Using Simulations to Promote Generational Communication Awareness and Empathy in Construction Management Students – A Pilot Study

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Today's work environment, regardless of career, is experiencing an unprecedented number of generations working together. Specific to the construction management industry, in order to effectively manage a team in such a generationally diverse workforce, a construction manager needs to increase their awareness and empathy of the varying modes of communication. Working in teams, 29 undergraduate construction management students completed a quantity take-off estimating project where a series of communication constraints were implemented (simulation) within each team that mirrored the 'preferred available mode of communication' of different workplace generations. Likert scale questionnaires were administered throughout the course to collect data to determine if a student's awareness and empathy of generational communication changed through the simulation experience. The results from the simulation indicate promotion in workplace generational communication awareness and the role of empathy within the construction industry. However, these promotions do not appear to have a statistically significant correlation with each simulation. Furthermore, while students generally favour their own generational 'preferred available mode of communication,' they overwhelmingly rate face-to-face communication as the most effective communication style in the construction management industry.

Key Words: Empathy Awareness, Generational Communication, Construction Education, Soft Skills, Simulations

Introduction

A major goal of higher education technical programs is to develop students who are proficient in both professional and interpersonal skills. In other words, programs are developing and implementing holistic curricula to prepare students for successful careers in a specific field of study (Brunhaver et al., 2015; Caza, Brower, & Wayne, 2015). Many technical programs are accredited by an official body in addition to referencing industry publications, or bodies of knowledge, to provide oversight and guidance regarding technical skills. However, debate and concern has grown regarding the comprehensiveness of these guides to adequately represent and prepare a student for their career

(Cooke, Dunn, & Wolcott, 2013; Darabi, Douzali, Karim, Harford, & Johnson, 2017). To that end, programs are beginning to integrate alternative options to develop and enhance career preparedness within students (King, 2019).

A facet of the career preparedness motif is communication, specifically communication between generations. Currently, there is an unprecedented number of generations within the same workforce, with each generation valuing different attributes of a workplace culture; one attribute specifically being communication style (Boysen, Daste, & Northern, 2016; Tulgan, 2020; Venter, 2017). Different generations working in the same environment with varying values inherently creates resistance and conflict. Patel, Tinker, & Corna (2018) examined that younger generations' perceptions of older generations were mixed, while Stanton (2017) discussed patterns amongst generational cohorts. Whatever the differences in generational attribute values and conflicts are, workplaces still need to maintain their operational and company goals; the successful management, specifically teambuilding and communication, of a multigenerational workforce is paramount (Moore, Everly, & Bauer, 2016; Palese, Pantali, & Saiani, 2006).

With a goal of career preparedness and an unprecedented number of generations in the workforce, how can educators of technical programs continue to prepare students successfully for technical careers? Simulations, or environments attempting to echo a specific industry reality, are one approach that has been used successfully within the medical disciplines (Hayes, Jackson, Davidson, Daly, & Power, 2018; Liebrecht and Montenery, 2016; Peddle, Mckenna, Bearman, & Nestel, 2019). Furthermore, it is apparent that simulations can help students of the built environment to develop interpersonal skills (Luna, Chong, & Jurburg, 2019).

Against this contextual backdrop, the research undertaken focused on the development of a pilot simulation as a means to evaluate its effectiveness on promoting students' generational communication awareness and the role of empathy within the construction management industry. Research objectives were to: 1) develop a targeted team simulation; 2) measure students' change in generational communication awareness and the role of empathy; and 3) discuss the findings of research, but also propose areas of future research to address a shortage in simulation-based construction management education. The aim of this research is to help educators understand simulation pedagogy and its impact upon construction management students' communication skills.

Research Approach – Methodology and Methods

A postpositivist epistemological design was implemented using a deductive research methodological approach (Al-Saeed, Edwards, & Scaysbrook, 2020; Newman et al., 2020). A mixed methods research design was adopted to examine current literature, conduct an educational simulation, and gather student data (Chileshe, Edwards, Kavishe, & Haupt, 2020; Darko et al., 2020). Both qualitative and quantitative data were obtained to allow for a wider range of analysis and interpretation of the findings. This research approach was adopted because an interpretation of academic literature allowed for the development and application of a simulation within the construction management education field. Within this research approach, a two-phase process was used. The first phase was comprised of an elevated bibliometric and thematic analysis of current literature. The second phase included commencing simulations in a construction management undergraduate course.

Bibliometric and Thematic Analysis

Utilizing Scopus as a literature database, due to its focus on academic journal publications, a search for relevant publications under the simulation and generational communication keywords was conducted. The search query results were reviewed to identify the publications that were applicable to the intended search query. For example, results from a 'simulation' search included educational simulations, which was intended, as well as computer simulations, which was not intended. A total of 682 relevant publications were assembled ranging from 1977 to 2020. Using embedded analytics within the Scopus database (Roberts, Edwards, Hosseini, Mateo-Garcia, & Owusu-Manu, 2019), it was apparent that multiple disciplines were engaged with educational simulations. Specifically, Medicine and Nursing comprised over one-third (37.9%) of the publications in the query, whereas Engineering and Management encompassed 8.4%.

Bibliometric analysis is a statistical approach to quantitatively measure the impact of research that has been successfully used across a wide range of academic disciplines (van Eck and Waltman, 2010). Using a graphical representation, specifically visualizing the correlation strength as the distance between nodes, the software programme VOSviewer can display large quantities of data in an easy-to-interpret format (van Eck and Waltman, 2010). Bibliometric analysis has been successfully used across the construction management discipline (Araújo, Pereira Carneiro, & Palha, 2020; He, Wang, Chan, Li, & Chen, 2019) and can allow for the identification of common themes and the relationships between theme elements. A network diagram was created utilising VOSviewer from the abstract keywords of the 682 publications obtained from the Scopus query. Viewing the network diagram under a density filter, where different colours indicate varying degrees of keyword correlation, it is evident that 'human,' 'simulation' and 'education' are three themes that have a relatively high correlation to other keywords. Figure 1 outlines the bibliometric and thematic analysis process.

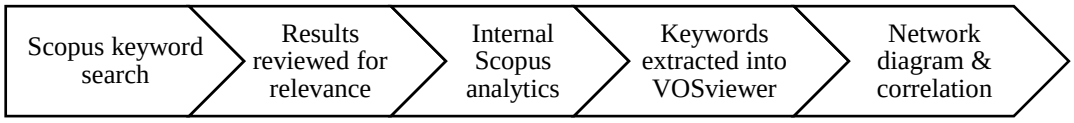

Figure 1. Bibliometric and thematic analysis process

Considering both the Scopus and VOSviewer analyses under a postpositivist approach, it is apparent that simulations are akin to a social element; the keyword 'human' acting as an axis of density in the network diagram. This may be why there is a high percentage of medical / nursing publications regarding simulations, as these disciplines are inherently connected with a strong human element. For example, Liebrecht and Montenery (2016) and Harvey, Mellanby, Dearden, Medjoub, & Edgar (2015) identify that effective communication enables nurses to develop authentic relationships with patients. As Doran (2019) explicitly notes, the same sentiment, a strong human element, primarily on interpersonal skills, exists within the construction industry.

However, as Paretti (2008) notes, while the concepts of soft skills and communication have been validated as important elements within engineering programs, there has been little evidence as to their implementation. This statement is further validated by the lack of engineering / management publications, as noted above, but specifically construction management programs (less than 1%). There are clearly gaps in the literature regarding the use of simulations within the construction management education field. Perhaps the medical / nursing education discipline can offer some insight into the use of simulations to enhance interpersonal and communication skills.

Simulations

An undergraduate quantity take-off estimating course was selected as the population (n=29) for the pilot simulations due to the course's strong emphasis on teamwork (San-Valero et al., 2019) to complete a term project. The course included a one-hour lecture, twice weekly, and a two-hour laboratory, once weekly. A control group (n=23) consisted of students who completed the same course during a different term but did not participate in the simulations. The simulations took place in the laboratory over the course of five weeks. Additionally, this course, which is offered during the second year of a student's study, allowed students to have completed an internship during the summer between year one and year two. This internship experience, while not essential for the simulations, was pertinent as it was typically the first time a student had experienced a professional construction management environment outside of an academic setting.

A series of three, Likert scale questionnaires, which also included one open-ended comment space, were developed: titled 'Initial,' 'Short' and 'Final'. The 'Initial' and 'Final' questionnaires were identical and were used to compare pre-simulations and post-simulations responses. The 'Short' questionnaires were administered at the conclusion of each laboratory as an attempt to track awareness and empathy promotion throughout that specific simulation. For the purposes of the questionnaires, awareness is defined as an understanding of a situation based on information or experience (Cambridge Dictionary, n.d.) and empathy is defined as an ability to share another's feelings by imagining being in that person situation (Cambridge Dictionary, n.d.).

The laboratory portion of the course consisted of teams of 3 – 4 students that completed an estimate for a small, two-story commercial office building. For five laboratories, the students randomly selected a card which contained a generation group (Baby Boomer, Generation X and Millennials) and one or two associated communication constraints. The communication mode constraints were selected from Zarra III (2017) to reflect the 'preferred available mode of communication' of a specific generation. Zarra III (2017), as well as others (Bidian and Max Evans, 2018; Sponaugle, 2019) underscore that the preferred modes of communication are widely accepted overviews of a specific generation and that not all members of that generation exhibit the conventional communication preferences. As illustrated in Table 1, one of a Baby Boomer's preferred available communication methods is face-to-face communication, while Generation X includes face-to-face and e-mail. If, for example, a student selected a 'Baby Boomer' card, he/she could only communicate with their team members via that communication mode (face-to-face in this example).

In an effort to remove misrepresenting or misleading assumptions and interpretations of a specific generation as a result of the selected communication mode(s), a guided student learning exercise was held explaining and providing a more well-rounded view of the different generations, inclusive of historic context and attributes. Furthermore, it was explained to the students that selecting only one or two communication modes to act as a constraint was a conscious, pedagogical approach for the simulation and not intended to cast judgement or typecasts on a specific generation group.

Table 1

Preferred available modes of communication as adapted from Zarra III (2017)

Generation	Millennials	Generation X	Baby Boomers
Preferred Available Modes of Communication	Email* Texting Social Media	Face-to-Face* Email* Cell Phone	Face-to-Face* Telephone

	Cell Phones*	Telephone
	File Sharing	Instant Messaging

**denotes the specific communication mode constraints used for the simulations*

Data Analysis

Comparing 'Initial' questionnaire data with 'Final' questionnaire data regarding students' perceptions of the role of empathy within the construction industry (Figure 2), a shift occurred. The students initially displayed a more neutral / reduced view on the role of empathy in the construction industry, prior to starting the simulations. The same neutral / reduced view was expressed by the control group. However, at the conclusion of the simulations, the participating students noted that empathy had played a more important role than originally anticipated.

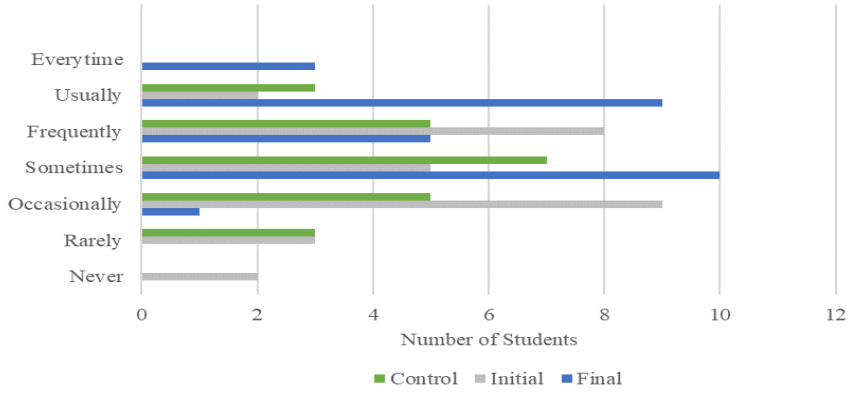

Figure 2. Empathy's role in construction industry (control vs. initial simulation vs. final simulation)

Students' rankings of the most effective methods of communication in the construction management industry was compared to the students' agreement with generational communication preferred available mode of communication, as recorded during the 'Final' questionnaire. It was evident that most of the students agreed with their specific generational communication mode (21 out of 29 students or 72%). Of the population, 25 students (86%) indicated they were members of the Millennial Generation, which according to Zarra III (2017) prefers more electronic natured communication. However, after completing the simulations and responding to the 'Final' instrument, 27 students (93%) overwhelmingly ranked face-to-face communication as the most effective communication method in the construction management industry. This demonstrated a clear difference in the students' agreement with generational preferred available modes of communication and effective communication methods.

Considering the above data from a statistical standpoint, data collected from the 'Short' questionnaires at the end of each laboratory offer a slightly different view. Analysis of variables two-factor without replication was used for statistical computation to determine if the interpreted results above were significant from a statistical standpoint. Considering preferred method of communication (Table 2), there was a significant difference in the students' responses to the different methods of communication (M1-M3) with $p = 0.00 < 0.05$. However, there was no significant difference in the students' laboratory responses with $p = 0.444 > 0.05$. In other words, the growth of students' views of

effective communication methods within the construction management industry was statistically significant. However, the impact of the sequential laboratory simulations was not a factor in this change in promotion.

Table 2

Analysis of variables for communication method effectiveness

Summary	Count	Sum	Average	Variance		
Lab. 004	3	6.21	2.07	0.739		
Lab. 005	3	6.03	2.01	0.759		
Lab. 006	3	6.12	2.04	0.792		
Lab. 007	3	6.00	2.00	0.902		
Lab. 008	3	6.00	2.00	0.811		
M1) Effectiveness of (Face-to-Face)	5	5.55	1.11	0.006		
M2) Effectiveness of (Email)	5	14.48	2.896	0.001		
M3) Effectiveness of (Voice)	5	10.33	2.066	0.0008		
Source of Variation	SS	d*f*	MS	F	P-value	F crit
Rows (Laboratory)	0.011	4	0.002	1.039	0.444	3.837
Columns (Effectiveness Quest.)	7.987	2	3.993	1487.471	5.17E-11	4.458
Error	0.021	8	0.002			
Total	8.020	14				

Considering awareness, different generations working, and the role of empathy within the construction management industry (Table 3), there was a significant difference in the students' responses to both questions (Q1 and Q2), with $p = 0.001 < 0.05$. However, there was no significant difference in the students' laboratory responses with $p = 0.164 > 0.05$. In other words, the rise in promotion of the students' views of generational awareness and empathy's role within the construction management industry was statistically significant. However, the impact of the sequential laboratory simulations was not a factor in this change in promotion.

Table 3

Analysis of variables for generational awareness and empathy's role in the construction management industry

Summary	Count	Sum	Average	Variance
Lab. 004	2	8.93	4.465	0.572
Lab. 005	2	8.70	4.350	0.369
Lab. 006	2	8.83	4.415	0.281
Lab. 007	2	8.39	4.195	0.110
Lab. 008	2	8.44	4.220	0.288

Q1) Awareness of Generations Since Previous Lab.	5	23.60	4.720	0.046		
Q2) Role of Empathy in CM industry	5	19.69	3.938	0.005		

Source of Variation	SS	d*f*	MS	F	P-value	F crit
Rows (Laboratory)	0.112	4	0.028	1.195	0.433	6.388
Columns (Awareness & Empathy)	1.528	1	1.528	65.097	0.001	7.708
Error	0.093	4	0.023			
Total	1.735	9				

Discussion

The literature analysis provided indicates a small quantity of simulation based, interpersonal skills teaching within the construction management education field. From a thematic analysis viewpoint, the interpersonal skills in medical and nursing fields are closely linked to that of construction management and offer a plethora of extant research for pedagogical and simulation adaptation. A change in students' generational communication awareness and their view of empathy's role within the construction management industry was witnessed. However, initial findings do reveal interesting discoveries. Students' views of generational awareness and empathy's role within the construction management industry rose in promotion but this rise was not directly related to the sequential manner of the simulations. Furthermore, students tended to agree with their preferred available mode of communication based on their generation, but at the conclusion of the simulations, overwhelmingly ranked a different communication mode as the most effective in the construction management industry. The pilot study was conducted with a small population, which inherently posed limitations. While appearing to be longitudinal in manner, the quantity of the laboratories acted in a more cross-sectional capacity. Future research could be explored by measuring and analyzing a larger quantity of sequential laboratories. This longitudinal perspective could provide additional metrics regarding the impact of using simulations to teach interpersonal skills.

Conclusion

Whilst research has been published on the use of simulations to promote awareness of interpersonal skills in other fields, this research presented signifies an early adaptation in the construction management education field. Findings indicate a lack of research and that more attention should be given to close this knowledge gap. This is rather puzzling given the common goals of construction management education programs to provide both technical and interpersonal education skills. Findings from this pilot study reveal that simulations do help to promote a level of communication awareness and empathy in a technical education setting. Construction management programs should therefore look to include simulations as part of their curriculum and/or pedagogy to better prepare expand the interpersonal skills of students. The findings from this pilot study could also encourage expanded interpersonal skills research amongst construction management educators. Therefore, this pilot study makes a small contribution to construction management pedagogic research.

References

Al-Saeed, Y., Edwards, D. J., & Scaysbrook, S. (2020). Automating Construction Manufacturing Procedures Using BIM Digital Objects (BDOs): Case Study of Knowledge Transfer

Partnership Project in UK. *Construction Innovation*, *20*(3), 345-377. https://doi.org/10.1108/CI-12-2019-0141

Araújo, A. G., Pereira Carneiro, A. M., & Palha, R. P. (2020). Sustainable construction management: A systematic review of the literature with meta-analysis. *Journal of Cleaner Production*, 256. https://doi.org/10.1016/j.jclepro.2020.120350.

Bidian, C. and Max Evans, M. (2018). *Examining inter-generational knowledge sharing and technological preferences*. Paper presented at the Proeedings of the European Conference on Knowledge Management (ECKM), Padua, Italy. 95-103. Academic Conferences and Publishing International.

Boysen, P. G., Daste, L., & Northern, T. (2016). Multigenerational challenges and the future of graduate medical education. *Ochsner Journal*, *16*(1), 101-107. http://www.ochsnerjournal.org/content/16/1/101

Brunhaver, S., Streveler, R., Carrico, C., Matusovich, H., Boylan-Ashraf, P., & Sheppard, S. (2015). *Professional engineering pathways study: A longitudinal study of early career preparedness and decision-making.* Paper presented at the Proceedings - Frontiers in Education Conference, FIE, El Paso, TX. https://doi.org/10.1109/FIE.2015.7344402.

Cambridge Dictionary. (n.d.) Awareness. In *Dictionary.Cambridge.org*. Retrieved February 10, 2021, from https://dictionary.cambridge.org/dictionary/english/awareness

Cambridge Dictionary. (n.d.) Empathy. In *Dictionary.Cambridge.org*. Retrieved February 10, 2021, from https://dictionary.cambridge.org/dictionary/english/empathy

Caza, A., Brower, H. H., & Wayne, J. H. (2015). Effects of a holistic, experiential curriculum on business students' satisfaction and career confidence. *International Journal of Management Education*, *13*(1), 75-83. https://doi.org/10.1016/j.ijme.2015.01.006.

Chileshe, N., Edwards, D. J., Kavishe, N., & Haupt, T. C. (2020). Perception on challenges impacting bid decision of indigenous building contractors in Dar Es Salaam, Tanzania. *Journal of Engineering, Design and Technology*. *(18)*6, 1641-1662. https://doi.org/10.1108/JEDT-10-2019-0280.

Cooke, H. G., Dunn, T., & Wolcott, S. B. (2013). *Preparedness of civil engineering technology graduates for design careers*. Paper presented at the ASEE Annual Conference and Exposition, Atlanta, GA. file:///C:/Users/id300468/Downloads/7732.pdf

Darabi, H., Douzali, E., Karim, F. S. M., Harford, S. T., & Johnson, H. (2017). *Life after university for engineering graduates*. Paper presented at the ASEE Annual Conference and Exposition, Columbus, OH. file:///C:/Users/id300468/Downloads/ED_Revised_-_Life_after_University_for_Engineering_Graduates_Revised_Final__1_.pdf

Darko, A., Chan, A. P. C., Adabre, M. A., Edwards, D. J., Hosseini, M. R., & Ameyaw, E. E. (2020). Artificial intelligence in the AEC industry: Scientometric analysis and visualization of research activities. *Automation in Construction*, *112*(103081), 1-19. https://doi.org/10.1016/j.autcon.2929.103081.

Doran, D. (2019). *Soft as Steel: Leadership Qualities to Grow Relationships and Succeed in Business and Life*. New York: Boss Media.

Harvey, R., Mellanby, E., Dearden, E., Medjoub, K., & Edgar, S. (2015). Developing non-technical ward-round skills. *Clinical Teacher*, *12*(5), 336-340. https://doi.org/10.1111/tct.12344.

Hayes, C., Jackson, D., Davidson, P. M., Daly, J., & Power, T. (2018). Pondering practice: Enhancing the art of reflection. *Journal of Clinical Nursing*, *27*(1-2), e345-e353. https://doi.org/10.1111/jocn.13876.

He, Q., Wang, T., Chan, A. P. C., Li, H., & Chen, Y. (2019). Identifying the gaps in project success research: A mixed bibliographic and bibliometric analysis. *Engineering, Construction and Architectural Management*, *26*(8), 1553-1573. https://doi.org/10.1108/ECAM-04-2018-0181.

King, S. O. (2019). *Producing 't-shaped' engineering graduates: The impact of student clubs as learning communities.* Paper presented at the IEEE Global Engineering Education Conference, EDUCON, 271-275. https://doi.org/10.1109/EDUCON.2019.8725241.

Liebrecht, C., & Montenery, S. (2016). Use of simulated psychosocial role-playing to enhance nursing students' development of soft skills. *Creative Nursing, 22*(3), 171-175. https://doi.org/10.1891/1078-4535.22.3.171.

Luna, A., Chong, M., & Jurburg, D. (2019). *Learning strategies to optimize the assimilation of ITC2 competencies for business engineering programs.* Paper presented at the Proceedings of 2018 IEEE International Conference on Teaching, Assessment, and Learning for Engineering, TALE 2018, 616-623. https://doi.org/10.1109/TALE.2018.8615444.

Moore, J. M., Everly, M., & Bauer, R. (2016). Multigenerational challenges: Team-building for positive clinical workforce outcomes. *Online Journal of Issues in Nursing, 21*(2). https://doi/org/10.3912/OJIN.Vol21No02Man03.

Newman, C., Edwards, D., Martek, I., Lai, J., Thwala, W. D., & Rillie, I. (2020). Industry 4.0 deployment in the construction industry: a bibliometric literature review and UK-based case study. *Smart and Sustainable Built Environment.* Ahead of Print. https://doi.org/10.1108/SASBE-02-2020-0016

Palese, A., Pantali, G., & Saiani, L. (2006). The management of a multigenerational nursing team with differing qualifications: A qualitative study. *Health Care Manager, 25*(2), 173-183. https://doi.org/10.1097/00126450-200604000-00011.

Paretti, M. C. (2008). Teaching communication in capstone design: The role of the instructor in situated learning. *Journal of Engineering Education, 97*(4), 491-503. https://doi.org/10.1002/j.2168-9830.2008.tb00995.x.

Patel, J., Tinker, A., & Corna, L. (2018). Younger workers' attitudes and perceptions towards older colleagues. *Working with Older People, 22*(3), 129-138. https://doi.org/10.1108/WWOP-02-2018-0004.

Peddle, M., Mckenna, L., Bearman, M., & Nestel, D. (2019). Development of non-technical skills through virtual patients for undergraduate nursing students: An exploratory study. *Nurse Education Today, 73*, 94-101. https://doi.org/10.1016/j.nedt.2018.11.008.

Roberts, C. J., Edwards, D. J., Hosseini, M. R., Mateo-Garcia, M., & Owusu-Manu, D. -G. (2019). Post-occupancy evaluation: a review of literature. *Engineering, Construction and Architectural Management, (26)*9, 2084-2106. https://doi.org/10.1108/ECAM-09-2018-0390

San-Valero, P., Robles, A., Ruano, M. V., Martí, N., Cháfer, A., & Badia, J. D. (2019). Workshops of innovation in chemical engineering to train communication skills in science and technology. *Education for Chemical Engineers, 26*, 114-121. https://doi.org/10.1016/j.ece.2018.07.001.

Sponaugle, S. (2019). Communicating Across Generations. *The IEDC Economic Development Journal, 18*(1), 15-23. https://platinumpr.com/wp/wp-content/uploads/2019/03/EDJ_19_Winter_Sandy_Sponaugle.pdf

Stanton, R. (2017). Communicating with employees: Resisting the stereotypes of generational cohorts in the workplace. *IEEE Transactions on Professional Communication, 60*(3), 256-272. https://doi.org/10.1109/TPC.2017.2702078.

Tulgan, B. (2020). *The Great Generational Shift 2020 Edition*. Whitneyville: RainmakerThinking.

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*(2), 523-538. https://doi.org/10.1007/s11192-009-0146-3.

Venter, E. (2017). Bridging the communication gap between generation Y and the baby boomer generation. *International Journal of Adolescence and Youth, 22*(4), 497-507. https://doi.org/10.1080/02673843.2016.1267022.

Zarra III, E. (2017). *The Entitled Generation: Helping Teachers Teach and Reach the Hearts and Minds of Generation Z.* London: Rowman and Littlefield.