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## WHATSAPP IS THE MESSAGE: OUT-OF-CLASS COMMUNICATION, STUDENT-TEACHER RELATIONSHIP, AND CLASSROOM ENVIRONMENT

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### ABSTRACT

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Aim/Purpose	To study associations between elementary-, middle- and high-school students' perceptions of classroom environment and student-teacher relationship and their out-of-class communication practices via WhatsApp app.
Background	Communication between students and teachers is usually extended beyond the classroom's time and space. This communication, referred to as out-of-class communication (OCC), may impact students' academic, social, and emotional development. Today, OCC is facilitated via social media and instant messaging services, which may have impact on its nature.
Methodology	Methodology was quantitative in nature. Data was collected using an online questionnaire (implemented on Google Forms, <a href="http://forms.google.com">http://forms.google.com</a> ), during June-July 2016. Participants (n=300), from 5th-12th grades (11-18 years old), were recruited in schools in a few Arab villages in northern Israel, with the assistance of their teachers.
Contribution	The present study expands the growing body of knowledge about student-teacher communication via online social networks, specifically regarding out-of-class communication. We identify the unique aspects of WhatsApp-based out-of-class communication, which shed light on student-teacher relationship at large. Findings from this study may assist educators (while in training and/or professional development programs) to reflect upon their own educational agenda and to check if and how they and their students can benefit from OCC.

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Findings	Overall, we identify WhatsApp's important, unique role in promoting good student-teacher relationship and positive classroom environment.
Recommendations for Practitioners	The findings regarding the unique contribution of WhatsApp to student-teacher out-of-class communication should be taken into consideration by policy makers while formulating policies for the use of online social networks in educational settings. Teachers should be aware of the important role this type of communication plays for their students and for their classroom. Both teachers and students should communicate respectfully, with teachers serving as role models for their students regarding proper digital behavior.
Recommendations for Researchers	This study should be replicated to more populations and to more communication platforms, in order to validate its findings.
Impact on Society	The associations between out-of-class communication via online social networks and student-teacher relationship have two main effects on society at large. First, promoting better student-teacher communication could improve learning and teaching. Second, if this communication is to be carried out properly, the students - who are the future citizens - will learn how to behave correctly in the digital age.
Future Research	It is advised to explore the studied associations in other populations and regarding other communication platforms. Also, qualitative exploration is advisable, as it may shed more light on the unique aspects of WhatsApp-based student-teacher out-of-class communication.
Keywords	out-of-class communication, student-teacher relationship, classroom environment, social media, instant messaging, WhatsApp

## INTRODUCTION

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Interactions between students and teachers in the class and during the school day are only part of the communication between them. Today, with the host of easy-to-use digital platforms, students and teachers often interact in many other ways, using different communication channels, e.g., schools' administrative systems, e-mails, social networking sites, or instant messaging services. The latter is the focus of the current study, as the popularity of these services has grown dramatically in recent years, and they have become a common means for both personal and professional communication.

Out-of-class communication (OCC) between students and teachers—that is, teacher-student communication that occurs beyond the classroom boundaries—may have positive implications for both students and teachers (Abd Elhay & Herskovitz, in press; Forkosh-Baruch & Herskovitz, in press; Goldman, Goodboy, & Bolkan, 2016; Herskovitz & Forkosh-Baruch, 2017). Communication is key in the development of relationship between individuals. Therefore, OCC may be associated with student-teacher relationship. Following this, student-teacher relationship is related to environment. Hence, OCC may be linked with classroom environment (these variables will be defined and explained below).

Most studies on OCC were focused on student achievements and on higher-education population, and there is still a lack of research on the relationships between OCC in grade-school and the overall learning experience. In today's digital world, many people—young and old—are constantly using online social networks and instant messaging platforms for communicating with each other. It is of no surprise, then, that OCC is facilitated via these platforms as well. However, these platforms may present some critical issues regarding privacy, information sharing, and boundary blurring, which may prevent some students and teachers using them, and may bring educational policy makers to ponder about that use. Of course, together with these potential obstacles, there are some important advantages that student-teacher communication via these platforms may promote, as accessibility, im-

mediacy, and the promotion of feeling of closeness (Asterhan & Rosenberg, 2015; Forkosh-Baruch & Hershkovitz, 2018; Forkosh-Baruch, Hershkovitz, & Ang, 2015; Hershkovitz & Forkosh-Baruch, 2017).

Therefore, the purpose of this study is to study associations between elementary-, middle- and high-school students' perceptions of classroom environment and student-teacher relationship and their OCC practices via WhatsApp app.

## BACKGROUND

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### *INSTANT MESSAGING AND SOCIAL MEDIA FOR OUT-OF-CLASS COMMUNICATION*

With the rapid emergence of new communication platforms, they have been used—like any preceding technology—not only in personal, but also in professional and business settings (Golden, 2017; Kaplan & Haenlein, 2010; Kietzmann, Hermkens, McCarthy, & Silvestre, 2011; Rönkkö, Urinboyev, Svensson, Svensson, & Carlsson, 2017). In the educational context, social media has been used for many purposes, including for teaching and learning and for general student-teacher communication (Dron & Anderson, 2014; Greenhow & Askari, 2017; Manca & Ranieri, 2016; Mnkandla & Minnaar, 2017). As the popularity of instant messaging apps has rapidly grown—WhatsApp has about a billion users daily, Facebook Messenger has about 70 million (Constine, 2017; WhatsApp, 2017)—these platforms too are used to extend student-teacher communication beyond school time (Bouhnik & Deshen, 2014; Nkhoma et al., 2015; Rosenberg & Asterhan, 2017).

Importantly, the use of instant messaging and social media for student-teacher OCC does not only extend this communication, but may also change its nature, specifically regarding frequency and content (Gross, 2015). In particular, social media and instant messaging extensively serve teachers and students for social-relational purposes (Asterhan & Rosenberg, 2015). For students, this type of communication adds an important layer to their existing personal use of such platforms. Using social media and instant messaging services for implementing rich, diverse OCC with teachers, may enrich students' learning-related uses of these platforms and enhance their overall motivation to learn (Aaen & Dalsgaard, 2016; Odewumi, Bamigboye, Olawuyi, & Bamigboye, 2017), hence, the attractiveness for students of using this type of OCC.

It is important to notice that it is the rich use of these platforms that makes a difference for students and teachers alike (Mazana, 2018; Tang & Hew, 2017). Indeed, when limiting the use of these potentially rich online environments to include only academic-related discussions with teachers, no differences are observed in their use by students, compared to other (online or offline) alternatives (DeSchryver, Mishra, Koehler, & Francis, 2009; Li & Pitts, 2009).

Nevertheless, this type of out-of-class communication is, of course, not without challenges—first and foremost, privacy issues—hence, has been a matter of debate among educators and educational policy makers (cf. Forkosh-Baruch & Hershkovitz, 2014; Mazana, 2018). Israel, where the current study was conducted, had dramatically limited teacher-student communication via online social networks. The Ministry's original regulation, published in late 2011 and still valid as of today (early 2018), clearly states that “the use of online social networks for interpersonal interactions between teachers and students is prohibited” (Ministry of Education, 2011). A few months after the original publication, the Ministry had published an updated regulation, this time allowing, even encouraging, student-teacher communicating in closed groups for learning purposes only, under some limiting conditions; one of the conditions is that no personal information about the teacher will be exposed to the students, and vice versa (Ministry of Education, 2013). Although these regulations had been phrased in the context of the now “old” online social networking sites, specifically Facebook, they may be applicable to the currently popular instant messaging services, specifically WhatsApp.

## ***OUT-OF-CLASS COMMUNICATION AND TEACHERS-STUDENT RELATIONSHIP, CLASSROOM ENVIRONMENT***

Communicating with teachers outside the classroom may impact students' perceptions of teachers (Dobransky & Frymier, 2004) and may affect the student-teacher relationship and classroom environment (Myers & Claus, 2012). Student-teacher relationship is key in the overall teaching and learning process (Birch & Ladd, 1998; Cornelius-White, 2007; Gregory & Weinstein, 2004; Hamre & Pianta, 2001, 2006; Sabol & Pianta, 2012); so is classroom environment (Dorman, 2003; MacAulay, 1990; Pawlowska, Westerman, Bergman, & Huelsman, 2014). Hence, OCC may affect learning and teaching at large.

Communication between students and teachers that goes beyond the classroom and beyond school time plays an important role in the development of close student-teacher relationship (Dobransky & Frymier, 2004; Sheer & Fung, 2007). It is also the nature of such communication that may promote closer relationship between students and teachers (Bolkan & Holmgren, 2012). Associations between OCC and variables that are related to classroom environment were also identified in the literature. For example, student motivation—which is associated with classroom environment (Ryan & Patrick, 2001)—was found associated with OCC practices (Jaasma & Koper, 1999).

Users of social media and instant messaging, including teachers and students, are usually self-exposed to a high degree on these platforms, as they were originally aimed at personal communication. As was previously shown, students who were exposed to a teacher's Facebook page that was high in self-disclosure—compared to those who were exposed to a page low in self-disclosure—anticipated higher levels of motivation to learning and of more positive classroom environment regarding this teacher's lessons, and perceived this teacher as more credible (Mazer, Murphy, & Simonds, 2007, 2009). Similarly, teachers posting social tweets—rather than just scholarly tweets—were perceived as more credible by students (Johnson, 2011). The other side of that coin is the case of teachers who feel confused and uncertain of their “expected” response when exposed to students' online misbehavior, or overall unsure whether their role boundaries should extend online (Forkosh-Baruch & HersHKovitz, in press; HersHKovitz, Forkosh-Baruch, & Ang, 2014). Therefore, OCC via the “new media” sets up some new challenges for the educational milieu (Helvie-Mason, 2011), and it is no wonder that in some cases this type of communication is prohibited by policymakers (cf. Forkosh-Baruch & HersHKovitz, 2014).

## ***THEORETICAL FRAMEWORKS***

### **Student-teacher relationship**

Our study of student-teacher relationships is based on the axes defined in Ang's (2005) Teacher-Student Relationship Inventory (TSRI), namely, Satisfaction, Instrumental Help, and Conflict. We found this framework suitable for two main reasons. First, this inventory was validated by populations of middle school teachers, while previous scales, mainly Pianta's (1992) STRS, were mostly focused on much younger ages. Secondly, Ang's axes well connect with the special characteristics of today's social media environments.

The first axis of this framework is Satisfaction, which refers to experiences reflecting positive experiences between students and teachers; these are linked to positive adjustment to school (Wentzel & Asher, 1995). Studies show that teachers prefer students who demonstrated positive—as opposed to negative—attitudes (Brophy & Evertson, 1978). Furthermore, supportive and positive teacher-student relationships predict positive educational outcomes among lower secondary and high school students (Davis, 2003).

The second axis is Instrumental Help, that is, when students refer to teachers as resource persons, such that they might approach for advice, sympathy, or help. Studies of teacher-student relationships

among secondary-school students state that one of the major dimensions connected to student outcomes is Instrumental Help. Teachers that are concerned about their students' well-being and academic performance, exhibiting interest in them, seek out to assist them in any way they can (Brophy & Evertson, 1978; Coladarci, 1992; Wentzel, 2003). Teachers that show they care for their students are also those who provide assistance, advice and encouragement, beyond the formal demands of their profession. Their students develop a positive connection to their teachers as well as higher engagement in class; hence, they strive for goals and outcomes in accordance to their teachers' academic values (Ang, 2005).

The third axis is Conflict, referring to negative and unpleasant experiences between students and teachers. Conflict is positively related to behavioral problems (Pianta, Steinberg, & Rollins, 1995) and negatively related to engagement in class (Ladd & Burgess, 2001), i.e., the higher the levels of conflict students feel towards their teachers, the more likely these students will demonstrate more behavioral problems and less engagement in class.

Originally, Ang's (2005) TSRI was used to collect data from teachers about their relationship with a given student of them. In previous studies, we adapted this tool, together with Prof. Ang, to collect data from students regarding a teacher of them (Forkosh-Baruch, Hershkovitz, & Ang, 2015), which is the version we will use here. We previously used this framework in the context of Facebook-mediated student-teacher communication, and we use it here to better understand students' perceptions of student-teacher relationship and communication via WhatsApp.

### **Classroom Environment**

Classroom environment—also referred to as classroom climate or learning environment—is overall referring to “the unique interactive combination of teacher behaviors, curriculum expectations, and student-to-student interactions which develops in the classroom setting” (R. E. Myers & Fouts, 1992, p. 930). Classroom environment (CE) has been extensively studied over the last decades, as it was found important for students' social, emotional, and cognitive development, as well as for teachers' well-being and professional development (Evans, Harvey, Buckley, & Yan, 2009; Fraser, 1991; MacAulay, 1990), and various different measures have been developed to capture it (Fraser, 1998).

We are mostly influenced by Moos and Trickett's seminal work (1974), which lay the groundwork for a three-dimensional understanding of CE. It was argued that CE is consisting of personal development, system maintenance, and relationship dimensions. Each of these dimensions is then divided into a few categories. Under the personal development dimension, the categories are task orientation, and competition; under the system maintenance dimension, the categories are order and organization, rule clarity, teacher control, and innovation; and under the relationship dimension, the categories are involvement, affiliation, and teachers support. It is important to note that although early empirical examinations supported this structure (Trickett, Qninlan, & Trickett, 1979), later analyses found different data-driven structures of it (Boren, Callahan, & Peugh, 2011; Pawlowska et al., 2014; van der Sijde & Tomic, 1992). Additionally, Moos and Trickett's original measuring tool for classroom environment—the Classroom Environment Scale (CES)—is a very long one, including ninety items. Therefore, as will be explained below, we used a modified, shortened version of CES, and checked its structure prior to continuing with the analyses.

### ***RESEARCH QUESTIONS***

Our research questions are the following:

1. What are the associations between general out-of-class student-teacher communication and:
  - 1.1. Student-teacher relationship?
  - 1.2. Classroom environment?

2. What are the associations between WhatsApp-based out-of-class student-teacher communication and:
  - 2.1. Student-teacher relationship?
  - 2.2. Classroom environment?
3. What is the unique contribution of WhatsApp-based out-of-class communication to classroom environment?

## METHODS

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### *RESEARCH FIELD*

The study takes place in a context of traditional school settings. That is, participants were students in typical local public schools in the area where they live. During the school day, there was no intervention what so ever, and all that we did was survey them regarding their relationship with their teachers and about their OCC practices. Of course, we assume that while participating in school routine—which is usually based on classroom meetings, studying different topics—some form of student-teacher relationship are naturally developed. And as OCC exists in most school settings, it is about these relationships that we had asked them.

### *RESEARCH POPULATION*

Methodology was quantitative in nature. Data was collected using an online questionnaire (implemented on Google Forms, <http://forms.google.com>), during June-July 2016. Participants, from 5th-12th grades (11-18 years old), were recruited in schools in a few Arab villages in northern Israel, with the assistance of their teachers. The villages in which data was collected are characterized by a relatively low socioeconomic status (Cluster 2 out of 10, with 1 hosting the villages with the lowest socioeconomic status, and 10 hosting the villages with the highest status) (Central Bureau of Statistics, 2017). Overall, we have 300 participants, of whom 171 are girls (57%) and 129 are boys (43%). The majority of the population, 180 (60%), is in elementary school (grades 5-6), 94 (31%) are in middle school (grades 7-9), and another 26 (9%) are in high school (grades 10-12). Participants had between 0-7 years of experience with WhatsApp ( $M=2.3$ ,  $SD=1.2$ ,  $n=289$ ).

### *VARIABLES AND MEASURES*

The research questionnaire was built from a few sections, each inspired by and adapted based on existing questionnaires, as will be detailed below. For making the questionnaire easy-to-fill for the younger participants, we shortened most of the measuring tools we used (some included over 30 items). Also, we used 5-point Likert type scales across the questionnaire, ranged from "1" (strongly disagree) to "5" (strongly agree). Our questionnaire was presented to students in Arabic (their mother tongue), so in addition to the adaptation mentioned here, we translated the items from either English or Hebrew. All questionnaires were presented to experts in educational research, to evaluate their validity and accessibility. English versions of the adapted tools are shown in the Appendix. Statistical analyses were done using IBM SPSS Version 24.

### **Background Variables**

Background variables included *grade-level*, *gender*, *experience using WhatsApp*, *most significant means of OCC with teachers* [multiple choice: phone, e-mail, text messages, WhatsApp, social networking sites, or at school after lessons], and *most significant way of communicating with teachers via WhatsApp* [multiple choice: WhatsApp group for the whole classroom, WhatsApp group for part of the classroom, broadcast by the teacher, private messages] (filled only by students who were communicating with a teacher of theirs via WhatsApp).

## Independent variables

Each participating student indicated whether they were *Communicating via WhatsApp with a Teacher who Currently Teaches You* [yes/no]. Using this variable, we partitioned the population into two mutually exclusive sub-groups of WhatsApp-Communicating and Non-WhatsApp-Communicating students.

Students in the WhatsApp-Communicating group were asked to think of a teacher who was currently teaching them and with whom they were communicating via WhatsApp, while other students (that is, in the Non-WhatsApp-Communicating group) were asked to think of an arbitrary teacher of their choice who teaches them. The remaining variables were measured referring to that teacher.

*WhatsApp Out-of-Class Communication* (WhatsApp-OCC, 15 items,  $\alpha=0.90$ ). This variable (measured only for participants in the WhatsApp-Communicating group) captures students' perceptions of WhatsApp communication with a specific teacher. It is based on Hayes, Weibelzahl, and Hall's (2013) study of text messaging for out-of-class communication. In the original study, 30 items were used to capture habits of undergraduate students' OCC with their instructors, using a 7-point Likert scale. We chose the most relevant 15 items and left them intact except for changing "lecturer" to "teacher" and "text messages" to "WhatsApp messages". WhatsApp-OCC was calculated as the mean of all items (one item was reversed; hence, it was reverse-coded by us, as was done for all reversed items in the other questionnaires). The full version of this questionnaire is presented in the Appendix.

*General Out-of-Class Communication* (General-OCC, 3 items,  $\alpha=0.70$ ). This variable measures general habits of OCC with teachers (not with a specific teacher) and is adapted from the Out of Class Interaction Scale (Knapp & Martin, 2002). Originally, the questionnaire included 9 items measured on a 5-point Likert scale. We chose the most relevant 6 items, 3 of which are reversed. Reliability test for this variable yielded a rather low Cronbach's alpha of 0.49. We assume that the phrasing of the reversed items was confusing for the participants. Indeed, an exploratory factor analysis resulted with a two-factor solution, where the reversed items were grouped together, apart from the non-reversed items. Therefore, we omitted the reversed items and were left with three items which were averaged to constitute the General-OCC variable. The questionnaire is presented in the Appendix.

*Homeroom Teacher* (Yes/No). All students were indicating whether the teacher to whom they referred when filling-up the TSRI questionnaire (see below) was their homeroom teacher or not. The term "homeroom" refers to the main teacher of the class. In the Israeli educational system, each class has a teacher who accompanies it for a few years; this teacher's main role is to support students' academic, emotional and social development and to lead the class as a cohesive entity. (The homeroom teacher may also teach other subject matters, according to her or his expertise.) As for the importance role homeroom teachers play in students' school-life, we use this variable to further partition each analyzed sub-group, hence, to test for its specific role in the context of our study.

## Dependent Variables

*Student-Teacher Relationship* (TSRI-S, 14 items, 3 dimensions,  $\alpha=0.75-0.83$ ). Based on Ang's (2005) framework for student-teacher relationship, this variable measures student-teacher relationships on three axes: Satisfaction, Instrumental Help, and Conflict. It was measured using TSRI-S, an adapted version of Ang's Teacher-Student Relationship Inventory (TSRI). Originally, TSRI captures teacher-student relationship as perceived by a teacher regarding an individual student. In a previous study, we created TSRI-S, in which students report perceived relationship with an individual teacher (Hershkovitz & Forkosh-Baruch, 2017); that version resulted with reliability coefficients (Cronbach's alpha) of 0.88, 0.87 and 0.88, for Satisfaction, Instrumental Help, and Conflict, respectively; we get only a little lower coefficients here, for the translated version, with  $\alpha=0.83$  for Satisfaction,  $\alpha=0.75$  for Instrumental Help, and  $\alpha=0.80$  for Conflict.

*Classroom Environment* (CE; 11 items,  $\alpha=0.89$ ). This variable is a multi-dimensional measure of classroom environment. The Classroom Environment Scale (CES) was originally developed by Trickett and Moos (1973) to capture middle- and high-school students' perceptions of classroom environ-

ment. The original tool included 90 items—to be ranked using yes/no scores dichotomous—that were categorized into three dimensions and nine sub-scales, as was detailed above. Later, this tool was refined (cf. Pawlowska et al., 2014). One of its most recent versions, in the context of undergraduate students, includes 32 items in five dimensions: Structure and Focus, Instruction Support, Participative Learning, Classroom Involvement, and Student Competition (Pawlowska et al., 2014); Pawlowska et al.’s analyses revealed a somewhat different inner structure of the Scale, with some items cross-loading in multiple dimensions and some failing to load in any category. As all items in our questionnaire are ranked on a 5-point Likert type scale—which may impact overall scale structure by itself; as we shortened the Scale, taking only 16 items (4 of which are reversed); and as we administered this questionnaire to elementary-, middle-, and high-school students – we ran an exploratory factor analysis, in order to explore the structure of this adapted tool. We used Quartimax rotation with Kaiser normalization.

Factor analysis resulted in a three-factor solution, which accounts for 54.3% of the variability. Factor loadings for each variable are shown in Table 1. Note that Component 2 includes all the reversed items (items 8, 9, 12, 16), which again demonstrate a potential problem with participants’ understanding of their phrasing; component 3 holds only one item (item 6), which is the only one directly referring to teacher-student relationship, an issue covered by the abovementioned variable. Therefore, we decided to remove these items. Re-running a factor analysis with the remaining eleven items indeed yielded a single-component solution, which accounts for 49.2% of the variability. Reliability test for the remaining items resulted with a Cronbach’s alpha of 0.89; overall score was calculated using linear regression, based on the factor loadings, and was constructed to have  $M=0$ ,  $SD=1$ .

**Table 1. Factor loading for each variable in the three-factor solution. Strongest loadings for each variable are emphasized in bold and in grey shade**

ITEM	COMPONENTS		
	1	2	3
1. Almost all class time is spent on discussing the course material	<b>.485</b>	-.295	-.294
2. There is a clear set of rules for students to follow	<b>.817</b>	.011	-.178
3. This is a well-organized class	<b>.828</b>	.057	.060
4. Assignments are usually clear so everyone knows what to do	<b>.699</b>	.143	.057
5. This instructor often spends time just talking with students	<b>.614</b>	-.056	.445
6. The instructor takes a personal interest in students	.419	-.024	<b>.700</b>
7. New and different ways of teaching are tried very often in this course	<b>.698</b>	.016	.309
8. Students have very little input on how class time is spent (R)	-.377	<b>.496</b>	-.090
9. Students do the same kind of work almost every day in this class (R)	-.078	<b>.609</b>	.366
10. Students in this class get to know each other really well	<b>.632</b>	.006	-.381

11. Students enjoy working together on projects in this class	<b>.754</b>	.093	.097
12. Students are often clock-watching in class (R)	.083	<b>.751</b>	.060
13. Students sometimes present something they've worked on to the class	<b>.625</b>	-.137	.161
14. Students try hard to get the best grade	<b>.731</b>	-.075	.003
15. Students have to work for a good grade in this class	<b>.739</b>	-.087	-.138
16. Students usually pass even if they do not do much (R)	-.052	<b>.575</b>	-.220

## FINDINGS

### *DESCRIPTION OF OCC PRACTICES (INDEPENDENT VARIABLES)*

Students' perceptions of OCC, measured by General-OCC, have an average of 3.11 (SD=0.99, n=300). Skewness and Kurtosis values are -0.003 and -0.47, respectively, and as n=300, we can assume normality based on these measures (Kim, 2013). There is **no correlation between General-OCC and grade-level**, with Spearman's  $\rho=0.04$ , at  $p=0.53$ . Also, **no differences were found between boys' and girls' General-OCC**.

Overall, **WhatsApp was marked as the most significant digital means of OCC** by a vast majority of 217 participants (72%). The other means—phone calls, text messages, email, and social networking sites—were marked together by 58 participants (19%), with 25 (8%) mentioning no OCC at all. Interestingly, only 3 participants (1%) mentioned that their most significant means for OCC was to talk with the teacher in school, after lessons.

The WhatsApp-Communicating group, that is, students who were communicating beyond classroom via WhatsApp with a teacher who was teaching them (while filling-up the questionnaire), holds 211 students (70%). The rest (89 students, 30%) were in the Non-WhatsApp-Communicating. Of the first group, 51 students (24%) stated that they were WhatsApp-communicating with teachers less than once in a week, 100 (48%) stated that they were WhatsApp-communicating with teachers a few times a week, and 60 (28%) stated that they were WhatsApp-communicating with teachers almost daily.

In the WhatsApp-Communicating group, the most popular means of communication was via a whole classroom WhatsApp group (156 students mentioned this, 74%), following by a WhatsApp group with part of the class (32, 15%), and private messages (23, 11%). No students mentioned that the teacher communicating with them on WhatsApp via broadcasting. Participants' perceptions of WhatsApp-based OCC, measured by WhatsApp-OCC, have an average of 3.68 (SD=0.80, n=211). Skewness and Kurtosis has values of -0.44 and -0.11, respectively; as n=211, we calculate absolute z-score for testing normality based on these values ( $\frac{\text{Skew}}{\text{SE}_{\text{Skew}}}, \frac{\text{Kurtosis}}{\text{SE}_{\text{Kurtosis}}}$ ), and get values of 2.63 and 0.33, respectively, from which we can conclude that the distribution of this variable can be assumed as normal (Kim, 2013).

Generally, there is a medium positive correlation between General-OCC and WhatsApp-OCC, with  $r=0.44$ , at  $p<0.001$ . As in the case of the former, there is **no correlation between WhatsApp-OCC and grade-level**, with  $\rho=-0.11$ , at  $p=0.10$ . However, there is a **small-medium negative correlation between frequency of WhatsApp-OCC and grade-level**, with  $\rho=-0.24$ , at  $p<0.01$ ; that is, the older the student in the WhatsApp-Communicating group, the less frequent their communication with

their teacher via WhatsApp. **No differences were found between boys' and girls' WhatsApp-OCC and neither regarding frequency of WhatsApp-OCC.**

Finally, we find a weak positive correlation between students' perceptions of their WhatsApp-based OCC and the frequency in which they communicate with their teacher via WhatsApp, with Spearman's  $\rho=0.15$ , at  $p<0.05$  ( $n=211$ ). That is, as expected, the more frequent the WhatsApp-based OCC occurs, the higher the students' perceptions of their WhatsApp-based OCC.

### ***DESCRIPTION OF STUDENT-TEACHER RELATIONSHIP, CLASSROOM ENVIRONMENT (DEPENDENT VARIABLES)***

Student-teacher relationship, measured by TSRI-S, includes three dimensions. Satisfaction has a mean of 4.04 (SD=0.96), Instrumental Help has a mean of 3.10 (SD=0.92), and conflict has a mean of 1.78 (SD=1.28), all with  $n=300$ . Skewness values for these dimensions are -1.28, -0.29, and 1.28, respectively; Kurtosis values are 1.28, -0.29, and 1.06, respectively – all are in the range to assume normality of these variables, considering the population size (Kim, 2013).

Recall that classroom environment, measured by CE, is eventually a calculated variable, which is based on the coefficients derived from the factor analysis of part of the CES items. Therefore, this variable has a mean of 0 and a standard deviation of 1 by definition, hence only its distribution is important. Skewness and Kurtosis values are -1.41 and 2.26, respectively, and as  $n=300$ , we can assume normality based on these measures (Kim, 2013).

### **Associations with Grade-Level, Age, Experience Using WhatsApp (Background Variables)**

There are **no significant correlations between participants' grade-level and neither of TSRI-S's axes**: correlation coefficients are for Satisfaction  $r=-0.14$ , at  $p=0.80$ ; for Instrumental Help,  $r=-0.11$ , at  $p=0.06$ ; and for Conflict,  $r=-0.07$ , at  $p=0.26$ . Also, **no significant correlation between grade-level and CE** ( $r=-0.05$ , at  $p=0.26$ ). All these tests ran with  $n=300$ .

Checking for associations with gender, while comparing variable means between boys and girls, **only TSRI-S's Conflict was found significantly different among genders (higher for boys)**. Mean conflict for the boys was higher than the girls' ( $M=2.03$ ,  $SD=0.95$ ,  $n=129$ ;  $M=1.60$ ,  $SD=0.86$ ,  $n=171$ ), with  $t(261.2)=4.02$ , at  $p<0.001$ . As Levene's Test for equal variances proved significance, with  $F=6.36$ , at  $p<0.05$ , we did not assume equal variances.

Testing for associations with experience using WhatsApp, only CE was found significant, however to a low extent, with  $r=-0.13$ , at  $p<0.05$ .

### ***ASSOCIATIONS BETWEEN OCC AND STUDENT-TEACHER RELATIONSHIP***

#### **General OCC and student-teacher relationship**

We first checked correlations between general OCC practices and student-teacher relationships ( $n=300$ ). We found **positive medium correlations between General-OCC and TSRI-S's Satisfaction and Instrumental Help** (Pearson's  $r=0.40$ , and  $r=0.37$ , respectively), both at  $p<0.001$ . That is, the higher the student's positive perceptions of general out-of-class communication with a given teacher, the higher the values of Satisfaction and Instrumental Help of the student's relationship with this teacher. No significant correlation was found between General-OCC and the Conflict dimension ( $r=-0.03$ ,  $p=0.57$ ).

Testing for effects of the chosen teacher being the student's homeroom teacher brings up some interesting results. **TSRI-S's Satisfaction and Instrumental Help were, on average, higher when referring to the homeroom teacher** ( $n=244$ ) **than when referring a non-homeroom teacher** ( $n=56$ ). Satisfaction average for students who referred to their homeroom teacher was 4.11

(SD=0.88), while average when referring a non-homeroom teacher was 3.73 (SD=1.24), with  $t(68.3)=2.15$ , at  $p<0.05$  (as Levene's Test for equal variances proved significance, with  $F=13.37$ , at  $p<0.001$ , we did not assume equal variances). Instrumental Help for students who referred to their homeroom teacher was 3.17 (SD=0.87), while the average when referring a non-homeroom teacher was 2.79 (SD=1.10), with  $t(71.5)=2.41$ , at  $p<0.05$  (as Levene's Test for equal variances proved significance, with  $F=6.34$ , at  $p<0.05$  we did not assume equal variances). Effect sizes for the differences in Satisfaction and Instrumental Help are medium-high, Cohen's  $d=0.52$  for Satisfaction, and Cohen's  $d=0.57$  for Instrumental Help. No differences were found regarding the Conflict dimension nor for General-OCC. Results are summarized in Table 2.

**Table 2. Comparing between TSRI-S and General-OCC when referring to a homeroom teacher or not**

VARIABLE	REFERRING TO HOMEROOM TEACHER, M (SD), N=244	REFERRING TO NON-HOMEROOM TEACHER, M (SD), N=56	T	EFFECT SIZE (COHNE'S D)
TSRI-S Satisfaction	4.11 (0.88)	3.72 (1.24)	2.15* df=68.3†	0.52
TSRI-S Instrumental Help	3.17 (0.87)	2.79 (1.10)	2.41* df=71.5†	0.57
TSRI-S Conflict	1.81 (0.91)	1.69 (1.01)	0.87 p=0.39	-
General-OCC	3.14 (0.98)	2.98 (1.05)	1.11 p=0.27	-

\*  $p<0.05$ , † equal variances were not assumed

Testing for the correlations between General-OCC and TSRI-S (as done above) in each of these two sub-populations separately also yields a noteworthy difference. While still significant positive medium correlations exist only for the Satisfaction and Instrumental Help domains, **these correlations are much stronger for those students who referred to an arbitrary teacher** ( $r=0.65$  for Satisfaction,  $r=0.58$  for Instrumental Help, both at  $p<0.001$ ,  $n=56$ ) **than for those who referred to their homeroom teacher** ( $r=0.32$  for Satisfaction,  $r=0.30$  for Instrumental Help, both at  $p<0.001$ ,  $n=244$ ). Using the Fisher  $r$ -to- $z$  transformation, we find that the differences in correlation coefficients are significant, with  $Z=2.92$  for Satisfaction, and  $Z=2.33$  for Instrumental Help, both at  $p<0.05$ .

### WhatsApp-Based OCC and student-teacher relationship

We now repeat the calculations reported in the previous sub-section, for WhatsApp-OCC ( $n=211$ ). Testing for correlations between perceptions of WhatsApp-based OCC and student-teacher relationships, we find ( $\frac{Skew}{SE_{Skew}}, \frac{Kurtosis}{SE_{Kurtosis}}$ ): Satisfaction (Pearson's  $r=0.58$ ), Instrumental Help ( $r=0.45$ ), both at  $p<0.001$ ; and Conflict ( $r=-0.29$ ), at  $p<0.01$ . That is, the higher the student's positive perceptions of WhatsApp-based out-of-class communication with a given teacher, the higher the values of Satisfaction and Instrumental Help, and the lower the values of Conflict, of the student's relationship with this teacher.

Here too we test for effects of the chosen teacher being the student's homeroom teacher ( $n=190$ ) or not ( $n=21$ ). Limiting our calculations for the WhatsApp-Communicating group only, there were no differences in any of TSRI-S's dimensions, nor in WhatsApp-OCC, between these two sub-populations. Results are summarized in Table 3.

Testing for the correlations between WhatsApp-OCC and TSRI-S (as done above) in each of these two sub-populations separately again yields an interesting finding. As reported above, here too **correlations of the OCC-related variable (now it is WhatsApp-OCC) seem stronger for the students who referred to an arbitrary teacher** ( $r=0.63$ , at  $p<0.01$ , for Satisfaction, and  $r=0.71$ , at  $p<0.001$ , for Instrumental Help,  $n=21$ ) **than for those who referred to their homeroom teacher** ( $r=0.58$  for Satisfaction,  $r=0.43$  for Instrumental Help, both at  $p<0.001$ ,  $n=190$ ). However, using the Fisher r-to-z transformation, we find that these difference are not significant ( $Z=0.31$ , at  $p=0.76$ , for Satisfaction;  $Z=1.72$ , at  $p=0.09$ , for Instrumental Help). As for Conflict – only in the case of referring to a homeroom teacher was the correlation with WhatsApp-OCC significant, with  $r=-0.29$ , at  $p<0.01$ ; for the students who referred to a non-homeroom teacher, this correlation was  $r=-0.15$ , at  $p=0.51$ .

**Table 3. Comparing between TSRI-S and WhatsApp-OCC when referring to a homeroom teacher or not in the WhatsApp-Communicating group**

VARIABLE	REFERRING TO HOMEROOM TEACHER, M (SD), N=190	REFERRING TO NON-HOMEROOM TEACHER, M (SD), N=21	T
TSRI-S Satisfaction	4.15 (0.83)	4.39 (0.70)	1.30, $p=0.20$
TSRI-S Instrumental Help	3.21 (0.83)	3.04 (0.81)	0.91, $p=0.36$
TSRI-S Conflict	1.79 (0.91)	1.45 (0.71)	1.64, $p=0.10$
WhatsApp-OCC	3.66 (0.79)	3.87 (0.85)	1.15, $p=0.25$

### *ASSOCIATIONS BETWEEN OCC AND CLASSROOM ENVIRONMENT*

#### **General OCC and classroom environment**

We now turn to test for associations between general OCC practices and students' perceptions of classroom environment ( $n=300$ ). We find a **medium positive correlation between General-OCC and CE**, with Pearson's  $r=0.49$ , at  $p<0.001$ .

Again, differences are observed based on the chosen teacher being the student's homeroom teacher or not. **CE was, on average, higher when referring to the homeroom teacher** ( $M=0.09$ ,  $SD=0.89$ ,  $n=244$ ) **than when referring a non-homeroom teacher** ( $M=-0.39$ ,  $SD=1.33$ ,  $n=56$ ); recall that CE is a normalized variable, hence the negative value of the average. This difference is significant, with  $t(66.5)=2.57$ , at  $p<0.05$  (as Levene's Test for equal variances proved significance, with  $F=22.19$ , at  $p<0.001$ , we did not assume equal variances).

Testing for the correlations between General-OCC and CE in each of these two sub-populations separately brings up an interesting difference. While still significantly positively correlated, the **correlation is much stronger for students who referred to an arbitrary teacher** ( $r=0.73$ , at  $p<0.001$ ,  $n=56$ ) **than for those who referred to their homeroom teacher** ( $r=0.41$ , at  $p<0.001$ ,  $n=244$ ). Using the Fisher r-to-z transformation, we find that the difference in correlation coefficients is significant, with  $Z=3.29$ , at  $p<0.01$ .

#### **WhatsApp-Based OCC and classroom environment**

Conducting similar calculations as the ones reported in the previous sub-section, we now check for associations between WhatsApp-OCC and CE, that is, in the WhatsApp-Communicating group only ( $n=211$ ). Correlation between these two variables is strong and positive, with  $r=0.63$ , at  $p<0.001$ .

Here too we test for impact of the chosen teacher—either the homeroom teacher ( $n=190$ ) or another teacher ( $n=21$ ). We first observe that there is no difference in CE in both sub-populations, with  $t(209)=0.53$ , at  $p=0.60$ .

Comparing correlations between WhatsApp-OCC and CE in both sub-populations, we find that in both cases the correlation is strong and positive ( $r=0.64$  for the homeroom teacher-group, at  $p<0.001$ ;  $r=0.60$  for the non-homeroom teacher-group, at  $p<0.01$ ), with no significant difference (comparison using Fisher  $r$ -to- $z$  transformation results with  $Z=0.28$ , at  $p=0.78$ ).

### ***CONTRIBUTION OF WHATSAPP-BASED OCC ON CLASSROOM ENVIRONMENT***

In order to study the contribution of WhatsApp-OCC on CE, we use a stepwise multiple hierarchical regression model, while controlling for the background variables and the independent variables. The background variables—grade-level, gender, experience using WhatsApp—were all entered in the first step. In the second step, a variable indicating whether the chosen teacher (referring to whom the questionnaires were filled-up) was the student's homeroom teacher or another teacher was entered. In the third step, the three domains of TSRI-S were entered, and finally General-OCC and WhatsApp-OCC were entered in the fourth and fifth steps, respectively. Results are summarized in Table 4 and are discussed below.

**Table 4. Five-step hierarchical linear regression model for CE, based on background, independent, and dependent variables ( $n=211$ )**

	STEP 1		STEP 2		STEP 3		STEP 4		STEP 5	
	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t	$\beta$	t
(Constant)	-	1.16	-	1.43	-	-5.70***	-	-6.15***	-	-7.36***
Grade-level	-0.16	-2.13	-0.17	-2.25	-0.04	-0.62	-0.04	-0.72	-0.02	-0.32
Gender	0.11	1.60	0.11	1.61	-0.04	-0.72	-0.06	-1.04	-0.03	-0.66
WA Exp.	-0.003	-0.04	-0.001	-0.02	0.01	0.19	0.02	0.38	-0.06	-0.11
Homeroom Teacher			-0.06	-0.84	0.01	0.18	0.02	0.35	0.03	0.65
TSRI-S Satisfaction					0.56	7.61***	0.50	6.82***	0.37	5.07***
TSRI-S Inst. Help					0.15	2.36*	0.14	2.23*	0.10	1.66
TSRI-S conflict					-0.07	-1.19	-0.11	-1.83	-0.10	-1.80
General-OCC							0.18	3.42*	0.09	1.68
WhatsApp-OCC									0.31	4.96***
Adjusted R <sup>2</sup>	0.02	0.02	0.47	0.49	0.55					
F	2.22 p=0.09	1.84 p=0.12	26.70***	26.07***	28.67***					

Note: Coefficients in the table are standardized beta coefficients; \*  $p<0.05$ , \*\*\*  $p<0.001$

The first two models (Step 1, Step 2) are not significant, that is, CE cannot be predicted based on the background variables solely, nor can it be predicted by adding the refereed teacher. Starting from Step 3 and onwards, the models are significant, and the coefficient of determination is constantly increasing, from an Adjusted R<sup>2</sup> of 0.47 for Step 3 ( $F=26.70$ , at  $p<0.001$ ), to an Adjusted R<sup>2</sup> of 0.49 for Step 4 ( $F=26.07$ , at  $p<0.001$ ), and finally to an Adjusted R<sup>2</sup> of 0.55 for Step 5 ( $F=28.67$ , at  $p<0.001$ ), in which WhatsApp-OCC was entered.

The background variables have no main effect in either of the models; the same is true for the choice of homeroom teacher. As expected, TSRI-S's Satisfaction has a positive main effect in all models involving it ( $\beta=0.56$  in Step 3,  $\beta=0.50$  in Step 4, and  $\beta=0.37$  in Step 5, all with  $p<0.001$ ). TSRI-S's Instrumental Help has a positive main effect in Step 3 and Step 4 ( $\beta=0.15$  and  $\beta=0.14$ , respectively, both at  $p<0.05$ ), but has no main effect in Step 5. Similarly, General-OCC was entered with a main effect in Step 4 ( $\beta=0.18$ , at  $p<0.05$ ), but has no main effect in Step 5. In the last step, WhatsApp-OCC entered with a main effect of  $\beta=0.31$ , at  $p<0.001$ .

Therefore, we conclude that WhatsApp-OCC has a unique contribution to CE, as shown by its main effect and in the increase in the fitness of the linear regression model when taking WhatsApp-OCC into account.

## DISCUSSION

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In this study, we analyzed associations between OCC between grade-school students ( $n=300$ , from elementary-, middle-, and high-schools) and their teachers, specifically using WhatsApp—a very popular instant messaging app—and two variables that are key to learning and teaching at large, namely, student-teacher relationship and classroom environment. **Overall, we see that WhatsApp plays an important, unique role in this context, and that its unique characteristics help in defining its role in OCC.**

**WhatsApp was found to be the most prominent means of OCC** in our population, but more than that, **we also found a very high frequency of WhatsApp-based OCC**; 76% of the participating students who were communicating with their teachers via WhatsApp, mentioned that they were doing so at least a few times a week. As WhatsApp has been the most popular instant messaging app in Israel—with more than 92% of smartphone users use it (Schwartz, 2016; Tsuria & Yadlin-Segal, 2017)—this finding may not be surprising. Nevertheless, there are two important aspects of this finding that are worth noticing. First is the fact that teachers do communicate frequently with their students beyond school hours. In recent years, teacher-student communication via social networking sites has extended their connection beyond school's space and time boundaries (Forkosh-Baruch et al., 2015). Mostly, they do so for reasons of convenience (Avci & Adiguzel, 2017), but this type of communication is not without challenges and dilemmas (Asterhan & Rosenberg, 2015; Rosenberg & Asterhan, 2018). Which brings us to the second important aspect: teachers who use WhatsApp for communicating with their students, do so despite the fact that it is prohibited by the Israeli Ministry of Education, as was detailed in the Introduction section. WhatsApp can definitely be seen as going beyond instant messaging towards online social networks; it is also clear that the discussions between students and teachers in the WhatsApp groups are not strictly limited for learning purposes (Bouhnik & Deshen, 2014; Rosenberg & Asterhan, 2017), and that some personal information is exposed to both parties (e.g., phone number, status, and profile picture). The reason for this rule-breaking by teachers is probably a result of WhatsApp being “the place” where they and their students are “present” anyhow, so it forms a natural, convenient meeting point, like was the case of social networking sites a few years ago (Deng & Tavares, 2013; Forkosh-Baruch & Hershkovitz, 2014; Thoms & Eryilmaz, 2014). Therefore, although schools offer dedicated administrative systems through which OCC is enabled, students and teachers prefer to use platforms they anyhow use and with which they are familiar (Deng & Tavares, 2013). Both parties do so despite of the possible risks they meet while holding this communication, which mostly includes—as *they* perceive it—issues of privacy and keeping of personal spaces, concerns regarding information sharing that otherwise may not be visible to the “other side”, and the broader matter of boundary blurring (Forkosh-Baruch & Hershkovitz, in press). Of course, OCC may be perceived differently by different students, based on, e.g., its setting, frequency, immediacy, and personal characteristics, like student's or teacher's gender (Alghazo & Nash, 2017; Nkhoma et al., 2015; Rester & Edwards, 2007; Young, Kesley, & Lancaster, 2011).

As expected, **both general OCC and WhatsApp-based OCC are positively associated with Satisfaction and Instrumental Help**, two positive-oriented dimensions of student-teacher relationship. In previous studies, OCC was found to be associated with related variables, such as verbal immediacy, trust, intimacy, empathy, credibility, and caring (Dobransky & Frymier, 2004; Jaasma & Koper, 1999; S. A. Myers, 2004; Nadler & Nadler, 2001). Both general OCC and WhatsApp-based OCC are positively correlated with the classroom environment. It was previously shown that students' in-class communication habits and behavior are related to out-of-class communication (Farley-Lucas & Sargent, 2011; Martin & Myers, 2006; Sidelinger, Bolen, McMullen, & Nyeste, 2015), and as the former is an integral part of classroom environment, this finding are understood.

However, **some differences are evident between general OCC and WhatsApp-based OCC**. While correlations between general OCC and Satisfaction, Instrumental Help—two dimensions of student-teacher relationship—are weaker in the sub-group of students who referred to their homeroom teacher, compared to those students who referred to another teacher of them, no such differences occur for WhatsApp-based OCC. The same observation occurs for the associations of the two OCC variables with classroom environment. Assuming that students feel closer to their homeroom teacher and perceive their homeroom teacher's classroom environment more positively—compared with an arbitrary teacher—as indeed evident in this study, the difference in correlations in the general OCC case might be simply explained by a ceiling effect: OCC can promote student-teacher relationship and classroom environment, unless these are already promoted. Following that, it might be that the explanation for the non-difference when referring to WhatsApp-based OCC is simple as well, and that the ceiling effect is in action here too, only on the other variable; that is, WhatsApp-based communication might raise closeness and intimacy no matter which teachers it is that the student is communicating with (Hu, Wood, Smith, & Westbrook, 2004). In that light, we might also understand that in the WhatsApp-Communicating group, only WhatsApp-based OCC (and not general OCC) was negatively associated with Conflict, and that this association occurs only in the sub-group of students who referred to their homeroom teacher. Assuming the high intimacy level of WhatsApp connections, and assuming the high level of closeness with the homeroom teacher, this finding makes sense, however revealing the full mechanism behind it requires some further examination; this should be further studied qualitatively, however other platforms for OCC should be examined, in order to find out what are the unique characteristics of each platform in facilitating teacher-student OCC.

These aspects of WhatsApp-based communication—convenience, immediacy, and intimacy—might explain our finding regarding its unique contribution to classroom environment, which goes beyond the contribution of student-teacher relationship and general OCC. It is this contribution that makes WhatsApp-based OCC so powerful. Referring to Marshall McLuhan's (1964) important work on the importance of media, we argue that **WhatsApp-based out-of-class communication between students and teachers illuminates some profound understanding of the relationship between them**. Many students strive to break traditional boundaries between teachers and students, which were set long ago due to various societal reasons, and they use technology as a means to fulfil this desire. Indeed, our analyses support the notion that WhatsApp is not just another platform with which students communicate with teachers; considering its affordances, using it for this purpose demonstrate students' need to make student-teacher relationship close and meaningful, probably in order to increase their sense of belonging to school, which is vital for their personal growth (De Wit, Karioja, & Rye, 2010). Teachers too have the basic psychological need for relatedness and communion, which might be the reason they were drawn to the classroom in the first place (Spilt, Koomen, & Thijs, 2011); for them as well, WhatsApp—being an integral part of their daily life—is important for achieving their closeness goals. Ironically, schools often undermine students' experience of belonging (Osterman, 2000), and policymakers undermine teachers' attempts to keep close communication with students which goes beyond school time. In that sense, WhatsApp is indeed the message.

This study is, of course, not without limitations. First, it was situated in a single country, characterized by a specific culture of education, technology, and implementing technology in schools; more than that, it is limited to a particular sub-population, which may have unique characteristics. Our findings should be validated by similar studies in other sectors and in other countries. Second, it was referring to a single communication app; as not all the communication apps are to be considered the same, the study should also be replicated with regards to other platforms; this will allow examination of the specific features that make a given platform more appropriate than the others for student-teacher out-of-class communication. Additionally, even when considering this narrowed-down point of view, the sampled population is not to be considered as representing the whole student population in the sector/country discussed here. Despite these limitations, we feel that the contribution of the current study is of importance for promoting a better student-teaching communication via SNS and a better learning in the digital age at large.

## CONCLUSIONS

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We conclude by saying that, according to our findings, WhatsApp-based out-of-class communication has a unique contribution to classroom environment that may not be evident in other platforms, as a result of the distinctive characteristics of this platform, compared to other online social networks and instant messaging apps. As out-of-class communication can greatly contribute to both students and teachers and as this type of communication may also pose some crucial challenges, there is a need in an open, honest discussion about this issue that will involve all stakeholders (including mostly teacher educators, teachers, students, educational leaders, and educational policy makers).

## REFERENCES

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- Aaen, J., & Dalsgaard, C. (2016). Student Facebook groups as a third space: Between social life and schoolwork. *Learning, Media and Technology*, 41(1), 160–186. <https://doi.org/10.1080/17439884.2015.1111241>
- Abd Elhay, A., & Hershkovitz, A. (in press). Teachers' perceptions of out-of-class communication, teacher-student relationship, and classroom environment. *Education and Information Technologies*.
- Alghazo, Y. M. & Nash, J. A. (2017). The effect of social media usage on course achievement and behavior. *Journal of Education and Practice*, 8(2), 161-167.
- Ang, R. (2005). Development and validation of the teacher-student relationship inventory using exploratory and confirmatory factor analysis. *The Journal of Experimental Education*, 74(1), 55–74. <https://doi.org/10.3200/JEXE.74.1.55-74>
- Asterhan, C. S. C., & Rosenberg, H. (2015). The promise, reality and dilemmas of secondary school teacher-student interactions in Facebook: The teacher perspective. *Computers & Education*, 85, 134–148. <https://doi.org/10.1016/j.compedu.2015.02.003>
- Avci, H., & Adiguzel, T. (2017). A case study on mobile-blended collaborative learning in an English as a foreign language (EFL) context. *International Review of Research in Open and Distributed Learning*, 18(7), 45-58. <https://doi.org/10.19173/irrodl.v18i7.3261>
- Birch, S. H., & Ladd, G. W. (1998). Children's interpersonal behaviors and the teacher-child relationship. *Developmental Psychology*, 34(5), 934–946. <https://doi.org/10.1037/0012-1649.34.5.934>
- Bolkan, S., & Holmgren, J. L. (2012). “You are such a great teacher and I hate to bother you but...”: Instructors' perceptions of students and their use of email messages with varying politeness strategies. *Communication Education*, 61(3), 253–270. <https://doi.org/10.1080/03634523.2012.667135>
- Boren, R., Callahan, C., & Peugh, J. (2011). Out with the old, in with the new: Factor analyses of a classroom environment measure. *Journal of Psychoeducational Assessment*, 29(3), 214–224. <https://doi.org/10.1177/0734282910383191>
- Bouhnik, D., & Deshen, M. (2014). WhatsApp goes to school: Mobile instant messaging between teachers and students. *Journal of Information Technology Education: Research*, 13, 217–231. <https://doi.org/10.28945/2051>

- Brophy, J. E., & Evertson, C. M. (1978). Context variables in teaching. *Educational Psychologist*, 12(3), 310–316. <https://doi.org/10.1080/00461527809529185>
- Central Bureau of Statistics. (2017). *Characterization and classification of geographical units by the socio-economic level of the population 2013 (report no. 1694)*. Jerusalem, Israel.
- Coladarci, T. (1992). Teachers' sense of efficacy and commitment to teaching. *Journal of Experimental Education*, 60(4), 323–337. <https://doi.org/10.1080/00220973.1992.9943869>
- Constine, J. (2017, September 14). Facebook Messenger day hits 70M daily users as the app reaches 1.3B monthlies (blog post). Retrieved from <https://techcrunch.com/2017/09/14/facebook-messenger-1-3-billion>
- Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, 77(1), 113–143. <https://doi.org/10.3102/003465430298563>
- Davis, H. A. (2003). Conceptualizing the role and influence of student-teacher relationships on children's social and cognitive development. *Educational Psychologist*, 38(4), 207–234. [https://doi.org/10.1207/S15326985EP3804\\_2](https://doi.org/10.1207/S15326985EP3804_2)
- De Wit, D. J., Karioja, K., & Rye, B. J. (2010). Student perceptions of diminished teacher and classmate support following the transition to high school: Are they related to declining attendance? *School Effectiveness and School Improvement*, 21(4), 451–472. <https://doi.org/10.1080/09243453.2010.532010>
- Deng, L., & Tavares, N. J. (2013). From Moodle to Facebook: Exploring students' motivation and experiences in online communities. *Computers & Education*, 68, 167–176. <https://doi.org/10.1016/j.compedu.2013.04.028>
- DeSchryver, M., Mishra, P., Koehler, M., & Francis, A. (2009). Moodle vs. Facebook: Does using Facebook for discussions in an online course enhance perceived social presence and student interaction? In *Proceedings of the Society for Information Technology & Teacher Education International Conference* (Charleston, SC, March 2-6, pp. 329–336).
- Dobransky, N. D., & Frymier, A. B. (2004). Developing teacher-student relationships through out of class communication. *Communication Quarterly*, 52(3), 211–223. <https://doi.org/10.1080/01463370409370193>
- Dorman, J. P. (2003). Relationship between school and classroom environment and teacher burnout: A LISREL analysis. *Social Psychology of Education*, 6(2), 107–127. <https://doi.org/10.1023/A:1023296126723>
- Dron, J., & Anderson, T. (2014). *Teaching crowds: Learning and social media*. Athabasca, AB, Canada: Athabasca University Press.
- Evans, I. M., Harvey, S. T., Buckley, L., & Yan, E. (2009). Differentiating classroom climate concepts: Academic, management, and emotional environments. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 4(2), 131–146. <https://doi.org/10.1080/1177083X.2009.9522449>
- Farley-Lucas, B. S., & Sargent, M. M. (2011). Enhancing out-of-class communication. *To Improve the Academy*, 30(1), 71–84. <https://doi.org/10.1002/j.2334-4822.2011.tb00649.x>
- Forkosh-Baruch, A. & Hershkovitz, A. (2014). Teacher-student relationship in the Facebook-era. In P. Isaías, P. Kommers, & T. Issa (Eds.), *The evolution of the internet in the business sector: Web 1.0 to Web 3.0* (pp. 145-172). Hershey, PA: IGI Global.
- Forkosh-Baruch, A. & Hershkovitz, A. (2018). *Knowing me, knowing you: Teachers' perceptions of communication with their students on Facebook*. Manuscript submitted for publication.
- Forkosh-Baruch, A., Hershkovitz, A., & Ang, R. P. (2015). Teacher-student relationship and SNS-mediated communication: Perceptions of both role-players. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 11, 273-289. <https://doi.org/10.28945/2329>
- Fraser, B. J. (1991). Two decades of classroom environment research. In B. J. Fraser & H. J. Walberg (Eds.), *Educational environments: Evaluation, antecedents and consequences* (pp. 3–27). Elmsford, NY: Pergamon Press.
- Fraser, B. J. (1998). Classroom environment instruments: Development, validity and applications. *Learning Environments Research*, 1(1), 7–34. <https://doi.org/10.1023/A:1009932514731>

## WhatsApp is the Message

- Golden, R. (2017). *Poll: 43% of employees use instant messaging tools on the job*. Retrieved from <https://www.hrdiver.com/news/poll-43-of-employees-use-instant-messaging-tools-on-the-job/444599>
- Goldman, Z. W., Goodboy, A. K., & Bolkan, S. (2016). A meta-analytical review of students' out-of-class communication and learning effects. *Communication Quarterly*, 64(4), 476–493. <https://doi.org/10.1080/01463373.2015.1103293>
- Greenhow, C., & Askari, E. (2017). Learning and teaching with social network sites: A decade of research in K-12 related education. *Education and Information Technologies*, 22(2), 623–645. <https://doi.org/10.1007/s10639-015-9446-9>
- Gregory, A., & Weinstein, R. S. (2004). Connection and regulation at home and in school: Predicting growth in achievement for adolescents. *Journal of Adolescent Research*, 19(4), 405–427. <https://doi.org/10.1177/0743558403258859>
- Gross, L. (2015). *An examination of the relationship between the communication methods used in out-of-class student-faculty interactions and the content and frequency of those interactions* (Unpublished Ph.D. dissertation). Cardinal Stritch University, Milwaukee, WI.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development*, 72(2), 625–638. <https://doi.org/10.1111/1467-8624.00301>
- Hamre, B. K., & Pianta, R. C. (2006). Student-teacher relationships. In G. G. Bear & K. M. Mink (Eds.), *Children's needs III: development, prevention, and intervention* (pp. 59–71). Washington, DC: National Association of School Psychologists.
- Hayes, P., Weibelzahl, S., & Hall, T. (2013). Text messaging for out-of-class communication: Impact on affective learning. In *Proceedings of the International Conference on Mobile Learning, International Association for Development of the Information Society* (Lisbon, Portugal, March 14-16, pp. 59–66).
- Helvie-Mason, L. (2011). Facebook, “friending,” and faculty–student communication. In C. Wankel (Ed.), *Teaching arts and science with the new social media* (Cutting-edge Technologies in Higher Education, Volume 3) (pp. 61–87). Bingley, UK: Emerald Group Publishing.
- Hershkovitz, A. & Forkosh-Baruch, A. (2017). Teacher-student relationship and SNS-mediated communication: Student perceptions. *Comunicar*, 53(4), 91-100. <https://doi.org/10.3916/C53-2017-09>
- Hershkovitz, A., Forkosh-Baruch, A., & Ang, R. (2014). “I miss my students”: Characterizing teachers seeking connection with their students via social networking sites. *World Conference on Educational Multimedia, Hypermedia and Telecommunications* (EdMedia; June 23-26, Tampere, Finland).
- Hu, Y., Wood, J. F., Smith, V., & Westbrook, N. (2004). Friendships through IM: Examining the relationship between instant messaging and intimacy. *Journal of Computer-Mediated Communication*, 10(1). <https://doi.org/10.1111/j.1083-6101.2004.tb00231.x>
- Jaasma, M. A., & Koper, R. J. (1999). The relationship of student-faculty out-of-class communication to instructor immediacy and trust and to student motivation. *Communication Education*, 48(1), 41–47. <https://doi.org/10.1080/03634529909379151>
- Johnson, K. A. (2011). The effect of Twitter posts on students' perceptions of instructor credibility. *Learning, Media and Technology*, 36(1), 21–38. <https://doi.org/10.1080/17439884.2010.534798>
- Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, 53(1), 59–68. <https://doi.org/10.1016/j.bushor.2009.09.003>
- Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, 54(3), 241–251. <https://doi.org/10.1016/j.bushor.2011.01.005>
- Kim, H.-Y. (2013). Statistical notes for clinical researchers: Assessing normal distribution (2) using skewness and kurtosis. *Restorative Dentistry & Endodontics*, 38(1), 52–54. <https://doi.org/10.5395/rde.2013.38.1.52>
- Knapp, J. L., & Martin, M. M. (2002). *Out-of-class communication: The development and testing of a measure*. Presented at the 93rd Annual meeting of the Eastern Communication Association (New York, NY, April 24-28).

- Ladd, G. W., & Burgess, K. B. (2001). Do relational risks and protective factors moderate the linkages between childhood aggression and early psychological and school adjustment? *Child Development*, 72(5), 1579–1601. <https://doi.org/10.1111/1467-8624.00366>
- Li, L., & Pitts, J. P. (2009). Does it really matter? Using virtual office hours to enhance student-faculty interaction. *Journal of Information Systems Education*, 20(2), 175–185.
- MacAulay, D. J. (1990). Classroom environment: A literature review. *Educational Psychology*, 10(3), 239–253. <https://doi.org/10.1080/0144341900100305>
- Manca, S., & Ranieri, M. (2016). “Yes for sharing, no for teaching!” Social media in academic practices. *The Internet and Higher Education*, 29, 63–74. <https://doi.org/10.1016/j.iheduc.2015.12.004>
- Martin, M. M., & Myers, S. A. (2006). Students’ communication traits and their out-of-class communication with their instructors. *Communication Research Reports*, 23(4), 283–289. <https://doi.org/10.1080/08824090600962599>
- Mazana, M. Y. (2018). Social media in the classroom: WhatsApp a new communication tool for enhanced class interactions. *Business Education Journal*, 2(1).
- Mazer, J. P., Murphy, R. E., & Simonds, C. J. (2007). I’ll see you on “Facebook”: The effects of computer-mediated teacher self-disclosure on student motivation, affective learning, and classroom climate. *Communication Education*, 56(1), 1–17. <https://doi.org/10.1080/03634520601009710>
- Mazer, J. P., Murphy, R. E., & Simonds, C. J. (2009). The effects of teacher self-disclosure via Facebook on teacher credibility. *Learning, Media and Technology*, 34(2), 175–183. <https://doi.org/10.1080/17439880902923655>
- McLuhan, M. (1964). *Understanding media: The extensions of man*. London, UK: McGraw-Hill.
- Ministry of Education. (2011). *Ethics and protectedness on the Internet* (in Hebrew). Jerusalem, Israel: Ministry of Education.
- Ministry of Education. (2013). *Using online social networks and collaborative communities in the education system* (in Hebrew). Jerusalem, Israel: Ministry of Education.
- Mnkandla, E. & Minnaar, A. (2017). The use of social media in e-learning: A metasynthesis. *International Review of Research in Open and Distributed Learning*, 18(5), 227–248. <https://doi.org/10.19173/irrodl.v18i5.3014>
- Moos, R. H., & Trickett, E. J. (1974). *Classroom environment scale manual*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, R. E., & Fouts, J. T. (1992). A cluster analysis of high school science classroom environments and attitude toward science. *Journal of Research in Science Teaching*, 29(9), 929–937. <https://doi.org/10.1002/tea.3660290904>
- Myers, S. A. (2004). The relationship between perceived instructor credibility and college student in-class and out-of-class communication. *Communication Reports*, 17(2), 129–137. <https://doi.org/10.1080/08934210409389382>
- Myers, S. A. & Claus, C. J. (2012). The relationship between students’ motives to communicate with their instructors and classroom environment. *Communication Quarterly*, 60(3), 386–402. <https://doi.org/10.1080/01463373.2012.688672>
- Nadler, M. K., & Nadler, L. B. (2001). The roles of sex, empathy, and credibility in out-of-class communication between faculty and students. *Women’s Studies in Communication*, 24(2), 241–261. <https://doi.org/10.1080/07491409.2001.10162436>
- Nkhoma, M., Cong, H. P., Au, B., Lam, T., Richardson, J., Smith, R., & El-Den, J. (2015). Facebook as a tool for learning purposes: Analysis of the determinants leading to improved students’ learning. *Active Learning in Higher Education*, 16(2), 87–101. <https://doi.org/10.1177/1469787415574180>
- Odewumi, O. M., Bamigboye, F. B., Olawuyi, O. F., & Bamigboye, O. O. (2017). Perceptions of undergraduate students on social media for learning: A case study of university of Ibadan. *Journal of Communication*, 8(2), 120–127. <https://doi.org/10.1080/0976691X.2017.1336269>

## WhatsApp is the Message

- Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of Educational Research*, 70(3), 323–367. <https://doi.org/10.3102/00346543070003323>
- Pawlowska, D. K., Westerman, J. W., Bergman, S. M., & Huelsman, T. J. (2014). Student personality, classroom environment, and student outcomes: A person–environment fit analysis. *Learning and Individual Differences*, 36, 180–193. <https://doi.org/10.1016/j.lindif.2014.10.005>
- Pianta, R. C. (1992). *The student-teacher relationship scale*. Charlottesville, VA: University of Virginia.
- Pianta, R. C., Steinberg, M. S., & Rollins, K. B. (1995). The first two years of school: Teacher-child relationships and deflections in children's classroom adjustment. *Development and Psychopathology*, 7(2), 295. <https://doi.org/10.1017/S0954579400006519>
- Rönkkö, K., Urinboyev, R., Svensson, M., Svensson, L., & Carlsson, H. (2017). *Literature review of social media in professional organisations 2000-2015: Work, stress, power relations, leadership, librarians, teachers, and social workers*. Kristianstad, Sweden: Kristianstad University.
- Rosenberg, H., & Asterhan, C. S. C. (2017). What's App, sir? Teachers and students in WhatsApp groups (in Hebrew). In Baruch Schwartz, Hananel Rosenberg, & Christa Asterhan (Eds.), *Breaking down barriers? Teachers, students and social network sites* (pp. 77–101). Tel Aviv, Israel: MOFET Books.
- Rosenberg, H., & Asterhan, C. S. C. (2018). “WhatsApp, teacher?” - Student perspectives on teacher-student WhatsApp interactions in secondary schools. *Journal of Information Technology Education: Research*, 17, 205–226. <https://doi.org/10.28945/4081>
- Rester, C. H., & Edwards, R. (2007). Effects of sex and setting on students' interpretation of teachers' excessive use of immediacy. *Communication Education*, 56(1), 34–53. <https://doi.org/10.1080/03634520600954619>
- Ryan, A. M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal*, 38(2), 437–460. <https://doi.org/10.3102/00028312038002437>
- Sabol, T. J., & Pianta, R. C. (2012). Recent trends in research on teacher-child relationships. *Attachment and Human Development*, 14(3), 213–231. <https://doi.org/10.1080/14616734.2012.672262>
- Schwartz, J. (2016, May 24). The most popular messaging app in every country (blog post). Retrieved from <https://www.similarweb.com/blog/worldwide-messaging-apps>
- Sheer, V. C., & Fung, T. K. (2007). Can email communication enhance professor-student relationship and student evaluation of professor? Some empirical evidence. *Journal of Educational Computing Research*, 37(3), 289–306. <https://doi.org/10.2190/EC.37.3.d>
- Sidelinger, R. J., Bolen, D. M., McMullen, A. L., & Nyeste, M. C. (2015). Academic and social integration in the basic communication course: Predictors of students' out-of-class communication and academic learning. *Communication Studies*, 66(1), 63–84. <https://doi.org/10.1080/10510974.2013.856807>
- Spilt, J. L., Koomen, H. M. Y., & Thijs, J. T. (2011). Teacher wellbeing: The importance of teacher-student relationships. *Educational Psychology Review*, 23(4), 457–477. <https://doi.org/10.1007/s10648-011-9170-y>
- Tang, Y., & Hew, K. F. (2017). Is mobile instant messaging (MIM) useful in education? Examining its technological, pedagogical, and social affordances. *Educational Research Review*, 21, 85–104. <https://doi.org/10.1016/j.edurev.2017.05.001>
- Thoms, B., & Eryilmaz, E. (2014). How media choice affects learner interactions in distance learning classes. *Computers & Education*, 75, 112–126. <https://doi.org/10.1016/j.compedu.2014.02.002>
- Trickett, E. J., & Moos, R. H. (1973). Social environment of junior high and high school classrooms. *Journal of Educational Psychology*, 65(1), 93–102. <https://doi.org/10.1037/h0034823>
- Trickett, E. J., Qinlan, D. M., & Trickett, E. J. (1979). Three domains of classroom environment: Factor analysis of the classroom environment scale. *American Journal of Community Psychology*, 7(3), 1–9. <https://doi.org/10.1007/BF00890692>

- Tsuria, R., & Yadlin-Segal, A. (2017). Israel. In L. M. Steckman & M. J. Andrews (Eds.), *Online around the world: A geographic encyclopedia of the Internet, social media, and mobile apps* (pp. 144–148). Santa Barbara, CA: ABC-Clio.
- van der Sijde, P. C., & Tomic, W. (1992). The influence of a teacher training program on student perception of classroom climate. *Journal of Education for Teaching, 18*(3), 287–295. <https://doi.org/10.1080/0260747920180306>
- Wentzel, K. R. (2003). Motivating students to behave in socially competent ways. *Theory into Practice, 42*(4), 319–326. [https://doi.org/10.1207/s15430421tip4204\\_9](https://doi.org/10.1207/s15430421tip4204_9)
- Wentzel, K. R., & Asher, S. R. (1995). The academic lives of neglected, rejected, popular, and controversial children. *Child Development, 66*(3), 754–763. <https://doi.org/10.2307/1131948>
- WhatsApp. (2017). *Connecting one billion users every day* (blog post). Retrieved from <https://blog.whatsapp.com/10000631/Connecting-One-Billion-Users-Every-Day>.
- Young, S., Kelsey, D., & Lancaster, A. (2011). Predicted outcome value of e-mail communication: Factors that foster professional relational development between students and teachers. *Communication Education, 60*(4), 371–388. <https://doi.org/10.1080/03634523.2011.563388>

## APPENDIX

We bring here the questionnaires used in this study.

### ***WHATSAPP-OCC, ADAPTED FROM (HAYES ET AL., 2013)***

The table below presents the version we used for measuring WhatsApp-OCC. In the second column, there appears the item number in the original questionnaire, based on which we phrased our item.

#	ORIG. #	ITEM (R – REVERSED ITEM)
1	1	Being in touch by WhatsApp messages with my teacher is a good idea
2	2	I like receiving WhatsApp messages from my teacher
3	3	I would like receiving more WhatsApp messages from my teacher
4	5	I enjoy the WhatsApp messaging with my teacher
5	6	I like receiving WhatsApp messages about school-related issues
6	7	I like receiving non-academic WhatsApp messages from my teacher
7	8	The contents of WhatsApp messages I receive from my teacher are appropriate
8	10	My teacher is more approachable as a result of using WhatsApp
9	18	WhatsApp messaging with my teacher is beneficial to me
10	20	I like the subject more as a result of communicating about it with my teacher via WhatsApp
11	21	WhatsApp messaging with my teacher has increased my motivation to learn
12	22	WhatsApp messaging with my teacher has increased my engagement with the subject
13	23	WhatsApp messaging with my teacher has increased my participation in class
14	28	think WhatsApp messaging with my teacher has helped me in learning
15	30	Receiving WhatsApp messages from my teacher is intrusive (R)

### ***GENERAL-OCC, ADAPTED FROM (KNAPP & MARTIN, 2002)***

The table below presents the version we used for measuring General-OCC. In the second column, there appears the item number in the original questionnaire, based on which we phrased our item.

#	ORIG. #	ITEM
1	1	I often talk to my students during my office hours
2	2	If I see a student on campus, I often talk to them
4	7	When I see a student around town, I usually spend some time talking to him/her

***TSRI-S, ADAPTED FROM (ANG, 2005)***

The table below presents the version we used for measuring TSRI-S.

#	AXIS	ITEM
1	Satisfaction	I think this teacher is enjoying having me in his/her class
2	Instrumental Help	If I encountered a problem at home, I would likely approach this teacher for help
3	Satisfaction	I would describe my relationship with this teacher as positive
4	Conflict	I think this teacher is frustrated by me more than by most other students in class
5	Satisfaction	I think my teacher would miss me if I'm absent from class
6	Instrumental Help	I share things about my personal life with this teacher
7	Conflict	I think this teacher cannot wait for the moment he/she does not need to have me in his/her class any more
8	Conflict	I think this teacher would feel relieved if I weren't in his class
9	Instrumental Help	If I need help, I am likely to ask this teacher for help
10	Instrumental Help	I turn to this teacher for a listening ear or for sympathy
11	Conflict	I think this teacher will enjoy the class more if I am not in it
12	Instrumental Help	I depend on this teacher for advice or help
13	Satisfaction	I am happy with my relationship with this teacher
14	Satisfaction	I like this teacher

## BIOGRAPHIES

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