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The contribution of social networks to the learning-social interaction and their impact on student motivation and academic achievement

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Abstract. This study examines how interactions in class WhatsApp groups impact students' motivation and academic achievements. The research incorporates both qualitative and quantitative analyses to explore associations between various types of interactions and academic performance. Key findings reveal a strong positive correlation between students' motivation and the volume of affective-emotive messages, especially those from teachers. While cognitive-analytic interactions did not significantly predict higher academic achievement, qualitative interviews highlighted the need for more educational content in WhatsApp groups, such as exercises. The study also found a positive, albeit weak, association between classroom climate and interaction patterns. However, an interesting inverse relationship emerged between socioeconomic status and the prevalence of affective-emotive messages. The research emphasizes the importance of incorporating affective-emotive interactions in educational settings and recommends expanding the use of WhatsApp groups as an effective supplementary platform for fostering motivation and improving academic achievements.

Keywords: Intrinsic motivation, extrinsic motivation, academic achievements, technological environment, social networks, WhatsApp, social interaction, learning interaction.

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Introduction

Over the past two decades, the introduction of new technologies has transformed classroom teaching. These advancements have redefined the role of teachers as mediators of technological learning methods (Waldman, 2007; Nachmias, & Mioduser, 2001). The rise of web-based platforms has significantly influenced the educational field, with an increasing number of educators utilizing internet technology to communicate with students. The integration of technology profoundly impacts learning methods, as well as interactions among students and between students and teachers.

Currently, meaningful learning for students is not solely reliant on traditional authorities like teachers or literary sources. Often, students acquire knowledge through interactions with their peers, engaging in discussions and sharing information cooperatively. Such diverse interactions within a socio-cultural context fulfil a basic human need. Social interaction serves as a primary catalyst for cognitive and intellectual development (Vygotsky, 2004). Among several cooperative learning methods, a significant one is through social networks (Adani et al., 2012). This type of learning not only fosters intrinsic motivation but also teaches students to be accountable team members, proud of their group's achievements (Gregory & Kaufeldt, 2015).

Social ties that support feelings of efficacy, autonomy, and belonging underpin intrinsic motivation and enhance self-directedness in extrinsic motivation (Adani et al., 2012). When students perceive their studies as interesting

and meaningful, they experience a strong sense of gratitude and belonging to their school (Adani et al., 2012).

Consequently, intrinsic motivation, which is inherently individual, plays a vital role in enhancing the atmosphere and fostering a sense of social integration within educational institutions. Social connections also provide students with confidence, both generally and in their learning endeavors. Cooperative learning not only promotes social learning but also acts as a significant motivator. As part of a group, students contribute to and learn from the group's success, driven by their team spirit and sense of belonging (Strauss et al., 2017).

WhatsApp, a smartphone app designed for instant messaging, has seen a significant increase in popularity in recent years. It is commonly used to organize student groups, with or without teachers, and facilitates much of the classroom activity online, including the distribution of messages and content (Deshen et al., 2014). However, the impact and development of WhatsApp as a technological platform within the Ministry of Education have not been thoroughly investigated, and its long-term systemic effects remain unexplored.

Motivation is a psychological process that incites arousal, direction, and persistence in purposeful, goal-directed behaviour. It is generally divided into two types: intrinsic and extrinsic (Richard & Deci, 2011). Intrinsic motivation is driven by personal satisfaction or the inherent interest in the activity itself (Levoy, 2008), whereas extrinsic motivation arises from external factors such as rewards or the avoidance of punishment (Adani et al., 2012). When students find their studies interesting and meaningful, they often feel a sense of gratitude and belonging to their school, enhancing both the atmosphere and social cohesion within educational settings (Adani et al., 2012). This shows that intrinsic motivation is crucial for fostering a positive interpersonal and social climate at schools, contributing to students' social development (Bromberg-Martin et al., 2010).

In technology-enhanced learning environments, the emotional dimension is critical. Many students struggle with the learning process due to a lack of intrinsic motivation or feelings of insecurity. Therefore, it is essential to bolster the motivational-emotional aspect and boost students' self-confidence to improve their comprehension and retention of study material (Ross et al., 2016).

The rise of mobile social networks has expanded the potential for technology-based communication between teachers and students. WhatsApp, recognized for its high availability, ease of use, and interactive nature, has become a prominent medium. Class WhatsApp groups that include both teachers and students are altering the traditional teacher-student relationship and are increasingly used for academic and social purposes. The dynamics of classroom communication within these shared WhatsApp groups represent a relatively unexplored area, making it a fitting subject for this study.

Globally, billions engage in technology-based social interactions. Preece and Shneiderman (2009) categorized the engagement of social platform users into four types: 1) readers, who primarily consume content like information and images; 2) contributors, who actively participate by posting critiques, uploading photos, or distributing materials to group members; 3) collaborators, who initiate or join groups to discuss and solve problems through collective efforts, where forming trust and empathy among members is crucial; 4) leaders, who play a pivotal role

by setting policies, enforcing rules, or editing materials and instructions.

Studies conducted in a technological environment enhance student involvement and creativity within the learning process (Chen & Bryer, 2012). Echoing the model developed by Preece and Shneiderman, learning that incorporates the use of social media can also be categorized into four levels of participation. At the first level, the reading level, students engage minimally by 'liking' or providing other brief responses to confirm that they have read the material or agree with a proposed option, etc. This reading is not only fundamental but also serves as the initial step towards more active engagement, with each mark of approval representing an expression of trust and appreciation.

Moving to the second level, the contribution level, some participants begin sharing materials with their peers, thereby enhancing the communal resource pool. The third level, the collaboration level, sees students taking a more active role. This is evidenced by their creation of various discussion groups (in contexts such as preparing assignments or making decisions) and taking initiative, such as writing a letter of request to the teacher on behalf of the entire class or responding to peers' inquiries about the study material.

At the highest level, the leadership level, students take on roles that significantly influence the learning environment. They provide guidance by correcting errors in content uploaded by others, initiating new ideas, or identifying and addressing issues for the benefit of all learners. They also enforce policies—such as discouraging the sharing of inappropriate materials or collaboration on unauthorized projects – start petitions and motivate all group members to participate actively (Preece & Shneiderman, 2009).

Methods

For this study, interactions on the WhatsApp social network were categorized into two distinct types based on their characteristics, following the model proposed by Hativa (2015).
Cognitive-analytic interactions – These involve contents that focus on the organizational aspects of the class, such as utilizing learning time effectively, explaining and clarifying study material, and creating student involvement in class activities.

Affective-emotive interactions – These interactions encompass caring and providing emotional support aimed at fostering students' success. Examples include words of encouragement, empathetic responses to students' difficulties, and offering help and encouragement.

To measure and categorize these interactions, a coding scheme was applied based on predefined criteria. Messages in the WhatsApp groups were independently reviewed and categorized by two raters. To ensure reliability, the raters underwent training to align their understanding of the coding criteria. The categorization was validated through interrater reliability testing using Krippendorff's Alpha.

This dual categorization enabled a comprehensive analysis of the types of interactions occurring within the WhatsApp groups and their potential impact on students' academic achievements and motivation.

Research Hypotheses

- There will be a positive correlation between the level of affective-emotive interactions and students' motivation levels. These interactions are expected to enhance students' emotional engagement and drive to succeed academically.
- There will be a positive correlation between the level of cognitive-analytic interactions and students' academic achievements. Effective organizational communication and clarification of study materials are hypothesized to improve educational outcomes/
- Increased student involvement in the WhatsApp social network is hypothesized to positively influence their motivation to study, providing a supportive and interactive learning environment.
- There will be a positive correlation between classroom climate and the patterns of interaction within the class WhatsApp group, encompassing dynamics such as student- teacher, student-student, teacher-student, and teacher-students.

Research Population and Sample

The study involved 217 participants enrolled in grades 7 through 9, ranging in age from 12 to 16 years old. These students were drawn from various schools located across different geographical regions of Israel, including the north, center, and south. The distribution of participants aimed to represent a diverse range of demographic backgrounds, including variations in socioeconomic status, which was measured on a scale from 2 to 9 based on their city of residence.

The sample size was selected to ensure sufficient statistical power for the analyses conducted, and the inclusion of multiple schools from geographically diverse regions aimed to enhance the representativeness of the findings. Furthermore, the range of socioeconomic backgrounds provided an opportunity to analyze potential variations in interaction patterns and their impact on student motivation and academic achievements.

While the study focused on a school-aged population, the findings should be interpreted with consideration of the developmental, social, and educational characteristics specific to this age group. Future studies may be needed to explore whether these findings can be generalized to other populations, such as college students or adult learners.

Research Tools

The study employed a mixed-methods approach, combining quantitative and qualitative research paradigms to enhance the reliability and depth of the findings (Tashakkor & Teddie, 2003). This approach allowed for a comprehensive examination of the research hypotheses through the integration of different research methods, thus enabling a more accurate exploration across various dimensions:
Quantitative Methods were used to distinguish between different types and levels of interaction and to assess their impact on students' academic achievements.

Qualitative Methods focused on a general examination of the phenomenon and the effects of different interactions on students' motivation levels before and after the semester. They provided a deep understanding of students'

attitudes and perspectives towards the various types of interactions.

Research Design

Quantitative Research Design

The quantitative component of the study utilized the Motivated Strategies for Learning Questionnaire (MSLQ), which comprises 31 self-report items on a Likert scale and is recognized for its reliability and adaptability for various research, instructional, and student purposes. The MSLQ, translated into several languages, has been widely employed by researchers and instructors globally (Duncan & McKeachie, 2005). It assesses six dimensions:

- Intrinsic Orientation: Items 1, 16, 22, 24 (α=0.74, moderate reliability).
- Task Value: Items 4, 10, 17, 23, 26, 27 (α=0.90, high reliability).
- Control Beliefs about Learning: Items 2, 9, 18, 25 (α=0.68, moderate reliability).
- Self-efficacy: Items 5, 6, 12, 15, 20, 21, 29, 31 (α=0.93, high reliability).
- Test Anxiety: Items 3, 8, 14, 19, 28 (α=0.80, high reliability).
- Extrinsic Orientation: Items 7, 11, 13, 30 (α=0.62, low reliability).

Prior to administration, respondents were provided with an introduction explaining the questionnaire's purpose and instructions for completion. Additionally, a demographic details questionnaire was administered.

In the realm of classroom climate, the study employed the Classroom Environment Scale (CES), developed by Moos and Trickett (1974), which has been used extensively to analyze classroom climates in secondary schools. The CES evaluates nine dimensions across 10 true/false items per dimension:
Relationship Dimension:

- Involvement (α=0.81, high reliability)
- Affiliation (α=0.71, medium reliability)
- Teacher Support (α=0.85, high reliability) Personal Growth Dimension:
- Task Orientation (α=0.72, medium reliability)
- Competition (α=0.60, low reliability) System Maintenance Dimension:
- Order and Organization (α=0.90, high reliability)
- Rule Clarity (α=0.74, medium reliability)
- Teacher Control (α=0.71, medium reliability)
- Innovation (α=0.71, medium reliability)

Qualitative Research Design

As an integral part of the qualitative segment of the study, content analysis was employed, utilizing both personal and group interviews. This approach was geared towards gaining insights into students' perspectives on their motivation to study and the influence of social interactions via WhatsApp on both their motivation and academic achievements. Qualitative methods are particularly valuable for describing and thoroughly examining phenomena, capturing all their nuances, conceptions, and meanings. According to Shelsky and Alpert (2007), phenomenological research delves into individuals' personal experiences and elucidates the interpretations they attribute to their

perceived realities.

In addition, semi-structured interviews were conducted with students from each class at the semester's end. These interviews focused on the students' experiences with the WhatsApp groups, probing their perceived contributions to both motivation and academic success. The interview guide included five open-ended questions designed to explore the students' motivation to study and the impact of social interactions within these groups, aiming to complement the study's quantitative data.

Furthermore, focus group discussions were organized to facilitate group interviews, providing a platform for students to collectively discuss their experiences and views. This method enabled a richer, community-based perspective on the study's focal points.

Results

Examination of Interrater Reliability and Cronbach's Reliability

To assess the interrater reliability for the two types of interactions within WhatsApp groups – cognitive-analytic and affective-emotive – we implemented the Krippendorff's Alpha Reliability Estimate test (Hayes & Krippendorff, 2007). An additional evaluator reviewed all the messages and categorized them according to predefined criteria. Subsequently, a correlation test was conducted between the assessments of the two raters. This test revealed very high interrater reliability across all evaluated measures. The results are detailed in Table 1, which presents the interrater reliability scores for both cognitive-analytic and affective-emotive interactions.

Table 1

Interrater reliability (n=2)

Name of variable	Krippendorff's Alpha
Type of interaction – cognitive-analytic	α=0.95
Type of interaction – affective-emotive	α=0.96

To assess the internal reliability of the Motivation Questionnaire and the Classroom Climate Questionnaire, we conducted a Cronbach's alpha test of internal reliability. This test, applied to responses measured on a Likert scale, evaluates the consistency of items within each questionnaire. The findings from this test are displayed in Table 2, which presents the reliability values for the research questionnaires.

Correlations Between Research Variables

To investigate the hypothesis that there is an association between students' level of involvement in the WhatsApp social network and their motivation to study, we conducted a Pearson correlation test. The results demonstrated a strong, significant positive correlation ($r = .55$, $p < .01$), indicating that higher levels of general involvement in the WhatsApp network are associated with higher motivation levels among students.

Table 2

Cronbach's reliability

	n	Mean	SD	Cronbach's alpha
Motivation to succeed in studies – first semester	217	4.24	1.11	α = 0.95
Motivation to succeed in studies – second semester	217	4.75	0.84	α = 0.92
Classroom climate – first semester	204	53.28	13.68	α = 0.90
Classroom climate – second semester	204	53.42	13.34	α = 0.90

Furthermore, the analysis of message volume within the WhatsApp groups revealed that the quantity of general messages is a significant predictor of students' motivation. Table 3 details the regression coefficients for each submodel. In the first model, the results indicated that the progression from the first to the second semester significantly predicts an increase in students' motivation to study. According to the total model, the volume of general messages in the WhatsApp group emerged as the most significant predictor of students' motivation. Table 3 below presents the findings of the analysis.

Table 3

Level of motivation – linear regression coefficients for second semester and amount of general messages

	B	β	t	R^2	R^2 change
First model:				0.09	
Constant	3.83		48.22***		
Second semester	0.58	0.31	5.18***		
Second model:				0.39	0.30***
Constant	3.44		46.76***		
Second semester	0.58	0.31	6.31***		
Amount of general messages	0.01	**0.55**	11.29***		

p<0.001***, p<0.01**, p<0.05*

Association Between Classroom Climate and Interaction Patterns in WhatsApp Groups

The study investigated the hypothesis that there is an association between the classroom climate and the patterns of interaction in the class WhatsApp group, encompassing various dynamics such as student-teacher, student-student, teacher-student, and teacher-students. To explore this hypothesis, we conducted a Pearson correlation test. The results confirmed a positive, though weak, association between classroom climate and the patterns of interaction

within the WhatsApp group. This suggests that while the classroom climate does influence interaction patterns, the effect might not be strongly pronounced. The detailed findings from this analysis are presented in Table 4, which outlines the Pearson correlation coefficients between these specific research variables.

Table 4

Table of Pearson correlation test between the research variables

	1	2	3	4	5
1. Classroom climate	--				
2. Student-teacher	**.198****	--			
3. Student-student	**.175***	.899**	--		
4. Student-students	**.190****	.990**	.924**	--	
5. Teacher-student	**.173***	.950**	.962**	.951**	--
6. Teacher-students	**.162***	.808**	.472**	.767**	.614**

p<0.001***, p<0.01**, p<0.05*

The analysis revealed that student-teacher messages are the most significant variable influencing classroom climate. This underscores the teacher's pivotal role in shaping this climate. WhatsApp, utilized primarily for affective-emotive messaging, proves to be an effective tool for fostering a positive classroom environment through these interactions.

Semi-structured Interviews

During the semi-structured interviews, participants were given a questionnaire containing five open-ended questions. The responses to these questionnaires were thoroughly analyzed. The findings from these qualitative questionnaires supported and reinforced the quantitative results, highlighting the significant role of the classroom WhatsApp group in boosting students' academic achievements and enhancing their motivation.

Key insights include:

- Interactions with cognitive-analytic features are crucial and should be given more importance. It is recommended to not only use these interactions for disseminating material and technical announcements but to also incorporate actual learning elements.
- The involvement of teachers and educational staff in the WhatsApp group is essential and should be increased to maximize its educational potential.
- Consideration should be given to expanding the uses of the group, potentially transforming it into an additional learning platform alongside traditional classroom studies.

Focus Group

In focus group discussions, students expressed that the web is underutilized, particularly noting that it could be better used for providing exercises and examples to enhance learning. They highlighted that their level of involvement in learning activities is significantly influenced by the positive feedback they receive, especially from teachers. This raises a question about the correlation between the amount of positive feedback and student engagement, aligning with Preece and Schneiderman's model, though the exact nature of this relationship remains to be clarified.

Students also pointed out that the WhatsApp group serves as a critical tool for compensating for missed study material due to absences. They suggested improvements such as appointing someone to photograph the whiteboard and share it in the group at the end of each lesson to help those who were absent.

During the Covid-19 pandemic, when physical classes were replaced by Zoom sessions, the role of digital tools like WhatsApp became even more pivotal. Students noted the significant use of the WhatsApp group during this period, not only for academic purposes but also for maintaining social connections. They emphasized the importance of the WhatsApp group in building a cohesive class community and facilitating communication among students.

Discussion

The study found a significant positive association between students' motivation and the number of affective-emotive messages in the class WhatsApp group. Affective-emotive interactions include caring and offering emotional support for student success, such as words of encouragement, expressions of empathy for students' challenges, and providing help. Cooperative learning generates social learning, which is a proven motivator. Social ties reinforce self-efficacy, and autonomy and belonging are crucial for maintaining intrinsic motivation (Adani et al., 2012). The support given to students in the WhatsApp group boosted their intrinsic motivation, leading to improved academic achievements. Studies have demonstrated that intrinsic motivation fosters a more comprehensive understanding of concepts and theories because intrinsically motivated learners are inclined to continue engaging with topics that interest them, resulting in richer and more complex relationships. Furthermore, intrinsic motivation fosters desirable emotional states and inclines students to be considerate of others (Irvine, 2018).

According to the model devised by Fogg, changing behaviour requires sufficient motivation. Encouraging motivation becomes simpler with the use of technology, including online video and social networks. The model provides valuable insights for education professionals, helping them encourage behaviour changes in learning. A critical dimension in the model for generating motivation is the social dimension because the need for social acceptance and the desire to avoid rejection are powerful motivators (Fogg, 2009). This study shows that WhatsApp is a significant social motivator because adolescent students are primarily driven by their desire to gain social acceptance. Through affective-emotive messages on WhatsApp, particularly from teachers, a process of empowerment is set in motion. Students' strengths, particularly internally, develop and are acquired. Empowerment often occurs through communication in small groups where people build confidence in their ability

to achieve desired goals. These groups are often organized by a coach who can later withdraw, leaving the group to continue independently (Feldman, 2018). In the academic context, the teacher usually serves as this coach.

The most influential predictor of students' motivation is the number of affective-emotive messages, particularly those posted by the teacher. The conclusion is that positive reinforcement of students in the group increases motivation and learning achievements. WhatsApp, as a social network, is a suitable and readily available tool for offering support and sharing positive messages.

In contrast to the affective-emotive interaction, the level of cognitive-analytic interaction, consisting of content about lesson organization, time utilization for learning, explaining and clarifying study materials, and involving students in class, did not predict a rise in academic achievements. Cooperative learning fosters intra-group cooperation and mutual assistance during learning activities. When one student achieves their goals, others in a cooperative relationship with them also succeed (Gregory & Kaufeldt, 2015). Personal interviews and conversations with students revealed a lack of cognitive-analytic interaction in the WhatsApp group, such as providing questions and solutions, examples, explanations, and sharing information. Most cognitive-analytic messages involved general and administrative information about time management rather than facilitating access to information and cooperative learning. This limited scope of cognitive-analytic interactions might explain their lack of significant impact on academic achievement. While organizational messages, which focus on technical, logistic and administrative aspects are essential for maintaining structure, they do not directly contribute to enhancing understanding or application of the material. To maximize the potential of cognitive-analytic interactions, the teacher’s role in these groups must go beyond administrative tasks. Teachers can actively encourage discussions around specific exercises, post thought-provoking questions, and facilitate the sharing of student-generated solutions. As we explain below, by strategically emphasizing cognitive-analytic interactions in WhatsApp groups, educators can provide a balanced digital learning environment that complements emotional engagement with intellectual rigor. We are certain that this dual approach not only motivates students but also equips them with the tools and skills necessary for academic success.

The interviews and focus group revealed that most participants categorized messages in the WhatsApp group as primarily technical and administrative, such as test schedules and general announcements, without addressing effective learning, particularly in challenging subjects like mathematics. Studies on formal and informal learning show that formal learning is only a small part of the overall learning experience. Learners can use interactions to upload questions, content, and assignments to the web (Chen & Bryer, 2012). Thus, students believe that more strategic and consistent use of WhatsApp could enhance learning. Cognitive-analytic interactions can serve as a bridge between classroom teaching and independent learning. By using WhatsApp groups to post exercises, examples, and solutions, teachers can provide students with additional opportunities to engage with the material. This reinforcement will allow students to revisit concepts at their own pace, foster a deeper understanding and improve retention. The real-time communication aspect of WhatsApp groups will allow for quick clarification of doubts and immediate dissemination of information. Also, WhatsApp groups can help bridge the gap for students who might need additional support outside the classroom. For instance, providing detailed explanations, worked-out solutions, or study guides ensures that students with varying levels of prior knowledge or learning pace have

access to resources that meet their individual needs. In addition, WhatsApp groups, if enriched with cognitive-analytic content, can encourage cooperative learning. For example, students can collaboratively solve problems, discuss examples, or clarify doubts within the group. Teachers can allocate specific times for sharing cognitive-analytic materials, such as example problems, step-by-step solutions, or summaries of key concepts. A teacher-moderated approach will ensure that shared content remains accurate and relevant. This may encourage students' consistent engagement, the sharing of their own solutions, insights, or summaries and foster a sense of mutual learning.

When individuals organize themselves around a shared goal, opportunities emerge for collective learning, mutual support, and group action. Individual vulnerabilities are reduced by the strength of the group. On this topic, students noted that WhatsApp was not used effectively, and therefore, the opportunity to give students an informal learning experience was not fully realized. As the students mentioned in the questionnaires, the WhatsApp group is a valuable platform for peer learning, making up missed material, and sharing information. They acknowledged that this process was necessary and could have improved their achievements. In the focus group, students also highlighted the social importance of the WhatsApp group in building a cohesive class, maintaining communication, and sharing information about students' absences. They believe that this could improve mutual support among classmates.

Conclusions

General involvement of students in the WhatsApp social network improved their motivation to study. Social interaction is a primary motivator that fosters cognitive and intellectual development (Vygotsky, 2004). Consequently, high social interaction on WhatsApp could enhance students' motivation to achieve cooperative learning, as noted in the questionnaires, as well as their motivation to study. Research findings confirm that the volume of general announcements on WhatsApp groups is the most significant predictor of students' motivation. Moreover, cooperative learning nurtures students' intrinsic motivation. It teaches them to be team players, accountable for their group's success, and proud of their group's achievements. Cooperative learning and teamwork yield meaningful learning, arousing interest, curiosity, and higher-order thinking, such as critical and creative thinking. Collaboration among students focused on learning via WhatsApp instilled a sense of involvement and importance. Cooperative learning ignites students' motivation to succeed, leading them to strive and persevere (Gregory & Kaufeldt, 2015).

The qualitative findings revealed that most participants were eager for increased communication and interaction both socially and academically, emphasizing the need for examples and effective learning tools. According to Preece and Shneiderman (2012), participation occurs at four levels: reading, contributing, collaborating, and leading. Students believe that extensive online use and collaborative involvement would enhance their motivation to study and their achievements. However, practical tools like exercises and solutions are necessary to facilitate this participation.

The indirect relationship between socioeconomic status scores and academic achievements was significant and negative; higher socioeconomic scores predict better academic performance. This aligns with similar studies, such

as one presented in the literature review comparing African American and Caucasian students. Socioeconomic status was three times more important than ethnicity in predicting academic success two years post-high school graduation (Battle & Lewis, 2008).

The study identified a positive (albeit weak) correlation between classroom climate and patterns of interaction within the class WhatsApp group (student-teacher, student-student, student-students, teacher-student, and teacher-students). Terms like climate and class management describe the academic, emotional, and social atmosphere resulting from the interactions between the teacher, students, study materials, and other factors (De Pedro et al., 2016). This climate is often characterized by students and teachers feeling comfortable and happy and by the teacher's positive attitude and warmth toward students. A positive classroom climate boosts achievements and mitigates adverse effects from challenging factors while fostering a sense of well-being and pleasure (De Pedro et al., 2016). The finding that student-teacher messages were the most influential variable affecting classroom climate underscores the teacher's role in shaping this climate and the potential of WhatsApp as a tool for this purpose, particularly through affective-emotive messages.

The qualitative findings from interviews reinforce the quantitative results, demonstrating that the class WhatsApp group is vital for enhancing academic achievement and boosting student motivation. Cognitive-analytic interactions should be emphasized more. The involvement of the teacher and educational staff is crucial, and their use of cognitive-analytic interactions should be expanded to include exercises, examples, and solutions rather than merely technical announcements. The group could be transformed into an additional learning platform that complements classroom studies, providing more examples and solutions for exercises and study material.

The main conclusion of the study is that using WhatsApp groups is crucial, and educators must integrate this interaction, especially through affective-emotive messages, to bolster student motivation and academic achievement. The study confirmed a positive (though weak) correlation between classroom climate and the types of interactions in the class WhatsApp group (student-teacher, student-student, student-students, teacher-student, and teacher- students). However, no significant relationship was found between classroom climate and the types of interactions (cognitive-analytic, affective-emotive). Therefore, we conclude that communication via WhatsApp improves classroom climate regardless of the message type.

Limitations and future research directions

The research population consisted exclusively of school-aged students from various schools in different geographical regions. This diversity strengthens the generalizability of our findings to the broader population of students within this age group (Sackett & Yang, 2000). However, it is important to consider how the developmental, social, and contextual characteristics of school-aged students might limit the applicability of these findings to other groups, such as college students or adult learners.

We examined how interactions in class WhatsApp groups impacted students' motivation and academic achievements. A key finding was the critical role of affective-emotive interactions in fostering student motivation and engagement within educational settings, particularly those interactions initiated by teachers. The age and

developmental stage of the participants may have influenced these outcomes. For instance, school-aged students might be more responsive to the affective-emotive support provided by teachers and peers in digital platforms due to their reliance on external encouragement and their developing autonomy. College students, in contrast, might prioritize cognitive-analytic content over affective-emotive interactions because of their more advanced cognitive abilities and greater focus on self-directed learning (Zhoc et al., 2018). Moreover, differences in digital communication norms, learning environments, and academic expectations between school-aged and older populations may also affect how WhatsApp group interactions influence motivation and academic achievement. Future research should explore whether these observed effects hold across different age groups and educational contexts. Investigating college students, adult learners, or even workplace training environments could provide a broader understanding of how affective-emotive and cognitive-analytic interactions impact motivation and learning outcomes.

A notable finding from the study is that an increase in socioeconomic status scores predicts a decrease in the volume of affective-emotive messages within class WhatsApp groups. This aligns with a prior study that found positive school climates and supportive messages from teachers significantly improve student achievements, particularly for those from low socioeconomic backgrounds (De Pedro et al., 2016). A plausible explanation for this finding could be that the need for positive reinforcement diminishes as socioeconomic status increases. Students from higher socioeconomic status backgrounds often have greater access to resources, including private tutors, extracurricular activities, and a more supportive home environment. These may reduce their reliance on external emotional reinforcement from teachers and peers. Also, students from higher socioeconomic status backgrounds often have access to multiple educational resources, such as online learning platforms or private study groups, reducing their dependency on WhatsApp groups for interaction and support. An additional explanation using Maslow's hierarchy of needs (Maslow & Lewis, 1987). may be that for higher socioeconomic students, basic needs such as security and belonging are typically well-met, allowing them to focus on higher-order goals like academic achievement. Students from lower socioeconomic status might prioritize emotional support as part of fulfilling their belongingness needs. Future research could explore this relationship in greater detail through qualitative interviews or observational data, to better understand how socioeconomic status influences communication patterns. Variables such as family dynamics, cultural norms, and access to alternative educational tools should also be explored to provide a more comprehensive picture of this relationship.

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Dr. Sharon Tzur: Conceived and designed the analysis; Collected the data; Contributed data or analysis tools.

Prof. Nitza Davidovitch: Conceived and designed the analysis; Wrote the first draft; Reviewed and edited the final draft.

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