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Teenage peer-to-peer knowledge sharing through social network sites in secondary schools

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Abstract

The promise of social network technology for learning purposes has been heavily debated, with proponents highlighting its transformative and opponents its distracting potential. However, little is known about the actual, everyday use of ubiquitous social network sites for learning and study purposes in secondary schools. In the present work, we present findings from two survey studies on representative samples of Israeli, Hebrew-speaking teenagers (N_1 = 206 and N_2 = 515) which explored the scope, characteristics and reasons behind such activities. Study 1 shows that these can be described best as *online knowledge sharing*, that is: the up- and downloading of knowledge and knowledge sources to social network-based peer groups. Findings were replicated in study 2 to further support the claim that school-related knowledge sharing is common and widespread and entails different types of knowledge. Findings from study 2 furthermore show that sharing is mainly motivated by prosocial motives, as well as expectations for future reciprocation. Sharing is predicted by individual differences, such as gender, collectivist values, mastery goal orientations and academic self-efficacy. Relations between competitive-individualist values and sharing are more complex, and are, among others, moderated by expectations for future benefits. Implications for educational practices and for learning are discussed.

1. Introduction

1.1 Social networks, learning and school

The prominence of social network sites (SNSs) in everyday life has ignited musings and debates over the implications of these developments for education: Skeptics of SNSs for learning purposes pitch online social networking and formal learning as two mutually exclusive activities, emphasizing that SNSs have been designed and are mainly used for pastime socializing (Kirschner, 2015). This pastime socializing comes at the expense of and distracts from academic pursuits (e.g., Hollis & Was, 2016; Junco 2012, Kirschner & Karpinski, 2010). Research shows that teenagers and young adults indeed use SNS technology for various social purposes, such as self-presentation (Back et al., 2010), emotional self-disclosure and frustration "venting" (Manago, Taylor & Greenfield, 2012), and maintaining and creating social relations and affiliations (Hew, 2011). However, this does not rule out the possibility that students use SNSs for formal learning purposes as well.

At the other end of the debate, proponents of SNSs for learning envision that social media technologies will have positive and even transformative effects on how students learn, collaborate, share and create knowledge. These envisioned changes are often described in terms of a move away from traditional, hierarchical teaching structures organized in formal institutions, toward self-organized communities of interest, in which peers collaborate and discuss content, tutor newcomers, and create new knowledge, without the interventions of adult, certified teachers or other formal authority figures (e.g., Bingham & Connor, 2015; Clark & Mayer, 2008; Collins & Halverson, 2009; Greenhow & Robelia, 2009; Harasim, 2000; Mazer, Murphy & Simonds, 2007; Wegerif, 2013; Selwyn, 2009). Recent educational design research initiatives have shown that some aspects of that vision may be achieved, with the help of extensive technical and professional support and with specifically developed add-ons to existing SNSs (e.g., Greenhow, Gibbins & Menzer, 2015; Rap & Blonder, 2016; Tsovaltzi, Judele, Puhl & Weinberger, 2014; Wang, Woo, Quek, Yang, & Liu, 2012). Even though this shows the *possibility* of SNS-based learning activities under special circumstances and with tailored support systems, it does not provide further insights about the *everyday* and *spontaneou*s use of ubiquitous SNS technology for learning and study in secondary school settings.

We argue that prior to addressing the question of whether SNSs are beneficial or detrimental to learning and under what circumstances, we should first attain a better understanding about the ways in which students have adopted and are actually using these tools for school-related purposes. Recent work has sought to address this gap by exploring how teachers and students interact in SNSs (Asterhan & Rosenberg, 2015; Ophir, Rosenberg, Asterhan & Schwarz, 2016, Rosenberg & Asterhan, in press; Hershkovitz & Forkosh-Baruch, 2013) and how teachers create online professional communities in Facebook (Tseng & Kuo, 2014). The combined findings from those studies show that teachers use SNS-based communication with their pupils for social-relational and psycho-pedagogical purposes, but also to support academic-instructional activities. In the present work, we extend this work by focusing on teenage peer-to-peer, self-organized use of ubiquitous SNS technologies for learning and study purposes in formal school settings.

As a first step in that direction, an exploratory pilot study was conducted, based on in-depth interviews with Israeli teenagers (Bouton & Asterhan, in press). The interviewees reported on a variety of ways they use SNSs for study-related purposes, predominantly situated in self-organized, SNS peer groups in which students share information and knowledge. Their activities could be roughly categorized into five different types:

1. *Administrative messages*. Students send short messages relating to the administrative aspects of school life, obligations and/or assignments (e.g., reminders about which pages were assigned as homework, details about where to meet, and so forth).
2. *Snapshots*. Students use their cell phones to take pictures of teacher-created materials in class, which they then share in SNS study groups. These include, among others, snapshots of the whiteboard and of teacher hand-outs.
3. *Content summaries*. Student-produced summaries of lessons, class notes, and/or reading materials which are shared with the groups for the benefit of those who did not summarize or take notes.
4. *Copying*. This category refers to the sharing of solved and worked-out materials and responses that students are expected to produce individually and autonomously. Itis therefore prohibited by teachers. It includes solved homework solutions, sharing of exam forms and items (e.g., obtained from a different class or school), and sometimes answers to test questions.
5. *Peer assistance.* This type of activity refers to instances in which students directly consult with peers by posing and answering questions about content within the SNS environment (as opposed to just uploading materials), and/or give each other directions when assignments are not clear.

According to the teen interviewees, SNS study groups rarely contain in-depth dialogues about curricular content or collaborative peer learning directly within the online SNS itself. To make sure, dozens of transcripts from different SNS study groups in Facebook and WhatsApp (some from the interviewees, others from other teenage student volunteers) were examined. The overall majority of school-related contributions were indeed mundane and a selected few seemed unethical. Based on these first explorations, we concluded that teenagers' learning- and study-related SNS activities are best approached under the umbrella of *online knowledge sharing*. Online knowledge sharing is a well-known construct in communication, business management and informational sciences. We will first provide a short overview of these bodies of research and their main findings, and discuss how online knowledge sharing may be relevant to learning and instruction in secondary school settings.

1.2 Online knowledge sharing

Communication scholar Nicholas John (2012) has argued that "sharing" has become the constitutive activity of social media, and of social network sites (SNSs) in particular. *Knowledge sharing* refers to activities in which individuals make their own internally stored

knowledge and/or external knowledge sources they have at their disposal accessible to others. In online settings, this is achieved by uploading a source, by providing links to sources that are already online elsewhere, or by directly writing a post or response. There are countless examples of online knowledge sharing, such as contributing to an online Wikipedia entry, posting a response to a question on a thematic Q&A forum, uploading a tutorial video to YouTube on how to conduct a t-test in SPSS, or posting college lecture summaries to one's personal blog. Access to this knowledge may require membership (e.g., in certain forums, gaming communities or social network groups) or they may not (e.g., Wikipedia, Yahoo answers, YouTube, Interglot translation tools).

In the vast majority of cases, there is no direct monetary reward involved for making one's knowledge available. Moreover, in contrast to other forms of sharing, knowledge sharing is not a zero-sum game, as when one shares a candy bar with a friend or when sharing a dormitory room with another student. It involves letting someone else have something that you have, without entailing any kind of material sacrifice on the part of the sharer (John 2012). In other words, when sharing one's knowledge one does not become "less knowledgeable". Quite to the contrary, when a sufficient number of participants contribute, knowledge sharing leaves one with more.

However, it does require time and effort to assemble and share knowledge online, and this is done without receiving direct material benefits, without the assurance of reciprocation, and often without knowing who benefits from this knowledge. Moreover, if indeed "knowledge is power", then in a competitive environment the sharer may lose his/her relative advantage over others. In many ways, knowledge sharing has then similar features to a public good dilemma (Connolly & Thorn, 1990): In this case, the public good is knowledge, from which every member of a group may benefit, regardless of whether or not they personally contribute to its provision (Olson, 1965), but whose availability does not diminish with use. According to game theory, defecting (not contributing) is technically considered to be the dominant strategy, that is: the strategy which from an individual member's standpoint maximizes utility, independent of whether others contribute to the resource or not (Cabrera & Cabrera, 2002; Dawes, 1980). This arouses the question: What motivates individuals to voluntarily share knowledge?

One model that has been used as a framework for explaining willingness to share is the gift economy model (Mauss, 1967): In pre-monetary societies, people exchanged goods with their acquaintances in an intricate weave of reciprocal acts. As there were no formal financial systems such as banks that could protect the wealthy against future misfortunes,

'gifts' donated to society served as a social guarantee that the family that was kind enough to share their good fortune today, will be protected and taken care of, should the need occur in the future. This *quid pro quo* motive for sharing has been used to explain how seemingly altruistic online sharing may yield future economic rewards, such as in the case of code sharing by open-end programmers (Roberts, Hann & Slaughter, 2006), and an expertise reputation, such as in the case of Wikipedia contributors (Restivo & van de Rijt, 2014).

Knowledge sharing, its motivations and rewards has interested scholars from various fields of research, but predominantly so in business management and organizational science (e.g., Acquisti & Gross, 2006; Cabrera & Cabrera, 2002; Davenport & Prusak, 1998; Hwang, Singh, & Argote, 2015; Tsai, 2002). Employee knowledge sharing has been related to a range of success criteria, such as decreased production costs, innovation, revenues and team performance (see Wang & Noe, 2010, for a review).

Factors that have shown to predict individual willingness to share knowledge with members in an organization are, among others, expectations of reciprocity, expectations of personal benefit (and reduced costs of sharing), interpersonal trust, collectivist values, self-efficacy and lack of evaluation apprehension (Wang & Noe, 2010). Knowledge sharing has also been studied in the context of online professional learning communities (e.g., Belous, 2014; Lin, Lin, & Huang, 2008; Tseng & Kuo, 2014), where individual participants are not employees, but volunteer to take part in online professional learning communities. In these environments sharing is mainly motivated by intrinsic rewards (fulfillment, joy), altruism (the desire to help others) and self-efficacy. In some cases, monetary reward systems have shown to even reduce knowledge sharing (Lin & Huang, 2013).

1.3 Student knowledge sharing in educational contexts

Against this background, it is surprising that, to date, online knowledge sharing among students has received little scholarly attention in educational research. The informational science literature, contains some empirical studies on knowledge sharing in higher education (e.g., Wei, Choy, Chew, & Yen, 2012; Yuen & Majid, 2007). However, these have addressed the topic from an informational instead of an educational science viewpoint. As such, they did not clearly distinguish between knowledge sharing and other formats of interactive learning (such as peer collaboration, collaborative knowledge construction, discussion), but used knowledge sharing as an overarching inclusive term. Moreover, these did not consider the type of motivational constructs that are relevant to educational settings (such as academic self-efficacy, achievement goals) and with commonly accepted, validated assessment tools. Lastly, these studies did not specifically focus on *online*

sharing through social network technology and were limited to adult populations of university (instead of secondary school) students.

In educational research, peer collaborative learning has been the focus of extensive empirical research since the 1970s. In fact, peer collaboration, shared thinking and group discussions have become cornerstone concepts of progressive pedagogies (e.g., Howe & Abedin, 2013; Mercer & Littleton, 2007; Resnick, Asterhan, & Clarke, 2015; Webb, 2009). How does *knowledge sharing*, a term that originated in the information and organizational sciences, relate to the educational construct of *peer collaborative learning*?

In its broadest sense, most of human-human communication, including educational activities such as teaching and student group work, could be considered a form of knowledge sharing. Moreover, making an effort to make one's own knowledge available to others is in essence a collaborative act. In educational research, however, the term *collaborative learning* is reserved for a particular type of activity in which peers engage in rich and meaningful discussions, create shared meanings and build knowledge together (see Webb, 2009 for a review). *Peer knowledge sharing*, on the other hand, is limited to the mere act of making knowledge available to others - that is: the mere exchange of information and knowledge sources, without taking into account whether it was followed by further collaborative engagement on *the content* of those sources, or not. Borrowing a peer's notebook after school to copy its content is an example most will be familiar with from the pre-Internet era. In contrast to research on peer tutoring and peer collaboration in classroom settings, however, such after-school, peer-based sharing practices have not been the focus of empirical attention in the educational literature. We argue that with the widespread availability of ubiquitous and easy-to-use sharing technologies, after-school peer exchange of learning materials is likely to have evolved into a public, large-scale, multi-user, and frequent student activity, and as such warrants empirical research.

Three additional differences between online knowledge sharing in secondary school contexts and in organizational, adult contexts should be highlighted: First, students from a secondary school know and interact extensively with one another offline as well as online. Therefore, interpersonal motives, such as gains in social status and personal recognition for dispensing and distributing valuable knowledge, may play a more prominent role in school-related knowledge sharing. Personally knowing the receivers and being able to observe positive effects of one's sharing activities may further encourage participation. Secondly, individual excellence in secondary school settings does not translate into monetary or other materialistic rewards (such as, salary bonuses, promotions), and the potential of future

rewards (such as college scholarships in tertiary education) may be less salient to secondary school students. On the other hand, competition for academic excellence (medals, awards, honors) are by definition based on relative standing in a group. Such considerations may therefore stymie students' motivation to share school-relevant knowledge.

Finally, whereas knowledge sharing is actively promoted by managers and leaders in organizations, attitudes towards sharing in the educational realm tend to be more ambiguous: On the one hand, peer assistance and help-giving are valued and encouraged in schools. However, assessment and evaluation is predominantly based on individual performance. Thus, peer knowledge sharing in the sense of giving, receiving and using solved solutions, completed homework assignments, and answers to test items are considered unethical (cheating) and, therefore, prohibited. Moreover, sharing in the sense of exchanging learning derivatives is often discouraged: By relying on adapted materials and summaries that are produced by others, instead of processing the materials by one's self (e.g., relying on a book synopsis instead of reading the book, or reading someone's class notes instead of personally attending class), important immediate and future learning gains are forfeited.

1.4 The present research

The overall aim of the present research is to map teenagers' school-related knowledge sharing practices in SNSs. We focus on six "Wh- questions": *Whether* students share? *Where*, *when* and *why* do students share? *What* do they share with each other in SNS groups? *Who* are the sharers?

To address these questions, two studies were conducted on representative samples of Israeli, Hebrew-speaking adolescents: Study 1 was designed to gain first insights into teenagers' school-related SNS-based knowledge sharing practices and the extent of their reach. Study 2 was designed to replicate and extend the Study 1 findings in an additional, larger sample. A second aim of Study 2 was to answer specific questions regarding the characteristics of sharers and their motivations for sharing.

2. Study 1

An online questionnaire was distributed among a representative sample of Hebrew-speaking secondary school students in Israel. The research questions and hypotheses are organized according to the six different aspects of teenage school-related sharing in SNS:

(a) *Whether*: How common and widespread is the phenomenon? How often do they share, how often do they use shared materials? How many SNS study groups do they

participate in, on average? Do they appreciate it or is it considered a nuisance? Based on information from the pilot study interviews, it is expected that the majority of high school students participate in knowledge sharing through SNS, are members of at least one SNS study groups, and regard sharing positively (H1).

(b) Where: Which specific SNSs do they use and prefer for peer sharing? We focused on Facebook and WhatsApp[1], since these were by far the most popular and widely used social network applications used in Israel at the time of the survey administration.

(c) *When:* Who initiates the sharing of learning materials in SNS study group members? Is it mainly self-initiated or do members only share after they have been asked by other group members? It is expected that students mainly share their learning materials after a study group member specifically asks (H2). The rationale for this hypothesis is rooted in gift economy theory, which assumes that valuable resource will not be handed out without (future) reciprocation and that a resource's value is largely determined by the demand for it.

(d) *What:* What types of knowledge sources are shared most often by high school students? It is hypothesized that materials that require little personal effort to produce (e.g., snapshot of whiteboard or handouts, logistic and technical messages and reminders) will be shared more frequently, compared to learning materials that require substantive individual effort to produce (e.g., class notes and reading material summaries, or directly assisting other students learn and understand) (H3).

(e) *Who:* Is there a profile for frequent sharers, or central knowledge brokers, and can they be distinguished from less frequent sharers? It is hypothesized that sharing occurs more frequently among high achievers than among low achievers, and that high achievers will share types of learning materials that require more effort and skills, such as content summaries, peer assistance and solved homework assignments (H4). High achievers are more likely to be diligent in their collection and creation of learning materials, are more likely to be asked to share and may be more confident about sharing materials they themselves created.

It is also hypothesized that sharing is more frequent among female than among male students (H5). This expectation is based on existing studies on peer help-seeking in small-group classroom learning, showing that girls ask for help more frequently and respond more

[1] WhatsApp is a Mobile Instant Messaging (MIM) application made available to the public for the first time in 2009. Within several years, WhatsApp gained incredible popularity in many countries around the world (Lenhart, 2015). In Israel, where the application is rated as the most popular one among adults and youth alike, the average number of messages received by a junior high school student stands at approximately 500 per day (Rosenberg, 2015).

often to requests for help from their peers (Conwell, Griffin & Algozzine, 1993; Webb, 1984).

Finally, it is hypothesized that sharing tendencies are higher among active users of SNS, as they are more familiar with the internet-based norms of sharing, and in social networks in particular (H6). Previous research has reported positive correlations between the amount of time spent on Facebook and the *willingness* to use it for school work purposes (Cohen & Eini, 2012).

(f) *Why:* Finally, why do high school students share learning materials in SNS study groups, and why in their opinion, do others choose to share: Is this mainly motivated by pro-social motives (i.e., the wish to help others) or by more egocentric motives (i.e., self-enhancement, impression management, improving own achievements)? Moreover, do students differ in their attributions when they report on motives for their own sharing *as opposed to* those of other group members? Given the aforementioned differences between the organizational-professional and formal education settings, we did not have any specific hypotheses regarding motives for sharing, and therefore, adopted an open-ended item format to explore these questions.

2.1 Method

2.1.1 Participants and Procedure

Participants were 206 Israeli adolescents. They were recruited from the largest national panel data base (with over 10,000 active adolescent members), which is subjected to state privacy law and ethical regulations. In the registration process, users provide basic biographical data (e.g., age, gender, residence, mother tongue, religious affiliation). This biographical information is used for selection procedures (e.g., mother tongue, ethnicity, religiosity, SES) to build representative samples for surveys. Registration to the panel requires that adolescents as well as their parents read and sign consent forms.

Invitations to participate in the current study were sent via e-mail to all registered adolescent members (age 15-17) from the majority population in Israel (mainstream, ethnically Jewish population). Because of substantive differences in school systems, cultural norms, internet availability and/or teacher-student relationships, we did not recruit participants from the ultra-orthodox Jewish and the Arab-speaking population. The invitation did not reveal the research topic. Participation was on a first-come, first-served basis and was closed once the goal of 200 adolescent participants with active SNS accounts was reached,

while safeguarding a representative breakdown of gender, age, and the different religious sectors that is representative of mainstream Jewish adolescent population (53% secular, 18% traditional, 18% religious).

One respondent reported not owning an active WhatsApp nor a Facebook account. The mean age of the 205 remaining participants (103 male) was 16.00 (*SD* = 0.81). Thirty-eight percent of participants defined themselves as *excelling students* (GPA~ 90), 43% as good (GPA ~ 80), 15% as *average* (GPA ~ 70), 3% as *sometimes experiencing academic difficulty* (GPA ~ 60) and 1% as *often experiencing academic difficulties* (GPA ~ 50). The survey was completed online, during the last week of October 2014. Upon completion, participants were rewarded with panel system credits that can be traded for coupon vouchers in popular stores.

2.1.2 Materials

The complete survey contained 32 items (4 open, 28 closed) which targeted the following information:

Demographic information. Participants submitted demographic information regarding their gender, age, school type, residential area, high school achievement level (see above) and religiosity (secular, traditional, religious).

SNS activity. Participants indicated whether they have an active SNS account (none, Facebook only, WhatsApp only, both), how much time a day they spent on Facebook on average (in *hrs*), and how many WhatsApp messages they see on average on a given day (choice from "0-50", "50 -100", "100 - 500", "500 - 1,000", or "more than 1,000"). The next set of items addressed the use of SNS for school-related purposes: Participants indicated the number of SNS study groups they were members of during the last school year (choice from "none", "1", "2-5", or "more than 5"). They also indicated which SNS platform was used more often and which they consider to be better suited for study groups (choice between Facebook, WhatsApp or equally so) and explain their choice (open item, free text). Participants also indicated how many study groups included teacher members (“none”, “few groups”, “most groups” and “all groups”).

Sharing intensity. Based on the results from the pilot study (Bouton & Asterhan, in press), items were constructed to estimate the sharing intensity, both in general ("How often do you share?"), as well as separately for each of five different types of content identified in the pilot study: Administrative messages ("such as homework instructions/reminders, tests notifications and so on"), snapshots and handouts, content summaries ("of class notes, reading material summaries, and so on"), solved homework and other individual assignments,

and peer learning ("such as, helping friends and explaining online points they didn't understand "). Frequency of sharing for each type was rated on a 5 point Likert scale ranging from 1 ("never") to 5 ("very frequently"), separately for (1) content they shared themselves; and (2) using shared content posted by others. Internal reliability of the five sharing behavior items was good, Cronbach's, α =.778. An overall sharing intensity scale was then obtained by calculating the mean score of the five separate sharing behaviors combined.

Attitudes towards sharing. Participants indicated separately how much, on a 5 point Likert scale (ranging from 1 'not at all' to 5 'very much') they were satisfied with using SNS for school-related, academic purposes and whether they believe shared learning materials help students achieve better grades. They were also to indicate when they and other members share learning materials ("as soon as they obtain them", "if someone asks in the group", "if many members ask in the group", "after someone personally asks them").

Motives for sharing. Three open-ended items were constructed to gain insight into student motives to share. They were asked to explain in detail (1) why they themselves share learning materials and what (if any) benefits are gained from sharing; (2) why they believe others share materials and what (if any) benefits are gained from sharing; and (3) whether they believe students sometimes regret sharing learning materials, and if so – why.

2.1.3 Coding of student motives

Very few participants responded to the third open-ended item (referring to regrets after sharing) and the existing responses were very meager, which did not allow for a substantive content analysis of those responses. A coding scheme was developed to analyze the content of student responses to the two other open-ended items, which referred to sharing motives behind one's own sharing and that of others' sharing behavior. Using a grounded approach, recurring motives were grouped in larger, similarly themed categories. This procedure was repeated for responses to each of the open-ended items separately and yielded six categories that were identical for each test item (own motives, others' motives): Sharing improves the sharer's own academic achievements, to help classmates succeed, to attain a positive self-concept, quid pro quo (expectations of reciprocity in the future), to gain social stature[2], and because it is easy and does not require a lot of effort. Two trained human judges independently coded the entire data set according to the developed coding scheme. Coding

[2] Cohen's Kappa was low, and the motive was mentioned rarely.

categories were not mutually exclusive, and one written response could receive more than one code if the written response referred to more than one of the six motives, or none.

Cohen's Kappa reliability coefficients were calculated to establish interrater reliability. Table 1 present the content categories, including response examples (translated from Hebrew) in each content category for own and others' motives for sharing and the Kappa coefficients for each. Differences were resolved through discussion.

Insert Table 1 About Here

2.2 Results

2.2.1 Whether and where students share in SNS study groups

The large majority (83%) of the 205 respondents with an active SNS account reported having active accounts in both Facebook and WhatsApp. Those with an active Facebook account (*N* = 183) reported spending an average of more than two hours a day on Facebook (*M* = 2.34, *SD* = 2.31). Among adolescents with an active WhatsApp account (*N* = 193), more than a third (*N* = 80, 39%) stated they receive between 100 and 500 WhatsApp messages each day, and thirty students (15%) reported receiving more than 500.

As hypothesized (H1), the majority of participants (*N* = 176, 86%) reported that they are members of SNS study groups. Of these, 88% (*N* = 155) reported being a member of more than one study group, with 15% (*N* = 27) being members of more than 5 groups. When asked which of the two SNS accounts contains more study groups, 86% of adolescent students (*N* = 177) choose WhatsApp and 6% Facebook. The remaining 16 participants (8%) stated that they contained equal amounts of study groups. The majority (76%) of teenage respondents with membership to SNS study groups reported that teachers are members of at least one of their groups, whereas some (11%) even indicated their teachers are members of all their study groups.

General sharing frequency among students with membership in SNS study groups (*N* = 176) was moderate (*M* = 2.87, *SD* = 0.93). However, as hypothesized, the vast majority of the members 90% (*N* = 158) reported that they have shared at least some learning materials in the course of the previous school year.

As for general attitudes about sharing in SNS study groups as a phenomenon, 99% (*N* = 203) of participants indicated that sharing learning materials via SNS helps students improve their grades (13% 'a bit helpful', 38% 'somewhat helpful', 41% 'helpful', 7% 'very helpful').

Overall, 80% of the participants regarded the use of SNS for school work purposes favorably ("liked it" or "liked it a lot"). The remaining 20% either liked it only a little bit or not at all.

2.2.2 What is shared in SNS study groups?

Figure 1 summarizes the mean sharing frequency score for five different types of content, separately for whether a content category is *shared* by respondents themselves or *used* by respondents: Administrative messages, snapshots (of board and handouts), content summaries (class notes and reading summaries), copying (solved homework and assignments) and peer learning, ranging from 1 ("never") to 5 ("very frequently"). To examine whether the mean differences between types of shared content proved to be significant, paired sample t-test comparisons were conducted with Bonferroni alpha corrections for multiple comparisons (0.05/10) within each sharing activity (i.e., separately for content that is shared or used by respondents).

Insert Figure 1 About Here

Content shared by participants themselves. Online peer assistance proved to be the most frequent content category ($M = 3.46$, $SD = 1.25$), compared to all other content categories, $t(159^{3}) > 4.56$, $0.72 \leq d \leq 1.32$, $p < .001$. Content summaries are shared significantly less than administrative messages ($M = 2.89$, $SD = 1.25$), $t(159) = 3.41$, $p = .001$, and snapshots/handouts ($M = 2.83$, $SD = 1.29$), $t(159) = 3.02$, $p = .003$. None of the other comparisons were statistically significant.

Content used by participants. Shared content summaries ($M = 3.62$, $SD = 1.44$) were used less frequently than shared administrative messages ($M = 4.01$, $SD = 1.29$), $t(175) = 4.08$, $d = 0.62$, $p < .000$, and provided peer assistance ($M = 4.14$, $SD = 1.40$), $t(175) = 4.60$, $d = 0.69$, $p < 0.000$. Peer assistance is also used significantly more often than homework solutions (copying) ($M = 3.73$, $SD = 1.48$), $t(175) = 4.17$, $d = 0.63$, $p < .000$ or content summaries. None of the other comparisons proved to be significant.

The results indicate that hypothesis H3 was only partly confirmed. As hypothesized, learning materials that require little personal effort such as posting administrative messages or snapshots were shared and used frequently. As hypothesized, content summaries which require efforts and skills were the least shared. However, contrary to our expectations, peer

[3] Not all the participants who reported they are members of SNS study group actually share their learning material, this is the reason for the smaller df (159) in this section, compared to content encountered and content used (175).

assistance, which requires both skills and effort, was also among the most frequent content categories in SNS study groups.

2.2.3 When do students share?

As hypothesized in H2, most students (N = 143, 81%) agreed with the statement that people only share after someone in the group specifically asks. Only 21 participants (12%) agreed with the statement that people share what they have and when they have it, seven participants (4%) indicated that people share only after having received many requests, and finally only 5 participants (3%) stated that students share only after they are asked personally. A similar pattern was observed for responses to the item that targeted when the respondent him/herself shared: Most students (N = 112, 64%) indicated they shared only if someone in the group posted a request, whereas 30 participants (17%) stated they share only if they are *personally* asked to do so. Only 26 participants (15%) stated they shared whenever they have something, and eight participants (4 %) stated they share only after several requests have been posted in the group.

*2.2.4 Who shares**?***

Overall sharing intensity was calculated based on the mean frequency of the five separate types of learning materials (administrative messages, snapshots/handouts, content summaries, copying or peer assistance). As hypothesized (H6), sharing intensity was found to be positively correlated with overall WhatsApp activity, r_s = .195, p = .007, Facebook activity, r = .161, p = .043, and number of study groups in one's SNS account(s), r_s = .456, p < .001. As hypothesized (H4), a positive, yet low correlation was found between overall sharing intensity and self-reported school achievements, r_s = .13, p =.05. A breakdown into the five specific sharing content categories showed significant correlations between achievement level and two of the three content categories that require more skill and effort to produce, namely homework solutions (i.e., copying, r_s = .172, p = .023) and online peer assistance (r_s = .173, p = .022), but not content summaries (r_s = -.095, p = .212). Contrary to our hypotheses, achievement level did not predict the *use* of shared materials for any of the different categories.

Contrary to hypothesis H5, a one-tailed t-test for independent sample did not reveal a difference between male (N = 85, M = 2.78, SD = 0.97) and female students (N = 91, M = 2.95, SD = 0.89), t(174) = -1.201, p = .232. However, when considering each sharing

behavior type separately, Mann Whitney tests[4] showed that female students engage significantly more in online peer assistance (*Mdn* = 95.73) compared to male students (*Mdn* = 80.76), *U* = 4,525.0, *p* = .045. None of the other comparisons proved to be statistically significant.

2.2.5 Why share?

Participants were asked to name the reasons behind their own and their peers' sharing in SNS groups. It should be noted that response rates dropped considerably for these items (*N* = 86 out of the 158 self-identified sharers, and *N* = 151 out of 176 SNS study group members, respectively), perhaps due to the fact that these were open-ended items demanding more effort. A commonly mentioned motive for sharing was to help one's friends to succeed (24% own sharing, 36% sharing by others). The most common motive for own sharing was that it helps sharers learn better (43%), but it was recognized as a motive for others' sharing behavior in only 9% of responses. The quid pro quo motive (sharing to receive help in future when needed) was mentioned rarely as a motive for own sharing (11%), but in 21% of responses for others' sharing. Other motives were less frequent, such as sharing in order to feel good (16% and 15%, respectively), to advance one's social status (5% and 7%, respectively) and sharing is simple and easy (1%, and 6%, respectively).

2.3 Discussion

The findings of Study 1 show that secondary school peer-to-peer knowledge sharing in SNS groups is a common and frequent phenomenon in which most teenage students participate, either as sharers or as users of shared materials, or as both

The majority of respondents perceive these school-related usages of SNS favorably and believe it helps improve their own as well as their peers' academic achievements. The results also indicate that, at least currently, these study groups are mainly WhatsApp-based and peer-led, even though teachers are members in at least some of them (see also Rosenberg & Asterhan, in press). Finally, sharing intensity was positively associated with the extent to which students are active users of social network technology and with self-reported level of academic achievement. As for the latter, higher academic achievement was specifically associated with two types of content categories that require expertise and personal effort, namely real-time peer assistance and posting one's solved homework solutions. Lower self-

[4] A Mann Whitney tests were used because each separate sharing behavior was measured with one single item and an ordinal scale.

reported achievement level was not associated with more frequent use of shared materials. Thus, both low and high achievers make use of materials that are shared by others.

The expectation that sharing intensity would be lower for knowledge sources that require personal effort and expertise, and higher for those that require little personal effort and expertise, was confirmed in part: Solved homework solutions and student-made content summaries were indeed among the least frequently shared materials. These materials are arguably among the most valuable (for users) and costly (for posters) knowledge sources. Similarly, administrative message and snapshots of teacher-produced materials were indeed among the most frequently shared and used materials. However, unexpectedly, so was real-time peer assistance. This surprising finding could potentially be due to different subjective interpretations of "peer assistance". Respondents may have understood that this also includes any reply to requests for help, even technical help (e.g., "Who remembers what pages we have to study for tomorrow"?).

Our expectation that female teenagers would share more frequently than male students was only partly met: Of the different content categories, females only provide more peer assistance than male students, but did not share other knowledge sources more often.

In order to validate these finding further, a second study was designed to test for replicability in an additional and larger representative sample of Hebrew-speaking, Israeli secondary school students. Moreover, since not all participants chose to respond to the open items on sharing motives, we could not further examine relations between sharing motives, sharing intensity and other personal dispositions. In the next study, and based on the six motives identified in Study 1, forced response, closed items were used to assess students' motives for sharing. In addition, we explored whether selected individual characteristics are associated with SNS-based knowledge sharing.

3. Study 2

As aforementioned in the introduction, research on knowledge sharing in organizational settings and online communities has explored a number of personal variables that predict whether an individual is likely to share knowledge, or not (see Wang & Noe, 2010 for a review). Of these, two are of particular relevance to the educational context and are included in the current study, namely: self-efficacy and prosocial orientations.

A sharers' beliefs in their ability to supply valuable information to others (self-efficacy) has been found to be a strong predictor of whether a person is inclined to share knowledge in organizational settings and online communities (Belous, 2014; Cabrera, Collins & Salgado,

2007; Chen & Hung, 2010; Tseng & Kuo, 2014). For similar reasons, academic self-efficacy is likely to play an important role in knowledge sharing for school-related purposes. If students regard themselves as capable and efficacious in the academic realm, they will likely be more confident in their ability to contribute to someone else's academic success, as well as be less hesitant to post their own materials in the public realm. Academic self-efficacy is also likely to be a better predictor of sharing than measures of self-reported academic achievement level, which had yielded little variance in Study 1.

H7. Academic self-efficacy is expected to be positively correlated with overall sharing intensity.

As aforementioned, knowledge sharing brings to the fore a tension between the pursuit and advancement of collective group goals, on the one hand, and individual costs and gains, on the other. By sharing personal knowledge with others, one forfeits a potential individual advantage and invests personal efforts to actively share this knowledge, for the benefit of others (the group). Perhaps not surprisingly then, willingness to share knowledge online has been linked to the extent to which an individual endorses collectivist values (e.g., Hwang, 2012; Lin, & Huang, 2013; Ma & Chan, 2014). Collectivists define themselves as part of a group, have personal goals that overlap with the goal of their in-group, give priority to in-group goals over individual goals when there is a discrepancy, and they value relationships to be of greatest importance (Triandis, Leung, Villareal & Clack, 1985). An individual that endorses collectivist values is then more likely to share his knowledge with the group.

H8a. Collectivist value orientations are expected to be positively correlated with overall sharing intensity.

Endorsers of individualist value orientations, on the other hand, tend to define themselves as autonomous from the group and give priority to personal over group goals (Triandis et al, 1985). They are therefore less likely to engage in knowledge sharing, especially in competitive settings, when the costs of sharing increase. However, individual perceptions of sharing as a quid pro quo activity is likely to attenuate this association. Gift economy theory stipulates that sharing with others is never a purely altruistic move, but rather a way to buy confidence that others will share with you in the future or to gain a prominent status that will produce other benefits. For individualists who believe in quid pro quo benefits, knowledge sharing is likely to be perceived as congruent with the pursuit of their own success, since sharing is expected to produce future gains (e.g., access to knowledge repositories of others, gains in status). Accordingly, students who endorse

individualist values but believe in quid pro quo benefits will engage in sharing, whereas the opposite is expected for individualist students who do not believe in quid pro quo benefits.

H8b. A negative correlation will be found between individualist value orientation and overall sharing intensity among students who do not expect quid pro quo benefits from sharing.

H8c. A positive correlation will be found between individualist value orientation and overall sharing intensity among students who believe in quid pro quo benefits from sharing,

To test H8a-H8c an assessment tool is included that has been used to measure collectivist and individualist value orientation at the individual respondent level (Hui, 1988; Singelis, Triandis, Bhawuk & Gelfand, 1995; Triandis, Chan, Bhawuk, Iwao & Sinha, 1995).

Given the focus on school settings and learning behaviors in the present work, we also measure students' achievement goal orientations. Achievement goal theory (e.g., Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Nicholls, 1984) distinguishes between different goals that students pursue: Students pursue mastery goals when they define success in terms of learning and progress and strive to acquire worthwhile skills and understandings. In contrast, students pursue performance goals when they define success in terms of proving their ability, especially relative to others, and strive to demonstrate superior ability (performance-approach goal) or to avoid the demonstration of inferior ability (performance-avoidance goal). Research has shown that these goals matter because they are associated with qualitative differences in the ways students define and evaluate success, seek and process information, and regulate learning behaviors (for reviews see Butler, 2000; Midgley, Kaplan & Middleton, 2001).

Among others, and of particular relevance to the current study, mastery and performance goals are associated with differences in help-seeking behavior: When faced with difficulty or failure, mastery goals orient students to seek information and help that will improve their own understanding and overcoming the difficulty on their own. Performance goals, one the other hand, orient students to obtain the correct solutions without further effort, to seek help without having to reveal this need to others, and, in some cases, to cheating (e.g., Butler & Neuman, 1995; Meece, Anderman & Anderman, 2006). However, the association between students' achievement goals and participation in (online) knowledge sharing has not yet been explored.

Based on existing achievement goal theory and research, as well as the findings from Study 1, it is expected that students who are motivated by mastery goals will participate in

knowledge sharing more. Knowledge sharing is likely to be perceived as a learning opportunity, since communicating knowledge to peers requires them to fully understand it themselves. Students who are motivated by performance goal orientations, on the other hand, are less likely to participate in knowledge sharing, especially the sharing of materials that require cognitive effort (such as content summaries). The reasons behind this reduced willingness are because sharing may reveal a lack of competence (performance-avoidance goals) and/or because they would prefer to keep valuable learning materials to themselves (performance-approach goals). As for using shared materials, a positive association is expected between performance goals and the extent to which teenagers use shared materials, especially those that provide correct solutions of homework assignments (i.e., cheating and copying).

H9a. Mastery goal orientations will be positively associated with teenagers' knowledge sharing intensity.

H9b. Performance goals will be negatively associated with knowledge sharing intensity

H9c. Performance goals are expected to be positively associated with the use of shared knowledge, especially those that provide correct solutions of homework assignments (copying).

H9d. A negative association is expected between mastery goals and the use of those sharing categories.

The overall goals of Study 2 are two-fold: To replicate results from Study 1 in a new and larger sample and to test the new hypotheses (H7-H9) regarding the underlying motivation and individual characteristics of sharers. The set-up and methodology of the second study was similar to Study 1.

3.1 Method

3.1.2 Participants and Procedure

Participants were 515 Hebrew-speaking Israeli adolescents. Recruitment procedures were identical to those in Study 1, and excluded participants that had participated in the Study 1 sample. Relying on the results of study 1, we assumed that most of the educational uses of SNS were organized via specifically generated SNS learning groups, created mainly by students, in various social network sites such as Facebook or WhatsApp. However, in the current sample only less than two-third of the total sample (N = 291) admitted they were members of at least one SNS study group. The remaining 224 respondents then did not

complete survey items relating to SNS study group activities. Data analyses of research questions revolving around such group activities is then restricted to 291 participants, instead of 515.

Mean age of the 291 remaining participants (127 male) was 16.73 (*SD* = 1.04). More than half (*N* = 171, 59%) reported they are secular, a quarter were religious (*N* = 75, 26%) and the rest reported they are traditional - observant (*N* = 45, 15%). As was the case in Study 1, self-reported GPA was relatively high overall (*M* = 83.1, *SD* = 10.3). All the questionnaires were completed online, during the first week of April, 2015. Net time to complete the survey was estimated at 15 - 20 *min*.

3.1.2 Materials

The full survey included 93 closed-end items. It included the Study 1 items for demographic information, overall SNS use, SNS study groups and sharing intensity. They were also asked to indicate who usually initiates the creation of a study group (‘students’, ‘teachers’, or ‘students and teachers equally’), the number of members in a typical SNS study group, an estimate of the ideal number of members in an effective study group, and when they first encountered SNS study group sharing. In addition, 5 closed statements related to students' feelings about and when sharing. Content of the items was based on the open responses from Study 1 and included the following: ‘I feel as though some people in the group are pressured to share learning materials’, ‘I’ve regretted sharing learning materials’, ‘I feel as though the learning materials I’ve shared have helped others’, ‘I feel I need the learning materials my friends share in order to learn", and ‘I feel pressured to share learning materials’. Participants rated their agreement on a 5-point Likert scale ranging from 1 (‘not true ’) to 5 (‘very true’) The following measures were included in Study 2:

Explicit motives for sharing. Based on findings from Study 1, six common motives for sharing were phrased. Participants indicated their agreement with each on Likert scales, ranging from 1 ('not true') to 5 ('very true'), separately for the motives behind one's own sharing and behind the sharing by other group members. The six motives are: (a) Improving academic achievements; (b) Helping classmates succeed; (c) Positive self-concept; (d) Quid pro quo; (e) Gain social stature; and (f) Lack of effort.

Individualism and collectivism. Students' individual orientation towards collectivist and individualist values was measured by using two of the four scales from the Singelis et al. (1995) survey, which was translated to Hebrew and validated by Adar (2005). Individualist value orientation was measured with a scale originally termed Vertical Individualism (VI). It

focuses specifically on the competitive aspects of individualism: An individual who score high on this scale views the self as autonomous, and recognizes and accepts the existence of inter-personal inequality. Interpersonal competition is an important aspect of this orientation (Singelis et al, 1995). Examples of items are: "Competition is a law of nature", "It annoys me when others perform better than I do", and "It is important to me that I do my job better than others". Collectivist value orientation was measured by the scale originally termed Horizontal Collectivism (HC, 9 items). Individuals who score high on this scale see the self as a part of a collective, whose members are perceived as equals. The self is interdependent and the same as the self of others in the in-group (Singelis et al., 1995). Examples of items are: "The well-being of my co-students is important to me", "I feel good when I cooperate with others", and "My happiness depends very much on the happiness of those around me"). Participants indicated their agreement with each item on a 5 point Likert scale, ranging from 1 (‘not true’) to 5 (‘very true’). Internal reliability for the entire sample (N = 515) was α = 0.78 for the collectivist value orientation scale and α = 0.75 for the individualist value orientation scale.

Academic Self efficacy. Efficacy was measured with an adapted version of the English version of the General Self Efficacy scale (Schwarzer & Jerusaelm, 1995) - the New General Self efficacy Scale, NGSE, which was translated to Hebrew and validated by Chen, Gully, and Eden (2001). Participants indicated their agreement with each item on a 5 point Likert scale, ranging from 1 (‘not true’) to 5 (‘very true’). The original eight statements in the NGSE were adjusted to target the academic point of interest in the current study, by adding the word “learning” or “studies” (in Hebrew this is the same word: ‘לימודים’) to each statement (for example, “I can achieve most of the goals I set for myself in my studies”, or “Compared to other people, I can do most of the learning tasks well”). Internal reliability was high, α = 0.93 (N = 515).

Achievement goals. Individual achievement goal orientations were assessed with 18 items extracted from the Elliott & Church (1997) scale, translated to Hebrew and validated by Kogut (2002). These included six mastery goal items (e.g., "I hope that after the course I will have a better and deeper understanding of the topics we learned"), six ability-approach goal items (e.g., "It is important for me to perform better than the other students in this course") and six ability-avoidance goal items (e.g., "I just want to avoid failing the course"). Internal reliability was α = 0.76 for the mastery scale, α = 0.89 for the performance approach scale and α = 0.73 for the ability-avoidance scale, after omitting two items (“I wish this class was not graded”; “I’m afraid that if I ask my teacher a “dumb” question, they might not think I’m very smart”).

3.2 Findings

3.2.1 Whether and where students share in SNS study groups

On average, teenage participants (N = 515) reported receiving hundreds of notifications daily from the two SNS accounts together (M = 428.33, SD = 554.89, range from 0 - 2,000). This questionnaire did not include separate questions on memberships in WhatsApp or Facebook, but rather asked generally about number of notifications, as stated above. Only two participants (> 1%) said they do not receive notifications at all.

As in Study 1, participants were asked to indicate the number of SNS study groups they are members in. However, the format was slightly different from that in Study 1: Participants could either tick the "none" option or to write the number of SNS study groups in an open-ended format (rather than choose from a close set of predefined intervals, as in Study 1). In the current sample, only 57% of respondents admitted being members of at least one SNS study group, which is significantly less than in the Study 1 sample. Because of the different test item format, it is not possible to infer whether this reflects a genuine difference between the two samples or is an artifact of the different test format (i.e., clicking a predefined answer requires less effort, which increased participants' tendency to choose the "none" option more often). Participants who choose the "none" option, did not receive any further items on sharing in SNS study groups. The remainder of the data analyses on sharing behavior in study groups is therefore limited to N = 291.

Students with membership to SNS study groups are members of more than 4 groups on average (M = 4.33, SD = 2.97). The majority of these (89%) are members of more than one study group. Based on student self-reports, SNS study groups include about 20 members on average (M = 20.47, SD = 11.45). As for the recommended optimal size for an efficient SNS study group, participants recommended 17 on average (M = 17.13) members but varied greatly in their recommendation (SD = 17.56, range 2 -200). A bit over half of the participants (56%) reported that SNS study groups are usually initiated by students. Only 10% reported that their groups are mainly teacher-initiated. Finally, participants reported they first encountered the phenomenon of sharing learning materials via SNS between 2 to 3 years ago (M = 2.83, SD = 1.88).

As in Study 1, overall sharing intensity was calculated based on the mean frequency of the five separate types of learning materials (administrative messages, snapshots/handouts, content summaries, copying or peer learning). The mean average of sharing intensity among

students with membership in SNS study groups was M = 2.81 (SD = 1.05), which is similar to findings from Study 1. Finally, when asked whether they would be considered prominent sharers in their groups, 128 participants (44%) responded positively.

3.2.2 What is shared in SNS study groups?

As in Study 1, we examined which types of learning materials are most commonly used and shared by teenage participants. The results are presented in Figure 2. Paired sample t-test comparisons were conducted with Bonferroni correction to alpha (0.05/10) within each sharing category (own sharing, use of shared materials).

Insert Figure 2 About Here

Content shared by self. The types of study materials respondents themselves share most frequently are administrative messages (M = 3.18, SD = 1.36), snapshots/handouts (M = 3.12, SD = 1.37) and peer assistance (M = 3.01, SD = 1.36). No significant difference was found between administrative messages and snapshots, $t(290) < 1$, between administrative messages and peer assistance $t(290) = 1.94$, $p = .054$, nor between snapshots and peer assistance $t(290) = 1.15$, $p = .253$. Participants reported sharing content summaries less frequently (M = 2.67, SD = 1.39). Solved homework assignments (copying) were shared least (M = 2.07, SD = 1.27), $t(290) > 8.09$, $.95 \leq d \leq 1.50$, $p < .000$. Content summaries were shared more often than solved homework assignments, but less than the other three types of materials , $t(290) > 4.10$, $.48 \leq d \leq 1.50$, $p < .000$. In sum, the following pattern was observed: Administrative messages = snapshots = peer assistance > content summaries > copying

Use of sharing and shared materials. As in Study 1, participants reported using mostly administrative messages (M = 4.37, SD = 1.00), followed by snapshots (M = 3.91, SD = 1.2), content summaries (M = 3.63, SD = 1.31), peer assistance (M = 3.25, SD = 1.39) and lastly solved homework solution/copying (M = 2.93, SD = 1.52). All the comparisons above proved to be significant, $t(290) > 3.62$, $0.42 \leq d \leq 1.84$, $p < .000$. Thus the following pattern was obtained: Administrative messages > snapshots > peer assistance > content summaries > copying.

3.2.3 Why share?

Participants' responses to six predefined sharing motives were measured with separate items for one's own sharing and the sharing by other group members. Only students who self-identified as central and active sharers in their SNS groups (N = 128) were presented with the

survey items on motives behind one's own sharing. The test items referring to motives behind the sharing of group members was posed to all respondents (N = 291). To examine whether the mean differences between types of motives proved to be significant, paired sample t-test comparisons were conducted with Bonferroni adjustments for multiple comparisons (critical p = 0.05/15) within each sharing category (i.e., participants' own motives for sharing and their perceptions on others' motives to share).

Insert Figure 3 About Here

The mean scores for motivation behind own sharing are presented in Figure 3. The most frequent motive for participants' own sharing was to help classmates succeed (M = 4.43, SD = 0.84). It was significantly higher than any of the other motives such as improving one's own academic achievements (M = 3.10, SD = 1.49), improving positive self-concept (M = 3.48, SD = 1.25), quid pro quo (M = 3.44, SD = 1.27) or lack of effort (M = 3.66, SD = 1.34), $t(127) > 6.95$, $1.23 \leq d \leq 2.84$, $p < .001$. The least common motive for sharing was to gain social status (M = 2.05, SD = 1.36). It was significantly lower than any of the other motives, $t(127) > 7.22$, $1.28 \leq d \leq 2.84$, $p < .001$. None of the other comparisons proved to be significant. An identical patterns was found for respondents view on the motives behind sharing that is done by other group members.

Study 2 also included 5 closed statements addressing respondents' feelings during and about SNS-based knowledge sharing. The majority of participants (77%) strongly disagreed with the statement of experiencing regret after sharing learning materials (M = 1.42, SD = 0.88). Most participants (66%) strongly disagreed with the statement that they feel peer pressure to share (M = 1.69, SD = 1.15), or that they believe others are pressured (51%, M = 1.97, SD = 1.23). On the other hand, participants expressed overall agreement with positive statements endorsing sharing benefits: They feel that sharing their own learning materials helps their fellow classmates to improve their academic performance (M = 3.79, SD = 1.21). Moreover, 21% of respondents strongly agreed with the statement that they rely on sharing to succeed in their studies (M = 3.19, SD = 1.26).

*3.2.4 Who shares**?***

Gender differences in overall sharing were tested using a one-tailed independent sample t test. Unlike in study 1, but as predicted, female students were found to share more (M = 2.90, SD = 1.06) than male students (M = 2.69, SD = 1.03), $t(289)$ = 1.70, p = .045. When separately tested for each type of sharing, Mann Whitney test showed that female students shared content summaries more often (Mdn = 156.63) than male students (Mdn = 132.27), U

= 12,158.0, p =.012. None of the other comparisons proved to yield significant gender differences.

The survey included scales to assess six individual characteristics that were hypothesized to be potentially relevant to sharing in SNS study groups, namely collectivist value orientation, individualist value orientation, academic self-efficacy, and three types of achievement goal orientations (mastery, performance-approach and performance-avoidance). Table 2 presents the Pearson correlations between the six personal characteristics and overall sharing intensity, as well as Spearman correlations with each of the five different sharing categories (administrative messages, snapshot/handouts, content summaries, copying and peer learning).

Insert Table 2 About Here

Inter-correlations between most scales were either non-existent or low. However, a strong, positive correlation was found between the individualist value orientation scale and the performance-approach goal scale, $r(291) = .61$, $p < .001$. The correlations with sharing behavior measures (Table 2) also show nearly identical patterns of association. The items on the Singelis et al (1995) scale that was chosen to measure individualist value orientations very strongly refer to competitiveness. Thus, it is likely that the two scales then tap into the same theoretical construct. Given these findings, the variable performance-approach goal was omitted from further analyses and we refer to the remaining scale as "competitive individualism" from here on onward. Sequentially, the hypotheses regarding the performance approach goals (H9b and H9d) was merged with the corresponding scale of individualist value orientation (H8b and 8c).

As expected, positive correlations of moderate strength were found between overall sharing intensity and collectivist value orientations (H8a), as well as academic self-efficacy (H7), and mastery goal orientation (H9a), respectively. The data in Table 3 show furthermore that significant, positive Spearman correlations were found across the five different sharing types for each of these, in particular for peer learning. Endorsement of performance-avoidance achievement goals was not related with overall sharing intensity, $r = .09$, nor with any of the separate sharing behaviors.

No correlation was found between overall sharing intensity and competitive individualism, $r(291) = .04$, $p = .466$, without controlling for “quid pro quo” perspectives. Even though competitive individualism value endorsement was not associated with less overall *actual* sharing, positive correlations were found with experiencing regret after sharing (r_s =.233, $p < .001$), perceived peer pressure to share (r_s =.302, $p < .001$), and the belief that

others experience peer pressure as well (r_s =.316, p < .001). Thus, it seems that even though competitively oriented individuals do not necessarily participate less in sharing activities, but that they are less content about (having been forced into) doing it. Finally, it is noteworthy that endorsement of competitive individualism (and performance approach goals) was positively associated with one of the separate content categories, namely sharing solved homework tasks (copying) only (see Table 3).

Insert Table 3 About Here

A multiple linear regression was performed to examine the extent to which collectivist value orientation, mastery goal orientation and academic self-efficacy contribute to the prediction of sharing intensity. The model was statistically significant, $F(3,287) = 24.78$, p <.001, and accounted for approximately 20% of the variance of overall sharing intensity, R^2 = .206, Adjusted R^2 = .197. As hypothesized (H7, H8a and H9a) each of the three individual characteristics contributed separately to the prediction of overall sharing intensity, with scores on the collectivism scale being the largest contributor (β = .291, p < .001), followed by mastery goal orientation (β = .191, p = .003) and self-efficacy (β = .149, p = .014).

In contrast with expectation, a somewhat similar pattern was found for *using* shared learning materials: Positive and significant correlations were found between overall use of shared learning materials and collectivistic values orientation (r = .36, p < .001), as well as mastery learning goal orientation (r = .25, p < .001). Contrary to our hypothesis (H9c), positive correlations were also found between mastery goal orientation and the use of each of the content categories separately, including copying (.13 < r_s < .31, p < .025). In contrast to expectation (H9c), overall use of shared materials was not predicted by competitive individualism (r = .06, p = .322). However, and in accordance with hypothesis H9c, pof the different types of shared materials, a positive correlation between competitive individualism and the use of copied homework solutions was found (r_s = .13, p = .024).

3.2.5 Quid pro quo perspectives and sharing.

It was hypothesized (H8b) that competitive individualism would be negatively related with sharing when students do not expect any future gains from it (no belief in quid pro quo), but (H8c) will be positively related when students expect to gain future benefits (belief in quid pro quo). To test this hypothesis, respondents were characterized as either endorsing or not endorsing gift economy views, based on their responses to the item '*I share learning materials with others so that they will help me in the future, should I need it'* (the quid pro quo motive). Since only respondents who self-identified as prominent sharers were presented

with the 6 items that targeted different motives for sharing, the analyses could only be conducted on that particular sub-group (N = 128). Almost half of the participants (N = 62, 48%) either "very much" or "completely" agreed that their sharing was motivated by a quid pro quo motive. Table 4 shows the bivariate correlations of competitive individualism value orientation scores with overall sharing intensity (Pearson's r) and with each of the five sharing categories (Spearman's rho), separately for respondents who endorse gift economy views of quid pro quo benefits (N = 62), and those who do not (N = 66).

Insert Table 4 About Here

As hypothesized (H8c), among students who strongly identify with the gift economy motive for sharing, a significant and positive correlation was found between overall sharing intensity and competitive individualism, r = .24, p =.032. This pattern was consistent across the five different types of sharing behavior as well, but did not reach significance for peer learning r_s = .16, p =.204 and sharing snapshots/handouts, r_s = .24 p = .057.

As hypothesized (H8b), among students who did not (strongly) endorse the quid pro quo motive for sharing in SNS study groups, however, a reverse pattern of correlations was found: A significant negative correlation was found between overall sharing intensity and competitive individualism, r = -.28, p =.011. Negative correlations with sharing were also found across the five different types of sharing, except for copying, r_s = -.16, p = .095.

3.3 Discussion

Study 2 sought to replicate and validate the findings of Study 1 in a new and larger sample, as well as to delve deeper into the reasons behind teenage school-related knowledge sharing. Taken together, the findings from this second study indeed reveal a similar picture with regard to the general characteristics of the phenomenon: The majority of teenagers partake in SNS – based, school-related knowledge sharing and use shared materials posted by peers. As in Study 1, students reported using and sharing learning materials with their friends frequently. The types of materials that were shared and used most frequently are, once more, administrative messages, snapshots and real-time peer assistance, with solved solutions (cheating / copying) the least frequent content category. The majority of teenage students reported to be members of SNS study groups, often several ones. Due to a difference in item format in this study, we believe that the measured proportion of students that admitted being members in at least one SNS study group (57%) is an underestimation and that the actual number is higher and closer to the one reported in Study 1 (86%). SNS study groups are

predominantly self-organized and ideally should have a medium number of members (around 17).

The expectation that female teenagers would be more frequent sharers was confirmed in this (larger) sample: Girls were found to share more often overall, and specifically share more content summaries than boys. In Study 1, girls were found to provide real-time peer assistance more often. Both peer assistance and the sharing of content summaries are considered to require more personal effort and sacrifice.

Among the different motives for school-related sharing through SNSs, self-recognized "prominent sharers" most frequently mentioned the wish to help their classmates succeed. This was further mirrored in the data on individual predictors of online sharing: SNS knowledge sharing intensity was first and foremost predicted by a person's orientation toward collectivist values, followed by mastery achievement goals and academic self-efficacy.

Finally, competitive individualism was not associated with less overall knowledge sharing or more overall use of shared materials, as would be expected based on a straightforward utility maximization strategy. However, even though competitively oriented individuals participate in sharing activities to the same extent as others, they also expressed more regret and experienced more social pressure to share content. Moreover, and in alignment with the literature on performance approach goals, competitive individualism was associated with more frequent sharing of the cheating type, that is: sharing and using copied homework and other assignments. Finally, the results reported here also show that belief in quid pro quo, i.e., the gift economy rationale for sharing, serves as a moderating factor of the association between peer sharing and competitive individualism orientation: When teenagers do not expect quid pro quo benefits, stronger endorsement of competitive individualist values is associated with less sharing. For teenagers who expect quid pro quo benefits from sharing, on the other hand, the opposite patterns was found, that is: endorsement of individualism was associated with increased sharing. For them, the act of sharing could both boost their social reputation as well as give them access to other repositories of potentially useful materials and knowledge.

4. General conclusions

In the debate about potential damages and advantages of SNS for learning and education, arguments are often polarized and rarely founded on empirical evidence. The combined findings from the two empirical studies presented here reveal a more balanced picture: In contrast to the argument that SNS activity consists of mere socializing and entertainment which comes at the expense of academic involvement, we found that teenagers

have adopted SNS technology for academic purposes as well. In contrast to expectations that large-scale adoption of SNS technologies will significantly transform learners and their study practices, on the other, we found that these SNS-based activities are mainly characterized by peer-to-peer knowledge sharing, and not by rich peer-guided, autonomous knowledge construction.

The present work provides a first, descriptive account of this teenage, school-related knowledge sharing via ubiquitous SNSs. It refers to the up- and downloading (posts, files) of knowledge and knowledge sources that pertain to the learning and studying of curricular topics to/from a SNS peer group. The findings presented here show that SNS-based knowledge sharing has become an integral part of routine study practices among secondary school students. It includes the sharing of logistical and organizational information, sharing of teacher-created materials, providing online peer assistance, and to a lesser extent the sharing of student-created content summaries and even completed assignments (cheating).

Student have been known to borrow and copy content from each others' notebooks prior the introduction of Web 2.0 tools. Therefore, student peer-to-peer knowledge sharing is not a novel phenomenon in essence, nor is it created by SNS technology. What has changed, however, is the ease, and efficiency, and therefore the scale, with which information and knowledge can be duplicated and shared in large groups with the help of modern social network technologies.

We will discuss our main findings, their contributions and the directions for future research from two perspectives, namely the knowledge sharing literature and a learning theory perspective.

4.1 Knowledge sharing in school settings

The present work extends the literature on online knowledge sharing as it is the first to address the phenomenon in formal, secondary education. Existing works have predominantly focused on adult knowledge sharing in either professional settings (business management and organizations) or in online communities (e.g., Yahoo! Answers or Wikipedia). As previously outlined, school settings are different in several ways, which renders certain factors as less relevant (e.g., the role of anonymity, audience, and trust) or obscure (e.g., the role of competition vs. collaboration in education, the role of authority), whereas others have to be introduced (e.g., the role of academic motivation and academic self-efficacy).

Similar to findings from adult knowledge sharing in online communities, self-reported motivations for teenage sharing were predominantly pro-social in nature. In secondary school settings, interpersonal competition for material rewards and thus the personal costs of sharing

is perhaps less salient than in professional settings. Not all sharing was purely motivated by altruistic motives, however, since quid pro quo motivations were found to play a role as well: Even competitively oriented individuals participated in sharing, when they expected future benefits. Participation in SNS-based sharing is more likely when a teenager is female, endorses collectivist values, is guided by mastery goals for learning, and has high academic self-efficacy.

The present work constitutes a first attempt at mapping knowledge sharing in secondary school settings. As such, it has several limitations that should be addressed in future research: First, and as is common in knowledge sharing research in general, the present work was based on self-report surveys. Future research should further explore the phenomenon with direct observations and with qualitative research tools to obtain a more in-depth picture and validate the current findings. Research should also extend to additional cultures and countries. Given the popularity of SNSs among teenagers in other countries, it is reasonable to expect that knowledge sharing is a widespread and common phenomenon in at least those areas. However, different norms and practices may evolve locally and are likely to be influenced by local school cultures. Finally, future research should include additional educational settings. In higher education, for example, competition for individual monetary rewards is more salient (scholarships, job offers, placement in graduate schools) and social cohesion not as strong, compared to secondary schools. This may affect the frequency of sharing as well as motivations behind it.

4.2 Knowledge sharing, peer collaboration and learning

From an organizational point of view, knowledge sharing is a means to reach the organization's end goals more efficiently (Wang & Noe, 2010), but it is not an end goal in itself. Research in business or organization fields focuses predominantly on how employers may be encouraged to share more frequently and more effectively. From an educational point of view, however, the desirability of online knowledge sharing between students is less clear cut. Whereas values of collaboration, sharing and pro-social behavior are encouraged and nurtured by society, parents and in schools, assessment and evaluation is predominantly based on individual performance. Individual mastery of knowledge and skills is (one of) the end goal(s) of education.

The most obvious case of undesirable sharing is that of solved homework tasks and other assignments. Even though it proved to be the least frequent type of sharing in the current study, still more than a quarter of the participants in both studies admitted to doing it

very frequently. Copying assignments and handing them in as one's own is considered unethical ('cheating'), since it provides an inaccurate picture of the individual's progress.

Aside from these ethical aspects, however, the overarching question is whether SNS-based knowledge sharing is conducive to individual learning, or not? The present study was not designed to answer that particular question as actual learning outcomes were not assessed and the set-up was not experimental. To our knowledge, none of the existing studies have and, at best, only report on correlations between GPA and features of SNS behavior (e.g., Junco 2012, Kirschner & Karpinski, 2010). Our survey data does show that teenage students regard online peer-to-peer knowledge sharing positively and believe that it improves their academic performance. However, these subjective perceptions may not necessarily reflect *actual* learning benefits. There are, in fact, several reasons that dampen such positive expectations:

First of all, a vast body of empirical research has shown that peer-based learning may indeed produce individual learning gains, *provided* that peers engage in particular rich forms of egalitarian, reasoned, transactive dialogue in which they co-construct knowledge (for reviews see Asterhan & Schwarz, 2016; Hmelo-Silver, Chinn, Chan, & O'Donnell, 2013; Mercer & Littleton, 2007; Resnick, Asterhan & Clarke, 2015; Webb, 2009). Learners improve their individual knowledge and understanding through negotiating, externalizing and challenging (the reasons for) each other's knowledge structures. This form of peer learning, *collaborative knowledge construction*, shares some surface features with online knowledge sharing as it is described in the present work: It is a collaborative, peer-based effort in a formal learning context. However, it lacks the pivotal attributes of knowledge co-construction and can therefore not be assumed to improve individual learning in a similar vein. Quite to the contrary, by overly relying on learning derivatives that are produced by others instead of self-made, students may forfeit important individual learning activities that produce knowledge gains as well as develop important competencies (e.g., summarizing, highlighting and integrating information).

A second reason to be cautious about expected learning benefits from online knowledge sharing stems from recent research on transactive memory systems and the increasing role of the Internet as the ultimate transactive memory partner (Sparrow, Liu, & Wegner, 2011; Ward, 2013a; Wegner, 1987). The Internet contains infinitely more expertise than a singular human partner, is accessible to all and is ever available. Recent research shows that people systematically overestimate their own internally stored knowledge, as they conflate it with the vast amounts of knowledge that are *available* through the Internet (Ward,

2013b). For example, Fisher, Goddu & Keil (2015) showed that the mere act of searching the Internet for knowledge creates an illusion whereby people mistake potential access to Internet-stored information for their own personal understanding of the information even when the transactive memory partner is unavailable. Extrapolating from this research to the current settings, it is possible that the information gathered through and stored in online SNS study groups may cause a similar illusion of knowledge: The mere act of storing shared learning materials and derivatives in one's cell phone or cloud, combined with the knowledge that one can access this information at any time, may cause learners to overestimate their own internally stored knowledge and underestimate the need for extra study time. This could then paradoxically lead to *less* actual learning.

A second set of questions for future research pertains to the actual use of shared materials. The findings reported here show that students share and gather shared materials on a regular basis. They do not provide further insight about how they actually keep track, store, utilize and integrate these different knowledge resources, however. Are these shared resources mainly used as additional materials, or do they replace learning from the teacher-assigned, canonical texts? How do students select and decide what is relevant, important or helpful, especially when they have several knowledge resources at their disposal (e.g., shared summaries, lesson notes, whiteboard pictures, textbooks) from potentially different individuals? Are they capable of choosing and selecting adequately?

Future research should also focus on potential differences in benefits from knowledge sharing. As aforementioned, 'sharing' has become the buzz word of the 2010s and is usually considered in euphorically positive terms (John, 2012), with outcomes such as democratization, emancipation, increased social cohesion and more egalitarian access to resources. However, there is also increasing criticism, in particular about certain aspects of sharing economies. Among others, recent findings in the Netherlands reveal that the sharing of under-utilized physical goods (such as cars, tools, and apartments) is highly stratified within social class, with people preferring to share with individuals from within their own social group. Moreover, the supply and the demand of shared goods is dominated by middle-class participants, with considerably less participation from the upper and lower classes (de Beer & de Gier, 2015). The quid pro quo expectation may in fact deter the 'have-nots' from using shared goods, as they will have difficulty to return the favor in the future. Similar questions can and should be raised regarding knowledge sharing: Who gains most from knowledge sharing and who loses out on potential benefits? Recent research on Whatsapp groups in secondary school classrooms shows that subsets of students often open new groups,

unbeknownst to the rest of the class or the teacher (Rosenberg & Asterhan, in press). Are certain materials and knowledge only shared with some, and if so, what are the rules for inclusion and exclusion in SNS-based study groups?

The present work is a first step towards a better understanding of a widespread phenomenon that has been underexposed in the educational literature and could potentially have many implications for learning and teaching in formal education (e.g., overreliance on ready-made summaries, overconfidence in knowledge estimations, study shortcuts, cheating). More research is needed to broaden and deepen this understanding, not only for scientific purposes, but also to enable informed decision-making when addressing the practical, ethical and social questions that come along with it.

5. References

Acquisti, A. & Gross, R. (2006). Imagined communities: Awareness, information sharing and privacy on the Facebook. In G. Danezis & P. Golle (Eds), *Privacy enhancing technologies*. Cambridge, UK: Springer.

Adar, N. (2005). Intercultural diversity in a conflict: Examining the intercultural diversity model among kibbutz and city dwellers in Israel. Unpublished doctoral dissertation. Bar-Ilan University, Ramat Gan, Israel.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.

Asterhan, C. S. C. & Schwarz, B. B. (2016). Argumentation for learning: Well-trodden paths and unexplored territories. *Educational Psychologist, 51*(2), 164-187.

Back, M. D., Stopfer, J. M., Vazire, S., Gaddis, S., Schmukle, S. C., Egloff, B., & Gosling, S. D. (2010). Facebook profiles reflect actual personality, not self-idealization. *Psychological Science, 21*, 372-374.

Belous, Y. (2014). Why do we share information online? A study of motivations. *International Journal of Arts & Sciences, 7(4),* 383-400.

Bingham, T. & Connor, M. (2015). *The new social learning: Connect. collaborate. work.* Alexandria, VA: ATD.

Bouton, E. & Asterhan, C. S. C. (in press). Teenage sharing of learning materials through social network sites [in Hebrew]. In B. B. Schwarz, H. Rosenberg, & C. S. C. Asterhan (Eds.), *Breaking down barriers in education? Teachers, students and social network sites*. MOFET books.

Butler, R. (2000). What learners want to know: The role of achievement goals in shaping information seeking, learning and interest. In: C. Sansone & J. M. Harackiewicz (Eds). *Intrinsic and Extrinsic Motivation: The research for optimal motivation and performance.* San Diego, CA: Academic Press.

Butler, R., & Neuman, O. (1995). Effects of task and ego achievement goals on help-seeking behaviors and attitudes. *Journal of Educational Psychology, 87,* 261-271.

Cabrera A. & Cabrera E.F. (2002). Knowledge sharing dilemmas. *Organization Studies, 23,* 687-710.

Cabrera, A., Collins, W. C. & Salgado, J. F. (2007). Determinants of individual engagement in knowledge sharing. *The International Journal of Human Resource Management, 17,* 245-264.

Chen, C. J., & Hung, S.W. (2010). To give or to receive? Factors influencing members' knowledge sharing and community promotion in professional virtual communities. *Information & Management, 47,* 226-236.

Chen, G., Gully, S.M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods, 4,* 62-83.

Clark, R. C., & Mayer, R. E. (2008). *E-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning.* San Francisco, CA: Pfeiffer.

Cohen, A. & Eini, L. (2012). Facebook usage among adolescents with linkage to Educational Processes. In Y. Eshet-Alkalai, A. Caspi, S. Eden, N. Geri, Y. Yair, & Y. Kalman (Eds). *Learning in the technological era: proceedings of the 7th Chais conference for innovation in learning technologies.* 147–158. Ra'anana, Israel: The Open University.

Collins, A., & Halverson, R. (2009). *Rethinking Education in the Age of Technology. The Digital Revolution and Schooling in America.* New York. Teachers College Press.

Connolly, T., & Thorn, B. K. (1990). Discretionary databases: Theory, data and implications. In: J. Fulk & C. W. Steinfield (Eds). *Organizations and communication technology.* CA: Sage publications.

Conwell, C. R., Griffin, S. & Algozzine, B. (1993). Gender and racial differences in unstructured learning groups in science. *International Journal of Science Education, 15* , 107-115.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organization manage what they know*. Boston, MA: Harvard Business School Press.

Dawes, R. M. (1980). Social dilemmas. *Ann. Rev. Psychol., 31,* 169-193.

De Beer, T., & De Gier, M. (2015). Deeleconomie: speeltje hoger opgeleiden of ontluikende kans? A TNS NIPO report. Accessed 15/09/2016 at http://www.tns-nipo.com/nieuws/nieuwsberichten/deeleconomie-speeltje-voor-hoger-opgeleiden-of-ont/

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 70*, 968-980.

Fisher, M., Goddu, M.K., & Keil, F. C. (2015). Searching for explanations: How the Internet inflates estimates of internal knowledge. *Journal of Experimental Psychology: General*. *144*, 674-687.

Greenhow, C., & Robelia, B. (2009). Old communication, new literacies: Social network sites as social learning resources. *Computer Mediated Communication, 4*, 1130-1161.

Greenhow, C., Gibbins, T., & Menzer, M. M. (2015). Re-thinking scientific literacy out-of-school: Arguing science issues in a niche Facebook application. *Computers in Human Behavior*, *53*, 593-604.

Harackiewicz, J. M., Barron, K. E., Pintrich, P. R., Elliot, A. & Thrash, T. M. (2002). Revision of achievement goal theory: Necessary and illuminating. *Journal of Educational Psychology, 94*, 638-645.

Harasim, L. (2000). Shift happens: Online education as a new paradigm in learning. *Internet and Higher Education*, *3*, 41-61.

Hershkovitz, A. & Forkosh-Baruch, A. (2013). Student-teacher relationship in the Facebook-era: The student perspective. *International Journal of Continuing Engineering Education and Life-Long Learning, 23(1),* 33-52.

Hew, K. F. (2011). Students' and teachers' use of Facebook. *Computers in Human Behavior, 27*, 662-676.

Hmelo-Silver, C. E., Chinn, C. A., Chan, C. K. K. & O'Donnell, A. M. (2013). *The International handbook of collaborative learning*. New York, NY: Routledge.

Hollis, R. B., & Was, C. A. (2016). Mind wandering, control failures, and social media distractions in online learning. *Learning & Instruction*, *42*, 104–112.

Howe, C., & Abedin, M. (2013). Classroom dialogue: A systematic review across four decades of research. *Cambridge Journal of Education*, *43*(3), 325-356.

Hui, C.H. (1988). Measurement of individualism-collectivism. *Journal of Research in Personality*, *22*, 17-36.

Hwang, E. H., Singh, P. V., & Argote, L. (2015). Knowledge sharing in online communities: Learning to cross geographic and hierarchical boundaries. *Organization Science, 26(6),* 1593-1611.

Hwang, Y. (2102) Understanding moderating effects of collectivist cultural orientation on the knowledge sharing attitude by email. *Computers in Human Behavior, 28,* 2169–2174.

John, N. A. (2012). Sharing and Web 2.0: The emergence of a keyword. *New Media & Society, 15,* 167-182.

Junco, R. (2012). Too much face and not enough books: the relationship between multiple indices of Facebook use and academic performance. *Computers in Human Behavior, 28 (1),* 187-198.

Kirschner, P. A. & Karpinski, A. C. (2010). Facebook and academic performance. *Computers in Human Behavior, 26,* 1237-1245.

Kirschner, P. A. (2015). Facebook as learning platform: Argumentation superhighway or dead-end street?. *Computers in Human Behavior, 53,* 621-625.

Kogut, E. (2002). Adult attachment styles and the individual's encounter with the achievement domain. Unpublished doctoral dissertation. Bar-Ilan University, Ramat Gan, Israel.

Lenhart, A. (2015). Teen, social media and technology overview. Smartphones facilitate shifts in communication landscape for teens. Accessed on 19-9-2016 from: http://www.pewinternet.org/2015/04/09/teens-social-media-technology-2015.

Lin, F., & Huang, H. (2013). Why people share knowledge in virtual communities? *Internet Research, 23,* 133 – 159.

Lin, F., Lin, S. & Huang, T. (2008). Knowledge sharing and creation in teachers' professional virtual community. *Computers & Education, 50(3),* 742-756.

Ma, W. W. K., & Chan, A. (2014). Knowledge sharing and social media: Altruism, perceived online attachment motivation, and perceived online relationship commitment. *Computers in Human Behavior, 39,* 51-58.

Manago, A. M., Taylor, T., & Greenfield, P. M. (2012). Me and my 400 friends: The anatomy of college students' Facebook networks, their communication patterns, and well-being. *Developmental Psychology, 48*(2), 369-380.

Mauss, M. (1967). *The Gift: Forms and functions of exchange in archaic societies*. London, UK: Cohen & West.

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 students motivation, affective learning and classroom climate. *Communication Education*, *56(1)*, 1-17.

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annu. Rev. Psychol., 57*, 487-503.Mercer, N., & Littleton, K. (2007). *Dialogue and the Development of Children's Thinking: a sociocultural approach*. London: Routledge.

Midgley, C., Kaplan, A & Middelton, M. (2001). Performance-approach goals: Good for what, for whom, under what circumstances. *Journal of Educational Psychology*, *93(1)*, 77-86.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice and performance. *Psychological Review, 91(3)*, 328-346.

Olson, M. (1965). *The logic of collective action. Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.

Ophir, Y., Rosenberg, H., Asterhan, C., & Schwarz, B. (2016). In times of war, adolescents do not fall silent: Teacher-student social network communication in wartime. *Journal of Adolescents, 46*, 98-106.

Rap, S. & Blonder, R. (2016). Let's Face(Book) it: Analyzing interactions in social network groups for chemistry learning. *Journal of Science Education and Technology, 25*, 62-67.

Resnick, L. B., Asterhan, C. S. C., & Clarke, S. N. (Eds.) (2015), *Socializing Intelligence through academic talk and dialogue*. Washington, DC: AERA. Rosenberg, H., & Asterhan, C. S. C. (2017). WhatsApp, sir? Teachers and students in Whatsapp groups (in Hebrew). In B. B. Schwarz, H. Rosenberg, & C. S. C. Asterhan (Eds.), *Breaking down barriers in education? Teachers, students and social network sites*. MOFET

Restivo, M. & van de Rijt, A. (2014). No praise without effort: experimental evidence on how rewards affect Wikipedia's contributor community. *Information, Communication & Society, 17*, 451-462.

Roberts, J. A., Hann, I. H., & Slaughter, S. A. (2006). Understanding the motivations, participation and performance of open source software developers: A longitudinal study of the Apache projects. *Management Science*. *52*, 984-999.

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds), *Measures in health psychology: A user's portfolio*. Causal and control beliefs (pp. 35-37). Windsor, UK: NFER-NELSON.

Selwyn, N. (2009). Faceworking: exploring students' education-related use of Facebook. *Learning, Media & Technology, 34,* 157-174.

Singelis, T. M., Triandis, H. C., Bhawuk, D. P. S. & Gelfand, M. J. (1995). Horizontal and vertical dimensions of individualism and collectivism: A Theoretical and measurement refinement. *Cross-Cultural Research, 29,* 240-275.

Sparrow, B., Liu, J., & Wegner, D. M. (2011). Google effects on memory: Cognitive consequences of having information at our fingertips. *Science, 333,* 776–778.

Triandis, H. C., Chan, D. K. S, Bhawuk, D. P. S., Iwao S. & Sinha, J. B. P. (1995). Multimethod probes of allocentrism and idiocentrism. *International Journal of Psychology, 30,* 461 – 480.

Triandis, H. C., Leung, K., Villareal, M. J. & Clack, F. I. (1985). Allocentric versus idiocentric tendencies: convergent and discriminant validation. *Journal of Research in Personality, 19,* 395-415.

Tsai, W. (2002). Social structure of "coopetition" within a multiunit organization: Coordination, competition and intra-organizational knowledge sharing. *Organization Science, 13,* 179-190.

Tseng, F., & Kuo, F (2014). A study of social participation and knowledge sharing in the teachers' online professional community of practice. *Computer & Education, 72,* 37-47.

Tsovaltzi, D., Judele, R., Puhl, T. & Weinberger, A. (2015). Scripts, individual preparation and group awareness support in the service of learning in Facebook: How does CSCL compare to social networking sites? *Computers in Human Behavior, 53,* 577-592.

Wang, Q., Woo, H. L., Quek, C. L., Yang, Y., & Liu, M. (2012). Using the Facebook group as a learning management system: an exploratory study. *British Journal of Educational Technology, 43,* 428-438.

Wang, S., & Noe, R. A. (2010). Knowledge sharing: a review and directions for future research. *Human Resource Management Review, 20,* 115-131.

Ward, A. F. (2013a). Supernormal: How the Internet is changing our memories and our minds. *Psychological Inquiry, 24,* 341-348.

Ward, A. F. (2013b). One with the cloud: Why people mistake the Internet's knowledge for their own. Doctoral dissertation, Harvard University. Cambridge, Massachusetts.

Webb, D. (1984). More on gender and justice: girl offenders on supervision. *Sociology*, *18*, 367-381.

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology*, *79*, 1-28.

Wegerif, R. (2013). *Dialogic education for the internet age.* (2013). New York. Routledge.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 185–208). New York: Springer-Verlag.

Wei, C. C., Choy, C. S., Chew, G.G., Yen, Y. Y. (2012). Knowledge sharing patterns of undergraduate students, *Library Review, 61*, 327 – 344. doi: http://dx.doi.org/10.1108/00242531211280469

Yuen, T. J., & Majid, M. S. (2007). Knowledge-sharing patterns of undergraduate students in Singapore. *Library Review, 56*, 485 – 494. doi: http://dx.doi.org/10.1108/00242530710760382

Table 1

Content categories for coding student motives behind own and others' sharing

	Cohen's Kappa κ	*Examples for own and others' sharing*
Improves academic achievements	.708	"You get asked questions and just by answering it's a great rehearsal on the material, it's a way to test myself and see if I understand or not"
		"Of course they understand the material better when they share it. If other group members can fix and help them in case there's a mistake"
Help classmates succeed	.702	"I feel I'm helping other people"
		"Because they want their friends to succeed and they don't have any interest in seeing their friends not succeed"
Positive self-concept	.679	"It makes me feel good about myself, that they are counting on you and the learning materials you give them"
		"They make friends and feel good about themselves. It doesn't hurt them, quite the opposite"
Quid pro quo	.804	"When you help others, you will also receive help from them, if and when you need it"
		"The benefit is that when they'll need help their friends will help them"
Gain social stature	.428	"I help classmates who don't understand the material and this way I draw them to me,

		socially speaking”
		“In my opinion, sharing learning materials is directly related to the social dimension of the group. The more a person contributes to the group, the more wanted and popular he will be there. This is the reward for uploading, in my opinion.
Lack of effort	.814	"It is just easy and accessible, there is no real reason”
		“Helping others does not necessarily matter to them. Just take a snapshot and send - nothing is easier”

Table 2
Bivariate correlations between the six individual characteristics in Study 2 (N = 291)

	Collectivist values	Competitive individualism values	Self-efficacy	Mastery goal	Performance approach goal
Competitive individualism	-.033				
Self-Efficacy	.175**	.296**			
Mastery goal	.322**	.202**	.390**		
Performance approach goal	.000	.610**	.366**	.403**	
Performance avoidance goal	.151*	.116*	.031	.334**	.286**

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 3

Bivariate correlations[1] between individual characteristics and sharing measures (N = 291)

	Collectivism values	Competitive individualism values	Self-Efficacy	Learning goal	Performance-approach goal	Performance-avoidance goal
Overall sharing intensity	.374**	.043	.267**	.327**	.076	.092
Administrative msg	.340**	.018	.246**	.255**	.095	.089
Snapshots /handouts	.316**	-.012	.204**	.225**	.017	.087
Content summaries	.309**	.049	.186**	.252**	.053	.081
Copying	.202**	.142*	.209**	.248**	.143*	.048
Peer learning	.291**	-.003	.303**	.288**	.040	.060

[1] All correlations are Spearman's rho, except for the correlation with overall sharing intensity (Pearson's r).

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 4

Bivariate correlations[1] between sharing variables and competitive individualism scores, for high and low quid pro quo believers (N =128).

	Belief in quid pro quo in sharing	
	High	*Low*
Overall sharing intensity	.287*	-.282*
Administrative msg	.265*	-.215*
Snapshots/handouts	.243*	-.351**
Content summaries	.327**	-.226*
Copying	.278*	-.163
Peer learning	.163	-.248*

[1] All correlations are Spearman's rho, except for the correlation with overall sharing intensity (Pearson's r).

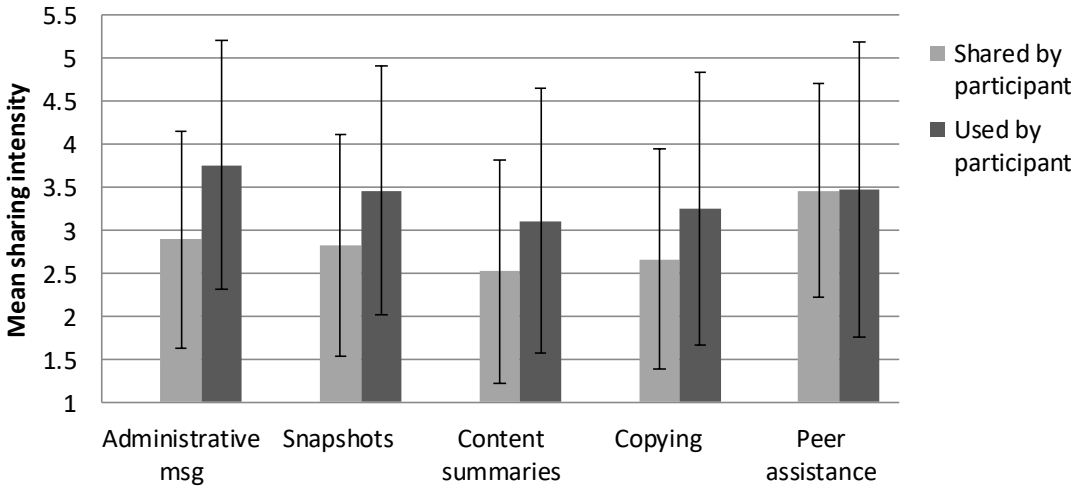
* Correlation is significant at the 0.05 level (1-tailed).

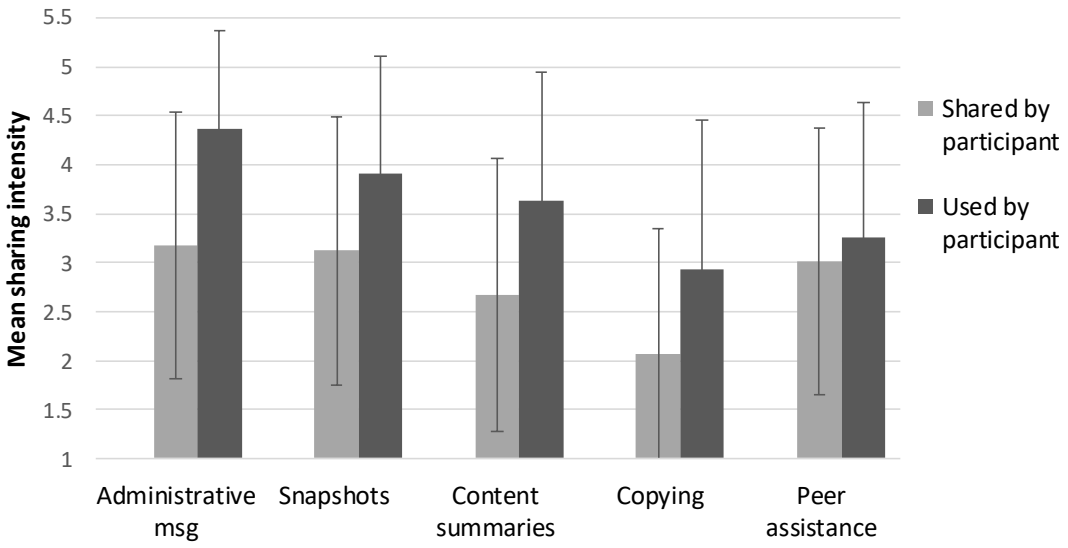
** Correlation is significant at the 0.01 level (1-tailed).

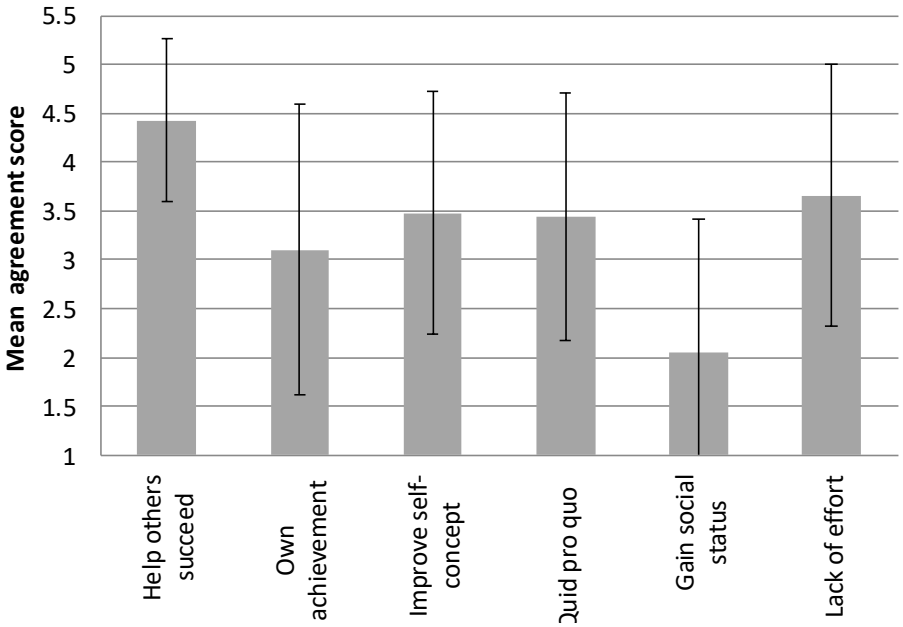
Figure 1. Study 1 mean frequency scores (and *SD*) for sharing materials and use of shared materials (*N* = 176).

Figure 2. Study 2 mean frequency scores (and *SD*) for sharing materials and use of shared materials (*N* = 291).

Figure 3. Mean (and *SD*) agreement scores with six pre-defined motivation categories behind own sharing behavior (*N* = 128)


Mean sharing intensity
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
Administrative msg
Snapshots
Content summaries
Copying
Peer assistance
Shared by participant
Used by participant


Mean sharing intensity
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
Administrative msg
Snapshots
Content summaries
Copying
Peer assistance
Shared by participant
Used by participant


Mean agreement score
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
Help others succeed
Own achievement
Improve self-concept
Quid pro quo
Gain social status
Lack of effort