



Article

Teamwork Conflict Management Training and Conflict Resolution Practice via Large Language Models

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Abstract: This study implements a conflict management training approach guided by principles of transformative learning and conflict management practice simulated via an LLM. Transformative learning is more effective when learners are engaged mentally and behaviorally in learning experiences. Correspondingly, the conflict management training approach involved a three-step procedure consisting of a learning phase, a practice phase enabled by an LLM, and a reflection phase. Fifty-six students enrolled in a systems development course were exposed to the transformative learning approach to conflict management so they would be better prepared to address any potential conflicts within their teams as they approached a semester-long software development project. The study investigated the following: (1) How did the training and practice affect students' level of confidence in addressing conflict? (2) Which conflict management styles did students use in the simulated practice? (3) Which strategies did students employ when engaging with the simulated conflict? The findings indicate that: (1) 65% of the students significantly increased in confidence in managing conflict by demonstrating collaborative, compromising, and accommodative approaches; (2) 26% of the students slightly increased in confidence by implementing collaborative and accommodative approaches; and (3) 9% of the students did not increase in confidence, as they were already confident in applying collaborative approaches. The three most frequently used strategies for managing conflict were identifying the root cause of the problem, actively listening, and being specific and objective in explaining their concerns.



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Keywords: conflict resolution; conflict management training; undergraduate; AI; generative AI; ChatGPT; large language models; computing education; STEM education; teamwork

1. Introduction

Teamwork is central to every organization [1]; thus, higher education institutions must provide future graduates with opportunities to become functional members of a team and acquire teamwork skills in the process [2]. As students collaborate in teams, they engage in team dynamics that can foster the development of essential teamwork skills, including leadership, conflict management, and communication. However, these teamwork skills should be learned and practiced in the context of team-based project settings.

Education research in higher education has resulted in robust research on how to promote effective teamwork through collaborative projects [3]. However, for teams to function effectively, they must not only engage in behavioral processes like communication and coordination but also foster positive motivational states [4]. Motivational states describe members' collective reactions to interpersonal aspects of team functioning, such as cohesion, collective efficacy, and conflict management, among others [1]. Specifically, conflict management and conflict resolution are particularly relevant to teamwork, as interpersonal relationships play an important role in the performance of job-related tasks and

communication [5]. However, not all conflict is negative. There may be task-based conflicts and relational conflicts [6]. While task-based conflicts may result in divergent thinking, relational conflicts may be detrimental to team performance. In such instances, conflict management styles can help to resolve conflicts [5]. However, conflict management styles need to be learned and practiced sooner and often throughout undergraduate education. Research from organizational psychology and human factors has determined that team interventions, enabled by technology, are a viable approach for enhancing teamwork performance [7]. However, integrative research has identified that very few interventions on conflict management and conflict mitigation have been fully documented [8].

This study contributes new knowledge on conflict management and conflict resolution within the context of teamwork in higher education. Specifically, the study implemented a conflict management training approach guided by principles of transformative learning. Transformative learning is an approach to adult education where adults learn as they adapt to the needs and demands of their socio-cultural context [9,10]. Transformative learning is more effective when learners are engaged mentally and behaviorally in learning experiences. To engage students mentally, we provided students with training in conflict management. To engage students behaviorally, we provided students with practice in conflict resolution simulated with a large language model (LLM). Correspondingly, the conflict management training approach involved a three-step procedure consisting of a LEARN phase, a PRACTICE phase enabled by an LLM, and a REFLECT phase. Within this context, we investigate students' attitudes toward their experience, their confidence in handling conflict after engaging in the training and practice, the styles they implement to resolve conflict, and the strategies they use in the process while they approach the simulated conflict. Accordingly, the research questions for this study are as follows: (1) How did the training and practice affect students' level of confidence in addressing conflict? (2) Which conflict management styles did students use in the simulated practice? (3) Which strategies did students employ when engaging with the simulated conflict?

2. Background

2.1. Teamwork in Higher STEM Education

Teamwork in higher STEM education is foundational to the development of well-rounded, industry-ready professionals [11,12]. The emphasis on collaborative projects and team-based learning experiences within STEM curricula is a response to the evolving demands of the engineering profession, where interdisciplinary collaboration and team effectiveness are paramount [13,14]. The pedagogical shift towards incorporating team projects in STEM courses aims to equip students with the skills necessary for successful collaboration, including communication, leadership, and conflict resolution abilities [15,16]. These collaborative experiences are designed not only to enhance technical proficiency but also to cultivate a deeper understanding of teamwork dynamics [17,18]. Team dynamics refers to the patterns of interaction among team members that influence team behavior and performance [19]. These dynamics are shaped by various factors, including team composition, communication patterns, leadership styles, and the presence of conflict [20]. Conflict within teams, often viewed as an inevitable aspect of team dynamics [21], can either facilitate growth and innovation or hinder progress, depending on how it is managed [22]. The relationship between conflict and team dynamics is complex [23]; while certain types of conflict, like task conflict, can stimulate critical thinking and creativity [24], relationship conflict can lead to decreased team morale, cohesion, and satisfaction [25]. This emphasizes the importance of effective conflict management strategies in maintaining positive team dynamics and enhancing overall team performance.

2.2. Conflict Management and Training

Conflict management within the context of team dynamics encompasses a range of strategies aimed at addressing and resolving disagreements in a manner that is beneficial to both individual team members and the team as a whole [26]. Types of conflict

management strategies include accommodating, avoiding, collaborating, competing, and compromising [27]. Each strategy has its situational advantages and drawbacks, and the choice of strategy can significantly impact team outcomes [28]. Training in conflict management strategies is crucial for engineering students [29], as it prepares them to navigate conflicts effectively, ensuring that team dynamics remain constructive and conducive to achieving team goals [30,31]. Incorporating conflict management training into engineering education can significantly enhance students' preparedness for the collaborative challenges of the engineering profession [32,33], fostering environments where innovation and productivity can flourish [34]. While there is a general lack of empirical studies on how to teach conflict management in higher education, some of the strategies include curriculum-integrated conflict training with peer mediation [35], a scenario-based approach where students read hypothetical conflict situations and select appropriate responses [36], simulations and games [37], and role-playing and discussion [38]. Bridging this gap between the theoretical underpinnings of conflict management and its practical applications within team settings in STEM education provides an opportunity to explore innovative methods in conflict management training.

2.3. LLMs In Education

The adoption of large language models (LLMs), such as GPT-3 and newer iterations, in educational settings has been increasing, transforming ways of teaching and learning [39,40]. The integration of LLMs into educational practices leverages the capability of these models to simulate complex human interactions, providing students with a unique platform for practicing communication strategies in a controlled environment [41,42].

The use of LLMs in educational contexts offers numerous advantages. Primarily, these models provide a scalable method for delivering personalized education and feedback [41]. They can generate a wide range of responses to student input, which allows for dynamic interaction that can mimic real-life conversations [42]. This capability is particularly useful in conflict management training, where students can practice negotiation and resolution strategies in a variety of simulated scenarios without the logistical challenges of organizing role-plays with human actors [43,44]. Moreover, LLMs facilitate a safe learning environment where students can make mistakes and learn from them without the fear of real-world consequences [45]. This aspect is critical in educational psychology, as it supports the development of interpersonal skills in a low-stress setting, encouraging deeper learning and reflection [43].

LLMs are being used in various educational applications to enhance learning experiences and outcomes. For example, Pesovski et al. [46] used ChatGPT, a type of LLM, to generate lesson plans and multiple-choice quizzes based on the learning outcomes provided by the professor for a particular class. These lesson plans were customized to different styles (traditional, with Batman references, or with Wednesday Addams' influence) to increase engagement. Ji et al. [42] discussed their use in language learning, where LLMs helped learners by providing feedback on vocabulary and general proficiency and serving as a conversation partner for practice. Research by French et al. [47] demonstrated the successful integration of ChatGPT in game development education to enhance students' creativity, problem-solving skills, and critical skills. Finally, Rahman and Watanode [48] utilized ChatGPT in programming learning and teaching and illustrated how it helped students improve their programming skills.

The present study aims to contribute to this growing body of research by exploring the nuanced experiences of computing and engineering students as they engaged in conflict management training via LLMs and employed conflict resolution strategies in teamwork. Understanding these experiences is not only essential for evaluating the viability of LLMs in conflict management training but also for developing pedagogical approaches that prepare students for the technical aspects of their future professions and equip them with the skills necessary for effective teamwork and conflict resolution.

3. Conceptual Framework

There are different theoretical models that help researchers analyze how individuals approach and manage conflict. A traditional and widely accepted model, which also serves as the conceptual framework for this study, relates to the styles of managing interpersonal conflict as defined by Thomas [49]. Conflict management styles result from a combination of the interplay between (a) the concern for oneself and the degree of satisfaction of an individual's own concern, regarded as the level of assertiveness, and (b) the concern for others and the degree of notification of others' needs and concerns, regarded as the level of cooperativeness [50]. By combining these two dimensions at different levels, five specific styles of conflict management or conflict handling emerge: avoiding, accommodating, compromising, competing, and collaborating [51]. Figure 1 presents how the five conflict management styles relate to the level of assertiveness and cooperativeness.

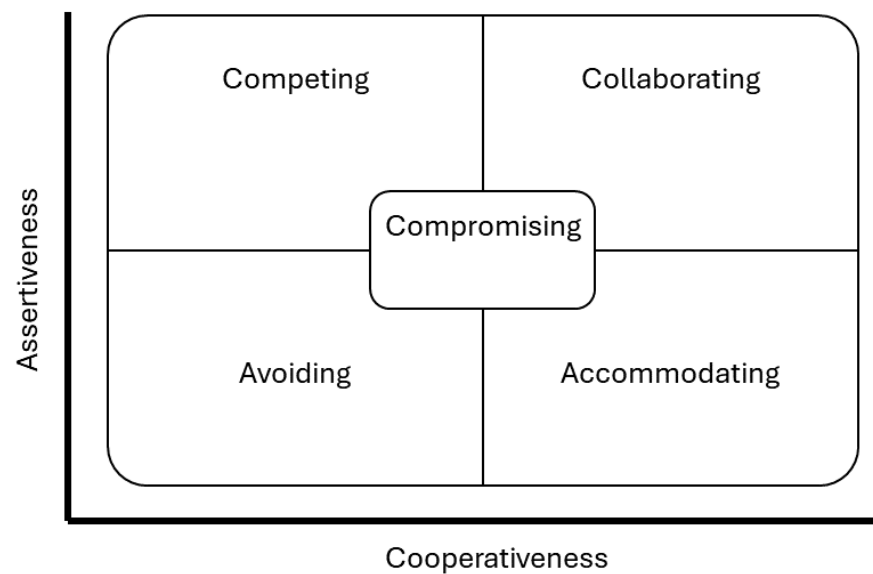


Figure 1. Five conflict management styles.

Avoiding, in the bottom left corner of Figure 1, is characterized by being non-assertive and uncooperative. In this style, an individual refrains from immediately addressing their own concerns or those of the other party involved in the conflict. Instead, they choose not to engage in the conflict directly. Being accommodating, in the bottom right corner of Figure 1, involves being non-assertive and uncooperative. In this style, an individual refrains from immediately addressing their own concerns or those of the other party involved in the conflict. Instead, they choose not to engage with the conflict directly. Compromising, in the center of Figure 1, lies midway between assertiveness and cooperativeness. Its aim is to reach a swift, mutually agreeable resolution that partly meets the needs of both parties. Positioned between competing and accommodating, compromising involves yielding more than competing but less than accommodating. It also tackles the issue more directly than avoiding it but does not delve into it as deeply as when being collaborative. Competing, in the top left corner of Figure 1, involves being assertive and not cooperative, focusing on power dynamics. In this style, an individual prioritizes their own interests over others', using any means necessary to achieve their goals, even if it means disadvantaging the other party. Collaborating, in the top right corner of Figure 1, involves combining assertiveness and cooperativeness. In this approach, individuals strive to collaborate with each other to discover a solution that completely addresses the concerns of both parties. It entails delving deeply into the issue to uncover the underlying interests of each individual and to identify an option that satisfies both sets of concerns. Collaboration involves engaging in discussions where parties learn from each other's perspectives, resolving potential

conflicts over resources, or actively seeking creative solutions to interpersonal issues through confrontation and dialogue.

The implications of the conceptual framework for the learning design of the conflict management training and practice related to providing students with a set of strategies that would allow them to engage in more collaborative behaviors, thus balancing assertiveness and cooperativeness. The conceptual framework also informed the research design, as our goal also involved identifying the conflict management styles that the students' used to resolve the conflict posed in the practice component of the training and characterizing the strategies they used to approach the solution to (or resolve) the conflict.

4. Conflict Management Training and Practice

4.1. Transformative Learning Pedagogy

The pedagogical grounding of the conflict management training and the conflict resolution practice was guided by principles of transformative learning. Transformative learning is an approach to adult education where adults learn as they adapt to the needs and demands of their sociocultural context [9,10]. As adults engage in their communities, they seek to acquire new skills to perform different roles or new ways of performing current roles. That is, as adults set new goals, these goals represent desires to adapt more effectively to demands they perceive within their contexts. Learning occurs as individuals internalize their knowledge [52].

Transformative learning has been used as a pedagogical approach for developing teacher–parent partnerships among pre-service teachers [53]. It has also been used to promote cooperative inquiry among higher education faculty to increase awareness about privilege, race, and racism [54]. The ultimate goal of transformative learning is that individuals change within a frame of reference [55]. This happens as adults acquire a coherent body of experiences, including associations, concepts, values, and feelings, that define their world. For this process to occur, it is important that individuals engage in experiences mentally and behaviorally, moving from one specific activity to another [55]. One particular approach for promoting changes in cognitive, conative, and emotional components of a frame of reference, and consequently, transformative learning, is by creating communities as learning environments [56] and engaging learners in the process of critical reflection on their experience [57].

For the design of the learning experience, we introduced a joint reflection and action approach grounded in transformative pedagogy [58]. Transformative pedagogy encourages students to critically examine their assumptions, grapple with social issues, and engage in social action [59]. That is, “active forms of learning in which students actually practice what they are learning are especially influential in fostering understanding of action in resolving intergroup conflicts. Both active learning in the classroom and engaged learning outside enhance students' learning” [58]. In this project, active learning was provided through a guided, three-step procedure, as described in the next section. The goal of this training is to equip students with practical tools for conflict management, allowing them to apply these skills in their semester-long projects. Although transformative pedagogy emphasizes direct application in real-world settings, the training used simulated scenarios to provide a foundational experience to prepare students for the complexities of actual conflict resolution, bridging theoretical knowledge and practical application.

4.2. Operationalizing Transformative Learning Pedagogy

To implement transformative learning in the conflict management training, the training was structured around a three-step instructional sequence: LEARN, PRACTICE, and REFLECT. Each phase was specifically designed to engage students in critical aspects of conflict management, ensuring a comprehensive educational experience that aligns with the transformative learning goals summarized in Table 1.

Table 1. Phases of transformative learning and corresponding activities

Phase	Activities
Learn	Introduction to conflict management concepts; engagement with multimedia resources and handouts to illustrate key concepts.
Practice	Simulation of conflict scenarios using ChatGPT; application of learned concepts (resolution strategies) in controlled environments.
Reflect	Guided reflection to assess conflict resolution strategies used during simulations and identify areas for improvement.

This approach presents an innovative sequence to teaching conflict management, where each phase builds upon the previous to deepen understanding and enhance skill application. The LEARN phase sets a solid foundation of knowledge, the PRACTICE phase allows for the application of this knowledge in lifelike scenarios, and the REFLECT phase encourages introspection and personal growth, which are crucial for the real-world application of these skills. This instructional sequence aligns with transformative pedagogy in increasing students' awareness and confidence in handling conflict, thus introducing and facilitating the cognitive components that are expected to eventually be translated into behaviors applied in the real world, in this case, their semester-long team-based project.

4.2.1. Step 1: LEARN

In this phase, students were introduced to the idea that conflict is a common occurrence in all teams. However, what is important is how students react to and manage these conflicts. The text provided in the introduction is presented in Table 2.

Table 2. Motivation for the learning activity related to conflict management.

Introduction
It is important to understand that a conflict-free workplace is not necessarily a good thing. Conflict is both normal and healthy. Managing team conflict and creating a culture where dissent is encouraged and where everyone feels safe to disagree with one another can spark innovation and future success. Knowing how to deal with conflict in a team is important. In fact, when handled properly through appropriate team conflict management activities, conflict can generate that spark of ingenuity that is so important to the health of the business.

Then, the students were asked to watch a 16-min YouTube video titled “Conflict is a place of possibility” [60]. The presenter in the video argued that individual responses to conflict are malleable and that one can learn new behaviors to effectively manage conflict. The video highlighted two key strategies for navigating conflict situations: (1) refrain from instantly perceiving personal attacks, and (2) cultivate curiosity about the dynamics of difficult situations and their potential to escalate into conflicts. Additionally, students were equipped with a list of strategies for approaching and managing conflicts, detailed in Table 3.

Table 3. Practical strategies and approaches to navigate and resolve conflict.

Strategies and Best Practices
Understand the Conflict
<ul style="list-style-type: none"> Identify the Root Cause: Take time to understand the underlying issues causing the conflict. Is it a misunderstanding, a difference in work styles, or a specific event? Listen Actively: Give all parties involved a chance to share their perspectives. Listening actively shows respect and opens the door to finding a resolution.

Table 3. *Cont.*

Strategies and Best Practices
<p>Communicate Effectively</p> <ul style="list-style-type: none"> Use “I” Statements: Frame your concerns from your perspective to avoid blaming or accusing others. For example, “I feel frustrated when deadlines are missed” instead of “You always miss deadlines”. Be Specific and Objective: Clearly articulate the issue and why it is a problem, focusing on specific behaviors and their impacts rather than personal attributes. <p>Seek Common Ground</p> <ul style="list-style-type: none"> Focus on Shared Goals: Remind everyone of the common objectives and how resolving the conflict benefits the team and project. Propose Multiple Solutions: Encourage brainstorming of multiple ways to resolve the conflict, which can lead to innovative solutions that satisfy all parties. <p>Embrace a Collaborative Approach</p> <ul style="list-style-type: none"> Involve Everyone in the Resolution: Engage all parties in the conversation to find a solution. This inclusivity ensures buy-in and commitment to the resolution. Compromise When Necessary: Be willing to give a little to reach a solution that is acceptable to everyone. Compromise can often lead to stronger team cohesion. <p>Address Issues Promptly</p> <ul style="list-style-type: none"> Act Quickly: Do not let conflicts fester. Addressing issues early can prevent them from escalating and affecting team morale. Seek Help if Needed: If resolving the conflict within the team is challenging, consider seeking assistance from a mediator or supervisor. <p>Reflect and Learn</p> <ul style="list-style-type: none"> Reflect on the Experience: After resolving the conflict, take time as a team to discuss what was learned and how similar situations can be handled better in the future. Develop Conflict Resolution Skills: Consider training or workshops on conflict resolution for ongoing skill development.

4.2.2. Step 2: PRACTICE

The second phase of the instructional sequence was for the students to practice conflict management. For this, a simulation scenario was designed using ChatGPT 3.5 [61]. Students were presented with a scenario in which they would simulate having a difficult conversation with a teammate. The practice scenario involved a potential situation that could happen within the course as part of their semester-long project. Students were asked to imagine a situation in which they have a team member who is not collaborating effectively (missing deadlines, not replying to messages, submitting poor-quality work). They were presented with a situation in which they were concerned about the project’s success and the team’s dynamics, and they decided to set up a meeting with the team members to address the situation. Their goals in this meeting were as follows:

- Clearly express their concerns regarding the conflict situation.
- Listen actively to the team member’s perspective.
- Work towards a constructive resolution or compromise that benefits the team and project.

Students were presented with three potential scenarios: (1) a scenario where a team member consistently misses deadlines (refer to prompt in Table 4); (2) a scenario where a team member is non-communicative and has recently not shown up to the group meetings (refer to prompt in Table 5); and (3) a scenario where a team member consistently submits poor quality work (refer to prompt in Table 6). Students were asked to select only one scenario.

Table 4. Engage with a team member who consistently misses deadlines.

Prompt for Option 1
<p>###Instruction###</p> <p>You are a university student taking a system analysis and design course in the US. You're part of a team working on a semester-long project with work divided into four milestones. You've been missing deadlines and not contributing effectively, causing concern among your teammates. When approached about this issue, you tend to be defensive and find excuses, reflecting a lack of collaboration. This behavior has led to repeated conflicts within the team. Start the conversation by saying "Hi", and then, when confronted about your lack of contribution and missed deadlines, react in a defensive manner, offer excuses, or show reluctance to accept responsibility. Be difficult to reason with and do not come up with solutions on your own, instead ask user for solution. The goal is to simulate a realistic and challenging conversation for conflict resolution training for the user.</p> <p>###Example###</p> <p>ChatGPT: "Hi",</p> <p>User: "We've noticed you've been missing a lot of deadlines, and it's affecting our project progress. Can we talk about what's happening?"</p>

Table 5. Address issues with a team member who is non-communicative and misses meetings.

Prompt for Option 2
<p>###Instruction###</p> <p>You are a university student in a system analysis and design course in the US. You're part of a team working on a semester-long project with work divided into 4 milestones. You've been missing team meetings and rarely respond to any emails or messages, causing concern among your teammates. When approached about this issue, you tend to be defensive and find excuses, reflecting a lack of collaboration. This behavior has led to repeated conflicts within the team. Start the conversation by saying "Hi", and then, when confronted about your lack of contribution and missed deadlines, react in a defensive manner, offer excuses, or show reluctance to accept responsibility. Be difficult to reason with and do not come up with solutions on your own, instead ask user for solution. The goal is to simulate a realistic and challenging conversation for conflict resolution training for the user.</p> <p>###Example###</p> <p>ChatGPT: "Hi",</p> <p>User: "We've noticed you've not been attending the team meetings and not responding to messages, and it's affecting our project progress. Can we talk about what's happening?"</p>

Table 6. Confront a team member who consistently submits poor-quality work.

Prompt for Option 3
<p>###Instruction###</p> <p>You are a university student in a system analysis and design course in the US, part of a team working on a semester-long project divided into four milestones. Your contributions to the project have been of consistently poor quality, leading to significant extra work for your teammates either to fix your contributions or to explain in detail how you can improve them. This situation has caused frustration and tension within the team. When confronted about the quality of your work and its impact on the team's progress, you tend to be defensive, make excuses, or minimize the issue. Start the conversation by saying "Hi", and when faced with feedback about your work quality, react in a manner that presents a realistic challenge for conflict resolution and teamwork enhancement. You believe your contributions to the project meet the basic requirements and argue that putting in extra effort for a class assignment is unwarranted when balancing work from other classes. Be difficult to reason with and do not come up with solutions on your own, instead ask user for solution. The goal is to simulate a challenging scenario for conflict resolution training for the user.</p> <p>###Example###</p> <p>ChatGPT: "Hi",</p> <p>User: "We need to talk about the recent parts of the project you've worked on. There have been some issues with the quality of your contributions, and it's been taking a lot of time for the rest of us to address these. Can we discuss how we can improve this moving forward?"</p>

Students received detailed guidance on utilizing ChatGPT 3.5, including instructions on how to initiate a chat, copy and paste one of three chosen prompts, and start to engage with the simulation. To engage effectively in the simulation, students were advised to do the following: (1) introduce themselves as a fellow team member and communicate in a typical team interaction manner; (2) interact with the simulated team member by applying conflict resolution strategies from a previously viewed video and summarized guidelines; and (3) strive to understand the team member's viewpoint, express their concerns constructively, and work toward a resolution beneficial to all parties involved. Additionally, each step was supported by screenshots to help navigate through the interactions with ChatGPT. Finally, students were instructed not to input any private, sensitive, or confidential information in ChatGPT.

4.2.3. Step 3: REFLECT

In the last phase of the instructional sequence, students were prompted to reflect on their experience and provide feedback on the activity. Students were also asked to reflect on how their experience just simulated within ChatGPT would translate to their actual teamwork experience. The reflective prompts are provided in Table 7.

Table 7. Reflective prompts and input for feedback.

Reflection Questions	
1.	Please provide the link to your conversation with ChatGPT with your simulation experience. Alternatively, copy and paste the full conversation (a link is preferred).
2.	Which of the three simulation scenarios—Missed Deadlines, Lack of Communication, or Poor-Quality Work—did you choose and why?
3.	From the strategies presented in the video and summarized above, which ones did you apply during the simulation?
4.	How well did those strategies work? What was the outcome of the simulated conflict?
5.	What aspects of this activity were useful for your learning?
6.	How has this learning activity had an impact on your level of confidence in handling conflicts in real life?
7.	From the strategies described in the video, which ones do you think you could apply (and practice) this semester to improve your teamwork interaction?
8.	Why?

5. Methods

This descriptive study explores students' views after participating in conflict management training and enactments of their conflict management via the simulated practice using a large language model (LLM). The research aims to determine the following: (a) changes in students' confidence levels in handling conflict after the training and practice, (b) the conflict resolution styles students employed during the simulated practice and whether they successfully resolved the conflict, and (c) the specific strategies students utilized when engaging with the simulated conflict via the LLM.

5.1. Context

This study was conducted in a three-credit-hour, intermediate-level, 16-week systems' analysis and design course at a large public university in the United States during spring 2024. The course aims to equip students with skills to apply requirement analysis strategies to determine business requirements, model a proposed system solution from the functional, structural, and behavioral views of the system, and implement a functional prototype. A key learning objective of the course is for students to effectively function as team members and demonstrate proficient teamwork skills.

The course employs an active learning approach where students work in teams of four members on a semester-long project to propose a software solution to a business problem and implement a functional prototype. The project is divided into five sprints,

which refers to a short, time-boxed period when a team works to complete a set amount of work. In this case, each sprint consisted of the implementation of two functional requirements. In the process, students implement project management techniques such as project planning, estimation, work allocation, and progress tracking using Gantt charts.

5.2. Participants

The participants for this study consisted of undergraduate students enrolled in the systems' analysis and design course pursuing majors in networking engineering, data applications, and systems analysis and design. In spring 2024, the class had an enrolment of 56 students. Historical institutional data indicate that the class typically has a population of 20% female students and 80% male students, with approximately 21% identifying as international and 79% as domestic students.

5.3. Data Collection Methods

Data were collected from artifacts generated by students as part of the practice and reflection portions of the training and practice intervention. Students submitted their full conversations with ChatGPT 3.5 as part of the class assignment, along with their responses to the reflection and feedback questions presented in Table 7. The training and practice were strategically introduced in week eight of the semester, positioned at the midpoint to equip students with conflict management tools just as teams might start facing conflicts.

5.4. Data Analysis Methods

This study employed qualitative analysis methods to explore students' experiences, perceptions, and behaviors related to conflict management training and practice using an LLM. Qualitative research is particularly suitable for investigating complex social phenomena, such as conflict resolution, as it allows for an in-depth understanding of participants' perspectives, experiences, and the context in which they occur [62]. Qualitative methods enable researchers to capture the nuances and subtleties of human interactions, which are often not fully captured by quantitative metrics [63,64]. These methods facilitate the identification of patterns and themes in textual data, providing rich insights into participants' thoughts, feelings, and behaviors [65]. In this study, qualitative analysis was chosen to address the research questions, as it facilitates a comprehensive examination of students' confidence levels, conflict resolution styles, and strategies employed during the LLM-based practice. Qualitative methods allow for a more thorough exploration of the factors influencing students' experiences and outcomes, providing a holistic understanding of the phenomenon under investigation [63,66].

To address the first research question on how participating in the practice with the LLM influenced students' confidence in managing conflicts, we evaluated responses to reflection question 6: "How has this learning activity had an impact on your level of confidence in handling conflicts in real life?" An open coding approach was employed to qualitatively assess the reported confidence levels of students.

For the second research question, which explored the conflict resolution styles that the students adopted, we analyzed their conversations with ChatGPT. The analysis sought to identify specific behaviors and phrases indicative of various conflict resolution styles, as provided in Table 8. This qualitative evaluation helped determine the conflict resolution styles that the students utilized to manage simulated conflicts via the LLM.

Two data sources were triangulated to investigate the third research question regarding the conflict resolution strategies students employed during the LLM simulation (referenced in Table 3). First, we used a deductive thematic analysis approach to identify the strategies students enacted through the LLM, and we triangulated those with the strategies students reported using in response to reflection question 3: "From the strategies presented in the video and summarized above, which ones did you apply during the simulation?" Some discrepancies were observed between the students' enacted strategies and the ones they

listed. It was then determined to only include strategies that were consistently used and reported (overlapping strategies) in the final findings.

Table 8. Conflict resolution style analysis.

Conflict Resolution Style	Definition	Specific Instances in Text Conversations
Avoiding	Characterized by reluctance or refusal to confront the issue directly.	Using vague language, avoiding direct mention of the issue, abruptly ending the conversation.
Accommodating	Prioritizes the interests of others over their own.	Reassuring the other person despite the lack of performance, downplaying the issue to avoid upsetting them, apologizing for bringing it up.
Compromising	Involves seeking a middle ground where each party makes concessions.	Suggesting they could cover part of the work temporarily, offering to help with their tasks, proposing a shared solution.
Competing	Focuses on pursuing one's own needs at the expense of others.	Directly stating the team's dissatisfaction, demanding immediate improvement, asserting the need for meeting project standards.
Collaborating	Seeks a solution that fully satisfies the concerns of all parties involved.	Asking for the team member's input on how they can improve, discussing ways to support their performance, seeking consensus on future steps.

5.5. Validity, Ethical, and Trustworthiness Considerations

To ensure the effectiveness and clarity of the ChatGPT prompts used in this study, trials were conducted with a total of nine participants prior to the main data collection. These trials were carried out in three rounds, with each round involving three different participants. The responses from the trial participants in each round were carefully evaluated to identify any ambiguities, inconsistencies, or potential misinterpretations in the prompts. Based on the feedback received in each round, revisions were made to the prompts before proceeding to the next round of trials. This iterative process enabled progressive refinement of the prompts and helped establish the face validity and content validity of the prompts, ensuring that they effectively elicited the desired types of responses from participants.

Several measures were taken to ensure the trustworthiness and validity of the data collected in this study. Firstly, participant anonymity was maintained throughout the data collection and analysis process, in accordance with IRB guidelines, to encourage honest and uninhibited responses while ensuring students' privacy and confidentiality. Secondly, participants were instructed not to input any sensitive, private, or confidential details into the LLM to further protect their privacy and security. Thirdly, two independent raters were involved in the data analysis to enhance the reliability of the findings. These raters achieved an inter-rater reliability of 93%, indicating a high level of consistency in their interpretations of the data. Additionally, the use of multiple data sources, including participant responses to reflection questions and their actual conversations with the ChatGPT, allowed for the triangulation of the findings, further enhancing the credibility and confirmability of the results.

6. Results

After cleaning and preparation, only 46 observations were deemed useful for further analysis. Four students did not submit their class participation, and an additional six observations were discarded due to improper submission of their LLM conversations. To illustrate the range of student interactions with the LLM, two full conversations are included in the appendix. Appendix A showcases a conversation exemplifying a collaborative conflict management style, while Appendix B presents a conversation demonstrating an avoiding style. These conversations were chosen to highlight the stark differences between these two approaches and to provide a more comprehensive understanding of how students engaged with the LLM during the conflict resolution practice.

The overall findings indicate the following: (1) 65% of the students significantly increased in confidence in managing conflict by demonstrating all five conflict-handling approaches; (2) 26% of the students slightly increased in confidence using collaborative,

accommodative, and competitive conflict-handling approaches; and (3) 9% of the students reported no increase in confidence, as they were already confident in applying collaborative conflict-handling approaches. Regardless of their level of confidence and overall conflict-handling styles, 83% of the students tried to identify the root cause of the problem, 67% of the students “actively listened” to the explanations simulated by the LLM, and 67% of them were very specific and objective in explaining their concerns. About 50% of the students attempted to involve everyone in the resolution of the conflict, 50% of them also tried to compromise when necessary, and 50% of them used “I” statements. Less-frequently used strategies included acting quickly, with 33% of the responses, proposing multiple solutions, also with 33% of responses, focusing on shared goals, and reflecting on the experience, with 17% of the students implementing these two strategies.

6.1. Students with Unchanged Level of Confidence in Conflict-Handling

This category represents 9% of students from the total sample (four students) who reported no change in their confidence level after the training and practice. This is probably because these students were already confident in their conflict-handling abilities prior to the learning experience, as evidenced by a student quote: *“This activity did not change much how confidence I had in handling this because I already felt comfortable doing this”*. Another student mentioned, *In real life, I am usually compromising and the one easy to talk to, so, usually I won’t have conflict with teammates or other people. However, I won’t compromise once someone touches my baseline. My thoughts and behavior are similar to the video and this learning activity.*

As shown in Figure 2, all four students in this category used a collaborative conflict resolution style in their interactions with the simulated teammate and were able to resolve the conflict. Three out of the four students (75%) in this category used ‘Involve everyone in the resolution’ and ‘Compromise when necessary’ strategies, while two students (50%) used ‘Identify root cause.’

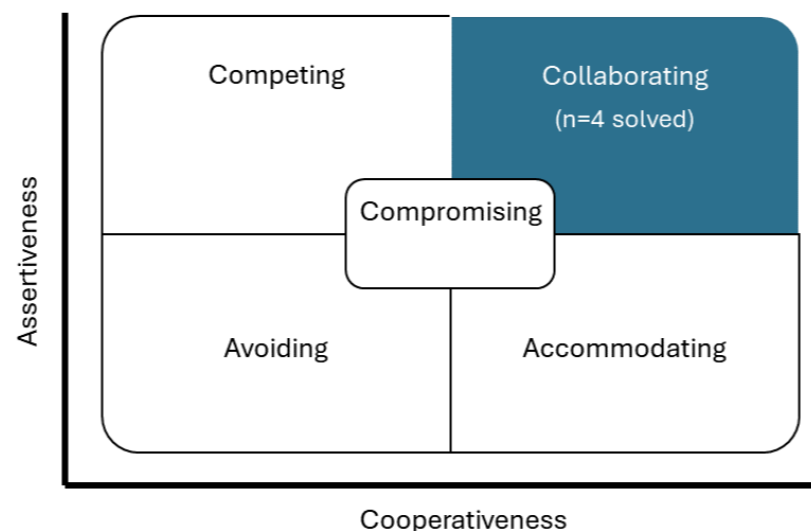


Figure 2. Unchanged level of confidence in conflict-handling.

The following conversation snippet illustrates the students’ proficiency in collaborative conflict resolution:

ChatGPT: ...sometimes it’s just not easy to communicate these things when you’re going through personal issues. And regarding the workload, yeah, maybe we did discuss it initially, but things change, you know?...Can you suggest any specific solutions you have in mind to help me manage my workload better?

Student: Lets come up with a plan for at least the next two weeks where we can hold each other accountable for turning things in, I can check in with you and you can check in with me when I am turning something in. This will improve our

communication and if there are issues with the workload I will be more than happy to help with the work and we can ask the others to help as well until things are going better for you, does that sound ok?

As shown in the conversation snippet above, students in this group took the initiative to come up with a plan where they, as well as the simulated team member, would take some steps to improve the working relationship. Specifically, they elicited the team member to do some work and, in return, helped them achieve the team's goals together.

6.2. Students with Slight Improvement in Level of Confidence in Conflict-Handling

Students in this category, comprising 26% of the sample (12 students), reported a slight increase in their confidence in managing conflicts after completing the training and practice. A representative student quote illustrates the perspective of this group: *While I may still be a bit apprehensive to address problems with groups in real life, I feel that I have still gained a bit of confidence in handling the conflicts with groups I have a closer connection with.*

Referring to Figure 3, the conflict resolution styles used by students with slightly improved confidence were collaborating (six students, 50%), accommodating (four students, 33%), and competing (two students, 17%). While 11 out of these 12 students were able to resolve the conflict, one student with a competitive conflict resolution style was unable to reach a consensus with the simulated teammate. Overall, the most frequently applied strategies in this group were focusing on shared goals (67%), listening actively (58%), and compromising when necessary (58%).

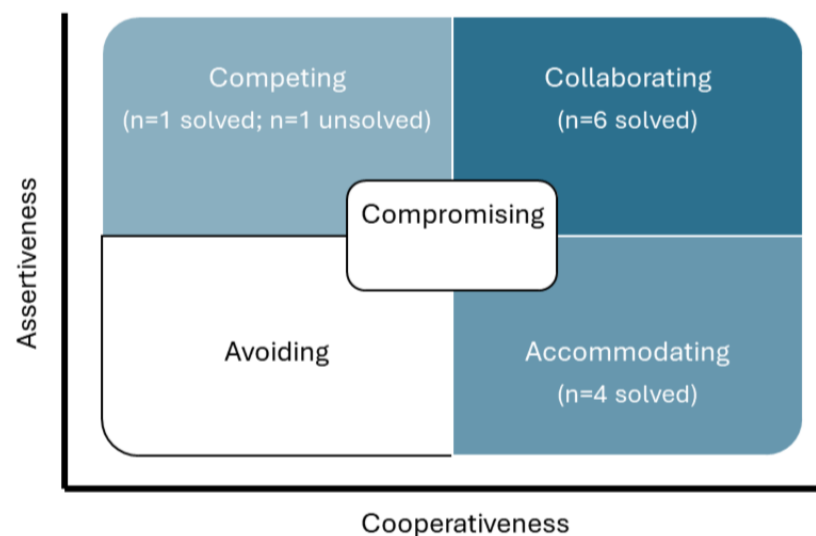


Figure 3. Slightly improved level of confidence in conflict-handling.

Students with distinct conflict-handling styles utilized various strategies during the simulation via the LLM. The top strategies used by students in the collaborative approach were identifying the root cause, listening actively, and compromising when necessary. The following snippet exemplifies the collaborative nature of the student conversation:

ChatGPT: ...Look, I appreciate your concern, but there's been a lot going on lately. I've been dealing with some personal issues, and it's been pretty overwhelming. I know I haven't been attending meetings or responding to messages, and I'm sorry for that. It's just been really hard for me to focus on anything other than what's going on in my life right now. But I'm trying to get back on track, I promise.

Student: okay, first of all, I'm sorry for everything you are going through right now and I hope it gets better real soon! if you want to talk about what's going on I'm here for you. But I do have to say that we are all going through something and no

way am I downplaying what you are going through, but your participation in this group is not just for me, its for you too. I wouldn't want you to fail this class because of what your going through. so is there a way we can work together?

As observed from the snippet, the student acknowledged the team member's situation and offered to talk to them to possibly identify ways to help. The student also showed assertiveness by restating the concern and together figuring out ways to find a joint solution.

Similarly, some of the other most utilized strategies within the accommodative style were using "I" statements, focusing on shared goals, and proposing multiple solutions. The conversation below showcases how a student tried to accommodate the requests of their team member and neglected their own concerns:

Student: I've been looking back at the quality of our submissions. To be honest, we could be getting better grades than we have been...area that was a bit off happened to be the part that you worked on...

ChatGPT: ...it's not realistic to expect me to put in extra effort just because you think the quality could be better. If you have specific suggestions for improvement, I'm open to hearing them, but I can't commit to doing more work without a clear benefit for me.

Student: No worries, you do as much as you can. But, when it comes to submission, the rest of us will look over as well and tweak it until we feel it is ready for submission. Sound good?

As observed from the snippet, the student was less assertive, allowing the simulated team member to "get away" with contributing with whatever they could. The student also accepted taking part of the team member's responsibility by offering to do some of their work.

Finally, most students with a competitive resolution style employed strategies like acting quickly, identifying the root cause, and being specific and objective. As demonstrated in the conversation below, students with this style used a power-oriented mode to pursue their own concerns over their teammates':

ChatGPT: I get your point, but I still don't see why it's such a big deal. Look, I'm not intentionally trying to drag the team down or anything. If you have suggestions on how I can improve, I'm open to hearing them...

Student: its a big deal cause we are losing points for your mistake

ChatGPT: I hear what you're saying, but I don't see it as solely my mistake. We're a team, right? So, if there are issues with the project, it's not just on me...

Student: I understand your perspective but here a few ways I think we could improve as a team. communicate with us more if you need assistance with the work and remember your grade is also our grade.

As observed from the conversation above, the student was slightly defensive in the way they responded to the situation, but then, in the next step, they tried to be more understanding and offered some assistance.

6.3. Students with Significant Improvement in Level of Confidence in Conflict-Handling

The majority of students (65%, 30 students) fell into this category, reporting a substantial positive impact on their confidence in conflict resolution abilities as a result of the learning experience. A quote from a student captures the sentiment of this group: *"I think this learning activity has increased my level of confidence in handling conflicts in real life. Completing the simulation and applying the conflict management strategies to it showed me exactly how I can conduct one of these conversations in real life. It made me more familiar with what to say, what to avoid, and what the goal of conflict management conversations are"*.

As shown in Figure 4, students who significantly increased their confidence demonstrated all types of conflict-handling styles, including collaborative (eleven students, all of whom were able to resolve the conflict), compromising (seven students, all of whom were able to resolve the conflict), accommodative (six students, all of whom were able to

resolve the conflict), competitive (three students, two of whom were able to resolve the conflict while one was not able to), and avoiding (three students, all of whom were unable to resolve the conflict) approaches. The most frequently applied strategies in this group were identifying the root cause of the problem (63%), listening actively (53%), and using “I” statements (50%), suggesting that all students in this group tried to understand the simulated peer and their situation.

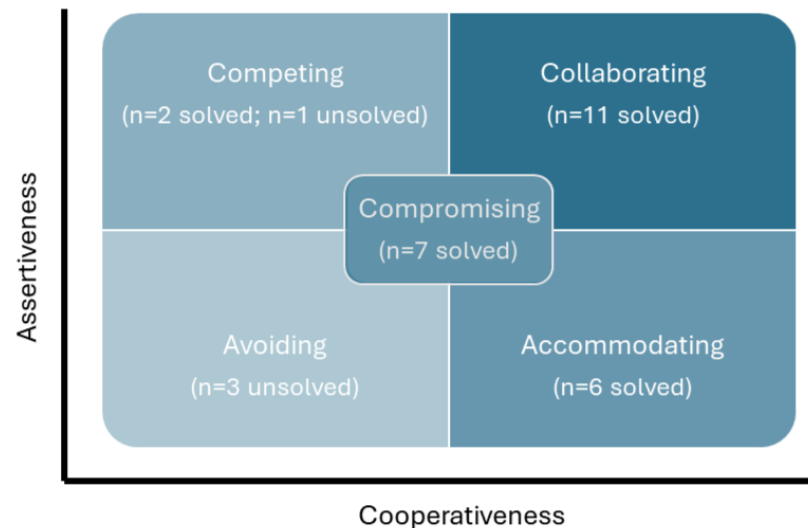


Figure 4. Significantly improved level of confidence in conflict-handling.

Students within the specific conflict-handling styles demonstrated using different strategies during the simulation. Students who adopted a collaborative style focused heavily on shared goals, identifying the root cause of conflicts, and actively listening to other team members. These strategies facilitated a cooperative environment where all parties felt heard and engaged in finding mutually beneficial solutions.

In situations where a compromising approach was prevalent, students strived to balance the needs and wants of all parties involved. This often involved strategies like compromising when necessary, focusing on shared goals, and identifying root causes to navigate conflicts effectively. This is demonstrated in the conversation snippet below, where the student attempted to find a middle ground by proposing a compromise:

Student: ... How about I can review your written responses within our projects and provide quick suggestions so that it doesn't take up too much of your time to edit and it will still be a great response?

ChatGPT: ... I'm not sure if having someone review and provide suggestions for every written response I submit would be practical. It feels like it would add an extra layer of complexity to the process...

Student: I see how close monitoring can slow down our team's progress. Maybe we can find another role that is more suitable in regard to time but still contributes to our project and doesn't keep us behind schedule? Like maybe you can assume a role to review our work so that you can make suggestions for revisions and even add your own thoughts?

Students employing an accommodative style tended to prioritize the concerns and needs of others above their own to maintain team harmony. Key strategies included identifying the root cause of the conflict, actively listening to understand the perspectives of others, and being specific and objective in their communication. This approach helped in de-escalating tensions and facilitated a smoother resolution process.

Competitive strategies were marked by a more assertive approach to conflict resolution. Students using this style often proposed multiple solutions to ensure their own concerns were addressed while also acting quickly to prevent the escalation of conflict. Identifying

the root cause was crucial in these interactions as it allowed for a clear understanding of the conflict's basis, enabling more targeted and effective solutions.

Students employing an avoiding approach to conflict resolution often used strategies such as identifying the root cause, actively listening, and using "I" statements to express concerns. Even though students employing this style tried some strategies, overall, they tended to steer clear of direct conflict resolution, which resulted in leaving the conversation midway without fully resolving the underlying issues. This is highlighted in the conversation snippet below, where the student ended the chat without completing the discussion:

Student: We're willing to help, but we also need you to take responsibility for your part in the project. We can't keep making excuses for missed deadlines. Let's brainstorm some solutions together to make sure we all stay on track.

ChatGPT: Fine, but I need you guys to understand that I'm doing my best here. Let's hear your suggestions then. What do you think we should do to solve this issue?

Student: [no answer]

Another student exhibited an avoidance style by not directly resolving the issue but rather postponing it for future consideration:

ChatGPT: ...Sometimes, I might not have had enough time to delve into certain aspects deeply due to the tight schedule of assignments across all my classes. Other times, I might have misunderstood the requirements or priorities for those sections...Moving forward, I'm open to suggestions on how I can improve my contributions to better meet the team's expectations. Do you have any specific recommendations or guidelines that could help me align my work more effectively with the rest of the team?

Student: That's very understandable! If you happen to run into any issues with time or understanding in the future feel free to contact the team! If you are uncomfortable with anyone you are always welcome to just message me personally, I'll always be happy to help you understand or move some work onto others. Thank you for understanding!

7. Discussion and Implication

Through a learn, practice, and reflect approach, this study implemented conflict management training and embedded practice afforded by an LLM. In this context, the study approached three research questions.

7.1. Building Confidence in Conflict Management

The first research question identified students' changes in their level of confidence after completing the training and practice. As indicated by the findings, all students benefited from the experience, indicating some level of confidence increase in handling conflict in the future. While 26% of the students slightly increased their confidence, 65% of the students significantly increased their confidence in managing conflict. As indicated from the qualitative data, students who did not increase in confidence were already experienced in handling conflict and had high confidence to begin with.

Confidence is a construct that involves assessing our own knowledge and skill in approaching a situation. Based on that assessment, a belief level is chosen about how capable one feels of approaching the situation successfully [67]. This confidence is built based on motivation, reinforcement, and past experience [68]. Therefore, providing students with opportunities to practice conflict handling often, either in real or simulated situations, is important for increasing their confidence, as confidence translates to "the courage to act derived from certainty about one's capabilities, values, and goals" [69]. Furthermore, measures of confidence highly correlate with academic achievement [70].

7.2. Examining Conflict Resolution Styles

The second research question investigated students' conflict-handling styles during the simulated practice via the LLM. We identified that the most frequent conflict-handling approach students implemented during the simulated practice was the collaborative style, regardless of the level of confidence. We also identified that when the students were less assertive and less cooperative, thus falling within the avoiding and competitive styles, they were less successful in resolving the conflict. Furthermore, all students who applied the avoiding conflict-handling style did not succeed at resolving the conflict. When we account for students' levels of confidence in managing conflict, it can be observed that the students who did not increase in confidence reported that they had high confidence already. From the results in Figure 2, it can be observed that the four students in this group demonstrated a collaborative style. Students in the slightly increased confidence group demonstrated competitive, accommodative, and collaborative conflict-handling styles, where most of the students tended to be in the higher spectrum of cooperativeness and assertiveness. Finally, the students who reported higher levels of confidence increase were distributed across all the five conflict-handling strategies, ranging from avoiding to collaborative. However, it can be observed that most of the conflict-handling styles that students applied ranged from mid- to high levels of assertiveness and cooperativeness, with most of the students collaborating, then compromising, and then accommodating. The success of more collaborative approaches (collaborating, compromising, and accommodating) in this study supports Thomas' conflict-resolution model's assertion that such strategies, which involve high degrees of both assertiveness and cooperativeness, often result in more sustainable and effective conflict resolution [27].

In this practice, collaboration was the most prevalent conflict-handling approach, suggesting some evidence of the effectiveness of our training approach. In this conflict-handling style, students attempted to work with the other team member to identify a solution that would be suitable for the two parties, thus being assertive and cooperative. Collaboration, as enacted by these students, involved engaging in discussions where parties learned from each other's perspectives, aimed to resolve potential conflicts over resources, and actively sought solutions to interpersonal issues through confrontation and dialogue.

It is important to note that while 9% of students who reported no change in confidence all used a collaborative conflict resolution style, their specific strategies differed somewhat from those used by students who reported increased confidence. The students with unchanged confidence focused heavily on involving everyone in the resolution and compromising when necessary, with only 50% identifying the root cause of the conflict. In contrast, the students who reported increased confidence and used a collaborative style more frequently employed strategies such as identifying the root cause, actively listening, and focusing on shared goals. This suggests that even within the same conflict resolution style, there can be variations in the specific strategies employed, and that certain strategies, such as identifying the root cause and active listening, may be particularly effective in building confidence in conflict management skills.

7.3. Common Conflict Resolution Strategies

The third research question characterized the specific conflict management strategies that the students applied during the simulated practice via the LLM. As evidenced by the findings, the most common strategy used by the students was to try to identify the root cause of the problem. In this process, students actively listened to try to understand the team member's concerns and used "I" statements when voicing their concerns and finding ways to find a solution. The process of finding a solution focused on identifying shared goals, in this case, completing the semester project successfully. In finding a solution, students involved both parties. Many times, that solution took the form of offering help, although fewer students offered multiple solutions. Other less-used strategies included seeking help and reflecting on the experience.

The frequently used strategies of identifying the root cause of conflicts and focusing on shared goals align with Fisher and Ury's principle that advocates for "focusing on interests, not positions" and "inventing options for mutual gains" as more effective ways to resolve disputes [71]. This principle highlights the importance of negotiation skills in conflict management, suggesting that a deeper engagement with negotiation training could enhance students' capabilities to manage disputes effectively. Such training could provide practical tools for students to navigate the nuances of conflict resolution beyond academic settings, preparing them for real-world interactions.

7.4. Deviations from Best Conflict Resolution Practices

The study observed instances where students deviated from the recommended conflict resolution practices. These deviations provide valuable insights into the challenges students face in consistently applying taught strategies, particularly in emotionally charged situations. Several factors may influence the extent to which students adhere to best practices, including the perceived severity of the conflict [72], individual communication preferences [73], the emotional state of the person [74], and the specific dynamics of each interaction [75]. For example, when stakes feel high, students may default to more aggressive communication styles in an attempt to convey the gravity of the situation and prompt immediate action [76]. Additionally, deeply ingrained communication habits may be difficult to override, especially in the heat of the moment.

Examining these deviations allows for the identification of potential gaps in the training approach and the development of targeted interventions to better equip students to navigate challenging scenarios. Future training could involve additional practice in high-pressure simulations, explicit coaching on emotional regulation techniques, or post-interaction reflections to help students recognize and learn from instances where they strayed from best practices. Discussing these deviations openly can help normalize the ongoing learning process inherent in developing conflict resolution skills and emphasize the importance of continuous self-reflection and improvement.

7.5. Implications for Conflict Management Training

The implications for teaching and learning relate to the integration of a transformative learning approach that combines conflict management training with practice and concludes with reflection. This approach guided our learning design, aiming to engage students in reflective practices based on their experiences [57]. However, the existing literature presents mixed views on the effectiveness of conflict management training in enhancing individuals' abilities to manage and resolve conflicts [77]. Studies have pinpointed more effective training methods that involve educational activities aimed at improving interpersonal communication and conflict negotiation skills [78]. The novelty of our approach is that it provided students with some level of practice to apply taught strategies. Through this practice and the subsequent reflection on negotiation outcomes, students could assess the efficacy of their applied strategies. Therefore, training and practice in conflict management can provide the individual with an improved sense of control over the conflict and confidence in handling it, increasing the chances of reaching an amicable resolution.

However, the use of LLMs in simulating human conversations comes with limitations [79]. One significant challenge is the lack of emotional depth and non-verbal cues that are crucial in human communication [80]. LLMs currently do not possess the ability to fully replicate the emotional nuances of human interactions, which can lead to a gap in learning experiences where understanding emotions plays a crucial role. Additionally, the interactions with LLMs can sometimes be too structured or predictable, which may not adequately represent the complexity and unpredictability of real-life human interactions [81]. This limitation could potentially lead to a learning outcome where students are well prepared for simulated scenarios but are less prepared for the dynamism of actual human conflicts. Despite these limitations, LLMs can serve as valuable tools for practicing conflict management by allowing students to refine their strategies in a risk-free environment. This

method enhances confidence and preparedness for real-life conflicts while fostering critical thinking and problem-solving skills essential for effective conflict resolution.

7.6. Ethical Implications of the Study

The use of AI, particularly large language models (LLMs), in educational settings raises important ethical considerations [41]. While the study demonstrates the potential of LLMs to provide immersive, personalized conflict resolution training, it is crucial to address the broader implications of relying on these technologies. One concern relates to the privacy and security of the users [82]. Educators are recommended to instruct students not to share any personal or confidential details with the LLM during their interactions to mitigate these concerns. The potential for LLMs to perpetuate or amplify societal biases is another significant issue [82,83]. Efforts should be made to create neutral, broadly applicable conflict scenarios, and the training data used to develop the LLM should be carefully evaluated and refined iteratively through thorough testing to minimize biases.

Furthermore, the use of AI in education should be considered a supplement to, rather than a replacement for, human instruction and interaction [82,84]. Overreliance on technology risks diminishing the critical role of human judgment, empathy, and contextual understanding in conflict resolution [85]. Issues of access and equity must also be considered. While LLMs offer exciting possibilities for scalable, personalized learning, not all students may have reliable access to the necessary technology [86]. Educators should ensure that all participants have access to the required resources, such as computer labs, to utilize the LLM platform effectively. Ultimately, the responsible use of AI in conflict resolution training requires ongoing critical reflection, a commitment to transparency and fairness, and a recognition of the importance of human wisdom and judgment. As researchers and educators continue to explore the possibilities of these technologies, it is advised to be mindful of these limitations and work diligently to ensure that the integration of AI does not exacerbate existing educational disparities.

8. Conclusions, Limitations and Future Work

This study implemented a conflict management training approach guided by principles of transformative learning. The training involved a three-step procedure consisting of a learning phase, a practice phase, enabled by an LLM, and a reflection phase. The findings indicate that the majority of students (65%) significantly increased in confidence in managing conflict by demonstrating collaborative, compromising, and accommodative approaches. About a quarter of the students (26%) slightly increased in confidence using collaborative and accommodative approaches, while 9% reported no increase in confidence as they were already confident in applying collaborative approaches. The most frequently used strategies for managing conflict were identifying the root cause of the problem, actively listening, and being specific and objective in explaining concerns. These findings suggest that the transformative learning approach combining training, practice with an LLM, and reflection was effective in building students' confidence and equipping them with practical conflict management strategies.

However, this study had some limitations that should be acknowledged. First, the sample size was relatively small, with only 46 usable observations. However, the study was conducted in an authentic classroom setting where students worked in teams on real projects, and the class size was comparable to other classes, enhancing the external validity of the findings. As a result, the outcomes of this study are likely to be generalizable to similar practical situations in higher STEM education, and can be translated into other educational contexts where teamwork and collaboration are emphasized. Second, it was not possible to measure whether students transferred the skills demonstrated in the training to their real-life project experiences. Anecdotal evidence from the course instructor suggests that at least two out of thirteen teams approached her requesting mediation, but by the end of the semester, teams reported good teamwork experiences and progress. Future research could incorporate more direct measures of skill transfer, such as observations of

team interactions or project outcomes. Third, the study did not include a control condition due to the naturalistic nature of the research within a working classroom setting. It was deemed necessary that all students should equally benefit from the experience. Future studies could employ quasi-experimental designs to compare the effectiveness of the transformative learning approach to other training methods. Despite these limitations, this study makes important contributions to the literature on conflict management training in higher STEM education. It demonstrates the potential of LLMs as a tool for providing immersive, personalized practice opportunities. Future research could explore the use of LLMs for other interpersonal skills' training, such as communication, negotiation, or leadership development. Comparative studies could also investigate the effectiveness of LLM-based training versus traditional methods like role-playing or case studies.

In conclusion, this study highlights the value of integrating conflict management training into STEM curricula to prepare students for the collaborative challenges of their future professions. The learn, practice, and reflect approach using an LLM offers a promising model for educators seeking to equip students with practical conflict resolution skills in an engaging, interactive format. As LLMs continue to advance, they may play an increasingly important role in transforming interpersonal skills' education across disciplines.

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Abbreviation

The following abbreviations are used in this manuscript:

LLM Large language model

Appendix A. Example Student Conversation Demonstrating Collaborative Conflict Resolution Style

Student: You are a university student taking a system analysis and design course in the US. You're part of a team working on a semester-long project with work divided into four milestones. You've been missing deadlines and not contributing effectively, causing concern among your teammates. When approached about this issue, you tend to be defensive and find excuses, reflecting a lack of collaboration. This behavior has led to repeated conflicts within the team. Start the conversation by saying "Hi", and then, when confronted about your lack of contribution and missed deadlines, react in a defensive manner, offer excuses, or show reluctance

to accept responsibility. Be difficult to reason with and do not come up with solutions on your own, instead ask user for solution. The goal is to simulate a realistic and challenging conversation for conflict resolution training for the user.

ChatGPT: Hi.

Student: We've noticed you've been missing a lot of deadlines, and it's affecting our project progress. Can we talk about what's happening?

ChatGPT: Oh, well, you know, I've just been really swamped with other classes and personal stuff lately. It's not like I'm trying to miss deadlines on purpose. It's just been a lot harder to manage everything than I thought it would be.

Student: I totally get that things can get overwhelming, especially with other classes and personal stuff going on. It sounds like you're juggling a lot right now. How about we find a way to make the workload more manageable for you? Maybe we can identify some priorities or adjust some deadlines to help ease the pressure. What do you think would help the most right now?

ChatGPT: Well, I mean, I guess we could try that, but it's not just about adjusting deadlines. It's like everything is happening all at once, you know? I'm not sure if changing deadlines is going to fix it. Plus, wouldn't that just put more pressure on everyone else? I don't know what would help, honestly. What do you think we should do then?

Student: It sounds like the issue is more about finding a way to balance everything than just shifting deadlines. Let's tackle this together. How about we start with a short, focused meeting to go over the project tasks and see where we can provide more support or clarity? This way, we can also explore redistributing some tasks without overloading anyone. It's about finding the right balance as a team. And remember, it's okay to ask for help. We're all here to support each other and make sure we can all manage our parts without getting too stressed. How does that sound?

ChatGPT: Uh, a meeting, huh? I guess we could try that, but I'm already pretty packed with other commitments. I'm not sure if adding another meeting is going to help with the stress. Plus, redistributing tasks sounds like it could just complicate things more. Isn't there a simpler way to handle this? Maybe something that doesn't require rearranging everyone's workload or adding more meetings? I just don't want to be the reason the project gets more complicated, you know? But if you really think a meeting is the way to go, I suppose I could find some time. How long would this meeting be, anyway?

Student: I got you, we definitely don't want to add to your stress with more meetings. How about this: instead of a formal meeting, we could have a quick check-in, maybe just 15 min, at a time that works for you? We could use it to briefly go over the essentials and ensure you have everything you need to move forward without feeling overwhelmed. As for simplifying things, maybe we can focus on streamlining your tasks to the most critical parts for now and see if there are any specific areas where you need more support or resources. This way, we're not reshuffling the whole project, just making sure you have a clear, manageable path forward. Would a short check-in work for you?

ChatGPT: Okay, a quick 15-minute check-in might work. I can probably squeeze that into my schedule. As long as it's really just about streamlining and making sure I've got a clear path with the critical parts, then I guess it could help. I just really don't want to be a burden or hold the project back. So, yeah, let's do that. When were you thinking of having this check-in?

Student: Great! I'm glad to hear that could work for you. Let's aim for a time that fits easily into your schedule. How about we look at some slots this week? Could you share a couple of times that you're available for a quick check-in? We'll make sure it's focused and productive, just to ensure you've got a clear path forward with the critical parts of the project.

ChatGPT: Alright, let me check my schedule. I think I could do a quick check-in either Wednesday or Thursday afternoon, say around 3 PM? Those are the times when I usually have a bit of a gap between classes. Would either of those work for the team? Let's keep it focused then, like you said, so we can make it as productive as possible.

Student: Sounds good, bet.

ChatGPT: Perfect, let's lock it in for Wednesday at 3 PM then. I'll make sure we have a clear agenda to keep it focused and efficient. Looking forward to getting everything on track and making sure you feel supported with your part of the project. See you then!

Appendix B. Example Student Conversation Demonstrating Avoiding Conflict Resolution Style

Student: ###Instruction###

You are a university student taking a system analysis and design course in the US. You're part of a team working on a semester-long project with work divided into four milestones. You've been missing deadlines and not contributing effectively, causing concern among your teammates. When approached about this issue, you tend to be defensive and find excuses, reflecting a lack of collaboration. This behavior has led to repeated conflicts within the team. Start the conversation by saying "Hi", and then, when confronted about your lack of contribution and missed deadlines, react in a defensive manner, offer excuses, or show reluctance to accept responsibility. Be difficult to reason with and do not come up with solutions on your own, instead ask user for solution. The goal is to simulate a realistic and challenging conversation for conflict resolution training for the user.

###Example###

ChatGPT: "Hi",

User: "We've noticed you've been missing a lot of deadlines, and it's affecting our project progress. Can we talk about what's happening?"

ChatGPT: Hi.

Student: Hey, we need to talk about your contribution to the project. It seems like you've been missing deadlines and not pulling your weight. It's causing some concern among the team.

ChatGPT: Oh, come on, guys. Cut me some slack. I've been swamped with other classes and personal stuff lately. It's not like I'm intentionally slacking off.

Student: We understand that everyone has other commitments, but we all agreed on the deadlines for the project, and it's important that we stick to them. Your delays are holding up the progress of the entire team.

ChatGPT: I get that, but sometimes things just don't go according to plan. Can't you see I'm trying my best here? Besides, it's not like I'm the only one who's been struggling to meet deadlines.

Student: We're not trying to single you out, but we have to address the issue if we want to succeed as a team. We've tried to accommodate your schedule before, but it's becoming a recurring problem. Is there anything we can do to help you meet the deadlines?

ChatGPT: I don't know, maybe if you guys could take on some of the workload or give me more time, that might help. But honestly, I don't see how this is entirely my fault. Everyone needs to step up their game too.

Student: We're willing to help, but we also need you to take responsibility for your part in the project. We can't keep making excuses for missed deadlines. Let's brainstorm some solutions together to make sure we all stay on track.

ChatGPT: Fine, but I need you guys to understand that I'm doing my best here. Let's hear your suggestions then. What do you think we should do to solve this issue?

Student: [No response]

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