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Article abstract

Multimodality in assignments is increasingly common in higher education, thereby requiring students to demonstrate competency in the employment of multiple modes to communicate. Specifically, the field of engineering communication relies on multimodal resources to construct meaning and convey information. This article describes the integration of multimodality in a second-year software design and communication course assignment. In this assignment, students read the text, Made to Stick that enlists six principles of effective communication strategies and are expected to apply these communicative principles to a tech talk video. Students then produce a written argument which evaluates how effectively the presenter employed Made to Stick principles. Through engagement with multimodal resources, students are afforded the opportunity to practice and develop three skills of application, analysis and argumentation.

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Article

A Multimodal Assignment Design to Develop Discursive Skills in Engineering

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Introduction

Appealing to an audience requires communicators to employ certain strategies to achieve their rhetorical goals. Within the engineering discipline, oral and written communication skills constitute important student outcomes required for engineers to graduate (Canadian Engineering Accreditation Board - CEAB). For example, to demonstrate competency in communication skills and lifelong learning, graduates of our engineering program are required to identify and communicate knowledge in a credible manner, use multiple modes of communication and develop communication skills iteratively in addition to summarizing, analyzing, synthesizing and evaluation knowledge from sources (CEAB). However, novice undergraduate engineering students may be ill-equipped to demonstrate such skills (D'Silva & Kinnear, 2021). Consequently, engineering programs across North America have sought to incorporate these competencies within their curricula (Ford, 2006) to prepare engineering students for their professional working environment. More importantly, the globally diverse nature of teamwork in engineering has demanded the necessity of effective communication skills in the workplace as engineers need to engage in complex and varied communicative tasks with a range of audiences. Sales (2006) conducted a study of engineers in their workplace and in interviews, they reported feeling uncertain about their communication abilities. He found that engineers expressed a yearning to be "more articulate and elegant in their use of language" (p.19) and admired colleagues who were able to communicate persuasively and concisely. The interviews also revealed that engineers lacked confidence in their

written and spoken expression. Therefore, there is greater emphasis on the development of communicative skills in higher education.

Communication is an integral part of the engineering design process. "The highly contextualized nature of engineers' communication processes and how they enable the transmission of considerable amounts of technical information during the design process underscores the significance of the communication process within a design-specific context" (Gopsill, McAlpine & Hicks, 2015 p.523). In order to be an effective communicator, engineers have to break down complex engineering concepts and design details into lay terms to make them accessible to non-technical audiences. In her study of orality as a site for communication in a discipline-specific context such as engineering, Dannels (2002) found that to ensure that the designed product is marketable and functional, "students have to translate their specifications into language, examples, and appeals that made sense to a multidisciplinary audience" (p.264). This strategy could entail employment of multimodal resources to communicate ideas. In other words, it is the responsibility of the communicator to ensure that oral and written discourses are made accessible to the audience. From an academic discursive standpoint, Dannels (2002) found that, "learning to speak like an engineer was not just about negating filler words or nervous gestures, but rather about the complex ways orality was tied to the situated values, norms, and audiences of engineering" (p.266).

To help engineering students meet these communicative needs, the second-year software design and communication course at a large Canadian university introduces students to the design and development of a software project in addition to communication deliverables about the design process in oral and written form. As identified in the course syllabus, the course focuses on practical skills in all these areas: Design, software development, oral and written communication, project management and teamwork. In this paper, we present an assignment that employs multimodality to assist second-year engineering students in their development of effective oral and written participation in their disciplinary discourse. This assignment affords students the opportunity to practice and develop three critical skills: Application, analysis, and argumentation.

Multimodal assignment design

This paper will focus on the first written assignment in the course which entails reading the text, *Made to Stick: Why Some Ideas Survive and Others Die* (MTS) by Chip Heath and Dan Heath (2007). Students are required to summarize two principles from the text and use them to assess a video segment of a technical presentation. The assignment incorporates multimodality in the form of

multiple representation modes: text mode (reading a book), digital mode (watching a technical talk) and written mode (composing a written text). In their written analysis, students are expected to argue whether or not the presenter in the video applies MTS principles effectively and identify one principle the presenter could use to improve the presentation (see Figure 1). Students are provided with detailed instructions on style, references, format, length, and submission procedures along with a rubric that outlines specific grading parameters.

Instructions:
This assignment asks you to use three communication principles described in the course text ***Made to Stick*** to assess Elon Musk's launch of the Tesla Cybertruck on November 21, 2019: https://www.youtube.com/watch?v=SwvDOdBHYBw. Comment only on the first 11 minutes 30 seconds of the presentation (0:00 – 11:30).

Do Musk's ideas stick? Your analysis should do the following:
• Briefly summarize **two** principles from *Made to Stick* that Musk uses in the presentation.
• Explain how his use of these principles makes the presentation effective and memorable.
• Make a case for **one** area in which Musk could improve, drawing here on a third principle from *Made to Stick*. Briefly summarize this third principle and explain how Musk could have better used it.

Figure 1. An excerpt from the assignment instructions.

Rationale

The use of multimodality in assignments allows students to not only explore their nonlinguistic resources, but also encourages them to make critical decisions of how to employ various modes to enhance their communication. The interplay between multiple modes of communication in this assignment represents a multimodal approach to pedagogy, which is symbolic of the transformative nature of post-secondary education. Accordingly, students need to cope with increasingly diverse multimodal genres and demonstrate multimodal competencies within their academic domain (Breuer & Archer, 2016; CEAB). Multimodality provides students with an opportunity to compose texts and communicate ideas using a multiplicity of resources. For example, students using multimodal genres such as Power Point or Prezi "construct meaning in multimodal dynamic texts and move across multiple modes of text design (visual, spatial, gestural and audio modes), enhancing and exploring new creative possibilities" (Pinar, 2019 p.1585). Thus, it is important for students to think about the ways in which the construction of an academic text may rely on a range of modes to carry meaning.

Specifically, the field of engineering relies on multimodal resources to construct meaning in multiple ways. For example, visual elements such as drawings, graphs, tables, and images in engineering writing are frequently used to express and convey meaning. Engineers are not only expected to demonstrate competence in employing multimodality in their communication but are also expected to make sense of meaning that is conveyed through multiple modes. Simpson (2016) underscores this intertextual relationship in his chapter on modal integration and its functional role in Civil Engineering (cited in Breuer & Archer, 2016) when he posits that a civil engineer must possess the ability to "'read' and produce a variety of text-types drawing upon any number of genres, modes, and technologies: maps, calculation sheets, drawings" (p.241). Engineers regularly make use of visual aids to communicate sophisticated ideas or numerical evidence in a way that is comprehensible to a lay audience. In doing so, they rely on multiple modes to create and convey meaning. Additionally, Dannels emphasizes the importance of visual aids in engineering presentations and argues that it is "a key aspect of knowledge production, transfer, and translation for the audience" (p.263). Enhancing communication through visualization is critical to making a persuasive argument in engineering.

Moreover, a multimodal composition task enables the disciplinary and pedagogical affordances of technology in the development of multiliteracy skills. In addition to multimodal writing, students learn to engage in collaborative writing processes, enhance their digital literacy abilities, and navigate online spaces (Li & Storch, 2017). Pinar (2019) highlights the use of multimodality to promote learner engagement and creativity. Specifically, in reference to visual resources and student's development of oral presentation skills, she argues that "students might be involved in the higher-order thinking task of analysing and evaluating these talks, as these demand some kind of critical multimodal analysis through creative engagement" (p.1586). Additionally, Hafner (2014) demonstrates how multimodal writing promotes the development of undergraduate students' academic writing through a multimodal task-based project. In his study, students had to report their experimental findings by creating a multimodal documentary targeted at a general audience as well as create a specialized lab report targeting a specialist audience. His findings reveal that through this task, the students were not only able to foster their communicative abilities and gain a sense of audience awareness, but also motivated to develop discoursal identities.

Similarly, in an effort to familiarize engineering students with relevant discursive skills, our course assignment used a text mode, digital mode, and written mode to enable pedagogical

affordances of multiple modes to create meaning. This assignment allows students to engage in and develop academic skills such as *application, analysis, and argumentation.*

Application through critical reading

The selected text *Made to Stick: Why Some Ideas Survive and Others Die* (MTS) enlists six principles: Simple, Unexpected, Concrete, Credible, Emotional and Stories to make communication "sticky" and memorable (Heath & Heath, 2007). The book utilizes several real-life examples and evidence from scientific literature to illustrate how communication concepts can have a lasting impact on the audience. Overall, the text offers effective guidance to readers to ensure that the ideas presented remain accessible and memorable to any audience. The assignment requires students to fully understand the text and independently familiarize themselves with the six strategies in MTS. Additionally, they are required to apply principles from the text to evaluate an assigned video. For example, our assignment requires students to explain how the presenter's (tech talk) use of these principles (MTS) makes the video presentation effective and memorable (see Figure 1).

The ability to read and apply information from a text is a crucial skill at the post-secondary level, particularly in engineering where students are expected to read from a variety of source texts and understand concepts in their field well enough to apply to them to the design process. In their study of university students' skills and challenges in academic reading, Liu & Read (2020) found that when source texts were not fully comprehended, integration of those texts tended to be problematic. They recommend that students develop strategic awareness to employ skills that allow them to "evaluate textual information, to integrate information from different texts, and to reconstruct information or express opinions using their own words" (p.89). Likewise, in this assignment, reading and application of the text to the video constitute critical abilities required of students to complete the assignment.

Analysis of the assigned video

After students gain a deep understanding of the text, they must apply their knowledge of MTS principles to an assigned video. As for content of the video, an effort is made to select videos that are relevant to the engineering discipline and educational context of the course. Examples of videos selected in the past have been Elon Musk's launch of the Tesla Cybertruck and the Google I/O developer conference by Sundar Pichai. The purpose for including a video analysis is to call

attention to presenter's organizational structure, strength of argument and evidentiary support along with delivery strategies employed to captivate the audience. The successful application of the MTS communication principles to the video will depend on how well the text was understood. Students will need to demonstrate a thorough understanding of the text enough to apply MTS principles to determine the effectiveness of the presenter's delivery. The video analysis task creates an interactive and authentic learning environment allowing students to analyze not only what the presenter said, but also how it was presented.

The ability to analyze the video and apply textual principles to evaluate it demonstrates higher order thinking skills that are often required of post-secondary students (Pinar, 2019). The use of digital pedagogy allows students to make connections between multimodal texts, thereby promoting student's motivation and active learning (Giannakos et al., 2016). Video choices could vary contextually depending on the disciplinary context; in our case, it included a snippet of a technical presentation on YouTube along with a time stamp indicating the length of the video (Figure 1). The optimal length for online educational assignments should ideally fall between 6-9 minutes (Guo et. al. 2014). The deliberate choice of a technical presentation is intended to convey how oral presentations are often "connected to the norms, values, and ideologies of the engineering discipline" (Dannels, 2002 p. 265) or discourse community they serve.

Argumentation

The final step of the assignment includes constructing a written argument. Based on their video analysis, students are expected to argue whether or not the presenter employed principles of MTS effectively and in their argument, they are required to demonstrate structure and organization. Thus, they are advised to use timestamps from the video and quotes and/or paraphrases from the book to substantiate claims in their argumentative analysis. For example, the assignment instructions advise students to "make specific claims supported by concrete evidence." Since this is the first assignment in the course, the written argument also functions as an informal diagnostic that provides instructors with a general sense of student's writing and analytical skills. Instructors can get a sense of paragraphing skills, argumentation skills, source usage, syntactic issues and other discursive skills that may be necessary for the specific disciplinary and rhetorical context.

Post-secondary students are often expected to demonstrate academic and communication competencies at the university level, specifically with regard to argumentation and use of sources (D'Silva, 2013). However, constructing an argument and supporting it with evidence can be a fairly

challenging process as it involves understanding "the architecture of argumentation" (Hirvela, 2017), which includes comprehending "how logic operates within the argumentative moves they make so that a coherent and cohesive structure is seen in the essay product they generate" (p.71). Moreover, the ability to paraphrase and synthesize sources requires particular academic skills that novice academic writers may struggle with (Keck, 2014; Du, 2013; Stander, 2020). Thus, argumentation may present as a daunting academic task for novice writers in higher education.

Conclusion

Multimodal pedagogies have become an integral part of higher education with an increasing number of assignments requiring students to demonstrate multimodal competencies (Breuer & Archer, 2016). In this course, through the use of multimodal resources such as an assigned text, a technical talk, and a written argument, students are afforded the opportunity to engage with principles of oral and written communication and potentially apply these communicative strategies in their own presentation. This assignment served as the first communicative deliverable in the course, thus setting the stage for more complex upcoming communication deliverables such as the graphics proposal and oral presentations. In this particular assignment, students were assigned a text and video; however, in later assignments in the course, they assume responsibility for locating their own source texts to support their claims and build an argument. By engaging in application, analysis and argumentation in this assignment, students not only learn critical educational skills, but also learn to develop discursive strategies that may be that may be transferable to their workplace context. This assignment strategically integrated communicative elements of reading, writing, and listening to develop professional communicational skills relevant in the engineering context.

Communicating with a range of audiences and in a multidisciplinary context is a critical skill required of engineers. Through this design and communication course, second year engineers learn to apply, analyze and argue their perspectives to both a technical and nontechnical audience. Our multifaceted pedagogical approach in this assignment seeks to equip undergraduate engineering students with relevant discursive skills in order to help them successfully transition to the workplace. Additionally, this assignment sought to develop student's multimodal competencies in engineering communication. In doing so, we aim to underscore the situated nature of communication in a discipline-specific context such as engineering.

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