

WIP: Strategies for Improving the Communication Skills in Engineering Technology Programs

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Abstract — *This innovative practice WIP paper describes a novel metric for evaluating students' communication skills in engineering technology programs and provides guidance of how to improve them further. The ultimate objective of any academic engineering program is to prepare students to be ready for future industrial roles and challenges. According to the Engineering Competence Model [1] which was released by the American Association of Engineering Societies and the Department of Labor, this model describes the engineering competence that includes the personal effectiveness competencies, academic competencies, workplace competencies, industry-wide competencies, and industry-sector competencies. On one hand, the Zoomers (Generation Z) were born during the peak of internet and connectivity revolution era and live with tendency to and dependency on virtual sphere. Thus, this might be problematic once those students move to the next phase of their lives and commence their industrial career where performing different tasks requires excellent communication skills and involves full engagement in teamwork, client surveys, and feedback. On the other hand, the engineering technology workplace hosts a wide array of professionals who may be inhomogeneity and/or different in one way or another. Effective communication skills entail meticulous attention to details across all aspects, including forms, style, and context of communication, such as, high context vs low context communication, introvert vs extrovert communication, one directional vs rhetorical communication, virtual vs face-to-face communication, hierarchy communication consideration, and human factors (for example, emotions and psychology) vs machine factors. Thus, gaining informative awareness about all these topics is significantly beneficial. The main goal of this research is to develop an evaluation metric that can be systematically used to continuously assess and develop the students' communication skills in the Engineering Technology programs. The proposed metric may include self-reported surveys and/or structured case scenarios interviews. In addition, the integration and utilization of the gained skills will be investigated, and the best practices shall be recommended. These practices will be shared with the workforce and their feedback sought for further refinement.*

Index Terms—Zoomers (Generation Z), Engineering Competence Effective, communication skills, evaluation metric, students' communication skills.

I. INTRODUCTION

Communication is defined as the imparting or exchange of information or news [2]. In any engineering related industry, excellent communication skills are a critical factor for engineers in the workplace. In the engineering industry, collaboration among team members or/and with other teams in

an interdisciplinary project that requires strong communication skills; such a project is more complex in nature. Thus, it requires fully effective engagement and communication strategy among diverse engineers. For example, a project that requires a team of mechanical engineers working closely with electronics technology engineers. Also, during the various project design stages, engineers are perpetually maintaining effective communications with client/customer and stakeholders. Engineers are interpreting clients' needs and expectations to concise technical concepts language that is well understood by clients. Thus, guaranteeing successful projects outcomes and milestones. In addition, engineers are frequently required to maintain active communication channels with government regulatory bodies or agencies. Engineers usually perform project management roles, and effective communication is vital in articulating project objectives, milestones, team coordination, and resources allocations. Furthermore, safety and risk management are very important aspects in the engineering industry. Safety policies and protocols must be adhered to ensure the well-being for both workers in the workplace and the end-users. A safe workspace environment is attained through clear forms of effective communications. All safety procedures, mandatory precautions, and complex emergency protocols are conveyed by in charge engineers using several forms of communications.

In the first and second decades of the twenty-first century, the engineering industry has been witnessing a massive transformation in the workforce. Millennials and Zoomers are entering the workforce and taking over generation X' and late Boomers' responsibilities of current and future engineering roles and challenges. It is decisively reasoned for sustainable economy and development of any nation to invest in the success of current and future workforce engineers. Therefore, understanding and preparing those valuable individuals is significant for the engineering industry. Hence, developing an evaluation metric to assess current and future engineers' soft skills such as communication skills should be given the highest priority.

In this paper, research in progress is discussed that describes the main aspects of the research objective, theme, methodology and the proposed tools. We will investigate the strategies for improving communication skills in engineering technology

programs; The objective is for students to acquire these necessary skills to be workforce ready. It is incumbent on all of us, as faculty, that while preparing future engineering technology graduates we additionally train and offer opportunities for them to practice and enhance their communication skills. The expected impact of this innovative research is to identify best practices and methods of how to evaluate and improve these skills of our students to narrow the gap between industrial workforce needs and expectations and the graduates acquired set of communication skills. The paper is structured as follows: Section II provides a literature review. Section III describes the proposed phases of research process. Section IV presents the evaluation metric model. Finally, in Section V we draw conclusions based on the expected results of this study.

II. LITERATURE REVIEW

Zoomers, also known as “Generation Z”, are those who were born in mid to late nineteen-nineties. According to [3], it is well-known in the industry that digital communications have an immense impact on the general population when interacting in person. Also, Zoomers’ dependency on social media has affected their ability to utilize interpersonal communication skills to establish strong ties in the workplace. The work in [3] investigated the numerous problems arising from Zoomers’ lack of interpersonal communication skills in workplace such as participation in open discussions, difficulties of knowledge transfer from one generation to another, miscommunication, and conflict between Zoomers and their supervisors in workplace. The working Zoomers were surveyed in [4]. The survey results showed unexpected differences in attitudes, personal preferences, and professional behaviors for Zoomers. The Zoomers’ ability to adopt into current workplace norms may slow changes in workplace communication. The study recommended that employers should develop new strategies that adapt new communication policies to consider current technology use.

Generation Z uses various communication platforms in many ways. For example, text messages are used to communicate with people who they are closely in contact to, emails for teachers or professors, Snapchat for the same age group, and Facebook is for everyone else [5]. In another study, it was found that instant messaging and texting are the denominated practices for Zoomers when communicating with family and friends [6]. In addition, Zoomers were found to use the uppermost volume of instant messaging and texting and have the highest preference to texting over phone calls compared to all generations [7]. Generation Z tend to use different online platforms for various purposes. For example, learning, communication, and entertainment [8]. Also, it was found in [5] that Generation Z segments the various platforms for different personas such as having multiple Instagram accounts targeting different audiences or having real vs fake

Instagram accounts. The negative impact of the unlimited screen-time of online-interactions over in-real-life interactions on Zoomers because of their commonness to multitasking between personal and academic activities was investigated in [9]. A previous research [10] indicated that Generation Z “was no longer trained in the nuances of verbal communication and conversational skills, and this lack of training could inhibit their effectiveness in verbal communication”. In another study [11], titled “A Qualitative Descriptive Study of Verbal Workplace Communications Skills of Generation Z: Supervisors’ Perspectives”, the researcher sought the feedback of the supervisors to describe the verbal communication skills of Generation Z in the workplace and the effectiveness of Generation Z’s verbal communication skills. The study data shows that Generation Z verbally communicated effectively with their peers; however, they verbally communicated moderately effective with their supervisors, clients, and customers.

While some research focused only on measuring the effectiveness of communication skills of engineering students on employability, such as in [12], others for example [3] and [4], provided only mere data on the style and/or importance of effective communication skills in workforce. Also, other research introduced evaluation schemes for communication skills for other disciplines such as medical students [13]. To the best of our knowledge, none has introduced a metric that can specifically evaluate communication skills for students in engineering technology programs. Therefore, this innovative in progress research is vital as it will develop this tool to be used systematically and effectively to evaluate communication skills for students in such engineering programs. In addition, it will provide guidance and best practices on how to improve those skills further to meet industry needs and expectations.

Self-reported surveys have many advantages [11] such as being both time and cost effective when targeting a large sample of participants. Subsequently, a large volume of quantitative data can be collected and generalized especially when the sample is selected randomly. Thus, self-reporting can be instrumental for screening in the early stages of a study. Also, it is more accurate as participants know best about themselves. In spite of the pros of self-reporting, it has some limitations such as the risk of receiving invalid responses or untruthful answers which is known as *social desirability bias* on the responses’ side. In literature, many studies assessing personality traits were found to only use self-report surveys [14], [15].

Case scenarios reinforce concepts and skills as they provide the opportunity to apply them [16]. Case scenarios can be used to response to a challenging interpersonal communication [17]. Using case scenarios is advantageous as they require original response from participants. Also, they focus on the ability to employ knowledge and skills to develop solutions to given problems. However, case scenarios have some limitations such

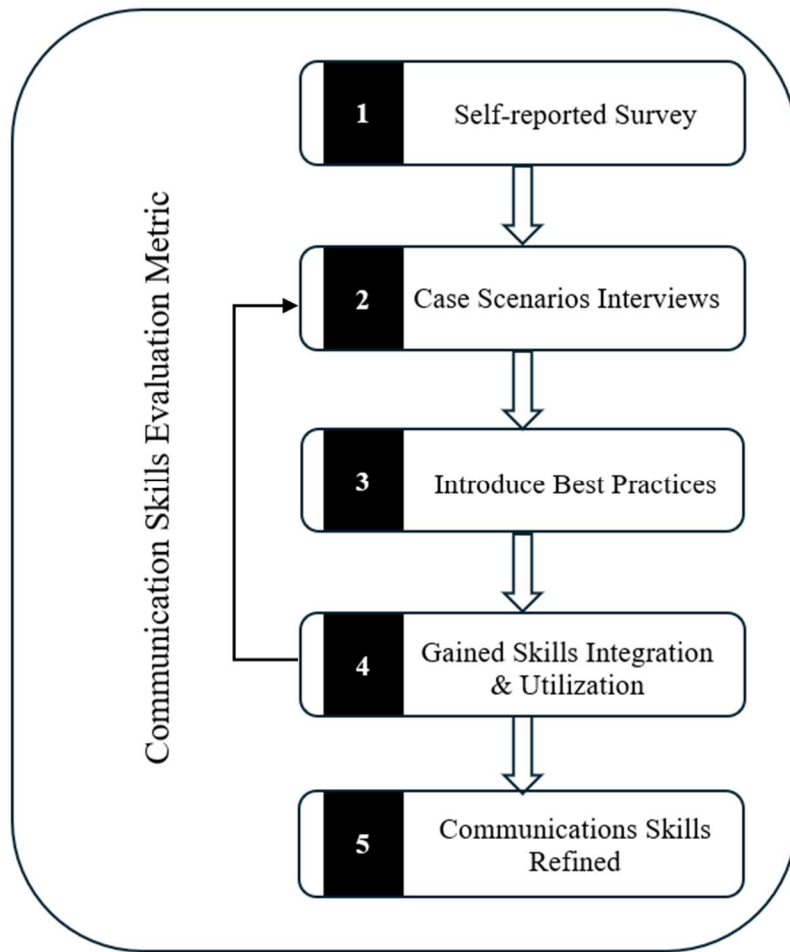


Fig. 1: A block diagram of the proposed metric for evaluating the communication skills of students in the Engineering Technology programs.

as requiring a large amount of time to assess and develop [18]. The evaluation process of teaching and learning of communication skills using a case study in the engineering curriculum was discussed in [19]. In [13], authors developed a scheme of how to assess communication skills of medical students based on developing a rating scale. After reviewing the literature, published assessment tools will be evaluated to determine their applicability and appropriateness for our study. If deemed suitable, they will be incorporated accordingly.

III. PHASES OF RESEARCH PROCESS

Participants in this research study will undergo several distinct stages:

- Self-reported survey: participants will complete a self-assessment of their communication skills.
- Case scenarios interviews: participants will engage in structured interviews involving various case scenarios. This stage emphasizes naturalistic evaluation without any enhancements.

- Introduction and discussion of best practices: best practices in communication will be introduced and thoroughly discussed.
- Skill emphasis, integration, and utilization: emphasis will be placed on the skills gained, ensuring their integration and practical utilization. At this stage, any deficiencies or areas for improvement identified in the process will prompt participants to revisit case scenarios for reassessment. This iterative process continues for several times until communication skills are refined with no significant remaining deficiencies.

The progression and various stages that participants undergo are detailed in Figure 1.

IV. EVALUATION METRIC MODEL

The proposed evaluation metric model is depicted in Figure 1. A self-reported survey is conducted first, then customized case scenarios will be used to assess a student's communication skills. Next, best practices will be applied to improve students' communications skills. The findings will be investigated

further and shared with industrial partners for further development.

The self-reported survey will include many questions that will delve into personal characteristics and help us understand what type of communication skills are required to be improved. Therefore, the case scenario interview and the subsequent steps will be determined and guided based on this self-reported survey. As an example, a few survey questions are shared below:

- Do you consider yourself as: (a) Introvert; (b) Extrovert?
- What is your preferred theme of communication?
- What setting of class sessions do you prefer: (a) Face-to-face; (b) Online; (c) Hybrid?

A brief description will be included alongside the self-reported survey, offering explanations of terminology, and providing examples for participants who may require clarification. Additionally, a rubric will be developed and used to evaluate students' answers and behavior when responding to a given case scenario task. Once a student's communication traits are identified, then recommended practices are introduced to improve student's communication skills further. It is important that students will be given multiple case scenarios to refine their communication skills. In the above model, this is shown as repeating steps 2 to 4 several times (i.e., 1 to 3 times depending on the student's self-report survey and first interview feedback). Adopting this innovative approach should make it possible to systematically evaluate and provide clear patterns of student's communication skills and how to develop them further. This metric will be incorporated in teaching several advanced courses in the engineering technology programs such as EET 4940 Project Design I and EET 4950 Project Design II.

V. CONCLUSIONS

In this research a novel metric for evaluating communications skills for students in Engineering Technology programs is introduced. The study will target senior students who are expected to graduate within a maximum of two semesters. We aim for current students to assess and improve their communication skills effectively and provide constructive feedback to enhance success and efficiency in the workplace. Self-reported surveys in conjunction with case scenarios are the main components of this metric. Applying this metric in several advanced courses in the engineering technology programs such as EET 4940 Project Design I and EET 4950 Project Design II will provide the required environment for students to learn, practice, and foster their communications skills in real-world scenarios. Additionally, our research team plans to collaborate with nearby industries for further feedback and refinement of the evaluation metric processes, ensuring continuous improvement in students' communication skills.

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