Enhancing Student Communication Skills through Inductive Teaching

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Abstract

Global literature and national industry reports consistently highlight deficiencies in the professional communication skills of college graduates. Despite employers stressing the need to improve these skills in future specialists, students often perceive themselves as proficient in this area. This study, grounded in constructivism, examined the gap between student perceptions and actual proficiency levels in professional communication skills and proposes the use of the inductive teaching methodology to address it. The effectiveness of the proposed methodology was assessed using a combination of quantitative and qualitative analyses. The findings confirm that inductive teaching methodology can be effective in revealing student misconceptions about their proficiency in communication skills and promoting the development of these skills. They offer valuable insight into how professional communication competencies develop in learners under different teaching interventions and suggest practical recommendations to enhance current pedagogical practices to support the acquisition of professional skills in students.

Keywords: Inductive Teaching, Communication Competencies, Constructivism, Student Overconfidence

A significant share of a practicing specialist's time involves communicating with a variety of audiences, including clients, managers, and colleagues (de Souza Almeida et al., 2019). Not surprisingly, professional communication skills are ranked among the top competencies sought by employers worldwide and are considered an essential part of the hiring process (Scott, 2015; The Foundation for Young Australians, 2017; Taylor et al., 2022; Hickman & Stoica, 2023; NACE, 2024).

Professional communication skills can be broadly defined as a socially complex phenomenon related to interpersonal interactions and community engagement, i.e., being able to express one's thoughts and ideas clearly (orally and in writing), being a good listener, and proactively engaging in constructive communication (Nicometo et al., 2010). To supply the industry with high-quality employees who can successfully navigate modern work environments, higher education institutions have engaged in various curricula initiatives like offering communication electives, technical and business writing modules, and implementing integrated curriculum and communication centers, to support the development of professional communication skills in college students (Drake & Reid, 2018; Paretti et al., 2014). However, industry leaders remain skeptical about what they see as a growing problem in college graduates: while most employers rate professional communications as an 'essential' or 'absolutely essential' for a modern workforce, less than half of them believe novice specialists are proficient in these critical abilities (NACE, 2024). In stark contrast, more than 80% of students think they are highly competent and possess all the necessary communication skills (written, oral, presentational, etc.) to succeed in the workplace (NACE, 2019).

Overconfidence in one's abilities, marked by an excessive sense of knowledge and skills, can lead to complacency and reduced effort and hinder student development, diminishing their prospects for employability (Hack-Polay, 2020). Educators must aid students in recognizing their overly optimistic views of communication proficiency, acknowledging the need for improvement, and assisting them in developing robust professional communication competencies during their college years (AACSB, 2020).

Extant literature demonstrates that student-centered pedagogies can boost student engagement and significantly improve learning outcomes across different fields (Ballesteros et al., 2021; Eagan et al., 2014). Among these, inductive teaching stands out by emphasizing learners' crucial role in knowledge construction and engaging them in active self-discovery. Through introspection and self-analysis, students uncover prior (often erroneous) beliefs about their abilities and initiate remediation, fostering the acquisition of relevant new knowledge (Prince & Felder, 2007).

Inductive teaching's efficacy for student learning in the core discipline skills is well-supported by established learning theories and substantiated in empirical studies (Felder et al., 2014; Nguyen et al., 2016; Prince et al., 2013). However, there is limited evidence about the role of inductive teaching in forming student professional competencies, such as professional communication skills (Lai et al., 2017).

Given the importance of communication skills to graduate employability, it appears beneficial to examine the applicability of inductive teaching in fostering professional communication at the college level. To this end, this study aimed to empirically validate an inductive teaching methodology to uncover students' self-perceptions of professional communication skills and explore how they evolve under different teaching interventions. The proposed research question guiding this study is as follows:

> *How effective are inductive teaching methods in revealing and remedying student misconceptions regarding proficiency levels in professional communication skills?*

Literature Review

Understanding how people learn is important for designing effective teaching methods. Learning can be broadly defined as a process of gaining new understanding, knowledge, and skills through experience, study, or by being taught. People are generally more motivated to learn things that they perceive as valuable and in which they feel deficient (Fischhoff et al., 1977; Han et al., 2021).

Constructivist Perspective on Learning

One of the dominant theories that explains how people learn is constructivism. Constructivism posits that in the process of knowledge development, individuals take information from the environment and selectively store it in their memory. The learners then make connections between the new information and their prior knowledge and beliefs to make sense of their experiences (Piaget, 1978). Individuals thus actively "reconstruct" new meanings of the world around them via interactions with information and learning environments (Vygotsky, 1978). Further developments in constructivism argue that knowledge can also be socially constructed through interpersonal communication and collaborative meaning-making (Delia, 1977; Pearse & Cronen, 1980). Individuals engage in an ongoing exchange, verbal or non-verbal, to collectively construct shared meaning (Pickering, 2006). In this process, participants send and receive feedback and compare it to their pre-existing mental models. They then adjust behaviors and mental constructs in light of this new information (Hargie, 2019; Waltman, 2002). Thus, communication plays a vital role in the learning process (Pearce & Cronen, 1980). Applying Gerbner's general communication theory (1956) to the learning context, individuals' abilities to communicate in social situations vary. The outcomes of communication (success or failure in learning) are influenced by one's pre-existing perceptions and situational factors. Gerbner's model of communication posits that a sender of a message in the communication process formulates (encodes) the message based on their individual perceptions, while the receiver interprets (decodes) it in the context of their own understanding. Because the sender and receiver may perceive the same situation differently, this may lead to wrong interpretation and miscommunication. Thus, application of Gerbner's model is two-fold in the context of this study:

1) Effective learning requires aligning new information with learner's pre-existing beliefs and knowledge (which parallels the inductive teaching methodology where students gradually build understanding by connecting new concepts to what they already know), and
2) Gerbner also emphasizes the critical role of feedback for effective communication. Strong professional communication skills enable individuals to send clear, well-structured messages and apply clarification strategies (i.e., follow-up questions and feedback to prevent misunderstanding and miscommunication). These skills are especially relevant to business specialists because poor professional communication at the workplace (miscommunication, misunderstanding, and lack of communication) results in an average cost of $62.4 million per company per year (Grossman, 2011).

Importance of Motivation for Learning

Constructivism views learners as the primary agents, who determine what is learned from the experience, assuming full responsibility for the process (Biggs, 1996). Thus, the learner's active engagement and cognitive effort become the key drivers of knowledge creation (Biggs, 1996; Felder, 2014; Trigwell & Prosser, 1991). According to the self-determination theory, a learner's engagement and motivation can be fostered through the mechanisms of autonomy, relatedness, and competence (Ryan & Deci, 2017). People perform better when they make choices aligned with one's values and engage in autonomous, self-directed behaviors, i.e., assume responsibility for one's learning (Benson, 2001). Relatedness entails a sense of social connectedness and being valued in the community. Finally, competence, a feeling of being effective in the context of one's social environment, drives a desire to take on the learning challenge. When these psychological needs for autonomy, relatedness, and competence are fulfilled, students are intrinsically motivated to engage in the learning process because they want to achieve their goals and personal growth (Ryan & Deci, 2017).
To sustain student engagement, intrinsic motivation should be supported by external factors like social and environmental conditions. External events such as relevant teaching interventions and positively framed instructor feedback promote greater perceived competence. Greater perceived autonomy enhances student motivation and learning effort (Deci & Ryan, 1985; Vallerand & Reid, 1984).

Inductive Teaching to Support Motivation and Learning in Students

An emphasis on the active role of a learner in knowledge construction suggests a shift from the traditional teacher-centered forms of instruction to more student-oriented methods (Felder et al., 2014; Prince et al., 2013). One such popular approach to practicing student-centered pedagogies is inductive teaching. It posits that individuals must actively construct their own understanding of reality rather than simply absorb the version presented by instructors. In this approach, responsibility shifts to students, with instructors acting as facilitators to guide, encourage, and mediate the learner's knowledge (re)construction process (Prince & Felder, 2007). In line with the constructivism paradigm, inductive teaching "induces students to

construct knowledge for themselves, help them reveal inconsistencies in their prior knowledge and, when necessary, adjust or reject their prior misconceptions in light of the evidence provided by the experiences" (Prince & Felder, 2006, p.125). While there are many definitions and descriptions of misconceptions in the Scholarship of Teaching and Learning (SoTL) literature (McAffee & Hoffman, 2021), we define misconceptions as epistemically mistaken beliefs about an individual's knowledge and skills.

Inductive teaching has demonstrated high effectiveness for teaching core technical or subject-specific competencies (Felder et al., 2014; Nguyen et al., 2016), but little is known if it can be leveraged for teaching professional skills such as communication. Common communication deficiencies reported in students are weak listening skills, reluctance to connect due to communication apprehension, and, often, overconfidence about their communication abilities (Beardsley, 2001; Collins, 2009; Ehrlinger & Shain, 2014). Because they regularly engage in commonplace communications in their daily lives, students often automatically assume themselves effective communicators and feel no need to improve (Metcalfe & Finn, 2008). Similarly, Hendricks and Pappas (1996) report "the apparent resistance from students to developing English writing skills" (p. 343) and complaints about too many unnecessary writing assignments and presentations.

Teaching professional skills alongside the core subject skills creates synergies and enhances the learning process (Froyd & Ohland, 2005). It enables a contextual application of professional skills to achieve the core subject goals, supports critical thinking in students, broadens student's perspectives, and helps to recognize their deficiencies, motivating more learning efforts (Matusovich et al., 2012; Paretti & McNair, 2008). Therefore, it is argued that:

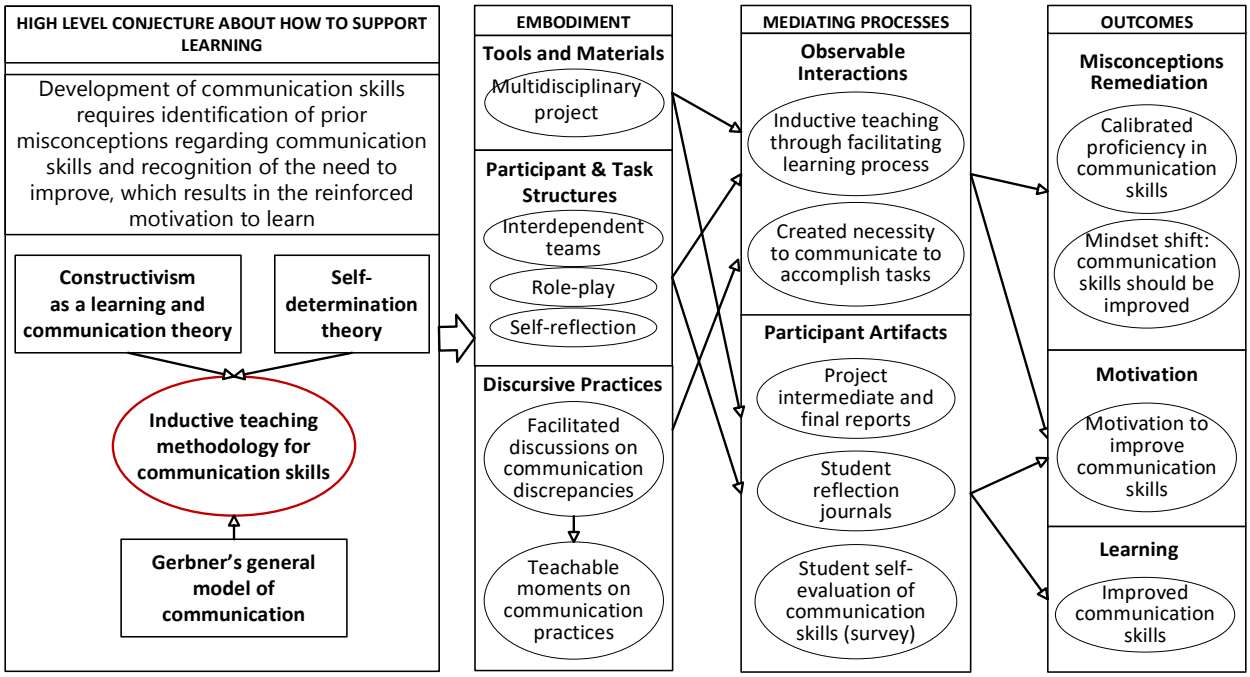
> *Hypothesis 1: Inductive teaching interventions will effectively reveal and help adjust students' misconceptions of proficiency levels in professional communication skills.*
> *Hypothesis 2: Student learning outcomes (SLOs) for professional communication skills will improve as a result of applying inductive teaching interventions.*

Conceptual Framework

To empirically test the proposed research hypotheses, appropriate learning environments must be designed. The conjecture mapping approach (Sandoval, 2014) was used to develop targeted teaching interventions to support the overall goal of developing strong professional communication skills in students. The process starts with the high-level conjecture: Development of professional communication skills in students requires the identification of prior misconceptions regarding professional communication skills and recognition of the need to improve, which results in the reinforced motivation to learn. The conjecture then is reified through the elements of the learning environment: tools and materials (a collaborative multidisciplinary project), task and participant structures (teams assigned to interconnected tasks requiring extensive coordination and informational exchange), and discursive practices (discussions and reflections on errors and discrepancies in communications causing teams' incohesion). Interactions between the participants and the learning environment produce

artifacts (intermediate and final group reports, individual reflection journals, and survey data) to validate the effectiveness of the proposed instructional design (i.e. students recognizing their communication deficiencies and adjusting learning efforts), as shown in Figure 1. More details on the implementation of the instructional design are provided in the next section.

Figure 1. Conjecture Mapping of the Proposed Instructional Design



Instructional Design Implementation

A research team consisting of faculty from two different universities designed a multidisciplinary collaborative project by integrating two courses offered by their institutions. The participating colleges were four-year schools within their respective regional non-profit educational systems. The colleges report similar entrance test scores, acceptance rates, and grade point averages (GPAs). They offer a comparable variety of degrees (undergraduate, graduate, and professional programs), enjoy similar class sizes, slightly below national average student-faculty ratios, and have comparable demographic composition of the student body. Thus, they appear suitable for an integrative collaborative project (Corker et al., 2017).

The integrated courses were parts of the core curriculum in each institution and included the Supply Chain Management (SCM) class and the Principles of Marketing (PM) class offered to business majors. The multidisciplinary nature of the Project provided an additional benefit in the context of professional communication skills as it required participants to understand and appreciate inputs presented by other disciplines, beyond their own professional focus areas of business (Nicometo et al., 2010).

Project Design

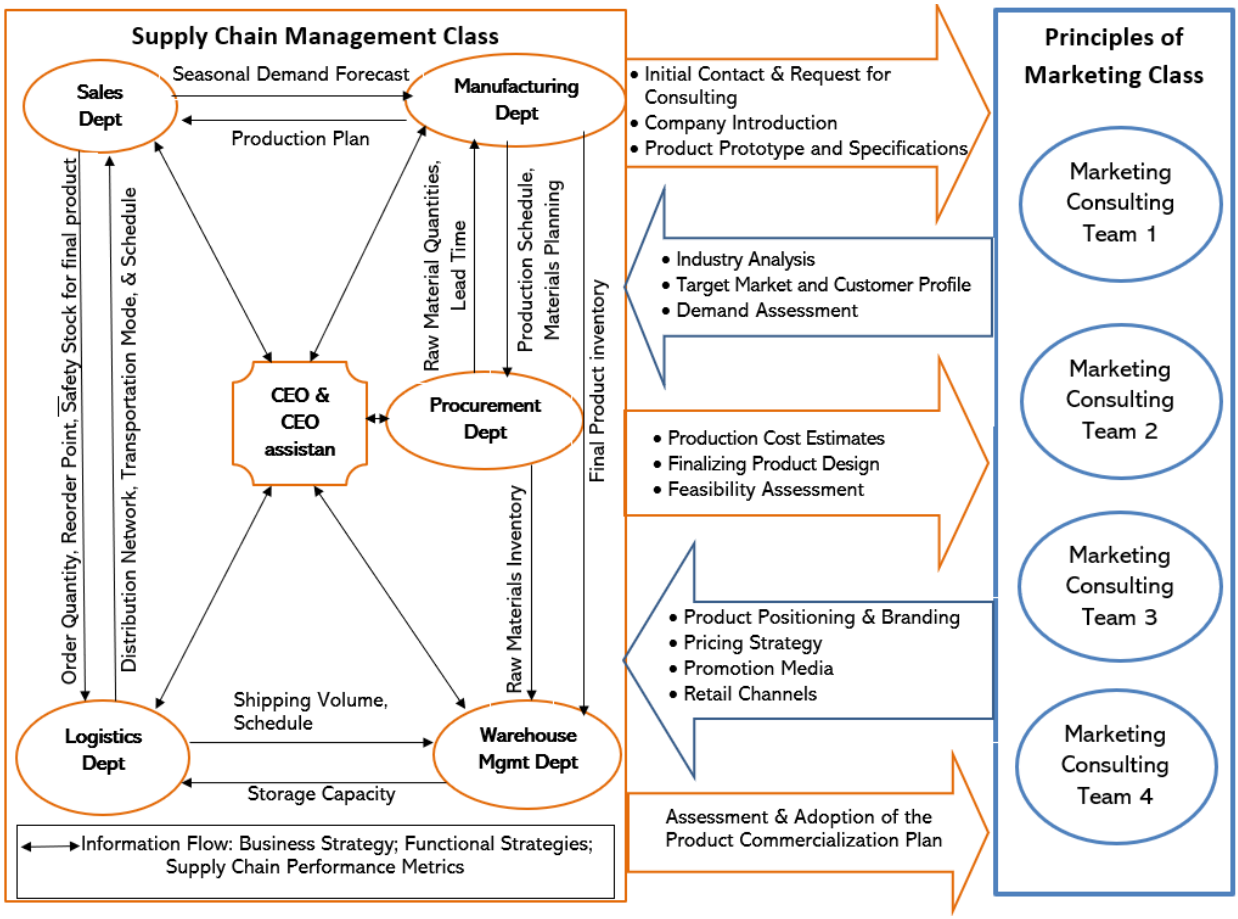
In line with the principles of inductive teaching, the Project was organized as a collaborative problem-based project with loosely defined parameters to simulate a real-life situation. Participants were to develop a comprehensive business plan for a new product by a nationally recognized shoe producer, including manufacturing operations, warehousing, procurement, logistics, and market commercialization strategy. The SCM students were responsible for the manufacturing operations, warehousing, procurement, and logistics functions. The PM students were responsible for the market assessment and commercialization strategy.

In each class, groups were formed of three to five students. Each SCM group was responsible for one of the organizational functions (manufacturing, warehousing, procurement, or logistics department) and had to communicate extensively with other SCM groups as well as the PM groups. The PM teams all worked on the market assessment and alternative commercialization strategies and communicated with SCM groups, but not other PM groups.

At the beginning of the semester, both classes received an introductory presentation on the Project, highlighting the collaborative multidisciplinary nature and its objectives. From week one of the semester, each class received lectures on the core subject material relevant to their respective coursework as well as instructions pertinent to the Project. Starting week five, groups from both classes began meeting using ZOOM technology to work on the Project jointly. The instructors were present at the meetings to observe and facilitate student communications.

At the end of the semester, the PM teams submitted a detailed market analysis and several alternative commercialization strategies. SCM teams jointly assessed and adopted the best commercialization strategy to be incorporated as a part of the overall business plan. As a final submission, the teams in both classes submitted written reports and made presentations to their peers and instructors, summarizing what was done and the expected outcomes if the business plan were to be implemented. Figure 2 provides a visual model of the Project structure.

Figure 2. Project Structure



Project Teaching Interventions: Procedural Validity

An ability to demonstrate effective professional communication skills was included in the student learning outcomes (SLOs) in both courses, along with the core subject SLOs. To ensure that the instructors did not directly influence students' self-perceptions of professional communication skills, and remediation of misconceptions (if any) happens naturally in line with the inductive teaching philosophy, the research team took several important steps. First, neither instructor made any explicit comments regarding students' professional communication skills during the Project. Second, all formative feedback in each class was centered solely on the core subject contents and not on students' professional communication skills.

Although both classes practiced collaborative multidisciplinary problem-based learning, students in the two classes were exposed to different teaching interventions. While the PM instructor employed primarily deductive teaching strategies, the SCM instructor applied both the traditional deductive methods and inductive teaching interventions. Thus, the SCM class served as an experimental group, and the PM class was a quasi-control group in the

experiment, thus allowing for a comparison of progress toward effective professional communication skills between the two classes.

A summary of the conceptual differences in teaching instructions between the PM and SCM classes is presented in Table 1 below.

Table 1. Conceptual Differences in the Project-related Teaching Interventions, PM vs SCM Class

PM class	SCM class
Similarities	
Problem-based learning	
Teamwork & shared decision-making	
Required communications between the two classes	
Differences	
Primarily deductive approaches: lectures with elaborate and structured theoretical background & exercises to apply theory, i.e., quizzes	Primarily inductive approaches: a brief theoretical introduction with gradual enhancement of theoretical concepts; role-play exercises
Videos observing experts solving the problems	Videos on the relatedness of theoretical concepts to real-world situations
Scheduled communications with the SCM groups No required communications with other PM groups	Scheduled communications with the PM groups Active regular communications within and between the SCM groups
Instructor feedback on the individual parts of the Project	Instructor feedback on three iterations of the whole Project (starting with a rough model and adding more details with each iteration)
Group-based revisions based on instructor feedback.	All-groups' open in-class discussions and collaborative effort to ensure effective & accurate communications across teams and classes

PM Class: Deductive Teaching Interventions

PM students followed a traditional college-level curricular schedule that primarily employed the conventional deductive teaching practices addressing both the core discipline competencies and professional communication skills. More specifically, Project-related materials were presented in a very structured way: first, PM students were exposed to the theory (i.e., lectures). Subsequently, they explored the practical application of the theories (examples and videos showcasing best practices in the field) and completed exercises (i.e., case analyses) to reinforce understanding. Finally, they were asked to apply the same logic to the Project

assignment. Each PM group was working independently, with communications limited to the partners from the SCM class.

SCM class: Inductive Teaching Interventions

The SCM groups, in addition to the core discipline requirements addressed through the traditional deductive teaching methods (lectures, quizzes, videos, etc.), also received inductive teaching interventions related to the Project.

At the outset, the Project was introduced to the SCM students in very broad terms as an open-ended problem with loosely defined parameters. Such ill-structured tasks reflect real-world scenarios that can provide effective learning environments and cultivate professional skills in students (Hauer & Daniels, 2008). The meta-analysis by Dochy et al. (2003) empirically supports the notion that loosely structured problem-based learning can enhance interpersonal communication skills. Consistent with this perspective, students in this Project were tasked with designing a comprehensive business plan, with minimal guidance offered. Initially perceived as a unique challenge, this approach afforded students considerable freedom and authority in decision-making. More importantly, it fostered interpersonal interactions and facilitated effective communications within and between the SCM teams.

The Project was structured as a role-play scenario, with each SCM group assuming the role of the functional departments within the organization. Several meta-analytical reviews highlighted the effectiveness of role-playing and cooperative learning in communication training (Jin et al., 2018; Lane & Rollnick, 2007). The teams-departments (manufacturing, procurement, sales, warehousing, or logistics) were all interconnected and interdependent. To fulfill the Project objectives, departments needed to coordinate their activities across the functional areas and at the global corporate level, while extensively communicating with the external audiences (PM groups), as well. This design facilitated cross-functional and multidisciplinary communications.

Thirdly, throughout the Project duration, the SCM students were required to submit regular work-in-progress reports. The instructor used them to provide formative feedback and encourage student reflection and discussions. For example, in the initial intermediate report, SCM teams provided a rough outline of the global business strategy for the firm and outlined departmental plans to support the global strategy and specific performance metrics. Upon submission, during the in-class review session, the SCM instructor summarized the departmental proposals and facilitated student analysis of areas of agreement and discrepancies. For example, while the manufacturing department modeled the production levels based on the average monthly demand estimates, the procurement department factored seasonal fluctuations in demand and alternative cost structures into their plans. The review session revealed multiple mismatches in the departmental strategies, prompting a brainstorming session on how to enable effective communications for timely and accurate information exchange among the departments. With each round of intermediate feedback, discrepancies in departmental submissions gradually reduced to become fully eliminated in the

final Project report. Below are some SCM student quotes to illustrate the gradual refinement of student communication patterns through this calibration process:

> *"We realized that there were discrepancies between each of the departments due to the lack of communication and doing a lot of the work on our own in our departments."*

> *"It was very hectic because the several groups were not on the same page for many of the parts and it caused some chaos but was resolved later on after we received the comments back."*

Finally, to further enhance their learning experience, at the beginning of the Project students were directed to extra-curricular resources, such as the professional communication services offered by the university Writing Center. Additionally, the SCM instructor presented how to conduct effective professional business meetings after the first virtual meeting with the PM teams. The SCM students were encouraged to reflect on their experiences during the meetings with the PM teams to identify the best communication practices and suggest improvements when necessary.

In summary, the inductive teaching interventions in the SCM class aimed to "immerse" students and experience each step in the Project first-hand, then reflect on their experiences, discuss achievements and missed expectations, and finally, propose strategies for deficiency remediation. Importantly, the suggested changes and improvements originated from the students rather than the instructor.

Methodology

Sample

The study participants were students from the Supply Chain Management (SCM) class from one University and the Principles of Marketing (PM) class from another University who participated voluntarily. The participants were mostly males (68%), who previously completed the foundational General Education requirements of their respective degrees that were similar in length and composition. They were working towards their majors, on average in their 6th or 7th semester of coursework and had comparable GPA scores. All the participants remained engaged in the Project from the inception to the conclusion, providing reliable empirical data to test the theory. Detailed demographic data is provided in Table 2.

Table 2. Participant Demographics

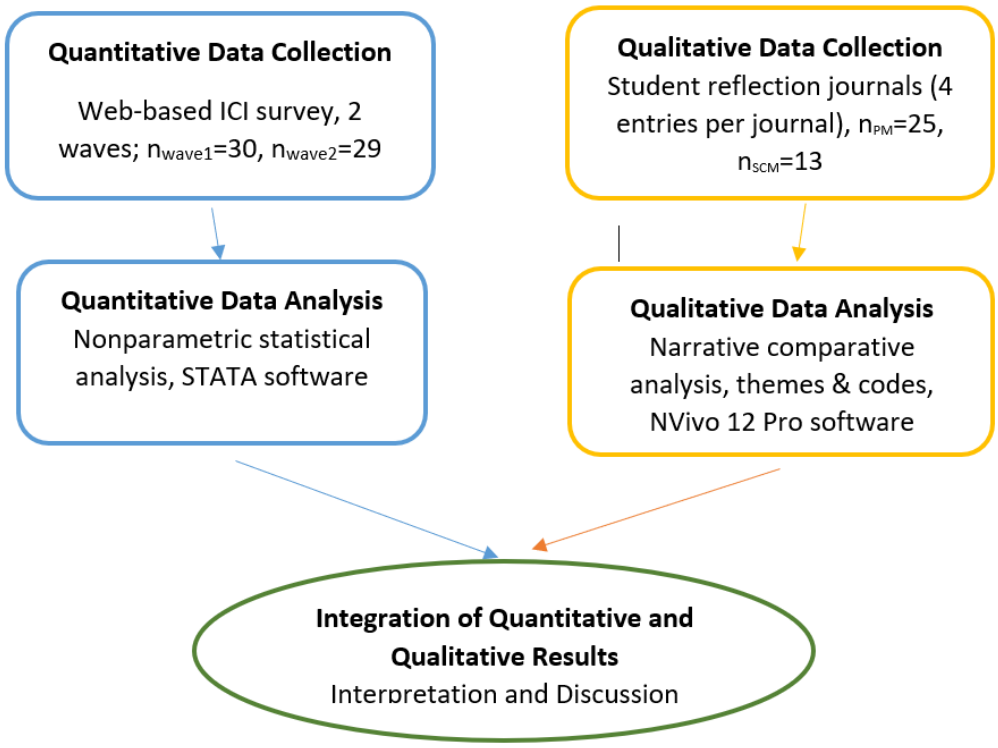
Course	Major	Gender		Year	GPA $_{avg}$	Total
		Male	Female			
SCM Class	Business	13	0	3rd or 4th year in a Bachelor program	3.1	13
Total		**13**	**0**			**13**
PM Class	Business	11	10	2nd or 3rd year in a Bachelor program	3.2	21
	Music Management	2	1	3rd or 4th year in a Bachelor program		3
	Communication Studies	0	1			1
Total		**13**	**12**			**25**

Data Collection

Data were collected using a concurrent (convergent parallel) mixed study design that offers the advantage of integrating both quantitative and qualitative data within a single study, to gain a better understanding of the research problem (Creswell et al., 2003). While quantitative data allow for hypothesis testing and specific recommendations, qualitative data provide a richer interpretation of the statistical results. Combined, quantitative and qualitative datasets heighten the validity of the methodologically different inferences and produce more comprehensive insight into how students' self-perceptions of professional communication skills evolve under different teaching interventions (Ivankova et al., 2006).

Quantitative data were collected through online surveys to yield numerical information on student learning outcomes related to professional communication skills. Qualitative data were collected through self-reflection journals, where students reported on their experiences in the Project and the coursework. The visual map of quantitative and qualitative data collection and integration process is presented in Figure 3.

Figure 3. Visual Model of Data Collection and Analysis Procedures



Before the start of data collection, ethical approvals were received from the Institutional Review Board of each college (IRB-1901009-EXM). The appropriate guidelines were strictly followed. The informed consent was obtained from the participants via email. They were also informed about voluntary participation and the opportunity to withdraw at any time.

Quantitative data was obtained via an electronic survey administered in both classes in two waves (once during week one and again in week 14 of the 15-week semester), using the well-established Interpersonal Communication Inventory (ICI) survey (Bienvenu, 1971) that measures the process of communication as an element of social interaction and focuses on the patterns, characteristics, and styles of communication, but, importantly, not on the contents of communication. These attributes were defined by employers as important in professional communication (Coffelt et al., 2019). The survey includes 40 questions covering five categories: listening skills, ability to send clear messages, giving/receiving feedback, ability to handle emotionally sensitive interactions, and willingness to trust other people. The ultimate score is obtained by summing up the scores of all the questions, where the higher scores indicate more advanced professional communication skills. The ICI has proved to be gender-neutral and consistent across different age groups, with validity and reliability confirmed in multiple studies (Bienvenu & Stewart, 1976), which makes it suitable to assess professional communication skills across diverse disciplines like engineering and business majors.

At the beginning of the semester (week one), the participants in both classes evaluated their professional communication skills using the ICI prior to engaging with the Project (survey wave 1). In week 14, students were asked to re-evaluate their professional communication skills retrospectively at the beginning of the semester and also to assess their current professional communication skills upon completion of the Project (survey wave 2). Importantly, the two-wave design allowed us to establish the baseline in student self-perceptions of professional communication skills and control for differences between the two classes prior to engaging with the Project. Also, it allowed the researchers to measure changes (if any) in student perceptions regarding their professional communication skills as the Project progressed, for each participant individually and between the classes. The observed response rates were reasonably high for the internet-based surveys, 85% for the SCM class and 72% for the PM class, and, thus, acceptable to proceed with statistical analyses (Selm & Jankowski, 2006). Responses with missing data were removed from further analysis. Cronbach's alpha of 0.78 obtained in this study was consistent with other studies using the ICI instrument (Herzog & Cooney, 2002).

Qualitative Data Collection

To complement the quantitative results and provide deeper insight into student experiences in developing professional communication skills, participants were asked to complete individual self-reflection journals to track their learning and professional growth throughout the semester. The journaling assignment included four entries and was submitted electronically via the university learning management systems. In the initial entry, due in week 2, students had to review the learning objectives set by instructors in the course syllabus and articulate their personal and professional goals in the course. In the subsequent journal submissions, students reflected on their experiences, exploring how the coursework and the Project contributed to their learning and the achievement of their professional goals. A sample of the journaling assignment is available in Appendix A.

Qualitative cross-case narrative comparative analysis was conducted using the NVivo 12 Pro software to compare student perceptions of the effectiveness of learning processes and their progress in the development of professional communication skills. The research team developed a codebook derived from the research question. Using the codebook, two independent coders completed the initial round of coding with five journals. Notably, the coders did not participate in the earlier stages of the Project and, therefore, did not have any research-related bias. The initial round of data coding revealed some disagreements between the coders, and through deliberation, the research team revised and refined the code definitions and rationales for data assignment, using methods outlined in Creswell et al., (2003). The same coders then coded an additional set of five student journals to confirm the consistency, validity, and reliability of the updated codes. After that, all the remaining journals were coded using the revised codebook. Excerpts from the codebook and examples of quotes are provided in Table 3.

Table 3. Excerpts from the Codebook Relevant to the Research Question and Hypotheses

Theme	Statement Focus	Examples of Student Quotes
The goal to improve professional communication skills is stated.	The student states an improvement of professional communication skills as a personal goal for the course.	*"I hope to be able … to hone my social and communication skills."*
Evidence of remediation of misconceptions is present.	The student mentions any 'aha' moments of the class: ideas that they originally perceived differently but later recognized their wrong perceptions and adjusted in the course of the Project. Include any contextual factors related/contributed to the remediation of misconceptions.	*"I realized that there were discrepancies between each of the departments due to the lack of communication and doing a lot of the work on our own in our departments*." "*I have especially changed my mind in thinking that marketing was just advertising. Throughout the course I have realized I'm wrong with that assumption more and more every week."*
The Project helps with professional communication skills.	The student mentions that the Project helped develop their professional communication skills.	*"I believe that over the semester I have improved my communication skills quite a bit due to several things. First was the project that we have been working on all semester."*

Results

Quantitative Analyses

To test the proposed hypotheses, a series of nonparametric statistical tests were employed, with the results reported below. First, to account for any pre-existing differences in students' perceptions regarding their professional communication skills between the two classes before the Project's start, the data collected in the first wave of the survey (week 1) was analyzed. On a scale from zero to 120 (where a zero score means no professional communication skills and a 120 score corresponds to superior professional communication skills), SCM students (n=13) reported a mean (median) score of 97.00 (96.00), and the PM students (n=17) reported the mean (median) of 96.59 (96.00). The nonparametric Mann-Whitney test revealed no statistically significant difference *(p=0.32)* between student self-perceptions about their professional communication skills in the two classes. These results suggest that before engaging with the Project, students in both classes had similar, reasonably high opinions about their levels of mastery of professional communication skills. Thus, the participants in the two classes can be considered reasonably similar in terms of their backgrounds and self-perceptions regarding their professional communication skills before engaging with the Project.

Next, data collected during wave 2 of the survey (week 14) was used to examine how student self-perceptions of professional communication skills changed because of participating in the

Project. The Wilcoxon sign-rank test was used to compare student self-perceptions at the start of the Project, as reported in wave 1, with their self-perceptions at the beginning of the Project, as reported in wave 2. The results indicate that in the PM class, there was no statistically significant difference *(p = 0.65)* between student self-evaluations of professional communication skills before the Project start (wave 1) and the adjusted self-perceptions at the Project start, as reported in wave 2. However, in the SCM class, there was a statistically significant difference (*p = 0.02)* between how students perceived their professional communication skills before the Project start (wave 1) and adjusted professional communication skills at the Project start as reported in wave 2. The SCM students, who were exposed to the proposed inductive teaching interventions, decreased perceptions of the professional communication skills they held previously. The PM students, who were not exposed to these teaching interventions, did not change their perceptions of their pre-Project communication skills and reported similar mean (median) scores for the retrospective assessment of their initial proficiency (Table 4). Thus, Hypothesis 1: Inductive teaching interventions will effectively reveal and help adjust students' misconceptions of proficiency levels in professional communication skills, was supported.

Table 4. Differences in Students' Self-Perceptions of Professional Communication Skills Assessed at the Project Start (wave 1) and Re-assessed Retrospectively at the Project End (wave 2), on a Scale from 0 to 120

	Student perceptions of professional communication skills at the Project start	Student perceptions of professional communication skills at the Project start re-assessed retrospectively	*Wilcoxon sign-rank test*
Class	Mean (Median)	Mean (Median)	*p-score*
PM (n=18)	90.59 (96.00)	89.31 (93.00)	*0.65 (n.s.)*
SCM (n=11)	97.00 (96.00)	85.78 (87.00)	***0.02***

Next, the efficacy of the inductive teaching methodology to improve student proficiency in professional communication skills was assessed. The Wilcoxon signed-rank test was conducted to test differences in student perceptions of their progress in professional communication skills via a comparison of the retrospective assessment of the initial levels and their reported levels after completion of the Project. In the PM class, there was no statistically significant difference between student retrospective evaluations of their professional communication skills at the Project's start and their evaluation of professional communication skills upon the Project completion *(p=0.31)*. Conversely, in the SCM class, there was a statistically significant difference (*p=0.03*) between student retrospective evaluations of their professional communication skills at the Project start and their evaluations of professional communication skills at the Project end (Table 5). Notably, at the end of the Project, SCM students reported improved professional communication skills in comparison to the adjusted levels of professional communication skills before the Project start, in support of Hypothesis 2: Student learning outcomes (SLOs) for professional communication skills will improve as a result of applying inductive teaching interventions.

Table 5. Differences in Student Self-Perceptions of Professional Communication Skills at the Project Start Assessed Retrospectively and at the Project End, on a Scale from 0-120

	Student perceptions of professional communication skills at the Project start assessed retrospectively	Student perceptions of professional communication skills at the Project end	*Wilcoxon sign-rank test*
Class	Mean (Median)	Mean (Median)	*p-score*
PM (*n*=18)	89.31 (93.00)	94.00 (94.00)	*0.31(n.s.)*
SCM (*n*=11)	85.78 (87.00)	101.00 (96.50)	***0.03***

Overall, students in the two classes reported different levels of progress in developing professional communication skills. PM students, not exposed to the inductive teaching interventions, maintained a high regard for their communication skills and did not actively work on improvements. On the other hand, SCM students benefitted from the proposed teaching interventions, recognized their deficiencies, and reported progress toward higher proficiency levels by the end of the Project.

Qualitative Analyses

To gain a more comprehensive understanding of the observed numerical evidence, a qualitative analysis of the student reflection journals was conducted to complement the quantitative results. Several important themes and factors emerged as discussed below.

The theme 'Goal to Improve Professional Communication Skills is Stated' captures student intentions (if any) to improve these skills at the Project's outset. Analysis of the reflection journals revealed that despite effective professional communication skills being listed among the SLOs in both courses, only seven SCM students (54%) and six PM students (24%) explicitly indicated the improvement of professional communication skills as their personal goal in the course. Instead, many participants in both classes prioritized other professional skills like teamwork, time management, and research skills. The qualitative data suggest that the majority of students do not see the need to work on their professional communication skills, either due to a lack of appreciation for their importance or because they perceive themselves as already proficient.

The theme 'Evidence of Remediation of Misconceptions is Present' includes students' 'aha' moments: something that initially they perceived or understood differently, but later realized their perceptions were wrong and adjusted them. There was a dramatic difference in the two classes' responses. PM students mostly identified 'aha' moments related to the core subject (marketing), reporting no remediation of misconceptions concerning professional communication skills. In contrast, for the SCM students, the fundamental misconceptions and most surprising 'aha' moments related to communication functions in the Project. The example quotes from the PM students and SCM students are provided below:

> *"Prior to this semester, I did not realize how vital a function marketing is to a business's success. […] I was ignorant to the level of research and effort that goes into preparing a business's marketing program" (PM student's quote about marketing misconceptions).*

> *"I believe that without this project, we would not have realized just how important communication is…, [before] we had a lot of differences in our parts of the projects due to a lack of communication. As of now, we have worked better together and communicated a lot more with each other in order to make sure that we are all on the same page and can put together a good project and product for the project" (SCM student's quote about communication misconception).*

The observed difference between the two classes in misconception identification and remediation supports the quantitative results and provides empirical evidence that students' preconceptions of proficiency in professional communication skills were adjusted during the Project to varying degrees. The inductive teaching interventions the SCM students received were successful in calibrating students' perceptions of their professional communication skills and motivating them to work on improvement.

The theme 'Project Helps with Professional Communication Skills' reports student progress attributed to the Project. Overall, students from both classes reported some improvement in professional communication skills. However, a remarkably higher proportion of the SCM students (46%) reported progress compared to the PM class (20%). The difference in the improvement rates corroborates with the results of the quantitative analyses (Table 6), reporting statistically significant improvements in professional communication skills for the SCM students, but not the PM students. Furthermore, different aspects of professional communication skills were reported as improved by the two classes. For example, the PM students mentioned mostly their writing skills improved:

> *"My communication skills through email improved because I would write detailed descriptions of what we had to do for the three reports."*

In contrast, the comments from the SCM students painted a much more complex picture of the communication competencies, like the importance of timely communications, the disadvantages of working in a silo, the importance of asking questions, creating clear messages to pass information to various stakeholders, and the value of accurate interpretation of received information:

> *"I have also learned communication is a key in a successful project. The CEO needs to communicate to department heads, and the department heads need to relay those messages clearly and accurately in order to have the most likely success on the project. Department heads also need to have a full understanding*

> *on not just their departments but everyone else's as well, so we can all work together to reach the end goal."*
>
> *"This is harder than it looks because in order to get information from other groups we go through our "boss" to gain information and if he doesn't asks the right questions when he is talking with them then we won't get an answer at first."*

Overall, students from both classes indicated improvements in both core subject and professional communication skills, with many attributing their progress to the Project. Also, many students recognized the relevance of the Project to their future careers (85% in the SCM class and 72% in the PM class) and appreciated its real-world scenario. Both classes found value in the multidisciplinary collaboration, embracing the opportunity to learn from the different disciplines' perspectives.

While a small number of references suggested limited or no progress in the student learning outcomes in both classes initially, by the end of the semester these respondents also reported some improvements. Also, one student (8%) in the SCM class and four students (16%) in the PM class did not submit their reflection journals. Applying a conservative approach, these instances were considered negative cases, implying that these students may have been reluctant to report limited progress or lack of progress in student learning outcomes.

Discussion

Communication is an integral part of a business specialist's professional life, alongside technical or subject-specific or subject-specific expertise. Yet, despite efforts in higher education, global labor markets continue to report a persistent noticeable deficit in critical communication competencies among college graduates (NACE. Job Outlook, 2024; Taylor et al., 2022).

Traditional teaching methodologies in higher education programs, while reliable for skill acquisition, may fall short in assisting learners in recognizing their deficiencies in communication in the first place and motivating them to improve. To bridge this gap, a novel application of inductive teaching methodology is proposed to help learners discover misconceptions regarding their proficiency in professional communication skills, alert them to the need for improvement, and create effective learning environments to enhance their communication competencies.

The conjecture mapping approach, rooted in constructivist theory, serves as a foundation for the proposed inductive teaching methodology (Sandoval, 2014). Central to this approach is a multidisciplinary problem-based project emphasizing teamwork and informational exchange, key components of effective professional communications. Student development is emphasized via multiple opportunities for inquiry, self- and peer-teaching, and supported by positively structured instructor feedback. As students reflect on their experiences in the Project, the instructor facilitates the process by asking leading questions, offering debriefing sessions, and

learning opportunities (teachable moments) with short lectures and exercises on communication theory and best practices. These mediating processes result in student artifacts (work-in-progress reports, final reports, student self-reflections) serving as student-generated evidence of the learning progress. These processes and artifacts reveal learners' misconceptions about their proficiency levels, trigger motivation to improve, and, ultimately, promote enhancement in professional communication competencies.

The study utilizes a concurrent mixed methods research design for a comprehensive examination of the research question from multiple perspectives. It quantitatively establishes the *effects* (i.e., differences in student learning outcomes across the two classes) and provides a qualitative description of the underlying *processes* (i.e., varying awareness levels about misconceptions and the need for remediation) to *contextualize these effects*.

In line with prior research (Trevelyan, 2012; Wright, 2023), the findings confirm students' tendency to overestimate their communication proficiency. Consequently, they do not feel the need for improvement and are not as actively engaged in the learning process for communication skills. The findings further demonstrate the effectiveness of the inductive teaching methodology in adjusting students' perceptions of their proficiency in professional communication skills. Notably, the SCM students, exposed to inductive teaching methods, showed improved recognition of their communication limitations. Unlike the PM students experiencing deductive instructional methodologies, the SCM students calibrated their self-perceptions of competence, as demonstrated by the quantitative analysis results. SCM students also recognized the need and were motivated to develop their professional communication skills in asking questions and clarifying received information, creating clear messages, and improving personal interactions, as revealed by the qualitative data.

Therefore, based on the quantitative results and qualitative findings, the proposed inductive teaching methodology is effective for business disciplines to calibrate their overestimated competencies in communication skills and to motivate them for improvements. Targeted interventions aiming at enhancing professional communication competencies contribute to significant progress in SLOs and improve overall satisfaction levels, as reported by the SCM students in this study. Additionally, the proposed design allows for effective use of class time and can be successfully implemented within the typically rigorous, tight business curricula – another notable advantage of this methodology.

Limitations

While the research team strived to follow the best practices in the field and ensure the validity and reliability of the research design, some limitations could hinder the identified positive outcomes from being entirely attributed to the implemented inductive teaching interventions. First, the differences in individual teacher styles and levels of experience with inductive teaching methodologies may have influenced the results of the study. Implementation of the methodology by other instructors and researchers might require adjustments depending on their experiences.

Second, several aspects of the study might potentially impact the generalizability of the results: the researchers employed the convenience sampling approach utilizing the classes they were assigned to teach, and the overall sample size in the study was relatively small. Informing students about their participation in the research project could trigger awareness of the importance of the research and introduce social desirability bias, impacting their responses. Finally, the influences of other contextual factors on student progress, such as student background, cognitive and non-cognitive development, extra-curricular activities, and out-of-class environment should not be discounted.

Directions for Further Research

For future research, it seems beneficial to replicate the study at a larger scale and include a representative sample from multiple disciplines. Also, semi-structured interviews would be helpful for a deeper and more accurate exploration of the learning processes and analysis of the contextual factors that impact students' perceptions of their communication proficiency and learning progress.

While this study targeted learners' overconfidence in communication proficiency, some students may actually have low confidence in their abilities instead despite being quite proficient in communication. Testing the effectiveness of the proposed teaching methodology for these misconceptions seems promising.

An interesting observation in the study was that students from underrepresented groups (females, and students of color) desired to take leadership positions in the project. It might be a fruitful venue to explore the impact of inductive teaching on leadership and other professional skills as well.

Conclusion

The study findings suggest that the inductive teaching methodology shows promise in developing professional communication skills. The unique advantage of the methodology lies in the successful adjustment of students' overconfidence in their communication skills, thereby motivating them to improve. It also reveals specific areas for improvement such as an ability to create clear messages, asking clarifying questions, communicating in a timely manner, and preventing misunderstanding and miscommunication – vital qualities for business professionals. Implementation of the inductive teaching methodology for professional skills in the higher education business curricula has the potential to bridge the gap between employers' expectations for professional communication competencies and the proficiency levels of college graduates.

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Appendix A

Journaling Assignment

Description:

Each student is required to do journaling during the semester, reflecting on their professional development/learning in the course. Students have to carefully read the course learning objectives, state their personal goals for the course, and reflect whether the class activities and assignments contributed to their learning, achieving their goals, and the course learning outcomes. Students should demonstrate critical thinking and express ideas related to their learning process and professional development. Reflection on their transformation process as professionals (or lack thereof) is important in the reflection.

Requirements:

1. Journal entries should be submitted 4 (four) times during the semester. There are due dates for the submission of journal entry in the course syllabus. All submissions go to the designated D2L Dropbox. Each submission has to be at least 0.5 pages but not more than 1.5 pages.
2. All entries have to be typed in a single (the same) Word document, Times New Roman 12, single space, 1" margins.
3. Provide student's name and course number in the top left corner of the first page, page number at the bottom right corner of a page.
4. Provide dates for each entry in the document.

The final submission (complete document which contains all entries) will be graded. Grading rubric (attached) will be used to grade the assignment.

Important: Student's journal content **will not be graded** based on student's progress in the course and their achieving or not achieving the learning objectives. The goal is to provide meaningful and truthful reflection on your learning process and demonstrate critical thinking to reflect on why the learning process was successful or was not so.

Journal Grading Rubric:

	Weight	Excellent	Good	Fair	Poor
		100	80	70	60
Meeting Requirements	5%	All submission requirements are met	Most of the requirements are met	Some of the requirements are met	Requirements are not met
Volume	10%	3-4.5 pages	2-3 pages	1.5-2 pages	Less than 1.5 pages
Timeline	5%	Submission deadline is met	Late for a few hours, but less than one day.	One day late	More than one day late
Grammar and Spelling	5%	Journal is highly polished; no grammar or spelling errors.	Journal is polished; maximum of two	Journal is adequate; maximum of	Inadequate discussion; more than

			grammar or spelling errors.	three grammar or spelling errors.	three spelling or grammar errors.
Structure and Organization	35%	Writing demonstrates sophisticated clarity and conciseness, includes thorough details and relevant information; extremely well-organized	Writing is accomplished in terms of clarity and conciseness; includes sufficient details and relevant information; well-organized	Writing lacks clarity or conciseness; gives insufficient details; lacks organization	Writing is unfocused, lacks details and relevant information; poorly organized
Reflection	40%	Demonstrates meaningful connection of expressed ideas with the course learning outcomes; supports opinions with strong arguments and evidence; presents a balanced and critical view; interpretation is both reasonable and objective	Demonstrates connection of ideas with the course learning objectives; supports opinion with reasons and evidence; presents a fairly balanced view; interpretation is both reasonable and objective	Connection of content with the course learning objectives is weak; supports opinions with limited reasons and evidence	No connection with course learning objectives is identified. No reasoning and arguments are provided
Total					