DESIGNING A GROUP ASSIGNMENT IN A DIGITAL ERA

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ABSTRACT

Millennials, also called "digital natives," are attracted to new communication technologies and may incorporate them into their daily activities. But do they? Much research considers how faculty can effectively use the newest education technology to enhance coursework materials. Faculty expectations are high regarding student use of these new technologies to complete and comprehend course assignments and materials. Using results from an exploratory study involving two focus group interviews, a 66-item questionnaire was developed to test these assumptions and begin to determine what student experiences suggest regarding their use and impact on group project performance. We collected responses from 82 students at a Midwestern United States university. Our research question is: do students' experiences with and preferences for increased/enhanced technology in the completion of group assignments support and encourage an increased emphasis on technology-based interaction by faculty?

We collected data regarding student experiences with both virtual meetings and social media and compared them with face-to-face (FTF) group member interactions in the completion of class assignments involving group projects. Direct student experience demonstrates that superior performance and satisfaction result from FTF meetings rather than technology-based interaction. Students also prefer face-to-face meetings over virtual meetings. This result is true whether comparing FTF with social media or virtual meetings. Surprisingly, students find neither virtual meetings nor social media to have significantly more positive impact on groups than face-to-face interaction along both performance and process dimensions. Recommendations for faculty are provided and suggestions for future research are included.

Keywords: Millennials, Group work, Face-to-face interaction, Technology-based interaction

INTRODUCTION

Classrooms have changed dramatically over time. We have gained knowledge about learning styles and how people learn. There is a continuous flow of new educational technology available to faculty members. Small group activities and assignments are used to break down the size of the class and more closely replicate a work environment many students already face and others will soon be entering. Group experiences provide opportunities for students to practice interpersonal and leadership skills, both of which transfer directly to the job. They also increase participation and student involvement, which have direct relationships to the learning process. Moreover, group projects allow students to try out new ideas on and to gain feedback from peers to improve

contributions to project outcomes. In addition, students often experience accountability and group issues such as social loafing.

Today's students have been called "digital natives" (see, e.g., Roberts & Kidd, 2017). Faculty expect these students to prefer technology in all of its forms when presenting course materials in the classroom. Faculty use these new educational technologies to better communicate with and involve current students. These expectations often influence faculty perceptions regarding student preferences in completing class assignments. Research that studies the availability and use of technology usually takes the perspective of faculty. Changing the perspective to determine how students actually use technology requires different research.

The present study investigates student experiences in their use of and preferences for technology in the completion of group assignments. Our research question is: do students' experiences in the completion of group assignments support and encourage an increased emphasis on educational technology by faculty? Specifically, we compare student experiences when using face-to-face or technology-based meetings in completing group projects.

LITERATURE REVIEW

Two basic issues are included in this literature review, namely, possible discrepancies between the expectations by faculty members and students' actual use of technology in the completion of classroom assignments, and the outcomes produced by students when they actually use face-to-face interaction or digital technology while working in groups. In the past few decades, many instructors have moved away from a sole diet of traditional lectures to a class in which students are active participants in the learning process. Small-group work is among the most often-used approaches to get students engaged in the classroom (Davidson, Major, & Michaelsen, 2014). Group work has developed into an increasingly valuable component of higher education (Cheng & Warren, 2000) providing students with pseudo-workplace projects that allow the opportunity to gain valuable teamwork experience and has the potential to enhance abilities such as communication and group skills (McCorkle et al., 1999).

Group work is defined as students working together in a small enough group so that everyone can participate on a clearly assigned learning task (Cohen & Lotan, 2014). Of a larger scope than individual assignments, group projects allow for in-depth work that provides a more realistic work experience than typical coursework (McCorkle et al., 1999). However, many benefits of group work are possible only when students communicate and work collaboratively (Gordon & Connor, 2001).

Digital technologies are now an important component of the university student learning experience. These students have been known to use a lot of digital communication tools (Roberts & Kidd, 2017). Some researchers, however, suggest that digital technologies are clearly not transforming the nature of university teaching and learning, or even substantially disrupting the student experience (Henderson, Selwyn, Finger, & Aston, 2015). For instance, while today’s college students are immersed and fluent in social media, instructors expect their students to be proficient in and prefer to use any form of digital communication tools, particularly course-learning technology. Hence, they see no need to provide training in the use of these tools or group

interaction skills (Kirschner, & De Bruyckere, 2017). So, while 65% of the instructors thought that students were tech savvy, only 42% of the student respondents felt that instructors provided students with adequate training and support in the use of instructional technology (Buzzard, Crittenden, Crittenden, & McCarty, 2011). Perhaps the disconnect here between faculty and student perceptions relates not to digital skills. Rather, it relates to social media or educational technology preferences of each. Buzzard and colleagues (2011) found that while faculty members prefer the use of advanced level educational technology, students prefer more traditional instructional methods for effective engagement and learning.

Many of the current discussions and debates over social media are also unclear as to what aspects of social media use actually relate to education, learning and knowledge (Selwyn, 2012). One study of United Kingdom students' use of Facebook suggested that the vast majority (around 95%) of students' interactions were completely unrelated to their university studies (Selwyn, 2009). The majority of social media uses are perhaps most accurately described as constituting 'the ordinary stuff of life' (Shirky, 2008), rather than creative, communal and convivial activities. Recent studies suggest university students use social media at a surprisingly low level of sophistication (Gunter, Rowlands, & Nicholas, 2009; McLoughlin & Lee, 2010; Waycott, Bennett, Kennedy, Dalgarno, & Gray, 2010). At best, many students' engagement can be called a "low bandwidth exchange" of information and knowledge (Crook, 2008; Selwyn, 2009).

What if digital technologies do not actually help students and instead prevent them from attaining the maximum learning potential provided by group interaction during coursework? While much of the earlier literature on digital technologies was optimistic about their potential to enhance students' learning (for a review, see Selwyn, 2016), recent studies have been more cautious in this regard (see, for example, Chu, 2014). Kvavik (2005) found that many of the students most skilled in the use of technology had mixed feelings about technology in the classroom. Despite their potential benefits, students' uses of digital technologies are not the most expansive ways that they could be used (Henderson et al., 2015). Hence, to allow digital communication to have a positive impact on the learning process and to improve learning through the use of group projects, research should account for the role digital technology actually plays in students' group work completion (see, for example, McKnight et al., 2016).

Discussing success levels by considering how group projects are completed, the literature provides substantial information. For instance, building trust within a team is recognized as a key ingredient for team success (e.g., Davis, Schoorman, Mayer, & Tan, 2000; De Jong & Elfring, 2010). Breuer, Hüffmeier, and Hertel (2016) suggest that trust facilitates specific risk-taking behaviors such as reducing defensive control, open discussion of conflicts and mistakes, mutual feedback, and sharing of confidential information, which in turn should lead to more efficient coordination of team members' resources (time, effort, knowledge, etc.).

Social presence theory (Short, Williams, & Christie, 1976) explains how FTF interactions provide more complete communication since both verbal and non-verbal cues are part of the social exchange process. Advances in information technology have created new challenges for team processes (Cramton, 2001; Driskell, Radtke, & Salas, 2003; Rains, 2005; Thompson & Coovert, 2003). Digital communication can limit direct personal observations that allow members to perform effective cognitive trust assessment (Robert, Denis, & Hung, 2009). Awareness of who is

responsible for specific outcomes (Cui, Lockee, & Meng, 2013) and issues of accountability (Driskell et al., 2003; Reio & Crim, 2006) further reduce overall performance, while increasing frustration and dissatisfaction, and lowering participation. For instance, team members that exclusively rely on technology-based interaction will have no opportunity to see firsthand the amount of effort others are expending or participate in the informal interactions with team members. It has been found when social context cues are missing, increased depersonalization, lower cohesiveness, and less social conformity often result (Lu, Fan, & Zhou, 2016; Szeto & Cheng, 2013).

Media richness theory explains how face-to-face interaction is so rich since it enables not only the spoken language and other verbal cues, but also body language (Kennedy, Vozdolska, & McComb, 2010; Lantz, 2001). This gives the communicating parties a better basis for understanding each other compared to purely technology-based interaction (Lantz, 2001). In this regard, much of the literature concludes that FTF interaction at the beginning of a group project enhances the level of trust. Hambley, O'Neill, and Kline (2007), Horwitz and Horwitz (2007) and Lantz (2001), for example, advise project teams to have at least an initial FTF meeting before following up with virtual team interactions. Kennedy and colleagues (2010) found in their behavioral simulation study that mixed-media teams (i.e., first as FTF and second as digital communication) had improved participative decision making over only digital communication teams. Both high and low media richness levels are effective when matched with appropriate tasks. For example, media with lower richness are effective when used with more routine tasks and richer media are better matched with nonroutine, complex and ambiguous tasks (Denstadli, Julsrud, & Hjorthol, 2012).

RESEARCH METHODOLOGY

Questionnaire Development

Two focus group interviews were conducted in an exploratory study to investigate student experiences and preferences in the use of technology-based communication during the completion of group projects (Choi, Zeff, & Higby, 2017). Both interviews were transcribed and content analyzed. The researchers then discussed and considered how the experiences could be translated into questionnaire items. The 66 survey items were the result of this discussion. Issues from these experiences dealing with outcomes, processes and preferences were applied to each of three collaboration methods, namely, FTF, virtual and social media for comparative purposes.

Our focus groups found that traditional group interaction occurs in face-to-face meetings and involves two basic types of activities, namely, on-task (or the more formal activities occurring within a group) and off-task (or informal and more social types of activities). We wanted to compare experiences with face-to-face interaction and technology-based communication. To more directly deal with both types of activities, we split all digital communication forms into either virtual (more formal) or social media (more social or informal) types. A more detailed breakdown is described in the results section below. A four-point Likert scale ranging from 1, "Strongly Disagree" to 4, "Strongly Agree" was used for each question. A forced-choice questionnaire provides a more reasoned response (Smyth, Dillman, Christian, & Stern, 2006) and lessens the compromise effect, decreasing the relative proportion of an average response (Dhar & Simonson,

2003). All items were pre-tested to make sure they accurately reflected the comments from the two focus groups. A complete questionnaire can be found in the Appendix.

Sample

Data were collected during the 2016-17 academic year at an urban Midwestern United States university school of business with mainly commuter students. Students from four courses (2 undergraduate, 2 graduate) were invited by their instructors to complete a questionnaire investigating their experiences with group projects. After the instructor briefly introduced the purpose of the survey, questionnaires were distributed to students, 82 of whom volunteered and filled out the questionnaire. Demographic information indicates: 80.5% of these students are between the ages of 17 and 26; 58% are female; 60.7% are graduate students; and, 40.5% of the students have more than 30 hours out-of-class commitments per week. All but one student (98.8%) has access to and uses smartphones whereas only 56.1% report that they have access to and use tablets. Every respondent indicates he/she has access to and uses a computer.

Data Analysis

Our research question is: do students' experiences in the completion of group assignments support and encourage an increased emphasis on educational technology by faculty? To help answer our research question, we tested whether responses were significantly above or below the 2.5 neutral point of the Likert 4-point scale using a one-sample t-test. We also applied ANOVA tests to see if the students' responses were different between groups within the demographic dimensions of gender, graduate/undergraduate level and number of hours per week out-of-class commitments (e.g., number of hours working per week). We used SPSS (version 22.0, 2013) to analyze questionnaire results.

RESULTS

Results from the questionnaire completed by 82 students are presented below. They are grouped into the three basic sections covered by the questions, namely, FTF, virtual and social media distinctions. For each section, we present the results responding to questions that relate to: outcomes (project/grade results, satisfaction and efficiency); process (including trust, task-orientation, information exchange/effective communication, boredom/division of work/asking for help); and, overall preference for method of group interaction for assignment completion. Most of the student responses were found to be significantly different from the 2.5 neutral point (unless otherwise noted). We have included the t-test statistics for each item in the table below the paragraph presenting the data, while any data comparing item-to-item responses are included parenthetically in the body of the paper. In the tables that follow, a t-test with a negative value indicates disagreement with the item and a positive value indicates agreement.

Performance

Performance issues deal directly with the outcome both for the group and the individual. Examples include the completed project and the ultimate value (grade) of that project for the group and satisfaction for the individual.

Outcome. Performance is better when meeting face-to-face than when using social media or virtual meetings. In particular, a higher grade is earned when more face-to-face meetings are used in group projects (see item #17, Table 1, below). And, while both face-to-face interaction and social media increase group effectiveness, FTF interaction results in greater effectiveness (items #40 and #12). Moreover, virtual meetings do not lead to higher grades (item #43), nor do they lead to better outcomes than FTF meetings (item #46). However, more virtual meetings do not lead to lower grades (item #34). So, participating in virtual meetings neither increase nor decrease student grades.

There is also a direct link between being more comfortable with group members and the grades received on group projects (item #59). FTF meetings help students feel more comfortable with others (item #63) while social media interactions do not increase the comfort level with group members (item #65). Thus, higher grades are attained when groups have more face-to-face meetings.

Table 1. Performance: Outcome

		№	Question	Mean	SD	*T*	*p*	df
Outcome	FTF	24	Face-to-face meetings result in better outcomes than virtual meetings	3.11***	.71	7.70	<.001	79
		17	I earn a higher grade when group has more face-to-face meetings	3.00***	.74	5.99	<.001	79
		30	My class grade is improved with face-to face teamwork	3.13***	.68	8.43	<.001	81
		21	My groups perform better when meeting face-to-face than using social media	3.09***	.72	7.32	<.001	81
		40	Face to face interaction is a good way to improve group effectiveness	3.15***	.76	7.60	<.001	79
		63	Face-to-face meetings help me to feel more comfortable with my group members	3.16***	.68	8.59	<.001	78
		59	My grades on group projects are better when I feel more comfortable with my group members	3.09***	.81	6.45	<.001	79
	Virtual	46	Virtual meetings result in better outcomes than face-to-face meetings	2.15***	.59	-5.33	<.001	80
		43	I earn a higher grade when my group has more virtual meetings	2.21***	.68	-3.81	<.001	80
		34	My grades suffer when the more virtual meetings are used	2.23***	.61	-3.86	<.001	80
	Social Media	28	Social media helps groups work only after you get to know group members	2.70*	.76	2.39	.019	80
		61	When I work in groups, we perform better with social media interaction	2.50	.69	0	1	79
		6	Our group performance improves most when only social media interactions are used	2.02***	.65	-6.56	<.001	80
		12	The use of social media improves team effectiveness	2.75***	.64	3.54	<.001	80
		65	Social media interactions help me to feel more comfortable with my group members	2.35*	.63	-2.18	.032	80

*** $p < .001$; ** $p < .01$; * $p < .05$

Satisfaction. Face-to-face meetings provide more satisfaction than virtual meetings (see items #37, #53, and #10 Table 2, below). In addition, more virtual meetings do not increase satisfaction with other group members (item #18), which further strengthens the relationship between FTF interaction and satisfaction. Likewise, virtual meetings do not provide a better experience than face-to-face interaction (item #36).

Table 2. Performance: Satisfaction

		№	Question	Mean	SD	*t*	*p*	df
Satisfaction	FtF	37	Face-to-face meetings provide more satisfaction than virtual meetings	3.05***	.71	6.91	<.001	81
		53	My satisfaction with other group members is greater when we have more face-to-face meetings than virtual meetings	3.00***	.76	5.86	<.001	79
	Virtual	10	Virtual meetings provide more satisfaction than face-to-face meetings	2.06***	.65	-6.07	<.001	81
		18	My satisfaction with other group members is greater when we use more virtual meetings than face-to-face interactions	2.23**	.75	-3.20	.002	81
		36	Virtual meetings provided better experience for me than face-to-face meetings	2.23**	.72	-3.35	.001	81

*** $p < .001$; ** $p < .01$; * $p < .05$

Efficiency. FTF meetings are more efficient than virtual meetings, although virtual meetings do not waste more time (items #14, #29, #56, and #5, Table 3, below). One face-to-face or virtual meeting is neither better nor worse than several meetings of the opposite type (items #39 and #60).

Table 3. Performance: Efficiency

		№	Question	Mean	SD	*t*	*p*	df
Efficiency	FtF	14	Face-to-face meetings are more efficient than virtual meetings	3.07***	.75	6.84	<.001	80
		5	When my group members have a face-to-face meeting, we waste more time	2.27*	.88	-2.28	.042	80
		60	One long face-to-face meeting is more effective than several virtual meetings	2.59	.72	1.08	.283	79
		66	Face-to-face meetings typically take less time than virtual meetings.	2.48	.81	-.27	.783	79
	Virtual	29	Virtual meetings are more efficient than face-to-face meetings	2.20***	.69	2.39	<.001	81
		56	When my group members have a virtual meeting, we waste more time	2.48	.77	-.28	.775	79
		1	Project demands require more virtual meetings than face-to-face meetings	2.49	.72	-.15	.879	81
		39	Several virtual meetings are more effective than even one long face-to-face meeting	2.35	.73	-1.84	.069	77

*** $p < .001$; ** $p < .01$; * $p < .05$

Process

Process issues deal with how the group functions to work on and complete the project assignment. We investigate the formation of trust, how members work together and the use of communication. Additional elements of process we consider include degree of boredom, division of work and asking for help.

Trust. Trust, as we saw in the literature review, is one of the more important issues that groups must resolve. Face-to-face meetings are effective in building trust (item #20, Table 4, below). It is also a more preferred method than social media (item #58). FTF meetings result in stronger relations and getting to know team members better than virtual meetings (items #54, #42, and #23). Social media are not helpful in building trust (item #16), getting to know other members (item #62), and improving group activities (item #47). So, face-to-face interactions are better than both social media and virtual meetings in this area.

Table 4. Process: Trust

		№	Question	Mean	SD	*t*	*p*	df
Trust	FtF	20	Face-to-face meetings are effective in building trust with group members	3.34***	.57	13.33	<.001	81
		58	I prefer to build trust with group members during face-to-face meetings as opposed to social media interactions	3.22***	.71	8.95	<.001	78
		54	Face-to-face meetings result in stronger relations between team members than virtual meetings	3.10***	.80	6.66	<.001	79
		23	Face-to-face meetings help me to get to know my group members better	3.34***	.74	10.28	<.001	81
		9	I find face-to-face interactions better than social media interactions	3.22***	.70	9.26	<.001	81
	Virtual	42	Virtual meetings result in stronger relations between team members than face-to-face meetings	2.13***	.71	-4.67	<.001	79
	Social Media	16	Social media (e.g., facebook, Instagram) are effective in building trust with group members	2.48	.76	-.21	.827	80
		62	Social media interactions help me to get to know my group members better	2.48	.63	-.35	.726	79
		47	Social media interaction improves group activities	2.59	.70	1.19	.237	78

*** $p < .001$; ** $p < .01$; * $p < .05$

Task-orientation. Both face-to-face meetings and social media are effective in encouraging project-related interactions (see items #35 and #4, Table 5, below). While FTF meetings do not distract group members from project tasks, social media interactions do (items #33 and #7). It is possible, therefore, that social media have considerable noise attached to the communications, as

they have both positive and negative impact on working toward and completing project tasks. Multitasking occurs more in virtual meetings than FTF sessions (items #51 and #25). Group members are more focused on a task during FTF meetings while they are not more focused during virtual meetings (items #15 and #44).

Table 5. Process: Task-orientation

		№	Question	Mean	SD	*t*	*p*	df
Task-orientation	FtF	35	Face-to-face meetings encourage project-related interactions between group members	3.05***	.71	6.91	<.001	81
		33	Face-to-face meetings distract group members from project tasks	2.21***	.74	-3.53	<.001	81
		51	In face-to-face meetings, people are more likely to multitask than in virtual meetings	2.26**	.72	-2.93	.004	79
		15	Group members are more focused on a task during a face-to-face meeting.	2.91***	.71	6.84	<.001	80
	Virtual	25	In virtual meetings, people are more likely to multitask than in face-to-face meetings	3.13***	.66	8.67	<.001	81
		44	Group members are more focused on a task during a virtual meeting.	2.21***	.68	-3.73	<.001	79
	Social Media	4	Social media encourage project-related interaction between group members	2.68*	.63	2.58	.012	78
		7	Social media interactions cause distraction from group work	2.74**	.72	2.93	.004	79

*** $p < .001$; ** $p < .01$; * $p < .05$

Information exchange/effective communication. Face-to-face meetings are more effective than social media interactions in encouraging the exchange of ideas (see item #3, Table 6, below). Students gain and remember more project-related information from face-to-face meetings than they do from virtual meetings (items #2, #52, #49, and #22). In addition, they are not more confused after face-to-face than virtual meetings (item #38) nor is communication more effective in virtual than face-to-face meetings (item #11). Overall, therefore, communication is more effective in face-to-face than in virtual meetings.

Table 6. Process: Information exchange, effective communication

		№	Question	Mean	SD	*t*	p	df
Information exchange, Effective	FtF	3	Face-to-face meetings are more effective than social media interactions in encouraging the exchange of ideas	3.07***	.76	6.77	<.001	81
		2	I gain more project-related information from face-to-face meetings than I do from virtual meetings	2.96***	.86	4.84	<.001	81
		52	I remember more information from face-to-face meetings than I do from virtual meetings	2.99***	.73	5.91	<.001	79
		38	I am often more confused after face-to-face meetings than I am after virtual meetings	1.99***	.71	-6.44	<.001	80
	Virtual	49	I gain more project-related information from virtual meetings than I do from face-to-face meetings	2.26**	.67	-3.16	.002	79
		22	I remember more information from virtual meetings than I do from face-to-face meetings	2.24**	.77	-2.97	.004	81
		8	I am often more confused after virtual meetings than I am after face-to-face meetings	2.43	.77	-.86	.392	81
		11	Communication is more effective in virtual meetings than in face-to-face meetings	2.13***	.73	-4.52	<.001	81
		55	Social media interactions increase the exchange of ideas related to the group project	2.56	.70	.78	.433	79

*** $p < .001$; ** $p < .01$; * $p < .05$

Boredom/division of work/asking for help. Boredom does not occur more often in face-to-face than virtual meetings (see item #32, Table 7, below). Students are more likely to ask for help in FTF sessions, which are also a better way to divide project work than social media interactions (items #50 and #41). Social media interactions do not enhance understanding of teammates' strengths more than face-to-face meetings (item #27).

Table 7. Process: Division of work, help asking, and boredom

		№	Question	Mean	SD	*t*	*p*	df
Division of work	FtF	50	Face-to-face meetings are a better way to divide project work than social media interactions	2.90***	.70	5.07	<.001	79
	Social Media	27	Social media interactions help me understand my group members' strengths more than face-to-face meetings	2.11***	.70	-4.95	<.001	80
		13	Social media interactions are a better way to divide group work than face-to-face interactions	2.34	.75	-1.89	.062	81
Help	FtF	41	Group members are more likely to ask for help in face-to-face meetings	3.03***	.69	6.69	<.001	78
	Social Media	45	Group members are more likely to ask for help by using social media interactions than face-to-face interactions	2.41	.72	-1.15	.251	80
Boredom	FtF	32	I am more often bored or uninterested during face-to-face meetings than I am in virtual meetings	2.05***	.68	-5.90	<.001	80
	Virtual	57	I am more often bored or uninterested during virtual meetings than I am in face-to-face meetings	2.65	.73	1.83	.070	79

*** $p < .001$; ** $p < .01$; * $p < .05$

Overall Preference

These students overwhelmingly prefer face-to-face meetings over virtual meetings (see items #26 and #64, Table 8, below). As a bottom line issue, this preference, when combined with or perhaps because of their experiences, indicates that FTF interactions are both more effective and create a better process or environment for successful group completion of project assignments.

Table 8. Preference

	№	Question	Mean	SD	*t*	*p*	df
FTF	26	I prefer face-to-face meetings over virtual meetings	3.2***	.70	9.02	<.001	79
Virtual	64	I prefer virtual meetings over face-to-face meetings	2.1***	.79	-4.25	<.001	80

*** $p < .001$; ** $p < .01$; * $p < .05$

Demographic Comparisons

No differences were found when we analyzed male vs female responses. There were several differences between undergraduate and graduate students. Both graduates and undergraduates find that FTF meetings provide more information than virtual meetings and are more effective than social media interaction in encouraging the exchange of ideas (see items #2 and #3, Table 9, below). Undergraduates, however, more strongly support these results (item #2, $t(78) = 5.37$, $p = .023$; item #3, $t(78) = 3.99$, $p = .049$). Undergraduates also find that social media encourage project-related interaction (item #4). Graduates are not more confused after virtual than they are FTF meetings (item #8) and continue their awareness and use of virtual meetings. They do note, more so than undergraduates, that more multitasking occurs in virtual than FTF meetings (item #25, $t(78) = 4.37$, $p = .040$). Graduates see that grades do not suffer when more virtual meetings are used (item #34, $t(77) = 4.47$, $p = .038$). Finally, undergraduates are bored during virtual meetings while graduates are not (item #57, $t(76) = 4.99$, $p = .029$). Undergraduate students are comfortable with and use face-to-face sessions; and, graduate students, while preferring FTF sessions, are less uncomfortable with virtual meetings.

Table 9. Demographic comparisons: Grads and Undergrads

	№	Question	Grads			Undergrads			
			M	SD	n	M	SD	n	*t*
FTF	2	I gain more project-related information from face-to-face meetings than I do from virtual meetings	2.77	.90	48	3.22	.76	31	5.37*
	3	Face-to-face meetings are more effective than social media interactions in encouraging the exchange of ideas	2.94	.83	48	3.29	.64	31	3.99*
Virtual	8	I am often more confused after virtual meetings than I am after face-to-face meetings	2.25	.67	48	2.61	.84	31	4.51*
	25	In virtual meetings, people are more likely to multitask than in face-to-face meetings	3.25	.67	48	2.94	.63	31	4.37*
	34	My grades suffer when the more virtual meetings are used	2.10	.56	48	2.4	.67	30	4.47*
	57	I am more often bored or uninterested during virtual meetings than I am in face-to-face meetings	2.49	.75	47	2.87	.68	30	4.99*
Social Media	4	Social media encourage project-related interaction between group members	2.52	.59	46	2.93	.58	30	8.98**

*** $p < .001$; ** $p < .01$; * $p < .05$

Four significant differences were found when comparing students who had less than 30 and 30 or more hours of outside commitments. Three of these differences fit the picture drawn above for graduate and undergraduate students, i.e., students with less than 30 hours respond like undergraduates while those with higher commitment respond like graduate students. Respondents with less than 30 hours indicate that social media encourage project-related interaction (see item #4 in Table 10, below, $t(75) = 4.26$, $p = .042$) and agree more strongly that FTF meetings are more satisfying than virtual meetings (item #37, $t(78) = 4.02$, $p = .048$). Those with higher time commitments prefer knowing teammates before starting even more so than those with less (item #48, $t(76) = 4.78$, $p = .032$). The fourth difference contradicts this picture: higher commitment respondents note that social media improves team effectiveness (item #12, $t(77) = 5.81$, $p = .018$).

Table 10. Demographic comparisons: Outside Commitments

	№	Question	More than 30 hours			Less than 30 hours			
			M	SD	n	M	SD	n	*t*
FtF	37	Face-to-face meetings provide more satisfaction than virtual meetings	2.84	.80	32	3.17	.63	47	4.02*
	48	I like to be in teams where I know everyone beforehand	3.22	.75	32	2.89	.57	45	4.78*
Social Media	4	Social media encourage project-related interaction between group members.	2.48	.62	31	2.78	.59	45	4.26*
	12	The use of social media improves team effectiveness.	2.97	.54	31	2.62	.67	47	5.81*

*** $p < .001$; ** $p < .01$; * $p < .05$

DISCUSSION AND CONCLUSIONS

This research began by trying to compare face-to-face human interactions with the large category of technology-based communication. Our initial focus was the role of technology (lumped all together) in the experiences and preferences of students. Face-to-face meetings utilize two sets of activities, on-task and off-task, to accomplish its purposes dealing with processes and outcomes. For technology-based interactions to be an effective surrogate, they must also successfully accomplish these purposes. Analyzing this data led to a series of conclusions about the relationship between face-to-face meetings and technology-based interactions. We found that technology-based interactions are divided into two distinct categories: virtual meetings, a more formal set of digital communication tools to complete task related activities; and, social media, a more informal set of digital communication interaction approaches that fulfill off-task activities. Virtual meetings

and social media, alone or in combination, are not as successful as FTF meetings in fulfilling its purposes.

Our study finds face-to-face interaction brings unsurpassed results in group output. We recommend, therefore, that faculty create opportunities within their course structures for increasing student involvement and peer interaction through FTF meetings. Our results, consistent with the literature, indicate resolving trust issues early in the semester improves group processes. Since trust is most established through FTF interaction, rather than any other mode, we suggest considering the early use of student collaboration for this purpose. Moreover, face-to-face interaction is the best way for students to get to know and feel more comfortable with each other, which further improves group performance. These results are consistent with Choi and colleagues (2017) who describe a "U-shaped" curve, where FTF interaction is found to be more effective in the beginning and ending stages of group projects and less effective in the middle stages where technology-based interactions are most effective. Face-to-face meetings near the beginning of a semester also help groups more effectively divide up project work. These FTF meetings have a direct and positive impact on satisfaction, both as a desired outcome and as a facilitator in creating higher group performance, greater member interaction and better course experience. Group communication also improves when face-to-face meetings take place during the semester. That is, people have less confusion, gain and remember more knowledge, maintain greater focus, have a better exchange of ideas and create a more effective communication process.

Demographic information regarding the level of education shows that the MBA students see more benefits of virtual meetings perhaps because they are more used to this form of collaboration at work. Undergraduate students are less likely to have this experience and, therefore, see fewer benefits in virtual meetings. They have more face-to-face meetings on campus since time is available between classes to meet with other students.

Interestingly, one area in which we find results quite different from what we expected deal with the use of virtual rather than FTF meetings. We find that even part-time MBA students, not just undergraduates, have a more positive experience with face-to-face meetings over virtual meetings. Given that many part-time MBA students have jobs and additional commitments, we originally thought they would prefer virtual over FTF meetings due to higher time and travel constraints (see, for example, Denstadli, et al., 2012). Our survey results, however, indicate they prefer FTF over virtual meetings at the same level as undergrads. Cramton (2001) notes that typed communication in technology-based interaction is more time-consuming and includes response delays that decrease the efficiency of virtual meetings. In addition, he indicates how the lack of nonverbal communication reduces the actual amount of information in messages (Cramton, 2001). Our students, likewise, indicate FTF meetings are more efficient than virtual sessions (see items #14 and #29). The model presented in Denstadli, et al., (2012) suggests that as the work becomes more complex, there will be a higher preference for FTF meetings to better accomplish the task. A group project assignment is a complex task and preference is greater for use of face-to-face sessions. These MBA students are aware of the advantages of FTF meetings based on their educational and work experiences to date.

Our overall conclusion is: face-to-face interaction brings unsurpassed results in group output. This is true for all types of respondents, including graduate and undergraduate students, less or greater

than 30 hours of time commitments outside of class, and gender. FTF meetings result in higher performance, improved group effectiveness, greater satisfaction, higher efficiency, greater trust, and enhanced overall communication. And, regardless of demographic group, FTF is the preferred method of interaction, as well as the preferred way to build trust. Surprisingly, neither virtual meetings nor social media have significantly more positive impact on groups than face-to-face interaction along any dimension studied. Moreover, technology is not a panacea. Therefore, faculty need to consider whether to include new technology into the context of a course. It should only be included if it enhances activities in improving the fulfillment of process and/or outcome results.

FUTURE RESEARCH

Future research will help in more fully identifying the categories of technology-based interactions, perhaps adding to the two types we included in this study. It may also study the specific roles each of these categories fulfill, as well as the level of effectiveness for each type. An earlier research study describes an effective integration of both FTF and technology-based interactions (Choi et al., 2017). This combination should be more fully investigated to provide additional information to faculty/trainers as they prepare students and managers in accomplishing their work-related tasks. It would also be beneficial to understand the impact of social media on satisfaction and other measures of outcome compared to virtual meetings.

We have assumed all undergraduate students would respond similarly. It is possible that undergraduate seniors are really more closely aligned with graduate students than they are with undergraduate freshmen or sophomores. This needs to be further tested.

Our research question of whether students' experiences in the completion of group assignments support and encourage an increased emphasis on educational technology by faculty is answered with an emphatic "No!" Additional research is required to determine how generalizable this response is and whether the answer needs to be modified in any way.

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APPENDIX

Research Survey: Social Media and Group Performance

Part I: Demographics: Please check the appropriate box.

Gender: ☐ Male ☐ Female

Born: ☐ Before 1980 ☐ 1980-1989 ☐ 1990-1999 ☐ After 2000

Years of College completed: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Some Grad work

Out of class commitments/week ☐ 0-9 hrs ☐ 10-19 hrs ☐ 20-29 hrs ☐ 30+ hrs

I have access to and use: ☐ Smartphone ☐ Computer ☐ Tablet

Part II: Please respond to the following questions ***based on your experiences with group projects***.
Check the degree to which you agree or disagree with each of the following statements, where 1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree.

Please check the appropriate level of agreement	Strongly Disagree 1	Disagree 2	Agree 3	Strongly Agree 4
1. Project demands require more virtual meetings than face-to-face meetings				
2. I gain more project-related information from face-to-face meetings than I do from virtual meetings				
3. Face-to-face meetings are more effective than social media interactions in encouraging the exchange of ideas				
4. Social media encourage project-related interaction between group members				
5. When my group members have a face-to-face meeting, we waste more time				
6. Our group performance improves most when only social media interactions are used				
7. Social media interactions cause distraction from group work				
8. I am often more confused after virtual meetings than I am after face-to-face meetings				
9. I find face-to-face interactions better than social media interactions				
10. Virtual meetings provide more satisfaction than face-to-face meetings				
11. Communication is more effective in virtual meetings than in face-to-face meetings				
12. The use of social media improves team effectiveness				
13. Social media interactions are a better way to divide group work than face-to-face interactions				
14. Face-to-face meetings are more efficient than virtual meetings				
15. Group members are more focused on a task during a face-to-face meeting.				
16. Social media (e.g., facebook, Instagram) are effective in building trust with group members				
17. I earn a higher grade when group has more face-to-face meetings				
18. My satisfaction with other group members is greater when we use more virtual meetings than face-to-face interactions				
19. I prefer to work in groups formed by the instructor				
20. Face-to-face meetings are effective in building trust with group members				
21. My groups perform better when meeting face-to-face than using social media				
22. I remember more information from virtual meetings than I do from face-to-face meetings				
23. Face-to-face meetings help me to get to know my group members better				
24. Face-to-face meetings result in better outcomes than virtual meetings				
25. In virtual meetings, people are more likely to multitask than in face-to-face meetings				
26. I prefer face-to-face meetings over virtual meetings				
27. Social media interactions help me understand my group members' strengths more than face-to-face meetings				
28. Social media helps groups work only after you get to know group members				
29. Virtual meetings are more efficient than face-to-face meetings				

Please turn the page. ⇒

Please check the appropriate level of agreement	Strongly Disagree	Disagree	Agree	Strongly Agree
	1	2	3	4
30. My class grade is improved with face-to face teamwork				
31. Communication is more effective in face-to-face meetings than in virtual meetings				
32. I am more often bored or uninterested during face-to-face meetings than I am in virtual meetings				
33. Face-to-face meetings distract group members from project tasks				
34. My grades suffer when more virtual meetings are used				
35. Face-to-face meetings encourage project-related interactions between group members				
36. Virtual meetings provided better experience for me than face-to-face meetings				
37. Face-to-face meetings provide more satisfaction than virtual meetings				
38. I am often more confused after face-to-face meetings than I am after virtual meetings				
39. Several virtual meetings are more effective than even one long face-to-face meeting				
40. Face to face interaction is a good way to improve group effectiveness				
41. Group members are more likely to ask for help in face-to-face meetings				
42. Virtual meetings result in stronger relations between team members than face-to-face meetings				
43. I earn a higher grade when my group has more virtual meetings				
44. Group members are more focused on a task during a virtual meeting.				
45. Group members are more likely to ask for help by using social media interactions than face-to-face interactions				
46. Virtual meetings result in better outcomes than face-to-face meetings				
47. Social media interaction improves group activities				
48. I like to be in teams where I know everyone beforehand				
49. I gain more project-related information from virtual meetings than I do from face-to-face meetings				
50. Face-to-face meetings are a better way to divide project work than social media interactions				
51. In face-to-face meetings, people are more likely to multitask than in virtual meetings				
52. I remember more information from face-to-face meetings than I do from virtual meetings				
53. My satisfaction with other group members is greater when we have more face-to-face meetings than virtual meetings				
54. Face-to-face meetings result in stronger relations between team members than virtual meetings				
55. Social media interactions increase the exchange of ideas related to the group project				
56. When my group members have a virtual meeting, we waste more time				
57. I am more often bored or uninterested during virtual meetings than I am in face-to-face meetings				
58. I prefer to build trust with group members during face-to-face meetings as opposed to social media interactions				
59. My grades on group projects are better when I feel more comfortable with my group members				
60. One long face-to-face meeting is more effective than several virtual meetings				
61. When I work in groups, we perform better with social media interaction				
62. Social media interactions help me to get to know my group members better				
63. Face-to-face meetings help me to feel more comfortable with my group members				
64. I prefer virtual meetings over face-to-face meetings				
65. Social media interactions help me to feel more comfortable with my group members				
66. Face-to-face meetings typically take less time than virtual meetings				

*** Thank you for your responses.**

QRBD

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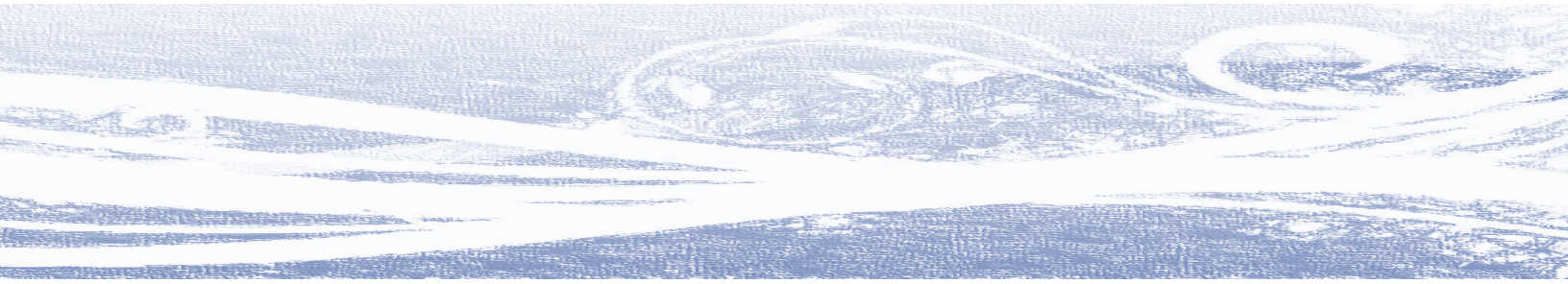

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