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Soft Skills: The Catalyst for Critical Thinking in Engineering Education

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Abstract:

This study examined how engineering students' critical thinking and the development of their soft skills are interconnected. The transferability Hypothesis, which claims that information obtained in one area may be applied in another, was utilized to evaluate how much critical thinking skills influence the improvement of time management abilities. The study comprised 110 students who completed a questionnaire designed by the researcher to assess their progress in improving critical thinking and soft skills.

To boost creative thinking and communication abilities, researchers developed two soft skills exercises and included them into two parts of Apollo University's B. Tech undergraduate course in Computer Science Engineering in Chittoor. The exercise, designed for first-semester students, requested students to participate in the activity provided by the facilitator. The second activity was done for first semester students in the different section. At the end of the semester, participants were invited to complete a questionnaire that was meant to collect feedback and record it as data.

This article provides the final results of a study that used a mixed-methods approach to examine the effects of incorporating a soft skills activity into an English language classroom. The purpose of the activity was to encourage creative thinking and the development of communication skills among B. Tech students. The benefits of this activity include fostering Perspective and Reflection, reducing stress and improving overall well-being, fostering interdisciplinary connections, improving critical thinking and analysis, and enhancing emotional intelligence.

Keywords: *Soft Skills, Critical analysis, Engineering education, perspective, stress relief*

1. Introduction:

In the present day, companies are seeking applicants that possess a diverse array of highly desired Soft Skills, such as flexibility, exceptional communication skills, problem-solving prowess, creativity, empathy, and responsibility. In order for new graduates to achieve success in their employment, it is essential that they possess the ability to accept criticism gracefully, exhibit proficiency, and react in a suitable manner. However, there are currently no specific areas of study dedicated to enhancing students' competitiveness, and it is difficult to instill social skills in people. Through collaborative efforts to discover resolutions, individuals may refine their interpersonal abilities and nurture a multitude of other commendable qualities. There are many examples in fiction when particular personality qualities are emphasized.

The purpose of bringing attention to these traits is to let readers understand how important they are, which will lay the groundwork for an in-depth examination of these qualities and provide an opportunity for growth. The students of today do not make full use of literature. Individuals are unable to participate in critical thinking, which hinders their personal growth, because they are not exposed to its potential advantages. The paper provides a case study to illustrate the issue by examining the instructor's use of guided analysis in relation to various methodology and approaches, with a focus on critical thinking. In order to help teachers and students use literature to cultivate soft skills, this resource provides pedagogical ideas for a framework of critical thinking growth. The term "online learning" refers to the practice of enhancing classroom communication via the use of various technological media.

As stated by Thurman in 2019. However, according to a survey of Indonesian schoolchildren, online learning has failed so far because of issues like slow internet and devices that don't meet the standards for online learning (Hamid, Sentryo, & Hasan, 2020). Schlenz et al. (2020) found that both instructors and students had positive views of online education. Any significant educational objective, however, may be justified by this assertion (Hitchcock, 2018). Important to this research is the idea of "soft skills," which includes a

person's character traits, routines, and outlook on life that influence their teamwork prowess (Vasanthakumari, 2019).

It is necessary to assess if this can effectively equip students with the ability to think critically and develop other interpersonal skills that are important for professional growth in the workplace. That is to say, attributes related to interactions between people and individual characteristics such as effective communication and efficient time management. The present study sought to assess the critical thinking and soft skills of students throughout their participation in online classes, and to determine whether there were discernible variations in these domains depending on students' demographic characteristics. The objective of this study was to investigate the correlation between students' critical thinking abilities and soft skills in the context of online learning. Ultimately, the study sought to reveal the influence of instructors' viewpoints and encounters on the development of their students' critical thinking abilities and interpersonal skills throughout their participation in online courses.

2. Literature Review:

Digital learning, as defined by Mayer (2019), is the method of delivering knowledge via electronic devices and the Internet. Upon doing a more comprehensive evaluation, Mayer (2019) discovered that online assessments first focused on assessing students' capacity to carry out replies, subsequently progressed to evaluating their knowledge, and ultimately settled on measuring their ability to convey that information.

As per Jones (2019), the most sought-after skills in today's world are those that encompass critical thinking and interpersonal capabilities. Currently, most educational institutions prioritise the instruction of invaluable skills to students, such as critical thinking and problem-solving. In a study conducted by Sangsawang (2020), it was established that education and professional training techniques that focus on critical thinking and problem solving are indeed beneficial. Hence, it is evident that contemporary schools must give utmost importance to the development of students' soft skills in order to equip them with the necessary abilities to thrive in the present-day society. This study is significant as it can create a starting point for future research on the effectiveness of online education methods in helping students build transferable abilities that will benefit them in their career and personal pursuits.

The majority of companies now value unique traits that help workers advance in their careers; in fact, 70% of these companies prioritize these traits. The capacity to communicate clearly, work well with others, be flexible, dependable, and resilient are all qualities that employers want in potential employees. If you want to be a real professional, you have to put your brain, heart, and soul into what you do. The term "soft skills" refers to a wide range of abilities, including the ability to communicate effectively, negotiate, plan strategically, show passion, empathize, and much more. Personal, social, and interpersonal abilities are the three main categories into which these skills fall. One individual or a group of people may make them via honest communication and teamwork. It follows that these traits are usually honed in settings where several people work together to solve complex problems. One attribute that makes up a person's set of soft skills is their moral character. Character traits like moderation, justice, courage, candor, dedication, etc., may be found here. When individuals talk about feeling like they belong somewhere, it's usually to a group of people who share your values, traditions, and aspirations. All of mankind and society hold the following to be ideals.

In order to develop these skills, it is crucial to assist students in assessing and comprehending their intuition, while also providing them with adaptable and enduring capacities. Engaging with literature and cultivating critical thinking are effective methods for enhancing one's soft skills and character qualities (Krajewski, 1992).

3. Research Methodology:

The study looks at developing personality traits, interpretation, and critical thinking using comprehensive and integrative techniques. Notable researchers including B. Bloom, J.L. Steele, K.S. Meredith, Ch. Temple, J. Dewey, J. Weinsheimer, and others have examined digital learning, critical thinking, and soft skills at length, and their ideas and methodology

form the basis of this work.

4. Statement of the Problem:

Students enrolled in the Bachelor of Technology programme at Apollo University, Chittoor were evaluated in this study for their critical thinking and soft skills while taking an English language class online utilising the YouTube platform. This research set out to address the following questions:

5. Research Questions:

How does teaching soft skills in the language classroom using a digital platform assist students develop their critical thinking and social skills?

6. Rationale of the Study:

The purpose of this study is to describe in depth how the B.Tech programme improves students' capacity for critical thinking and teamwork. Theoretical frameworks provide definitions of critical thinking, education, and cooperative digital learning.

7. Findings:

i.   **Creativity and Innovation:** Soft Skills encourages thinking outside conventional boundaries, fostering creativity.Metaphors and symbolism in Soft Skills can inspire engineers to approach problems with fresh perspectives. Creative thinking is crucial in engineering design and problem- solving, where innovative solutions often lead to breakthroughs.

ii. **Effective Communication:** Engineers often need to explain technical concepts to non-experts, such as clientsor project stakeholders. Soft Skills emphasizes concise and impactful language, enhancing engineers' ability to convey complex ideas in a way that is accessible to diverse audiences. Improved communication skills can facilitate better collaboration and understanding between technical and non-technical team members.

iii. **Emotional Intelligence:** Soft Skills explores human emotions and experiences, fostering empathy and emotional intelligence. Understanding the emotional aspects of a project can lead to moreuser-centered design and solutions that consider the human impact. Engineers with highemotional intelligence are better equipped to navigate interpersonal relationships, collaborate effectively, and respond empathetically to user needs.

iv. **Critical Thinking and Analysis:** Analyzing poetic language hones critical thinking skills, which are transferable to engineering problem-solving. Engineers can apply their analytical skills developed through Soft Skills to dissect complex technical issues, ensuring thorough and thoughtful solutions. The ability to interpret and analyze diverse forms of information is valuable inboth Soft Skills and engineering.

v.   **Perspective and Reflection:** Soft Skills encourages self-reflection and exploration of different viewpoints. Engineers who engage with Soft Skills may develop a broader

perspective on the societal andethical implications of their work. Reflective thinking helps engineers make informed decisions, considering not only technical aspects but also the broader context and consequences of their actions.

vi. **Stress Relief and Well-being:** Engineering students often face high-pressure situations and demanding coursework. Engaging with Soft Skills provides a creative and expressive outlet, promotingmental well-being and stress relief. The emotional and artistic elements of Soft Skills can serve as a counterbalance to the logical and technical aspects of engineering studies.

vii. **Interdisciplinary Connections:** Soft Skills often draws inspiration from various disciplines, fostering interdisciplinary connections. Exploring connections between Soft Skills and engineering exposes students todiverse ideas and ways of thinking. Interdisciplinary perspectives can lead to more holistic and well-rounded approaches to problem-solving. Incorporating Soft Skills into engineering education can nurture a more versatile and well-rounded engineer, equipped not only with technical prowess but also with creative, communicative, and empathetic skills that contribute to a more holistic.

8. Results

This module focuses on building language skills for speaking and writing in English about everyday situations and topics. These topics include family, lifestyle, habits, work, interests, and more. Practice grammar and vocabulary, introduce yourself, and create a personal profile. You can also explain visual elements and manage informalphone and email communications.

Table 1. Frequency Distribution of the Students' DemographicProfile
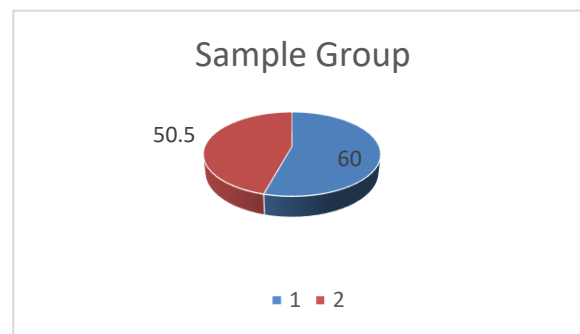
1.   CSE & 2. CSE (AI &ML)

According to the data provided, the students demonstrated a generally poor degree of critical thinking, with an average score of 2.50. The dimension that is ranked the highest is their exceptional degree of judgement and problem-solving, which is measured at 2.54. The students' questioning ability is good, with a mean of 2.51. However, their interpretation ability and analytical ability are both at a low level, with means of 2.49 and 2.47 respectively. Multiple variables contribute to the elevated degree of inquiry and critical evaluation exhibited by students during online sessions.

Table 2. Relationship of Critical Thinking and Soft Skills
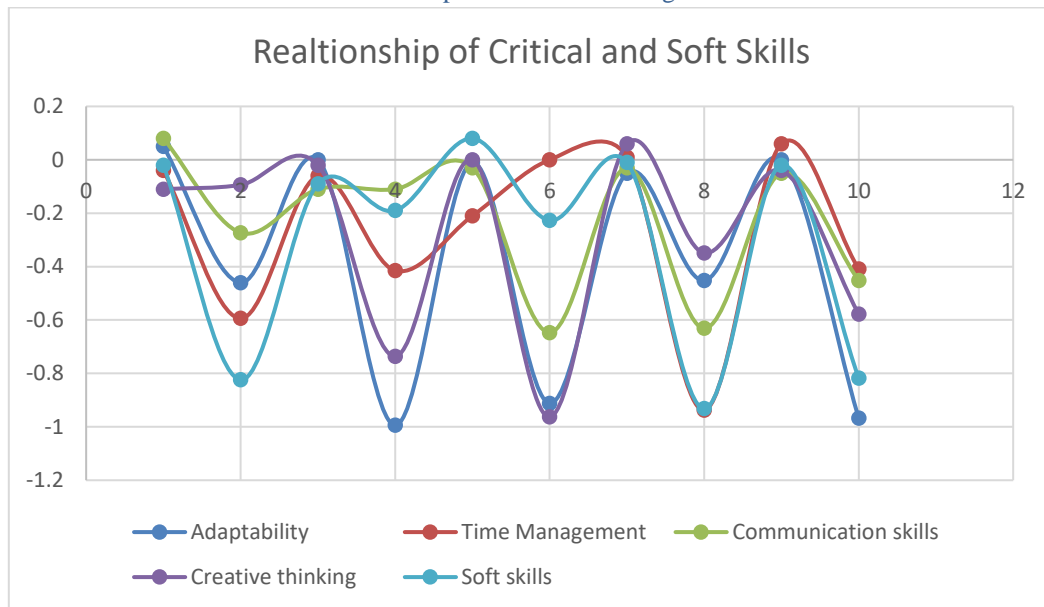
The table data indicates a small but statistically significant inverse association (r=-0.21, p=0.003) between analytical critical thinking skills and the capacity to successfully manage one's time. There is no statistical significance in any of the other pairwise correlations. In this study, we want to examine the Transferability Hypothesis by assessing whether the enhanced critical thinking skills of college students also contribute to their proficiency in time management. The Transferability Hypothesis posits that information and skills acquired in one domain may be applied in another. One instance where the analytical abilities acquired via critical thinking might prove valuable is in properly managing one's time. The concept of cultivating talents in a thorough and all-encompassing way is also in line with the Transferability Hypothesis. Students who cultivate their critical thinking abilities may also discover that they are more proficient in time management and adept at assessing and adjusting to unfamiliar circumstances.
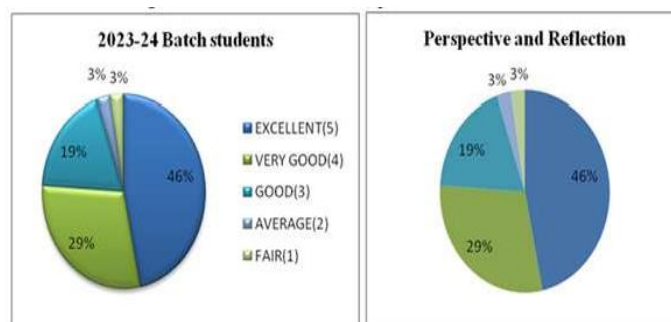
According to the Transferability Hypothesis, students who employ strategic thinking in one context, such as learning, may be capable of applying those abilities to another context, such as time management. Therefore, the study's inclusion of the Transferability Hypothesis might have significant consequences for education. Teachers can include time management strategies into critical thinking exercises by implementing targeted interventions.

DATA INTREPRETATION
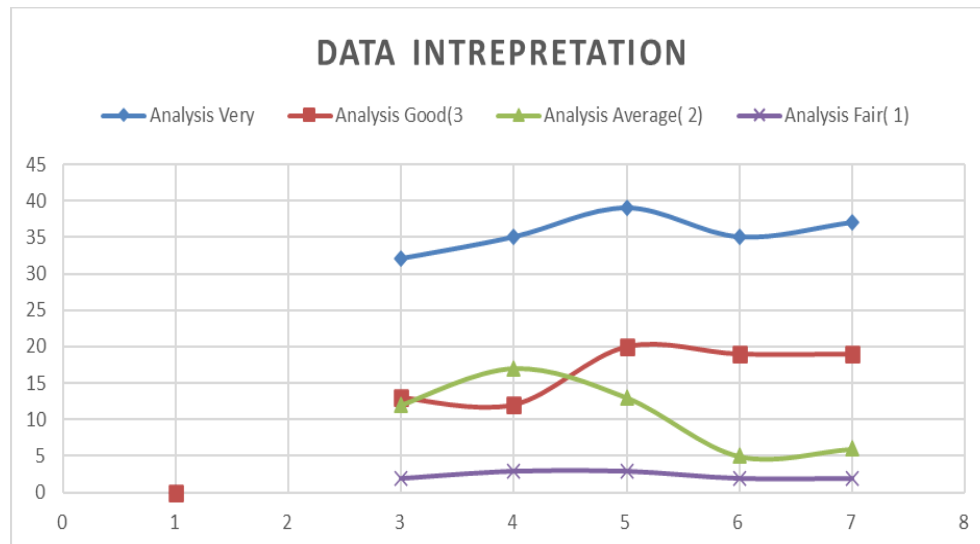
An analysis of the efficacy of the soft skills training that was conducted. Of the 110 students who took the reflection and perspective test, just 42 got a very excellent score. Figure 1 shows that out of the total number of scores for perspective and reflection, 29% are deemed excellent and 19% are deemed decent. 5.0% in this instance, which is reasonable and average Students want opportunities to use their skills, according to the report. Reducing stress and improving health, working together across disciplines, and honing analytical, critical thinking, and communication abilities all include comparable pie charts. Each poem has its own unique interpretation. The above chart displays the results based on the skill test. Displayed are details such as the average amount of lines for a certain skill type, as well as the standard deviation, minimum value, code count, and test for each. Verbal figurative language showed the highest degree of variability in the sample, as seen by the summarized statistics.

9. Discussion:

There were distinct trends shown by the survey data. Among the critical thinking skills evaluated, students' answers on judgement and problem-solving skills were the most unanimous (Mean = 2.54, SD = 0.47). Subsequently, questioning was rated second and yielded agreement (Mean = 2.51, SD = 0.49). Analyses (Mean = 2.47, SD = 0.49) and Interpretation (Mean = 2.49, SD = 0.51) were classified as low-level skills due to their disagreement. The total mean score for critical thinking abilities was 2.50 (SD = 0.24), which indicates a lack of expertise and a general tendency towards disagreement. When it came to developing soft skills, students were most in agreement on time management abilities (Mean = 2.54, SD = 0.50), which put it at the top of the list. Students also agreed on the importance of adaptability skills (Mean = 2.52, SD = 0.48) and communication skills (Mean = 2.53, SD = 0.47). Unanimity and a low degree of proficiency were the results of Creative Thinking Skills (Mean = 2.48, SD = 0.49). There was a lot of consensus and competence indicated by the mean score of 2.52 (SD = 0.25) for soft skills.

10. Conclusions

It is critical that engineering students improve their creative and communicative skills. This

refers to the development of skills and talents known as 21st-century competencies. To carry out this study, the researcher incorporated skill-building activities into English language classroom at the Apollo University. Data was gathered from the two sections of the B.Tech course studying in the CSE and CSE (AI&ML) for the AY. 2023-2024. This article shows preliminary findings from research on a curated selection of five skills.

The preliminary findings from this dataset indicate that the fundamental skills, specifically communication skills, serve as the foundation of talents and have the ability to alter the language tone and emotions spoken. This information also demonstrates the wide range of capabilities found in contemporary materials. Elucidate intricate ideas using easily understandable language. First and foremost, students feedback underscores the significance of the work for progress. Proficient communication abilities. Student feedback indicated that the assignment on soft skills undoubtedly, my comprehension of technical topics has significantly enhanced, especially in intricate issues. Further studies shall also analyse the use of digital platform for other methods of teaching like grammar, poetry, novels and so on that pertains to different innovative teaching skills. Moreover, it is also suggested that the teacher can utilise these preliminary findings to enhance the teaching aids to enhance the students' overall skills by developing supplementary resources for educational courses and employ an experimental methodology to assess their influence on academic achievement.

Developing soft skills and cultivating critical thinking talents equips students to understand real-world situations, form independent evaluations of these obstacles, and formulate their own ethical perspectives on significant moral matters. This can offer students tangible, experiential learning opportunities that they can further develop through problem-solving initiatives. By engaging in discussions, students enhance their self-assurance, hone their communication skills, develop their critical thinking abilities, and acquire the necessary readiness to confront comparable challenges in the future, such as ethical dilemmas. They engage in intentional reading, dedicating sufficient time to comprehend the information and actively seeking clarification by asking questions. This fosters a sense of self-reflection in children.

As a pedagogical activity, students can assume the position of facilitator and generate a question to present. In addition to this study, they will sporadically express their thoughts and opinions. Students enhance their precision and responsibility through the cultivation of their capacity to critically evaluate their own thoughts and beliefs. The objective of evocation is to stimulate curiosity in a subject and inspire individuals to delve deeper by activating preexisting knowledge, attitudes, or emotions. Subsequently, they acquire up-to-date information and are prompted to enhance their existing resources. Engaging in such activities fosters the growth of cognitive abilities such as analytical reasoning, active listening, flexibility, self-assurance, cooperation, and responsibility. At this point, the instructor facilitates class discussions, conducts a thorough analysis of the text's vocabulary, and initiates the evaluation of its stylistic components. The instructor possesses the jurisdiction to inquire about the comprehension, interpretation, and implementation of certain factual knowledge.

During the application phase, students will utilise the knowledge acquired from the introduction book to engage in a discussion and resolve a case study subject. This enables

students to utilise their existing knowledge. Subsequently, the class delves into the characters' activities, scrutinising the rationale behind their behaviours and other pertinent particulars. Synthesis is the stage of the process where the speaker encourages the students to generate their own situations that illustrate the problem. In the last phase, students are required to evaluate the significance of the characteristic they investigated. During the reflection phase, the recently learned knowledge is placed in a specific context, exercised, and used in problem-solving situations. The primary objective of each level is to engage students in the learning process by implementing collaborative teaching activities that enhance social skills, communication abilities, and long-term knowledge retention.

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