A Framework for Learning Combined Problem Solving Skills

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Abstract

Problem-solving is an important part of a well-rounded 2nd-century education. In his essay "Cognition in the Wild," Hutchins advises readers to look about their local region for artifacts that were not created by the combined efforts of multiple individuals, but also mentions but the only one in their region is the one in their area. A little stone on his desk was the thing that passed this test. Collaboration has a tremendous influence on our everyday lives. Researchers are continuously engaged in situations that need us to employ social skills to coordinate with other people, whether it is in schools, the workplace, or our personal lives. Tasks that need numerous students to work together to achieve a team goal, such as a final report, integrated analysis, or a joint presentation, are common in project-based work. Combined problem solving is rarely taught as a stand-alone ability separate from a specific subject. As a result, combined learning activities are frequently integrated into specialized courses of study, such as science, mathematics, and history, in school-based settings. Cooperative conflict resolution has been highlighted as a highly promising exercise that relies on a broad variety of social or cognitive abilities and can be tested in school settings where skills might well be evaluated or taught. The author of this work conducts a thorough investigation of problem-solving abilities. People with high problem-solving abilities can analyze issues, determine the severity of the situation, and weigh the pros and cons of various solutions. Employees who get problem-solving training in the workplace can collaborate more effectively with coworkers, clients, partners, or suppliers.

Keywords: cooperation, knowledge, problem solving, skill, student

1. Introduction

This research develops a conceptual framework for working collaboratively, based on data from cognitive science, education, behavioral science, the psycholinguistics, among other areas of study. The development of problem-solving abilities is a typical piece of advice that is regularly heard. This is the one talent that all professionals, regardless of their subject or industry, must possess. But why is it vital to have problem-solving abilities? To begin with, what else are problem-solving skills?

To address an issue, the first step is to comprehend it, as they say. With that line of reasoning, gaining problem-solving abilities is as meta as it gets; to do so, you must employ problem-solving abilities you don't yet possess? Let's not get forward of ourselves and take a step back. A problem is essentially a job that has to be completed using a technique or approach; it may be a question that needs to be answered, an illness that needs to be cured, an engineering construct that needs to be optimized, and so on. However, to perform any of that, you'll require problem-solving abilities. To put it another way, you must be able to solve problems to thrive at what you do and be recognized as a professional. You'll seldom get anything done without it. Let's look at some ways for developing problem-solving abilities now that People have demonstrated the value of having them (M. Uslu and Ç. Girgin 2010, Rosdiana, I. K. Budayasa, and A. Lukito 2019, R. Dahm 2014).

1.1 Appropriate Strategies for Skill Development

As previously said, the first stage is and always has been a description of the issue. Take a step back and examine the complete frame from top to bottom, left to right, or backward to comprehend the issue in its totality. Make sure you

can synthesize the main points and, if necessary, explain the situation to your peers. If you're dealing with a stratified issue, one that is multiple of them mixed into one, having a good understanding of the situation can help you succeed. If you can break anything down, no matter how hard it seems, you'll be helping your problem-solving skills grow in two ways. Now that you've figured out the issue, it's time to undertake some analysis. Investigate the techniques that may have been used in the past to solve the challenge. If it hasn't been solved previously, you may learn a lot from previous attempts' failures and come up with a superior solution (Samuelsson, M., & Samuelsson, J 2016, J. Bempechat 1990).

You'll be able to come up with the obvious facts of what has worked against the issue in the past and what hasn't if you do a lot of studies. Then you may begin brainstorming. One of the most important components of developing problem-solving abilities is brainstorming, or as some would call it, critical thinking.

You may come up with a solution by using critical thinking and adding your images to the mix to spice things up. It's important to remember that your initial solution, like any first draft, is certain to be faulty. But don't let it deter you; the more subtle thoughts and solutions you come up with, the more routes you'll be able to investigate for a feasible answer.

1.2 Problem-Solving in a Group

Before explaining collaborative problem solving, it's a good idea to define the words that make up this phrase, starting with "collaboration" or ending with "problem-solving." Collaboration is described as the practice of working together to achieve a common objective. The definition includes many different components. The first aspect is communication, the sharing of information or ideas by a receiver to improve understanding. This is needed but inadequate condition for collaborative issue solving since it understanding the concept that goes beyond the basic exchange. Collaboration is the second element, which is an agreed-upon division of labour. Collaborative issue resolution involves delicate, sensitive knowledge to prepare for or recognize a problem. An alternate interpretation might consider cooperation as just a lower order spirit of the collaborations, rather than just as an element of cooperation. People need not agree with the concept for the aforementioned purposes.

The third factor is reactivity, which involves active and thoughtful engagement. According to this theory, collaborative conflict resolution entails addressing a problem reactively by collaborating or sharing ideas. Collaboration is a useful tool, especially when specialized abilities are required (available), but it is based on variables such as a desire to be involved, mutual understanding, as well as the ability to deal with interpersonal conflicts. When dealing with difficult situations, collaborative problem solving is very beneficial. The science of learning has undergone considerable modifications in the 1990s to migrate from "collaborative lea Collaborative conflict resolution, according to this notion, is about attacking a task reactively by getting together or exchanging idea". Cooperation, as defined by him, is an activity carried out via the division of work. In other words, cooperative students usually operate in parallel, even though they sometimes coordinate throughout the course of their activity. Several scholars have said that cooperative learning does not fully use collective potential nor does it need the entire range of social qualities that people rely on while working together. It was centered on group learning. Students in cooperative learning work together to coordinate their efforts to solve a problem or attain a goal. The activities of learning are intricately linked; students' efforts build on one another, yet one learner's actions may be picked up or eliminated by another. The entire spectrum of social talents is triggered only when a job necessitates collaboration. As a consequence, programs including such working collaboratively are key testing grounds for assessing 21st-century competencies. When a student observes the difference between his current situation and the planned target state, knows that the disparity has no easy or regular remedy, but then looks at the actual scenario to accomplish that goal state, he is involved in problem-solving. , strives to work. It is accompanied by many behavioral or mental processes which might or might not occur in succession but may occur concurrently.

A method of conceptualizing this idea has been used. In its problem-solving framework, the Program for International Student Assessment (PISA) group first, a problem is explored, namely the disparity between the existing state and the desired state. Second, learner creates mental model of issue situations and tasks that enable them to converge between them (known as "problem spaces"). Third, learner devises a strategy for taking action that will get him closer to the desired situation. After this, the plan is implemented. Finally, the progress towards solving the problem is tracked. On the other hand, a procedural approach requires a solution-oriented mindset as well as an understanding of the nature of the issue and desired outcomes. The issue solver begins by examining the problem space and identifying its components. After that, they look for patterns and links between components, which they then turn into rules. The concepts are further developed, but then when assessing generalizations for possible possibilities the issue solver is thought to be proving the hypothesis.

This strategy is explained in more detail in the latter part of this paper. Collaboration problems solving may be characterized as joints experience in which dyad or organized numbers conduct a series of processes to change the existing situation into a desired target state based on these principles and approaches. Individual and collaborative issue solving vary in that each of these stages is instantly obvious in collaborative problem-solving. Participants must argue or share their awareness of the problem's elements, their appraisal of the relationship between the two sections, the link between actions but also consequence, and even the generalizations they offer in order to produce responses. The use of verbal and nonverbal visual cues can help coordinate steps toward a combined solution. Externalization provides the added benefit of making problem-solving tasks more visible and valuable. Individual problem-solving steps are applied to collaborative problem-solving, though in a different and more sophisticated way. The next sections examine the impact of incorporating multiple problem solvers in a collaborative setting (S. Sharma, A. D. Sharma, M. D. Arif Naseer, and R. Singh 2011, K. G. Verma, B. Kumar Kaushik, and R. Singh 2011, M. Jain, S. C. Agrawal, and P. Agarwal 2012) .

1.3 Processes for Collaborative Problem Solving

A PISA-like sequential procedure may be used to illustrate a fictionalized version of collaborative problem-solving. Collaborative issue resolution necessitates not only the collaborating parties' acknowledgement of a problem, but also the identification of both the aspects of the problem area that they can manage or monitor independently. Every person in the groups often addresses the area of concern or its components, as well as alerting partners about the contrasts between existing and anticipated issue circumstances. Cooperative group problem-solving activities necessitate the adoption of a shared representation among participants. Personal issue representation (internal cognitive images of the problem) that are similar across team members result in improved problem-solving skills, according to studies on so-called collaborative learning. Communication could be used to establish agreement among representation. Unlike with a shared mental model technique, which focuses exclusively on commonalities between individual characterizations? This problem area is developed and maintained through ongoing integration and collaboration among participants, so it serves as the basis for coordinated efforts (A. Lather 2012, R. Solanki, A. K. Chaudhary, and R. Singh 2012, U. Tiwari, K. Agarwal, A. Rai, N. Rai, and P. Pal 2013) .

For the intended state to be achieved, collaborators must agree on a plan. The administration of resources must be included in collaborative planning. Members of an income deriving from knowing who knows something or who has recognized certain pieces of the issue space, according to research on transactive memory systems. In the event of groups that make up of persons with varying degrees of issue related experience, resource planning must ideally take account that workers share all accessible information. Information sharing has not always been easy: studies of interpersonal psychology have shown that group members prefer to refer to common information while rejecting unshared knowledge that is exclusive to a single group member. When it comes to resource distribution, knowledge isn't the sole consideration. It should also include determining processing capacity or monitoring processes.

The strategy must be carried out by the group. This involves a coordinated effort by many member of the team at the very same time in particular collaboration problem-solving scenarios. One of the drawbacks of effective collaboration is that organisations often suffer from operational losses, which means they perform less effectively than they otherwise would give its members' talents and resources. Process losses may be characterized by reduced task motivation among group members, extra social objectives arising from the group context that drain resources away from work, or diminished brain capabilities as a result of social atmosphere (Y. S. Duksh, B. K. Kaushik, S. Sarkar, and R. Singh 2013, B. A. Jawale, V. Bendgude, N. Husain, N. Thosar, and P. Tandon 2011).

Participants universalize their unique problem-solving procedures and organize their contributions into the logical chronology of activities in this logical fashion of processes. It's unknown how much of this idealized sequence occurs in reality. Its occurrence will be determined not only by the dynamics of something like the groups but also by the properties of the tissue space. Rather than a single technique, collaborative issue solving is a complex, coordinated effort involving two or more people. As a result, successful problem-solving does not need a single ability, but rather a set of distinct sub skill that may be organized in response to changing circumstances. While the five stages stated above may be used to describe collaboration and coordination (issue identification, plan, problem representations, executing, or monitoring), cooperative problem-solving talents are not simply paired to the phases. Many skills, but at the other hand, cover a wide range of problem-solving abilities.

1.4 Skills in the Social Process

Individuals require a variety of social abilities to be effective in collaborative problem solving, including the ability to coordinate activities in synchrony with the other participants. Perspective-taking, Participation, and social control are three kinds of indicators that might be included under the overall banner of the social skill in our

definition of social skills. The term "participation" refers to the basic conditions for collaborative work. It relates to people's desire and preparedness to externalize and share knowledge and opinions, as well as participate in problem-solving phases. The capacity to perceive a situation through the eyes of a partner is referred to as perspective-taking abilities. This may be incredibly beneficial since it enables easier collaboration amongst partners. Furthermore, perspective-taking abilities are required for certain sorts of jobs, since a group cannot solve unless its members can comprehend the actual circumstances in which their collaborators find themselves. Lastly, "social regulations skill" refers towards the more strategic aspects of collaborative problem-solving. By theory, partners should use their understanding of each other's strengths but also limits to coordinate or resolve any differences in viewpoints, interests, and approaches.

1.5 Skills in Cognitive Process

Collaborative problems solving is more productive and efficient when both social and cognitive abilities are used. Collaborative issue solving cognitive skills are very similar to single solving problems cognitive skills, and they apply to how problem solver handle the work at hand or the cognitive skill they utilize. The collaborative problem-solving framework divides cognitive abilities into four categories: planning, execution, monitoring, adaptability, and learning. A person's capacity to build solutions based on feasible stages toward a problem solution is referred to as planning abilities. Plans for collaborative issue solving must address common problems representations or offer the foundation for a well-coordinated and planned problem solution. This acts as a foundation for ongoing plan adjustments, resulting in a circular problem-solving habit. Flexibility abilities are evident in problem solvers' ingenuity when confronted with a particularly difficult element of a problem solution, as well as how they respond to ambiguous circumstances.

Task Control Techniques One of the most important aspects of issue resolution is "planning". Planning include the generation of hypotheses about how to achieve the objective, as well as the selection of actions that advance the problem systems based on a (common) problem space. During planning, problem solvers need reflect on their mental abilities, which is an important metacognitive activity. People divide planning into four dimensions: problem analysis, self-improvement, strategic planning, or complexity. After an analysis phase, which is an assessment of the individual or combined representation of an issue, the work is divided into sub-task with matching sub goal. Sub-tasks or sub-goals may help manage the problem-solving process while also allowing you to track your progress. Finally, their designs' intricacy and sophistication might vary. The best way to describe it is to compare it to a chess match. The planning challenge is minor whenever a component is relocated without care. Planning skills grow more complicated when a series of activities is planned, but possible counter movements are shown in parallel plans of distinct courses. Fluidity problems is indeed a skill class in the cooperative problem-solving capabilities framework that is divided into two parts: ambiguity tolerance and breadth.

Diverse degrees of ambiguity tolerance lead to different problem solving approaches. Some critical thinkers are only active in obvious situations, whereas others explore the complex problem in response to ambiguity. Critical thinkers who have a high level of uncertain tolerance are far more likely to view uncertainty or ambiguity in a way that helps them make important decisions about another solution step. Issue solvers that only employ one way of research have a low degree of skill when it comes to breadth. When a deadlock is reached or additional information becomes known via monitoring, a moderate degree of flexibility is required to try other approaches. A large degree of width leads to a restructuring of specific problems or planned activities if movement throughout the issue spaces is hindered. Problems solving is action in which participant must solve a range of challenges. Most problems are intrinsically ambiguous, for example, since the optimum viable solutions stage is not always evident. Furthermore, solution stages may end in a deadlock, indicating that the effort did not go as planned. When confronted with roadblocks on the way to a solution, challenging solvers often abandon the project. It may happen with any situation, but it's especially critical when dealing with ill-defined difficulties, who are by definition puzzling. Problem solvers have the capacity to accept ambiguity, which might also help them overcome hurdles in problem-solving activities. In addition, competent problem solvers are able to change strategies on the go.

1.6 Collaborative Problem-Solving Skills Assessment

People must consider assignments that target the different skill groups indicated above to measure problem-solving abilities in educational situations. One of the concerns in task classification is the trade-off among task reality or measurability. In aspects of realism, cooperative conflict resolution can be located in a range of daily tasks, such as sitting with a coworker while simply trying to format a windows system object, continuing to develop a partnership approach for student cafeteria use that considers the interests of multiple stakeholders, but rather finding a movie which appeals to a group of friends. These are all instances of situations in which a group must come up with a

nonobvious answer that demands consensus. All of these tasks have one thing in common: they are often confusing. It might be difficult to explain the intended objective state, for example. Furthermore, since people and groups are not completely aware of the repertory of activities that might move them from their present condition to the target state, challenges can be ill-defined.

While many real-life situations are cooperative or undefined, most research on problem solving focuses on well-defined issues assigned to individuals. The "Tower of Hanoi," wherein people move discs as according stated criteria to transform a beginning position through a well goal position, is a very well concept. Beginning with Newell and Simon's pioneering work, a growing body of research has started to illustrate how individual conflict resolution behaviour may be understood or portrayed digitally as just an application of basic concepts and assumptions. Some good tasks have the benefit of having well-understood representations or computational dynamics. As a consequence, there exist criteria for measuring the effectiveness of problem-solving activities that have been agreed upon.

The disparities between real-world difficulties and those investigated in the psychological investigation increase the query of whether well-defined and ill-defined tasks are appropriate for collaborative conflict resolution. Well-defined tasks ease the process comparisons between different assignments or hard workers, setting the framework for the development of issue standards. Since the phases of problem-solving for very well tasks might well be easily taught, comprehended, used in the search for alternative solutions, or commented on, employing precise projects should upsurge the teachability of cooperative problems solving.

As a consequence, he feels that when creating collaborative problem-solving activities, it's best to start with projects designed for solo problem-solving and then adapt them to collaborative work. For example, introducing resource dependency is a common way to build collaborative (rather than cooperative) situations. This is how tasks may be changed to ensure that what a job can indeed be finished by a single individual working alone. Because the tasks are confined in such a manner that all resources are available, regardless of their level of visibility, this method might not educate students how to cope with the truly ill-defined challenges.

Benefits of Problem-solving abilities:

Every business has problems, and every individual has problems. As a consequence, the ability to solve problems is very significant to both individuals and businesses. A few of the benefits are as follows:

- Make what seems to be impossible an actuality. Knowledge by itself does not solve problems; it is the combination of knowledge and systematic problem-solving approaches that helps to differentiate. This assists organizations or individuals in overcoming hazardous situations.
- It distinguishes People from the crowd. People are taught to perform the expected. They've honed their talents and understanding in their field. People, on the other hand, have hard time-solving situations that are unexpected or unusual. You will be quickly seen, acknowledged, and praised if you become a frequent issue solution at work.
- Increased self-assurance. Having the capacity to solve difficulties can enhance your confidence without matter what job or what profession you are in. People don't waste time wondering about what people will do if an issue arises since you're confident in your capacity to address challenges.

2. Literature Review

Shelly Wismath. examined student perceptions of problem-solving abilities. Problem-solving is an important part of a well-rounded 21st-century education. This research looks at how students feel about taking a college liberal education program that focuses on problem-solving abilities. We explain how the research participants came to their conclusions on what problem-solving abilities are and why they are essential. Students reported improved communication skills, higher knowledge of the relevance of problem-solving expertise in their major, and considerably enhanced confidence in overall problem-solving capabilities based on both quantitative and qualitative data gathered before, during, and after the course. They also displayed a solid understanding of how the abilities they learned may be used in both academic or real-world settings (S. Wismath, D. Orr, and M. Zhong 2014).

Problem-Solving Abilities in Suicidal Psychiatric Patients was examined by David E. Schotte. They looked at a deregulations model of suicide conduct, with the diathesis being such a problem-solving cognitive deficiency. Suicidal people's problem-solving abilities or impairments were further investigated. This was done by contrasting a sample of 50 suicidal patients with acute with a control group of 50 non-suicidal hospitalized. The suicidal group outperformed the control group on a variety of dependent measures, supporting the prediction that suicidal people are poor at impersonal or interpersonal solving problems, have higher stress levels, or are hopeless. Relational problem-solving deficiencies were limited to activities that required participants to come up with alternative

solutions to issues and predict unfavorable repercussions of suggested answers. Finally, an examination of the mechanism(s) by which suicide intent is lowered might be beneficial to treatment outcome studies in this field (D. E. Schotte and G. A. Clum 1987).

An Assessment Framework for Cooperative Solving Problems in Practice-based Learning Activities was investigated by H. A. Simon. For systematic search of the working cooperatively procedure in the open ended, hand on, single dedicated design tasks which can then be used to provide meaningful having to learn analytics data, a framework that explains the key operational qualities, stages, but also actions in open-ended, hands-on, physical computer processing design tasks is needed. Furthermore, since the system is data-driven, it is appropriate for use in real-world learning scenarios. They argue that appropriate analytical frameworks are important for developing and presenting learning analysis for practice-based learning. They believe the technology we developed can be used in many educational contexts, particularly in face-to-face learning situations where identification and student-college interactions are challenging. The next step in our study will be to scale up this framework and provide learning metrics for instructors and students to aid in their education - learning during training activities (H. A. Simon 1975).

Smooth Transitions Aid Learning, from Example Studies to Problem Solving, was researched by Alexander Renkl. Combining examples study with problem solving in the early stages of cognitive development has been found to be effective in studies. On the other hand, current techniques of combining diverse learning modalities are stagnant and do not allow for transference from example study to future problems solving in early stages of skills development. As a result, the authors proposed to gradually incorporate problem-solving elements into example studies until the learner was able to solve the problems themselves (complete examples + more incomplete cases plus problems to be solved). They've supplied solid proof for the efficacy of our new reasoning for combining case studies with problem-solving. However, further tests are required to fully comprehend how this works or to improve the use of this logic (A. Renkl, R. K. Atkinson, U. H. Maier, and R. Staley 2002).

An intervention approach meant to increase the collaborative problem-solving abilities of primary school kids was researched by C. J. Nigro. Innovative learning approaches like collaborative inquiry have received a lot of attention. Collaborative issue solving is becoming more popular in schools, yet little is known about how to teach kids the abilities necessary for collaborative problem-solving. We built and included a practical usage for a collaborative inquiry program at primary education in Shanghai based on the design process in social contact of collaborative learning mixed with work from of the metacognitive or cognitive processes of problem-solving. This framework sought to help students acquire the abilities needed to complete cooperative problem-solving activities. The importance of teaching pupils group skills and the ramifications of fostering collaborative learning in the classroom were explored. Last but not least, the research revealed fresh information on other ways for assisting students in developing collaborative problem-solving abilities (C. J. Nigro 2006).

3. Discussion

Collaborative conflict resolution, or even the collaborative or shared activity of the altering a present issue states into to the intended goals state, might well be considered among the most important talents in the twenty-first century due to the extensive application in real-life scenarios. Collaborative problem-solving skills are divided into various components according to the framework proposed in this article. Most importantly, social cooperation skills may be distinguished from problem-solving cognitive talents. Since people all confront obstacles daily, having excellent problem-solving skills may be beneficial to anybody. Some of these problems are more significant or complex than others.

3.1 Benefits Critical Thinking

- The capacity to reason and think logically.
- The capacity to objectively assess data.
- The capacity to see how concepts are linked logically.
- For example, the ability to make sensible judgments.

It would be ideal to be able to deal with all situations efficiently and effectively; nevertheless, there is no one-size-fits-all answer to all problems. The last step in the problem-solving process is to ensure that the procedure was successful. Whenever it comes to problem-solving, it was all about following the right steps and adhering to a plan that's tailored to the situation. Realizing that your team or company has an issue isn't enough for you to come up with effective issue strategies. This may be accomplished by keeping track of and soliciting input from those who have been impacted by any changes that have happened. Keeping track of outcomes or any additional issues that

arise is a good idea.

4. Conclusion

Collaborative problems solving, or the collaborative or shared activity of changing a present issue state into a desired goal state, might be regarded one of the most significant abilities in the 21st century due to its extensive application to real-life circumstances. The structure suggested in this paper divides collaborative problem-solving abilities into many components. Most crucially, cooperation social skills may be separated from problem-solving cognitive abilities. Certain talent elements may be found among these categories. The framework was based on research from a range of fields and serves as a starting point for a more in-depth look at collaborative problem-solving. Another of the framework's main aims is to assist designers in creating cooperative problem-solving tasks that include as many technical skills as possible. Once the results of these tasks are known, the framework's theoretical assumptions may be examined to confirm or enhance it, enabling us to understand further about collaborative problem-solving. This article's main objective is to show you how to tackle difficulties in a number of methods. People with strong problem-solving skills can assess problems, assess the magnitude of the issue, or consider the advantages and disadvantages of alternative solutions. This work's author performs an extensive examination of problem-solving skills. People with strong problem-solving skills can assess problems, assess the severity of the situation, and consider the advantages and disadvantages of alternative solutions. People who get problem-solving training at work are better able to interact with teammates, customers, partners, and suppliers. The author of this paper investigates problem-solving talents thoroughly. People with strong problem-solving skills can assess problems, assess the magnitude of the issue, and consider the advantages and disadvantages of possible ideas. Employees who receive problem-solving training at work are better able to interact with colleagues, customers, partners, and suppliers.

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