concentration in online and face-to-face learning was compared using paired-samples t-tests and Wilcoxon signed-rank tests on the composite scale scores and two matched statements: concentration (items 1 and 8) and understanding of learning materials (items 5 and 11). Holm correction was applied to the three comparisons. Relationships between peer interaction and concentration were examined using Pearson correlation coefficients, with 95% confidence intervals calculated through Fisher's z transformation, and Spearman rank correlations. The difference between the correlations of peer interaction with concentration in the two learning modes was examined using Williams' t-test for dependent correlations.

Additionally, ordinary least squares regression was used to examine the association between peer interaction and concentration in each learning mode, initially without and subsequently with the response-style indicator as a control variable. Regression assumptions were examined using the Shapiro–Wilk test for residual normality and the Breusch–Pagan test for homoscedasticity. Percentile bootstrap confidence intervals were calculated using 5,000 resamples. A sensitivity analysis was conducted by repeating the main analyses after excluding respondents with duplicate and uniform response patterns. All statistical tests were two-tailed, with the significance level set at $\alpha = .05$. Statistical analyses were performed using Python 3 with the pandas, SciPy, and statsmodels libraries, while figures were generated using Matplotlib.

RESULT AND DISCUSSION

Students reported high concentration in online learning (M = 4.17) and very high concentration in face-to-face learning (M = 4.24), and peer interaction was also high (M = 4.04; Table 1). The difference between the two modes on the scale scores was small and not significant, −0.07 points, t(58) = −1.09, p = .281, dz = −0.14 (Wilcoxon p = .443), so H1 is not supported. On the matched statements (Table 2), face-to-face learning scored higher for concentration (4.34 against 4.12; p = .041) and for understanding the material (4.31 against 4.03; p = .017), but neither difference survived Holm correction (adjusted p = .083 and .051). Agreement with the negatively worded statements was also high (M = 4.00), including losing concentration online (M = 4.20) and being tempted by social media online (M = 3.97), which signals response-style agreement.

Table 1. Descriptive Statistics, Reliability, and Tests against the Midpoint (n = 59)

Scale	Items	M	SD	95% CI	Category	α	t(58)
Concentration, online	5	4.17	0.51	[4.04, 4.30]	High	.74	17.60
Concentration, face to face	5	4.24	0.38	[4.14, 4.34]	Very high	.55	25.10
Peer interaction	4	4.04	0.50	[3.91, 4.17]	High	.70	15.89
Negatively worded statements	5	4.00	0.59	[3.85, 4.16]	High	.74	12.95

Source: authors' survey data (2026). Scale 1–5; CI = confidence interval; a = Cronbach's alpha; all t values are significant at p < .001

Table 2. Paired Comparisons of Online and Face-to-Face Learning (n = 59)

Comparison	Online M	Face-to-face M	Difference [95% CI]	t(58)	p	Holm p	dz
Concentration scale	4.17	4.24	−0.07 [−0.21, 0.06]	−1.09	.281	.281	−0.14
Concentrate (S1 vs S8)	4.12	4.34	−0.22 [−0.43, −0.01]	−2.09	.041	.083	−0.27
Understand material (S5 vs S11)	4.03	4.31	−0.27 [−0.49, −0.05]	−2.46	.017	.051	−0.32

Source: authors' survey data (2026). Difference = online minus face-to-face; Holm correction for three tests

Peer interaction was strongly and positively correlated with face-to-face concentration (r = .61, 95% CI [.42, .75], p < .001; Spearman ρ = .63) but only weakly with online concentration (r = .18, p = .182; Spearman ρ = .26, p = .045; Table 3). The difference between these two correlations was significant, Williams t(56) = −3.51, p < .001, which supports H3. Concentration in the two modes was moderately correlated (r = .33, p = .011). The response-style indicator was correlated with online concentration (r = .60), with peer interaction (r = .45), and less with face-to-face concentration (r = .34).

Table 3. Correlations among Concentration, Peer Interaction, and the Response-Style

Indicator (n = 59)

Pair	Pearson r	95% CI	p	Spearman ρ	p
Peer interaction – Face-to-face	.61	[.42, .75]	< .001	.63	< .001
Peer interaction – Online	.18	[−.08, .41]	.182	.26	.045
Online – Face-to-face	.33	[.08, .54]	.011	.32	.014
Response style – Online	.60	[.40, .74]	< .001	.64	< .001
Response style – Face-to-face	.34	[.09, .55]	.008	.41	.001
Response style – Peer interaction	.45	[.22, .63]	< .001	.52	< .001

Source: authors' survey data (2026). CI = confidence interval (Fisher z)

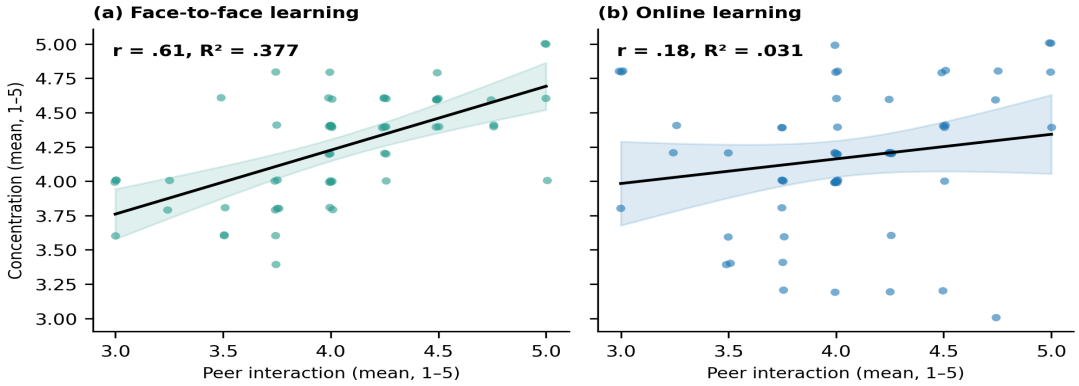
In the simple regression (Table 4; Figure 1), peer interaction had a significant positive effect on face-to-face concentration (B = 0.466, p < .001, bootstrap 95% CI [0.32, 0.63]), with R^2 = .377, F(1, 57) = 34.47, p < .001, and a large effect size (f^2 = 0.60); the effect remained after adding the response-style indicator (β = .577, p < .001), which itself was not significant. For online concentration, peer interaction was not a significant predictor (β = .176, p = .182; R^2 = .031), and when the response-style indicator was added, only the indicator was significant (β = .649, p < .001), lifting R^2 to .367. H2 is therefore supported for face-to-face learning only. Residuals were normal in all models (Shapiro–Wilk p ≥ .062). After excluding 5 duplicated patterns and 2 uniform responders (n = 52), peer interaction remained strongly correlated with face-to-face concentration (r = .59) and weakly with online concentration (r = .25; p = .079), and the mode difference remained nonsignificant (p = .136).

Table 4. Regression of Concentration on Peer Interaction, with and without the Response-Style Control

Outcome and model	Predictor	B	SE	β	p	Bootstrap 95% CI	R^2
Face to face, 1	Peer interaction	0.466	0.079	.614	< .001	[0.32, 0.63]	.377
Face to face, 2	Peer interaction	0.438	0.089	.577	< .001	[0.28, 0.60]	.382
	Response style	0.052	0.075	.081	.495	[−0.10, 0.26]	
Online, 1	Peer interaction	0.179	0.133	.176	.182	[−0.12, 0.50]	.031
Online, 2	Peer interaction	-0.118	0.121	−.116	.332	[−0.40, 0.21]	.367
	Response style	0.558	0.102	.649	< .001	[0.32, 0.84]	

Source: authors' survey data, 2026

Figure 1. Concentration in relation to peer interaction (lines are least-squares fits with 95% bands; source: authors' survey data, 2026



Students described their concentration as high in both modes, and the scale comparison found no significant difference between online and face-to-face learning, with only a small, uncorrected tendency favoring face-to-face learning for concentrating and for understanding the material. The clearer result concerns peer interaction: it was strongly related to face-to-face concentration, and about 38% of the variance was shared, but it was not significantly related to online concentration, and the two relationships differed significantly. In terms of the community of inquiry framework (Garrison et al., 2000), social presence is built into face-to-face classes, where interaction with peers and the lecturer happens naturally and shapes attention, whereas online it has to be created deliberately, so that students who interact little may not differ in concentration.

The absence of a clear mode difference contrasts with studies in which students and sensors indicate more lapses of attention online (Qiao et al., 2024; Vinh & Bang, 2023; Yang et al., 2022) and in which offline learning yields higher satisfaction and comprehension (Liu et al., 2024; Batra et al., 2021). Our matched statements point in the same direction as these studies, but the effects were small and not robust to correction, and the students may have been experienced online learners after the pandemic. The link between peer interaction and focus agrees with research that finds peer collaboration and discussion to support engagement and focus (Kilinc & Buyuk, 2023; Tran & Tran, 2026; Peungcharoenkun & Waluyo, 2024). That it was not found online is consistent with reports of communication barriers and reduced interaction in online classes (Shrivastava et al., 2021; Motz et al., 2022).

The study contributes a within-student comparison of modes that separates real differences from agreement bias, and it shows that peer interaction goes with concentration mainly face to face. For lecturers, this suggests using face-to-face time for collaborative tasks and discussion, which are linked to focus, and designing online sessions with structured group work, feedback, and peer rapport (Yang et al., 2022; Mann et al., 2026) rather than assuming that interaction alone will keep students focused. For institutions, decisions about mode should consider the social presence that each mode provides, and online courses should address distraction through self-regulation support and course design (Robb & Shellenbarger, 2021; Cho & Im, 2024).

Several results were unexpected. Students agreed with negatively worded statements about losing concentration and being tempted by social media while also agreeing that they concentrate well; the positive correlation between these statements and the positively worded ones signals acquiescence, and the response-style indicator alone explained most of the variance in online concentration scores, which means that the online scale partly reflects how students use the scale. The face-to-face scale had low reliability (alpha of .55), with the statement on staying focused in a noisy class unrelated to the others. These limitations, together with the small sample, self-report, many duplicated response patterns (5 of 59), the

missing description of the sample, and the cross-sectional design, mean that the findings are indicative. Future research should use validated and balanced concentration measures, objective indicators such as attention tracking or engagement logs, a larger and described sample, and longitudinal or experimental designs that vary the mode and the opportunities for peer interaction.

CONCLUSION

This study compared the concentration of 59 university students in online and face-to-face learning and tested the role of peer interaction. Concentration was high in both modes and did not differ significantly, although matched statements hinted at a slight advantage for face-to-face learning. Peer interaction was strongly related to face-to-face concentration, explaining about 38% of its variance, even after controlling for response style, but not to online concentration, and the two relationships differed significantly. The study contributes evidence that peer interaction goes with concentration mainly in face-to-face learning, which implies that lecturers should use face-to-face sessions for collaboration and deliberately build social presence into online sessions. The main limitation is the small, self-reported sample with modestly reliable scales and response-style bias, which prevents causal conclusions. Future research should replicate the findings with validated measures and objective indicators of attention.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to Universitas Negeri Makassar, particularly the Office Administration Education Study Program, for its academic support throughout this research. Appreciation is also extended to all participants who contributed to the study by sharing their experiences and perspectives on peer interaction and learning concentration in online and face-to-face learning environments.

AUTHOR CONTRIBUTIONS

S.H.A.: conceptualization, methodology, investigation, data collection, formal analysis, and writing–original draft. M.: methodology, supervision, data interpretation, and writing–review and editing. Both authors have read and approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to the research, authorship, or publication of this manuscript.

REFERENCES

Abou-Khalil, V., & Ogata, H. (2021). Homogeneous student engagement: A strategy for group formation during online learning. *Lecture Notes in Computer Science*.

Balve, A., & Manoharan, G. (2026). Virtual group dynamics in online classroom engagement. In *Trust and connection in digital spaces: From homes to classrooms*.

Batra, S., Sharma, S. R., Kumra, N., & Gupta, M. (2021). Traditional vs e-teaching learning due to COVID-19: A case study for mathematics course. *Journal of Engineering Education Transformations*.

Cho, S. Y., & Im, T. (2024). The structural relationships among online class related factors, zoom fatigue, learning engagement, perceived achievement, and class satisfaction in university online classes. *Education and Information Technologies*.

Cvetković, K., Lazović, N., Krulj, J., ... Kostić, J. O. (2025). The correlation between academic media multitasking and achievement: A meta-analysis. *International Journal of Cognitive Research in Science, Engineering and Education*.

Dai, Y., & Hu, X. (2025). Exploring the impact of cognition, motivation and environment on the concentration of online learning among college students in Western China. *Education and Information Technologies*.

Dontre, A. J. (2021). The influence of technology on academic distraction: A review. *Human Behavior and Emerging Technologies*.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105.

He, X., & Wen, J. (2025). The impact of teacher feedback, perceived teacher support, and peer relationships on online learning engagement: An analysis of the mediating effects of self-efficacy and learning motivation. *SAGE Open*.

Kilinc, H., & Buyuk, K. (2023). Examination of online group discussions in terms of intrinsic motivation, social presence, and perceived learning. *E-Learning and Digital Media*.

Kokoç, M. (2021). The mediating role of attention control in the link between multitasking with social media and academic performances among adolescents. *Scandinavian Journal of Psychology*.

Liu, W., Yang, Y., & Peng, S. (2024). Impacting factors and effects of college student learning satisfaction: A comparative study. *International Journal of Innovation and Learning*.

Mann, B., Bali, T., & Minosky, S. A. (2026). Student perceptions of peer and faculty rapport in the online classroom: A qualitative study. *Scholarship of Teaching and Learning in Psychology*.

Mealings, K., & Buchholz, J. M. (2024). The effect of classroom acoustics and noise on high school students' listening, learning and well-being: A scoping review. *Facilities*.

Motz, B. A., Quick, J. D., & Morrone, A. S. (2022). When online courses became the student union: Technologies for peer interaction and their association with improved outcomes during COVID-19. *Technology, Mind, and Behavior*.

Nguyen, T. B., Cao, V. B., Trinh, C. M., & Nguyen, A. H. (2025). EFL undergraduates' perceptions of factors affecting concentration in online learning. *2025 7th International Workshop on Artificial Intelligence and Education*.

Peungcharoenkun, T., & Waluyo, B. (2024). Students' affective engagements in peer feedback across offline and online English learning environments in Thai higher education. *Asian-Pacific Journal of Second and Foreign Language Education*.

Qiao, L., Guan, S., & Wang, W. (2024). Online learning concentration recognition based on computer vision. *ACM International Conference Proceeding Series*.

Robb, M., & Shellenbarger, T. (2021). The distracted online student: Strategies to capture attention and promote connection. *Teaching and Learning in Nursing*.

Shrivastava, G., Ovais, D., & Arora, N. (2021). Measuring the walls of communication barriers of students in higher education during online classes. *Journal of Content, Community and Communication*.

Tahura, S. S., Shabur, M. A., & Nuva, T. J. (2025). Evaluating the online and offline learning effectiveness in Bangladesh using Analytic Hierarchy Process. *Discover Sustainability*.

Thongmak, M., & Ruangwanit, N. (2021). Online learning vs. offline learning in an MIS course: Learning outcomes, readiness, and suggestions for the post-COVID-19 world. *Proceedings of the International Conference on Electronic Business*.

Tran, N. N. Q., & Tran, N. T. (2026). Exploring the impact of peer-to-peer learning on student engagement and academic performance: Insights from online and hybrid higher education in Vietnam. In *Peer-to-peer learning in online and hybrid education*.

Vaszkun, B., & Mihalkov Szakács, K. (2025). Looking for student success factors outside of the educators' scope: The effect of digital literacy, personal skills, and learning habits and conditions on self-evaluated online learning effectiveness in management education. *International Journal of Management Education*.

Vinh, T. Q., & Bang, N. (2023). Evaluation system of student's concentration using deep learning-based head-pose estimation. *Proceedings of the 2023 International Conference on Advanced Computing and Analytics*.

Visentin, C., & Prodi, N. (2026). Let's get loud: How classroom activities influence speech and noise levels during lessons. *Building and Environment*.

Wang, C.-C., & Chen, M.-C. (2026). An eye-tracking study to investigate the impact of media multitasking behaviour on visual attention and learning performance in online learning. *Research Papers in Education*.

Wei, L., Chen, X., Zheng, M., ... Gao, Y. (2023). An analysis on the influencing factors of learning motivation based in the teaching blending online and offline: The mediating role of self-efficacy and task value. *E3S Web of Conferences*.

Yang, C., & Wang, H. (2023). Exploring the factors influencing online learning engagement: A partial least squares structural equation modeling approach. *Proceedings of the 2023 13th International Conference on Information Technology in Medicine and Education*.

Yang, T., Luo, H., & Sun, D. (2022). Investigating the combined effects of group size and group composition in online discussion. *Active Learning in Higher Education*.

Yang, Z., Kang, X., Gong, Y., ... Xie, Y. (2022). Study on online education students' attention based on multi-source data in COVID-19. *Proceedings of the 2022 Chinese Automation Congress*.

Zhao, L. (2023). Social media multitasking and college students' academic performance: A situation–organism–behavior–consequence perspective. *Psychology in the Schools*.