THE DYNAMICS OF MOTIVATION AND LEARNING STRATEGY IN A CREATIVITY-SUPPORTING LEARNING ENVIRONMENT IN HIGHER EDUCATION

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ABSTRACT
The purpose of the study was to model the processes involved in the development of creativity and discuss how motivation and teaching strategies figure into a creativity-supportive learning environment. The subjects included 28 college students enrolled in an Introduction to Instructional Media course. A questionnaire and interviews were used for the collection of data. Over the course of the semester, the students were tasked with making a "creative multimedia video website". The results of the study reveal that the motivation of students in areas such as task value and self-efficacy were enhanced by this exercise. Moreover, this study developed effective strategies for the promotion of creativity and the enhancement of high-level meta-cognitive processes.
Keywords: creativity, creativity learning strategy, high-level meta-cognitive process, creative multimedia video, MSLQ

INTRODUCTION

Many researchers have reached the theoretical conclusion that intrinsic motivation is positively related to creativity (Sternberg & Lubart, 1991; Woodman & Schoenfeldt, 1990), and empirical studies have supported this contention (Torrance, 1987). While engaged in the creative process, students become the centre of learning in which an understanding of the goal of innovative thinking and the prerequisites for creativity are essential. Students must also learn how to use a variety of learning strategies and resources in order to conceive of innovative notions or implement them in an innovative manner. Various technologies have been employed in the field of education to enhance learning (Chang & Lee, 2010; Chen, Liu, Shih, Wu, & Yuan, 2011; Feng, Lin, & Liu, 2011; Hassan, Ismail, & Mustapha, 2010; Jou, Chuang, & Wu, 2010; Liu, 2010; Liu, 2011; Liu & Chang, 2010; Liu & Lin, 2009; Liu, Lin, & Chang, 2010; Miller & Robertson, 2010; Nuutinen, Sutinen, Botha, & Kommers, 2010; Tsai, Chen, & Chen, 2010; Wang, Shen, Novak, & Pan, 2009), and it is now common for students to express their creativity through various media, indicating the inherent creative potential of all students (Lin, Liu, Kou, Virnes, Sutinen, et al., 2009).

CREATIVE PROCESS

From the perspective of the creative process, many researchers have emphasised that engagement in creative activities is meaningful, and regardless of whether the resulting products are innovative, useful, or creative, the entire process influences outcomes and improves individual performance (Drazin, Glynn, & Kazanijan, 1999). Many researchers have investigated human creativity from the cognitive psychological perspective. Kaufman and Baer (2002) used self-report and case study methods to investigate creativity, concluding that cognitive

mechanisms related to creativity are domain specific. Some researchers have investigated how one's mindset influences creative performance. For instance, Kray, Galinsky, and Wong (2006) found that a counterfactual mindset can impair the generation of novel ideas but can be beneficial to the performance of creative association tasks (Kray, Galinsky, & Wong, 2006). In addition, Miller (2007) and Necka (1999) indicated that a number of personal characteristics, such as field independence or a problem-solving style, are important dimensions influencing creative performance. Necka (1999) studied the relationship between attention and creativity and found evidence to support a link between creativity and a defective attentional filter. Scott, Lonergan, and Mumford (2005) investigated the influence of analogical and case-based approaches on the generation of new combinations. Researchers have also discussed creativity as it pertains to various dimensions of cognitive psychology (Hennessey & Amabile, 2009).

Creative behaviour has been seen as the performance of the creative process. The period of creative behaviour is believed to begin with the arousal of motivation and end with the finished product (Lubart, 2001). In other words, creative behaviour includes all of an individual's intrinsic and outwardly directed behaviours performed during the process of creative thinking.

MOTIVATION AND LEARNING STRATEGIES IN THE CREATIVE PROCESS

Amabile (1996) stressed that intrinsic motivation is essential for creative performance and has the power to propel a person in the pursuit of unachieved goals throughout the creative process. The period of creative behaviour is believed to begin with the arousal of motivation and end with the finished product (Campbell, 2007; Harris, 1998; Lubart, 2001). In other words, creative behaviour includes all of an individual's intrinsic and outwardly directed behaviours performed during the process of creative thinking. Torrance (1988) concluded that problems confirming and formulating hypotheses, discussions with others, and contradicting what is normally expected were stressed during the creative process. Joy (2004) discussed creative behaviour within the framework of social learning theory, in which human creative behaviour is believed to be influenced by expectancy and need value. Ford (1996) considered motivation, including expectations and emotion, to be an important factor influencing the creative actions of individuals. Moreover, domain-related skills were seen as the basis of creative performance, related to the domain-specific characteristics of given tasks.

LEARNING ENVIRONMENT FOR CREATIVITY LEARNING

A number of studies have indicated that interacting with the learning environment influences creative behaviour (Csikzentmihalyi, 1999; Sternberg, 2006). The decision to undertake tasks is based on the presence or absence of salient constraints in the social environment, which decreases individual intrinsic motivation, and in so doing detracts from creativity (Joy, 2004). Individual expectancy and need value influence creative performance (Joy, 2004; Zimmerman, 1989), and reinforcement from the environment encourages individuals to seek alternative strategies to overcome difficulties (Rotter, 1975). The model proposed in this study was designed to facilitate an examination of the effects of a creative environment on learner motivation and learning strategies. Our model enabled us to examine how learner motivation and learning strategies varied within the creative learning environment developed for this study.

RESEARCH QUESTIONS

Several studies in Taiwan have employed experimental designs using single data collection methods to investigate issues related to creativity (Tsai, Ting, & Kao, 1989; Wang & Horng, 2002). Although an increasing number of recent studies have used non-experimental methods to investigate learner creativity, the relationship between motivation and learning strategies remains unclear. Most studies have investigated changes in learning motivation and strategy within a creativity-supporting learning context and collected data at multiple points in time.

The four research questions addressed in this study are listed below.

1. In the creative process, what are the patterns of change in learner motivation and creative learning strategies?
2. Which factors related to learner motivation and creative learning strategies changed between the beginning of the semester and the middle of the semester?
3. Which factors related to learner motivation and creative learning strategies changed between the middle of the semester and the end of the semester?
4. Which factors related to learner motivation and creative learning strategies changed between the beginning of the semester and the end of the semester?

METHODS

Participants

A total of 28 students enrolled in the Introduction and Application of Instructional Media course at a university

in northern Taiwan participated in the study. Of these, 11 were graduate students (39%) and 17 were undergraduate students (61%). Among the 28 students, 12 were male (43%), and 16 were female (57%). In addition, 15 students were from the college of science (54%), and 13 students were from the college of liberal arts (46%). When grouped according to technical ability, 5 students (17%) had course-related experience in the use of video editing software, whereas 23 students (83%) had no such experience. Similarly, 6 students (21%) were familiar with web page building, while 22 students (79%) were not familiar with the technology. Although a number of the students were familiar with video editing software (such as PowerDirector, VCD Cutter, and Windows Movie Maker) and web page building software (such as FrontPage and Dreamweaver), none of the students had any experience with the software taught in the course (web page building software: Namo Web Editor 5.5; video editing software: VideoStudio). The researchers performed participative observation, and at the end of semester, randomly interviewed 20 students to collect information related to creative learning.

Instrument

The aim of this study was to investigate how student motivation and learning strategies change throughout the creative process. The Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich, Smith, Garcia, and McKeachie (1991), has been applied in many disciplines (Liu & Lin, 2010). In this study the MSLQ was adapted to examine learner motivation and creative learning strategies in a creative learning environment in which learners were assigned creative tasks to complete. The MSLQ comprised 35 items in total, which were rated on a six-point Likert scale with 1 = strongly disagree to 6 = strongly agree. In the motivation subscale, three factors were included: intrinsic motivation (3 items), task value (6 items), and self-efficacy (7 items). In the learning strategies subscale, five factors were included: rehearsal (2 items), elaboration (5 items), organization (2 items), critical thinking (4 items), and self-regulation (6 items). The results of reliability analysis indicate that the values of the Cronbach's Alpha for all factors were higher than .70, demonstrating the good reliability of the questionnaire (Table 1).

Table 1. Reliability Analysis of Motivated Strategies for Creative Learning Questionnaire

	Factor	Items	Alpha
Motivation subscale	Intrinsic goal orientation	3	0.83
	Task value	6	0.76
	Self-efficacy	7	0.91
Strategy subscale	Rehearsal	2	0.77
	Elaboration	5	0.85
	Organization	2	0.70
	Critical thinking	4	0.77
	Self-regulation	6	0.84

Course design

The objective of the course, Introduction and Application of Instructional Media, was to provide students with experience in the creation of an impressive multimedia video while collaborating with others. The most important element of instruction is to promote the learning process (Hou, 2010; Isman, 2011; Shieh, Chang, & Liu, 2011). Therefore, the course-related tasks required that students describe the creative process they follow when they present their mid-term reports, and to post their thoughts on a discussion forum. Prior to the course, the syllabus was thoroughly reviewed by one instructor and one teaching assistant. During the semester, the instructor was responsible for instruction, while the teaching assistant helped to monitor learning. During the course, documents and information, such as personal reflection journals, records of group discussions, and multimedia videos, were recorded in the discussion forum as student learning portfolios. The instructor and the teaching assistant monitored the discussions of different groups and provided suggestions.

Cole, Sugioka, and Yamagata-Lynch (1999) studied supportive environments for creativity in higher education with a focus on the role of the instructor. They found that strategies, such as remembering every student's name and calling the students by their names would make students more comfortable with the instructor and more willing to share their thoughts and innovative ideas within the enjoyable atmosphere. Therefore, the strategy the instructor and the teaching assistant employed in this course was to remember all of the students' names. Moreover, the instructor and the teaching assistant interacted with students in the discussion forum outside of class time. It was hoped that these strategies would give the students greater confidence in developing their own innovative ideas and products, and that this confidence would be less contingent on the comments of others regarding their work.

The tasks designed in this course provided students with the opportunity to express their creativity. The creative tasks had two characteristics: fuzzy structure and open-endedness. The theme and direction of the tasks were not

limited; students were permitted to select any topic for their midterm video, incorporate related resources, and edit their video as they saw fit. For the final assignment, the students were required to make a website with an instructional video, but the students were free to select a topic that they were interested in.

RESULTS

In the creative process, how did learning motivation and creative learning strategies change over time?

From the beginning to the middle of the semester, the mean scores on the two factors constituting creative motivation: Task value (t=2.71, p<.05) and self-efficacy (t=2.18, p<.05), improved significantly. This demonstrates that during that period, student expectations concerning task value and self-efficacy in producing a multimedia video were enhanced, and that students believed themselves capable of producing creative works (Table 2). The effect size of the factors of task value and belief in self-efficacy were moderate. Although the factor of intrinsic goal orientation did not show a significant change over time, the effect size of the factor was small, indicating that students' intrinsic goal orientation changed only slightly. In the dimension of learning strategies, the factor of elaboration did not change significantly over time and the effect size was only trivial or small.

Table 2. Comparisons between Pre-Test and Middle-Test

Factors	Pre-test		Middle-test		df	t	Effect size[a]
	M1	SD1	M2	SD2			
Intrinsic goal orientation	4.37	0.76	4.56	0.69	27	1.23	0.37
Task value	4.51	0.48	4.78	0.50	27	2.71*	0.78
Self-efficacy	3.91	0.63	4.16	0.51	27	2.18*	0.62
Rehearsal	4.27	0.65	4.19	0.68	27	-0.46	-0.17
Elaboration	4.30	0.58	4.42	0.55	27	1.31	0.30
Organisation	4.31	0.57	4.35	0.76	27	0.24	0.08
Critical thinking	4.44	0.63	4.45	0.59	27	0.08	0.02
Self-regulation	4.35	0.52	4.42	0.53	27	0.67	0.19

Note: *p<.05[a] (M2-M1)/(sqrt(SD_1^2+ SD_2^2)/2)

The mid-term task was to edit multimedia videos. During this process, the students considered how the task was important to them. The characteristics of motivation influenced the process, and the students appreciated being able to select a topic of personal interest. In this stage, students identified the value of the assignment and, after confirming the meaning of the task for themselves, engaged in the creative activity with greater commitment, became more interested in the task, and valued their work more highly:

> *I felt good because I felt that I was a director, and I could express my ideas freely. For example, I put my mid-term work on the website of a baseball team, and some viewers felt touched, and some felt amused, and some even said they awaited my follow-up work. I felt fulfilled. Because I spent lots of time and energy to complete the work, I also wrote many pages for the reflection journal. (Stu_C)*

> *I edited a video to record my memories in Australia. It was an unforgettable experience and I will treasure the work. (Stu_G)*

The improvement in self-efficacy was associated mainly with the skills involved in the use of video-editing software and with the students' belief in their own ability to complete the work. Students also indicated an awareness of the defects in their work, how to make improvements, and a willingness to do so. Thus, in the first half of the semester, the self-efficacy of the students showed improvement.

> *Actually, I believed that I was equipped with high-level skills; however, because of the limitation of the resources, the final product was different from the idea I generated at the beginning. The resolution of the video received my highest appraisal because I cared about the quality of the frames, and I thought I would revise it continually. (Stu_A)*

> *It was important to build an environment and push us to do something we did not know or something we thought we could not accomplish. When we accomplished the task for the final, we suddenly realised that we could actually do it. (Stu_J)*

How did motivational factors and creative learning strategies change between the middle and the end of the semester?

During the period from the middle to the end of the semester, the groups produced creative multimedia videos. Group discussions were incorporated into the curriculum, and the groups filmed videos. Changes in learning motivation and learning strategies are shown in Table 3. No statistically significant change was evident between the middle- and post-tests. Factors such as intrinsic goal orientation (t=.85, p>.05), task value (t=1.00, p<.05), belief in self-efficacy (t=1.70, p<.05), organization (t=1.08, p>.05), and critical thinking (t=1.69, p>.05) showed small effect size (Table 3). In the dimension of learning strategies, the effect size of the factor of self-regulation (t=1.62, p>.05) was moderate, indicating that the students' learning strategies had perhaps changed. The results indicate that creative motivation and learning strategies did not change dramatically between the middle and the end of the semester, but self-regulation perhaps changed by a statistically insignificant degree.

Table 3. Comparisons of Middle-test and Post-test Results

Factors	Middle-test		Post-test		df	t	Effect Size
	M1	SD1	M2	SD2			
Intrinsic goal orientation	4.56	0.69	4.69	0.65	27	0.85	0.27
Task value	4.78	0.50	4.89	0.59	27	1.00	0.28
Self-efficacy	4.16	0.51	4.30	0.50	27	1.70	0.39
Rehearsal	4.19	0.68	4.27	0.67	27	0.51	0.17
Elaboration	4.51	0.65	4.50	0.61	27	-0.67	-0.02
Organisation	4.35	0.76	4.56	0.83	27	1.08	0.37
Critical thinking	4.45	0.59	4.64	0.55	27	1.69	0.47
Self-regulation	4.42	0.53	4.63	0.60	27	1.62	0.52

During the interviews, the students described how the process of producing videos led to many discussions and negotiations with group members. Students even adjusted their creative ideas based on the information received from others. Furthermore, during the discussion, each group had to provide feedback to other groups, which led to the generation of more ideas and the development of high order meta-cognitive strategies.

> *After receiving feedback from others, I would accept the feedback and try to make some adjustments; therefore, I looked forward to receiving more feedback. Reviewers should explain the reasons why they feel my work was good or bad. Just saying "good" would not make me feel happy. (Stu_J)*

> *The discussion activity was helpful for us to generate creative ideas. Through the discussion, it became possible for us to see the defects in our work, and see where it could be improved. The suggestions from other groups helped us to examine our ideas. (Stu_H)*

How did motivational factors and creative learning strategies change between the beginning and the end of the semester?

Comparing the results of the pre-test and the post-test revealed that motivation and task value (t=2.66, p<.05) changed significantly, as did self-efficacy (t=2.93, p<.01). In the dimension of learning strategies, the factor of self-regulation changed significantly (Table 4). The result was that throughout the creative process, the students gradually used more high order meta-cognitive strategies. Analysis of effect size shows that the factors of intrinsic goal orientation and self-regulation had moderate effect sizes, and the factors of task value and self-efficacy had large effect sizes (Table 4).

Table 4. Comparisons between Pre-test and Post-test

Factors	Pre-test		Post-test		df	t	Effect Size
	M	SD	M	SD			
Intrinsic goal orientation	4.37	0.76	4.69	0.65	27	1.92	0.64
Task value	4.51	0.48	4.89	0.59	27	2.66*	1.00
Self-efficacy	3.91	0.63	4.30	0.50	27	2.93**	0.97
Rehearsal	4.27	0.65	4.27	0.67	27	0.00	0.00
Elaboration	4.30	0.58	4.50	0.61	27	1.39	0.48
Organisation	4.31	0.57	4.56	0.83	27	1.26	0.50
Critical thinking	4.44	0.63	4.64	0.55	27	1.35	0.48
Self-regulation	4.35	0.52	4.63	0.60	27	2.07*	0.71

p<.05*; *p*<.01**

Figure 1 illustrates that in a creativity-supporting learning environment, self-efficacy and task value were enhanced, and students employed higher order learning strategies. From the beginning to the middle of the semester, self-efficacy and student perceptions toward the value of the tasks they were asked to perform significantly improved. From the beginning to the end of the semester, self-efficacy and task value also improved, and students tended to employ more self-regulated learning strategies.

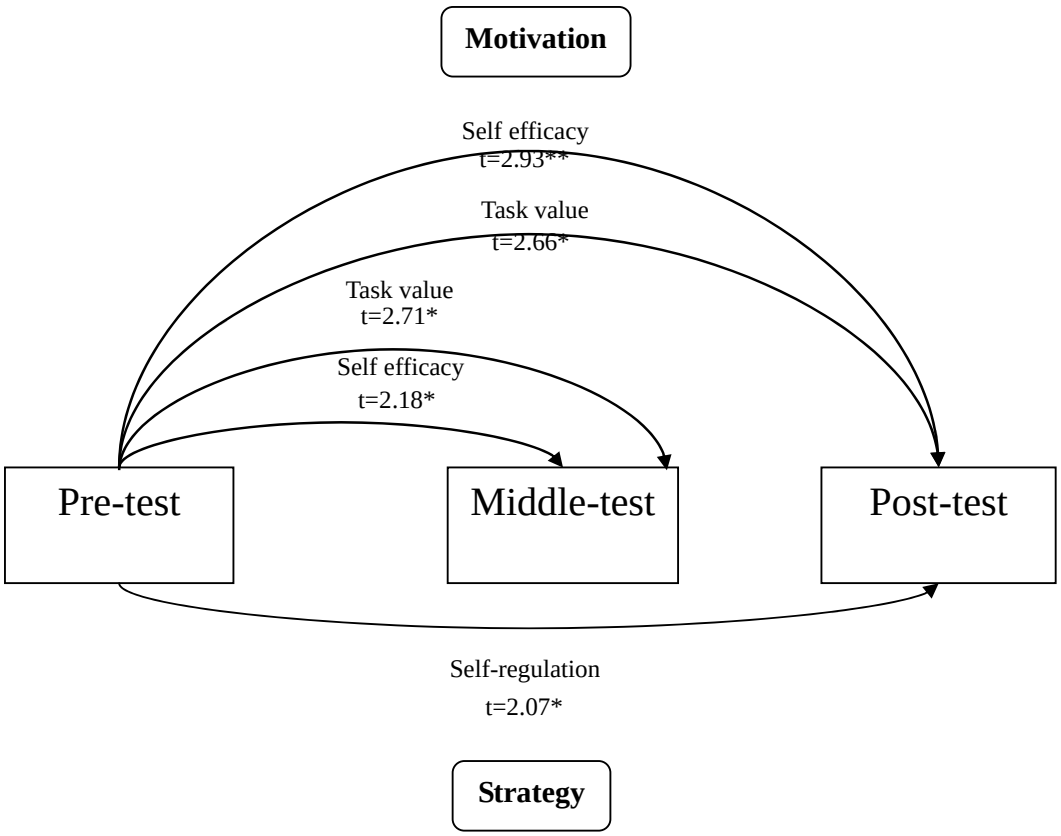

Fig. 1. Changes in Learning Motivation and Creative Learning Strategies

In the interviews, the students expressed how they sensed changes during the execution of creative tasks and how the course affected them:

> *I believe that the course influenced my creativity by helping me to implement my ideas through editing videos or building a website. The course enabled me to produce my own work and I really felt fulfilled. I got a lot from the course, and many different ideas were stirred within me. Generally, it would be impossible to discuss things with so many people in other courses. (Stu_B)*

> *I believe that this course is the most interesting course I have ever taken. Group discussion was interesting, and I felt that I could produce many creative things by being able to express my ideas freely. I was impressed by the work of others, and many different ideas were generated during the process. (Stu_J)*

CONCLUSION AND DISCUSSION

The purpose of the study was to design a suitable environment for the development of creativity and examine changes in learning motivation and learning strategies. Both qualitative and quantitative data indicate that students improved significantly with regard to task value and self-efficacy over the period of the semester. The characteristics of these changes influenced the willingness of students to engage in the creative process. During creative activities, the students continually adjusted their evaluative processes, confirmed the value of the task, saw an improvement in their self-efficacy, and adjusted the strategies they used to overcome problems. All of

these changes enhanced their willingness to engage in the creative process. These finding are consistent with social learning theory (Joy, 2004), which predicts that creative behaviour is influenced by expectancy and need value.

However, in the dimension of intrinsic goal orientation, no significant change was observed over the course of the semester. The mean scores on both the pre-test and post-test were very high, indicating little variance. The high mean scores may have been due to the characteristics of tasks used to inspire the creative process. The students were strongly engaged in the tasks and enjoyed overcoming difficulties during the process of learning; thus, they showed high intrinsic goal orientation from the beginning to the end of the semester. The willingness of students to engage in the creative task and the confirmation of task value were important for maintaining student motivation to engage in the creative process.

Basic learning strategies, such as rehearsal, did not change significant between the pre-test and post-test, for which the scores were both very high. Such learning strategies are very basic; however, they are highly valuable and students commonly employ them to bolster their performance. In this study, students employed these learning strategies consistently throughout the study period; however, self-regulation strategies showed significant improvement between the pre-test and post-test. The improvement in self-efficacy was the other key element fostering changes throughout this process. The creative learning process is a dynamic cycle, and a number of studies have found that creators continually evaluate the possibility of achieving their goals, forming a cycle between problem confirmation and the achievement of goals (Amabile, 1996; Necka, 2003). If instructors paid more attention to the changes occurring in the creative process and provided timely support, students would be more willing to engage in creative activities.

For this reason, instructors should evaluate students' final products and also try to adjust students' perception of creativity as well as helping students to understand the value of the assignments and bolstering their self-efficacy. Because students tend to underestimate their creative potential, it is crucial to help students improve their self-efficacy, understand the value of the task, break through fixed thinking in a supportive environment, and reassure them that they too can be creative. An optimum course design should focus on creative tasks and provide chances for students to experience the creative learning process in which they begin with nothing and end up creating something of value, while remaining cognizant of the changes they go through during the process. Creative instruction is not only the evaluation of creative products, but also a process of self-realisation.

Learning motivation is an essential issue when designing a course (Cheng & Yeh, 2009; Liu, Kou, Lin, Cheng & Chen, 2008; Liu & Lin, 2009). This study provides some principles for designing a course that supports creative learning to enhance learning motivation and learning strategies. First, it is important to develop an enjoyable atmosphere for students, which enhances the relationship between teacher and students (Cole, Sugioka, & Yamagata-Lynch, 1999). It could also encourage students to share creative ideas. One of the strategies we used was to learn all of the students' names to ensure that students become more comfortable with their partners and instructor, which is beneficial for students in the development of confidence and in the sharing of ideas.

Second, learning activities and creative tasks should include two characteristics: a fuzzy structure and open-endedness. The task should also allow students to employ various strategies to achieve the goal. The instructor could also provide students the opportunity to select the kind of task that they would like to complete. During the selection process, students would have to evaluate their own abilities and expectations and select strategies suitable for completion of the task. These meta-cognitive processes would enhance self-regulated learning. Furthermore, providing students the opportunity to choose their task could improve their recognition of task value and encourage them to engage more in the task.

Third, it is important for students to confirm and improve their basic creative skills (Amabile, 1996). These skills influence the generation of creative ideas as well as the discussion of creative ideas. Before assigning the task, the instructor should provide some training and help to develop and evaluate the students' basic skills in creativity. When students are equipped suitable skills, they generally demonstrate more confidence in their ability to complete the task and are more willing to share their ideas with others.

In this study, we developed a creative learning environment, examined the changes in learning motivation and learning strategies, and provided principles for developing a creative learning environment. Future studies could examine the relationship between learning motivation and learning strategies under a creative learning environment.

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