Igniting Strategic Thinking Through *ProblemUp!*

Vittorio Marone, University of Texas at San Antonio
Cary Staples, University of Tennessee, Knoxville
Katherine Greenberg, University of Tennessee, Knoxville

Abstract: Games can contribute to student learning in diverse settings. Social constructivism, situated learning, and social-historical theories support this; but what about students who lack a feeling of competence to learn through failing, who quietly drop out from school, or simply extinguish their desire to learn? The card game *ProblemUp!* derives its substance from the Cognitive Enrichment Advantage (CEA) approach, which provides the means for creating a community of practice where students adapt 22 specific strategies to meet personal needs in overcoming school, home, work, and interdependent learning problems. *ProblemUp!* focuses on helping underachieving students in high school and college settings by providing unusual, and often bizarre, game-generated problems that require creative solutions, strategic resourcefulness, and lateral thinking. Such "outside of the box" reasoning exercises supported by the CEA approach and enacted in a social and playful environment can help students develop metacognitive strategies that can be applied in real life.

Games can contribute greatly to student learning (Gee, 2007; Shaffer, 2006; Shaffer & Gee, 2005; Shaffer et al.; 2009, Squire, 2011). Social constructivism, social-historical, and situated learning theories help explain this phenomenon (Driscoll, 2005; Schunk, 2012); but what about students who lack a feeling of competence and are unaware of the many aspects of strategic thinking that could help them overcome personal challenges and envision future achievements? What kinds of games can help counteract resistance to learning, especially resistance to finding solutions to problems? How can we teach problem solving if we don't know what problems the future holds for the new generations? We formed a research design team to create a game that addresses the issues raised by these questions. The game is built on a growing body of work that demonstrates effective approaches to teaching strategic thinking and reasoning—or, in other words, teaching how to learn (Greenberg, 2014). The card game *ProblemUp!* (www.problemup.com) derives its substance from the Cognitive Enrichment Advantage (CEA) approach (Greenberg, 2014), which provides a framework for creating a community of practice where students adapt 22 specifically taught strategies to meet personal needs in overcoming school, home, work, and interdependent learning problems that force underachievers to quietly abandon school—and learning—due to their own and educators' lowered expectations (Greenberg, 2014). With *ProblemUp!* we focus on helping students in high school and college settings enter the world of challenges by using inventive strategies supported by the CEA approach. The game generates surreal problems in which students can explore strategic solutions and develop the ability to communicate rationales while learning from peers and more knowledgeable others in a social and playful environment.

The Need for Strategic Thinking

Most discussions of competencies required for success in career and life in the 21st century focus on mastery of basic academic knowledge and skills —communication, mathematics, science, technology, etc. Educators pay little if any attention to underlying competencies, particularly those of strategic thinking and metacognitive problem solving. Texts discussing research on effective learning tend to report what good learners do, and discuss how to teach students expert-developed strategies that apply to specific academic areas (Schunk, 2012). Few experts focus on underlying, micro-level ingredients of strategies that can be selected by individual learners based on personal strengths and weaknesses, and then adapted to overcome problems in situated contexts (Greenberg, 2014). Most educators and even fewer students engage in cognitive education approaches (Haywood, 1997). Hence, when students come up against challenges, they find ways to avoid them, letting others solve the problem for them, reinforcing their own and others' low expectations for success. For good reason, such students avoid confronting directly the reasons for poor performance (not wanting to focus on their perceived limited ability) and seldom if ever have the opportunity to learn the underlying metastrategic knowledge that could help them find solutions to their challenges. The focus remains on the product rather than on the process of learning.

Public media as well as scholarly journals are full of reasons why students need to be good strategic thinkers in K-12 and university settings—indeed, throughout life. The controversial Common Core curriculum emphasizes the need to engage students in gaining a deep level of understanding of curriculum (Rothman, 2011). At the same time, large scale studies of retention in college and university settings indicate that only about half of American students who enter postsecondary institutions graduate (Burkum, Habley, McClanahan, and Valiga, 2010). The

other half, take the backdoor as a way out. Even with the increase in the use of well-known approaches to improving retention and graduation, research does not support their overall effectiveness. This may be due, at least in part, to the use of one-size-fits-most interventions, whether focused on academic or nonacademic activities or a combination of the two (Lassibille, 2011). We contend that these approaches ignore a key need: the development of effective prerequisite strategic thinking skills and habits (of which students may be unaware) that can be applied in different contexts to overcome specific challenges.

When students do not know how to develop and adapt strategies, these challenges can become barriers to success as students run for the way out—by dropping out physically, intellectually, or emotionally. Strategic thinking has been successfully taught to students, but infrequently. Why? Most teachers are unaware of approaches to teaching students how to learn, especially when the focus is on the micro-level of strategic thinking through personalized strategies (Greenberg, 2014). Those who do, especially educators of older students in high school and post-secondary settings, find such students are resistant. We argue that what is needed is an alternative way in to strategic thinking development—something games can do by providing structure through rules and freedom of exploration through open-ended problems in an informal and non-judgmental environment.

Developing Strategic Thinking Through Games

Games meet conditions that enhance effective learning (Salen, Torres, Wolozin, Rufo-Tepper, and Shapiro, 2011). They potentially engage learners in nonthreatening (initially nonacademic) playful roles that allow them to practice strategic thinking and reflect on the outcomes of multiple attempts (their own and those of peers) while receiving and offering feedback. Games can provide a powerful learning environment. But underachievers may not succeed unless they become aware of and expand their knowledge about strategies that can help them—and the need to adapt such strategies to meet specific conditions within a given problem scenario (Greenberg, 2014).

How does one become successful in most games? Experts discuss the importance of learning from failure by players—the many private trials that lead to eventual success. In the late sixties, Reuven Feuerstein began to discuss the issue of trial and error learning for underachievers. He stated one can only improve through learning from errors if one develops effective strategies for identifying problems and determining new approaches to improved performance. Some learners need assistance to learn how to develop effective strategies in order for trial and error to become a positive learning experience. But how many learners understand—at an explicit level—how these strategies can be modified to meet very specific needs (based on game or personal requirements)? And how many students actually give up without meeting success—those who don't have the skills to seek assistance from more knowledgeable others or who are not able to adapt strategies to meet personal needs?

Evidence supports the use of the comprehensive CEA approach underlying the *ProblemUp!* game in a variety of settings with various ages of learners (Greenberg, 2014). Observations over time, however, highlighted several issues that led to limited dissemination of the approach. Our goal is to develop a game that will find a way to students who may otherwise exit educational settings, find a way to educators who understand the need to teach strategic thinking and do not have institutional support to develop their own approach, at least initially, and find, eventually, a way to assist any learner to overcome barriers in their personal learning goals. At this point, we see the potential of our game furthered by two approaches. First, teachers and others working in schools and universities can facilitate play in and out of the classroom. Second, our game is designed to meet needs discussed by Gee (2007) and others whereby learners are actively engaged in critical thinking, meaning making, and problem solving—but in the case of *ProblemUp!*, underachieving learners are engaged in surreal problem scenarios that take the sting out of daily failures and allow them to tinker with creative solutions by applying strategies (developed in the CEA method) they can then draw on to solve personal problems. As we seek this goal, we need to address specific design issues.
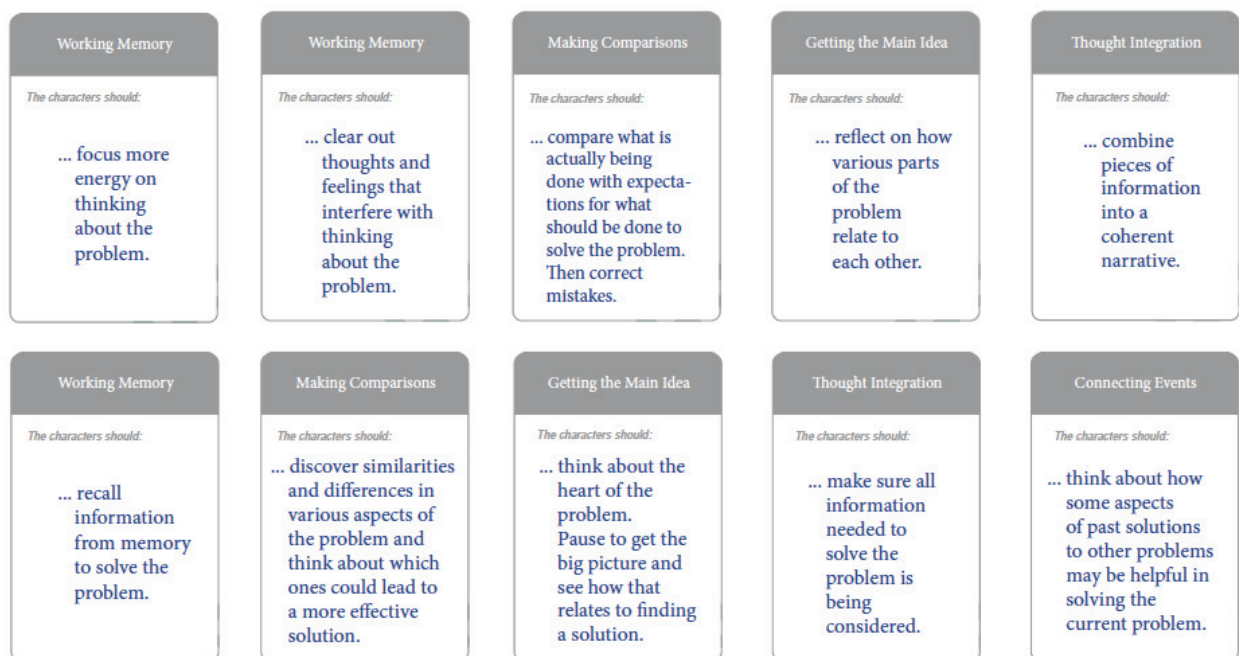
Figure 1: Strategy Cards.

Developing *ProblemUp!*

Over the past few years we have focused on stages 1 and 2 (see Table 1, Figure 1, and Figure 2):

1. Design and develop a card version of the game based on game-design principles (Salen & Zimmerman, 2004) and the CEA approach.

2. Develop a multi-player digital version of the game that will enable a group of players to interact through an application/software that would allow them to communicate with each other while playing.

3. Field test the card and the multi-player digital game and make iterative changes.

4. Establish a website and appropriate methods for communicating with schools, universities, and individual users.

5. Design, develop, and field test a single-player digital/online version of the game (with or without interaction with other players).

6. Develop and field test a blog where players of any age in any setting could talk with each other and a facilitator/mediator. The blog would also allow users to contribute to novel rule-sets and scenarios to be integrated in the game.

We began by planning development of a prototype game. We played different iterations of the game in our research group with the support and informal feedback of students and friends. We compiled lists of strategies and categories of meta-strategic knowledge that are part of the CEA approach, as well as scenarios for problem cards based on academic and nonacademic needs of fictitious university students. A prototype-version of the cards was designed. Throughout the process strategies have been reworded in order to make the game more accessible to high school and undergraduate students. The game was then tested in informal game sessions. Players oftentimes selected winners based on the creativity in the stories they told, rather than based on the degree to which the proposed strategy was well developed to meet the needs in the given scenario. This led to refinement of rules, emphasizing more explicitly the need to adapt specific metastrategic knowledge to solve situated problems.

On several occasions, K-12 and university teachers provided further informal feedback as they "messed about" with the card game. Those new to the approach quickly became engaged when an expert facilitated gameplay and also when they could observe others playing initially. They reported that the game could easily be adapted to learners of younger ages. In some of these situations, those playing the game began to help each other develop strategies. With an online prototype, we were able to let players interact and easily select new strategies. Overall,

these informal experiences and observations led us to refine the game in several ways.

Figure 2: Problem Cards.

First, we changed the content of the Problem Cards from "preset" scenarios presenting real-life dilemmas faced by students, to surreal and open-ended scenarios (see Figure 2) that can be freely interpreted by players and enriched with details not shown on the cards. Further, we developed a system that can generate virtually millions of different problem scenarios by combining and recombining the Problem Cards.

The prototype of the game includes five decks of 54 Problem Cards (for a total of 270 cards) that represent five categories (1: adjective, 2: protagonist, 3: problem, 4: descriptor and 5: object). Each card features a word/phrase. A player draws one card from each deck positioning them sequentially on the table (12345). This combination of cards determines a unique problem scenario. Cards 1 and 4, as well as cards 2 and 5 can be interchangeably used to create even more absurd scenarios, which allows for millions of combinations (see Table 1). This contributes to a high level of variety and increases the re-playability value of the game. Moreover, we predict this version will establish a safer climate for play where humor can further a sense of shared engagement with other players and lead to deeper critical and lateral thinking related to the problem scenarios and strategies.

Second, we revised the rules of the game. Instead of one judge determining the winner of a round, all players must decide which player they think provided the best response. Further, the rules emphasize the need to base votes on two factors: the most creative story based on the Problem Cards as well as the best solution that matches qualities of the strategy selected by each player. We believe this change will encourage all players to pay close attention to each player's response and think carefully about the criteria to use in determining their vote. In this manner, the game can better highlight its purpose of helping players develop flexible, yet detailed, strategies for overcoming situated challenges.

How to Play *ProblemUp!*	Player Cards	Strategy Cards	Problem Cards
SETUP Notes: Players may play alone, with a partner, or in teams. Individuals or teams receive one set of Strategy Cards to share Players decide before the game begins the victory conditions (how a player wins the game): how many rounds, amount time to play, or number of Problem Cards to be collected.	Each player selects a different Player Card to represent him or her and places it face up in front of him/her. Each player gives all other players a copy of his/her Player Cards. Each player places these cards in a stack, face down, beside their own Player Card.	One player shuffles the Strategy Cards face down and passes three Strategy Cards to each player. Each player holds the Strategy Cards in his/her hands.	One player shuffles the Problem Cards for each category separately and places them face down in five piles. One player turns over a Problem Card from the top of each of the five piles to begin a round. Note: The prototype of the game consists of 270 cards, i.e., 54 words/phrases for each of five categories (adjective, protagonist, problem, descriptor, and object), resulting in millions of combinations for problem scenarios.

GAMEPLAY	
	1. One player reads the problem scenario generated by the five Problem Cards. 2. Each player creates a story in which the characters use one of the three Strategy Cards to solve the problem. Stories should include as many details as possible that elaborate on the characters, problem, and strategies. 3. Each player reads his or her chosen Strategy Card, including the label for the strategy, and lays it face up on the table. Then, the player shares his/her story and proposed solution. 4. Other players listen to the stories and solutions in preparation to vote for the best one. 5. After every player has shared his/her story, players vote for the person they believe told the best story (most closely connected details of the problem and the solution to the problem scenario). Players vote by placing the Player Card of choice (face down) in the middle of table. 6. The winner of the round is the player with the most votes for his/her story/solution. 7. The winner receives the five Problem Cards used for that round. 8. All Strategy Cards played that round go on the bottom of the Strategy Card pile. 9. All players receive one new Strategy Card. 10. If no clear winner, the Problem Cards remain on the table. 11. Five new Problem Cards are placed face up to begin another round. The next clear winner receives all Problem Cards face up on the table. 12. The winner of the game is the player with the most Problem Cards when the game stops.

Table 1: Set up and gameplay for the card version of *ProblemUp!*.

Future Steps

Based on feedback received at the GLS Conference, we intend to make further iterative changes and then seek IRB approval to field test the card game as played both face-to-face and online. Results will be used to further refine the game and determine how best to incorporate a game facilitator/mediator to facilitate transfer of strategies to real-life scenarios. Eventually, we intend to research the efficacy of the game in improving academic performance of underachieving students in K-12 and higher education settings. We believe it also has potential for a broader

audience of adult learners willing to exercise their creative thinking and gain awareness of how different strategies can be successfully applied in different contexts. Informal interactions and observations, field testing, and iterative changes of the card game will continue, based on reports of use in various settings. The development of an online game will require resources for programming, design, testing, etc. Ultimately, we want to establish a blog with the dual goal of providing a forum for players to share interesting stories and perspectives and to propose future cards to the deck, and ongoing facilitator/mediator support. In conclusion, with this game we want to offer opportunities for creative thinking, problem solving, and social interaction to better meet the needs of those seeking to develop strategic thinking skills, essential to succeed and overcome the challenges of today's and tomorrow's world.

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