RESEARCH BRIEF

Strengthening Thai 7th Grade Student Creative Thinking Skills: A Curriculum Development Model

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According to the 21st century skills framework, students must be able to develop skills in critical thinking and problem solving, creativity and innovation, cross-cultural understanding, collaboration, teamwork and leadership, communications, information and media literacy, computing and ICT literacy, career and learning skills, and compassion, along with the traditional 3-R skills of Reading, W(R)iting, and A(R)ithmetic (Reeve, 2014; 2016; Scott, 2015).

Additionally, students must be prepared to face quick and unexpected challenges and change. According to Ratanapeantamma and Pruengnol (2016), in Thailand, education is the foundation for the nation's development, which also plays an important role in human resource development and economic growth. Furthermore, there must be a focus on the development of creative and creative thinking skills (Office of the Prime Minister, 2016).

The main educational goals must be clear, with a system of mechanisms put in place which drives educational policies according to the national strategies. These processes must be carried out in a complete cycle with the explicit understanding of the overall picture of the system. Furthermore, to push forward with all aspects in educational implementation, the cooperation of all sectors and stakeholders is required to create the body of knowledge on educational innovation, which prepares young people with the necessary skills to survive in the 21st century.

Additionally, there need to be two additional creative dimensions developed. These include *vertical thinking* and *lateral thinking*. Vertical thinking refers to solving a problem by analysis, which encourages a sequential, structured approach to redress a problem. Lateral thinking, on the other hand, requires one to think "outside the box," to solve problems and create innovative solutions (De Bono, 1990).

This is consistent with the "The Basic Education Core Curriculum B.E. 2551 (A.D. 2008)" (Ministry of Education Thailand, 2008) in which the learning process is stated to be able to cultivate 'thinking capacity', which is defined as the "capacity for analytical, synthetic, constructive, critical, and systematic thinking, leading to creation of bodies of knowledge or information for judicious decision-making regarding oneself and society" (Ministry of Education Thailand, 2008, p. 6).

The objectives of the present research are as follows:

1. To compare the difference between an experimental group and the control group of Thai 7th grade students' learning achievement and creativity skills.

2. To compare the difference between an experimental group and the control group's results in academic achievement and creative skills before and after the experimental group's creativity learning results.

3. To determine the student satisfaction with the experimental course which was designed to strengthen Thai 7th-grade creative skills.

Literature Review

Concepts and Theories of Creative Thinking

Torrance (1988) had a difficult time defining "creativity," but suggested a common theme throughout all discussions which was newness. Guilford (1959), on the other hand, referred to creativity as productive thinking, which was an aspect of intelligence. Both authors discussed divergent thinking, with the Torrance test of creative thinking (TTCT) consisting of both verbal and figural parts. Guilford, on the other hand, used task-based methods in which an individual has to come up with as many uses as possible for a common item, such as a brick.

The four subcategories of TTCT and Guildford's tasked-based creative test that measures creative cognitive traits are (O'Farrell & Meban, 2003):

1. fluency (the ability to produce a great number of ideas/solutions in a short time);
2. flexibility (simultaneously proposing a variety of approaches to a specific problem);
3. originality (the ability to produce new, original ideas); and
4. elaboration (the ability to systematize/organize details of an idea and carry it out).

Creativity has also been referred to as one of the vaguest, ambiguous, and confusing terms in education and psychology (Marakus & Elam, 1997). It has also been described as a process of developing sensitivity to the many problems, knowledge gaps, missing elements, and problems of life (Torrance, 1974).

Additionally, along with the continuing increase in technological complexity comes a continuing need to improve the creativity within individuals, thus allowing individuals to successfully deal with these complexities

of life. The emphasis upon an increase in creative skills of individuals also brings with it complex challenges.

Needs Assessment

Kaufman, Rojas, and Mayer (1993) stated that a needs assessment is a process used to identify needs by prioritizing essential needs. It is a systematic process for determining and addressing needs, or "gaps" between current conditions and desired conditions or "wants". The process of needs identification includes pre-assessment preparation (King, 2012), and the evaluation of data collected, data analysis, and essential needs prioritization (Watkins, Meiers, & Visser, 2012).

Curriculum Development and Supplementary Curriculum

Scholars in the field of curriculum studies such as Sayler, Alexander, and Lewis (1981), have indicated that curriculum development should be a plan for providing sets of learning opportunities for persons to be educated. Additionally, Dewey (as cited in Topolovčan & Matijević, 2017) was among the first pedagogues to clearly point out and explain the importance of a student's opinion and learning by discovering and solving problems.

A course plan is, therefore, a document designed to identify goals, objectives, learning objectives, content, activities, or learning experiences. Learning's outcome is the student achievement which is consistent with Ornstein and Hunkins' (2009) discussion concerning the dynamic in the construction of curriculum for present and future purposes, such as citizenship and economic gain, because of the preferred outcomes of stakeholders.

Stufflebeam developed the CIPP Model in the late 1960s as one alternative to the views about evaluations that were most prevalent at that time—those oriented to objectives, testing, and experimental design (Stufflebeam & Zhang, 2017). The main thesis, the most important purpose of program evaluation, is not to prove but to improve. It sees evaluation as a tool by which to help make programs work better for the people they are intended to serve.

Beauchamp (1982) later indicated that curriculum design is the substance and organization of goals

and culture content so arranged as to reveal potential progression through levels of schooling. Ritjaroon (2015) studied the curriculum evaluation process in the Thai education system and suggested that even though curriculum evaluation models are varied, there should be an evaluation period before developing the curriculum, an evaluation of the curriculum draft or curriculum analysis afterward, which leads to an evaluation before implementing the curriculum. This is followed by an evaluation during the implementation of the curriculum, and finally, an evaluation after the implementation of the curriculum, which appraises the results and effects of the curriculum.

Curriculum Evaluation

One of the earliest curriculum evaluation models, which continues to influence many assessment projects, was that proposed by Ralph Tyler. From this, we applied Tyler's objectives-centered model (Tyler, 1949), which is the process of determining the attainment of the intended goals in the curriculum. According to Tyler (1949), there are six key learning and assessment experiences. These include:

1. set a broad purpose,
2. determine the behavioral goals you want to measure,
3. determine the content of the learning experience you want to measure,
4. choose how to teach,
5. evaluation by judging by formative evaluation, and
6. if you do not achieve the intended purpose, you will need to make the decision to cancel or update the course. And if the goal is achieved, it may use back data to improve the targeting of the social context to improve the quality of the course (summative evaluation).

Ritjaroon (2015) outlined nine curriculum evaluation key processes. These were:

1. Analyzing the curriculum to be evaluated.
2. Studying approaches, theories, and evaluation models.
3. Setting objectives and evaluation indicators.
4. Designing the evaluation model.

5. Writing a curriculum evaluation project.
6. Developing data gathering tools.
7. Gathering the data.
8. Analysing the data.
9. Reporting the curriculum evaluation results.

Administrators should use the evaluation results in each time period to make decisions on the curriculum. This will prove curriculum evaluation to be cost-effective and valuable.

Student Satisfaction

Student satisfaction is an important indicator of the quality of learning experiences (Moore & Kearsley, 1996; Yukselturk & Yildirim, 2008). This is consistent with *Kuo, Walker, Belland, and Schroder (2013), which* showed that learner-instructor interaction, learner-content interaction, and Internet self-efficacy were good predictors of student satisfaction. In a student satisfaction instrument developed by Brashears (2004), clarity, delivery, content, and total satisfaction were chosen as the dependent measures of satisfaction. Shahrin, Toh, Ho, and Wong (2002) surprisingly discovered that when students received more control over their learning, an unintended result was also an increase in student satisfaction.

Research Hypothesis

This study has the following hypothesis:

H1. The experimental group of Thai 7th grade students' learning achievement and creative thinking skill scores will be higher than the control group.

H2. The experimental group of Thai 7th grade students' learning achievement scores and creative thinking skills before and after the experimental course are different.

H3. The experimental group of Thai 7th grade students is satisfied with the creative thinking skills curriculum.

Creative Thinking Learning Management Model

From a review of the literature and theory, the eight-step creative thinking learning management model is

proposed in Figure 1. A detailed synthesis of the model is further outlined in Table 1.

Methods

The research used stratified random sampling to select the sample groups from students enrolled in the first semester of the 2017 academic year at Bangkok's Protpittayapayat Secondary School. From this process, 41 students were selected to participate in the control group (traditional classroom methods), and another 41 students were select to participate in the experimental group (non-traditional classroom methods).

The variables studied included the independent variable of the requirements needed to develop programs to enhance the creative thinking skills of Thai 7th grade students, and the controlled variables which included l*earning achievement,* **creative thinking**, and student satisfaction.

The subjects selected for the evaluation process included social studies, religion, culture, and economics. The 36 learning units were divided as follows: 1) basic economics; 2) demand, supply, and equilibrium price; 3) sufficiency economy philosophy; 4) financial institutions; 5) economic groups; and 6) intellectual property.

The creative thinking skills curriculum development of secondary school students was divided into two main phases. Furthermore, each phase had multiple stages. These included:

Phase 1

This phase was further divided up into three stages (Table 3). These included:

Stage 1. Study the necessary requirements from the documentation, which included textbooks and related material from the Internet. This information was further analyzed by content analysis, from which seven essential components were identified as needed to develop creative thinking curriculum for Thai 7th grade students. These seven aspects included: curriculum documentation (aspect 1), course curriculum (aspect 2), curriculum learning activities (aspect 3), teachers (aspect 4), multi-media and teaching innovation (aspect

Table 1

The Creative Thinking Learning Management Model Eight Steps

| Step	Meaning	Activities	Output
1. Preparation	Prepare to face the situation.	creative situation brainstorming	Knowledge of the situation.
2. Reality	Understanding the truth of the problem.	discussion, focus group, and brainstorming	Understand the importance.
3. Analysis	Analytical thinking by distinguishing the various parts of the problem.	mind map, concept map, diagram, and flowchart	Have a clear understanding.
4. Synthesis	The synthesis of the solution and priorities.	classification, priorities	Solutions.
5. Accepting	Is the decision to exit the right approach?	discussion focus group, brainstorming.	Have a choice. The right approach.
6. Need for action	Follow the alternative and accept the result.	practice and preparation	Follow the choice. / Accept the consequences.
7. Test and evaluation	Check the results.	presentation, model, and testing	The results of the practice.
8. Applications	Using creativity to create new things.	productivity	New work / New method
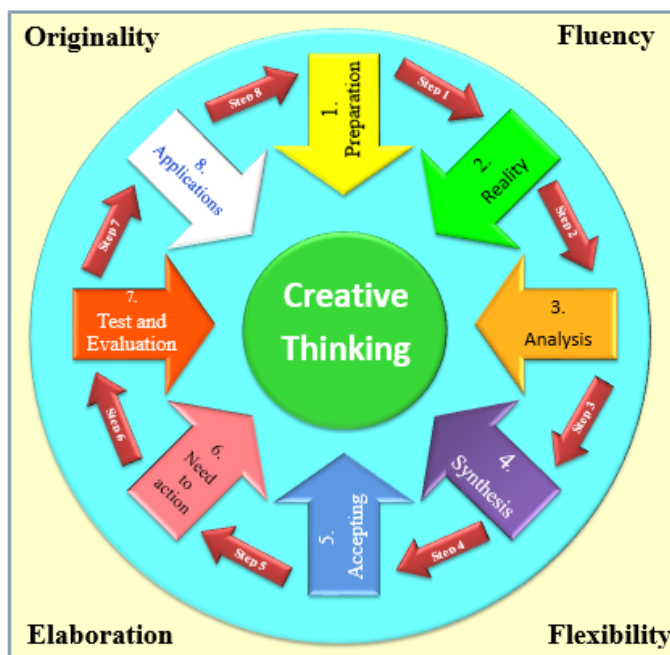
Figure 1. Creative thinking learning management model.
(Source: The authors)

5), measurement and evaluation (aspect 6), student satisfaction (aspect 7).

   Stage 2. In stage 2 of the study, results from a previous needs assessment study of *n* = 476 Thai teachers and school administrators were used. The results are presented in Table 2 and show that student satisfaction was evaluated to be of the highest priority, followed by the course curriculum. Curriculum documentation was judged by the teachers and administrators to be of the least importance.

Table 2
Needs Assessment Evaluations Items and their Priority

Evaluation Items Needs Assessment	PIN(modified)	Priority
Aspect 1 Curriculum documentation	0.367	7
Aspect 2 Course curriculum	0.433	2
Aspect 3 Curriculum learning activities	0.413	4
Aspect 4 Teachers	0.387	5
Aspect 5 Multi-media/teaching innovation	0.423	3
Aspect 6 Measurement and evaluation	0.380	6
Aspect 7 Student satisfaction	0.455	1
Total	0.408	

Stage 3. Learn how to build creative skills from related literature and research. Content analysis found that creative thinking skills come from encouraging students to think and accepting the novelty of student response. Additionally, there needs to be an environment in which recognition and award are used. From the above scholars and a study of the literature, we chose to divide the research into two phases as presented in Table 3.

Phase 2

This phase was further divided up into three stages (Table 3). These included:

Stage 1. Nine experts were tasked to examine and determine the quality of the selected course and curriculum documents as listed below. These educators and scholars had varied expertise in doctoral research, curriculum development, teaching, educational measurement and evaluation, economics, and research tools.

1. *Creative skills course development* was conducted by nine experts and found that the results were at the appropriate level ($\bar{x}$=4.74).
2. The *creativity skill test inspection* by nine experts for the experimental course was accomplished by nine experts using content validity and construct validity. Results showed that the index of item objective congruence (IOC) was between 0. 89–1.00, with the reliability of the tryout using alpha coefficient: μ equal to 0. 82.

Table 3
The Two Phases of Creative Thinking Curriculum Development

Phase	Stage	Sub-stage
RESEARCH Phase 1 – A study of basic information used in curriculum development.	Research Stage 1 - Analyze and synthesize the basic information needed.	
	Research Stage 2 - Assess essential needs ($n = 476$).	This was accomplished in a previous study.
	Research Stage 3 - Learn how to build creative skills.	
DEVELOPMENT Phase 2 - The curriculum for creative thinking skills development.	Results Stage 1 - Key elements in curriculum development.	1) Creative skills course development. 2) Creativity skill test inspection. 3) Achievement test inspection. 4) Student satisfaction questionnaire validation. 5) Knowledge sheet inspection. 6) Learning management plan inspection.
	Results Stage 2 - Course effectiveness evaluation.	1) Experimental design plan. 2) Data collection. a. Pre-trial / Pretest b. During the trial c. post-test
	Results Stage 3 - Curriculum evaluation and improvement.	1) Curriculum evaluation. 2) Curriculum updates.

3. The achievement test inspection for the experimental course was accomplished by nine experts using content validity and construct validity. Results showed that the index of IOC was between 0.78–1.00, with the reliability of the tryout being accomplished by use of the Kuder-Richardson Formula 20 (KR-20) (Kuder & Richardson, 1937).

4. The *student satisfaction questionnaire validation* for the experimental course was accomplished by nine experts using content validity and construct validity. Results showed that the index of IOC was between 0.78–1.00, with the reliability of the tryout using alpha coefficient: μ equal to 0.95.

5. The *knowledge sheet inspection* was conducted by nine experts and found that the results were at the highest level ($\bar{x}$ = 4.69).

6. *Learning management plan inspection* was conducted by nine experts and found that the learning management plan was most appropriate ($\bar{x}$ = 4.58).

Stage 2. Course effectiveness evaluation tools include:

1. The *experimental design plan* included the experimental group and control group. Derived from randomized control group pretest–posttest design.

2. *Data collection* was divided into three steps:
    a. The pre-trial/pre-test: Involved the sending out a written request to the director of the school in which the groups were being selected. In this initial communication, samples with details of the experiments were sent to help with administrator understanding.
    b. During the trial: Evaluation of the experimental group's (RE:1) management learning courses which enhance Thai 7th-grade creative thinking skills and the control group (RC:2) and normal learning.
    c. After trial/post-test: Testing of the experimental group's (RE: 1) creativity

skills and their achievement level after class, as well as each student's satisfaction. For the control group (RC: 2), creativity skills and achievement testing were given after class, followed by a score on creative skills, achievement learning, and student satisfaction. Scores were analyzed by statistical methods and SPSS for Windows 21 software.

Stage 3. Curriculum evaluation and improvement were conducted as follows:

1. *Curriculum evaluation* was based on the achievement of the target learners and the measurement of the behavior before and after the class.

2. *Curriculum updates* included content, time, and activities learning measurement and evaluation tools; method of measurement and evaluation; and media and learning resources. The development of the creative thinking curriculum for Thai 7th grade students can be summarized in Figure 2, with further details outlined in Table 4.

Figure 2. Curriculum development research and development.
(Source: The authors)

Table 4
The Development Process for Thai 7th Grade Creative Thinking Skills Curriculum

The process of creative thinking curriculum development.		Method / Data source	Results
RESEARCH Phase 1 - A study of basic information used in curriculum development.	Research Stage 1 - Analyze and synthesize the basic information needed.	Study papers, textbooks, and related research.	Key elements in curriculum development.
	Research Stage 2 - Assessing essential needs (n=476).	Assessing the essential needs assessment with the administrators and teachers.	The needs assessment for curriculum development
	Research Stage 3 - Learn how to build creative skills.	Study papers, textbooks, and related research.	Creative Thinking Learning Management Model
DEVELOPMENT Phase 2 - The curriculum for creative thinking skills development.	Results Step 1 - Key elements in curriculum development.	Curriculum quality is monitored by experts.	The course is appropriate.
	Results Step 2 – Course effectiveness evaluation.	Take the course with the trial to sample group.	Effective curriculum.
	Results Step 3 - Curriculum evaluation and improvement.	Assess and improve the curriculum. To be the most complete.	Complete course.

Analysis was conducted using SPSS for Windows 21 software from the use of descriptive statistics (frequency and percentage methods), as well as Wilks' lambda, which is a test statistic used in multivariate analysis of variance (MANOVA) to test whether there are differences between the means of the experimental and control groups of students on a combination of dependent variables (Everitt & Dunn, 1991).

The needs assessment for curriculum development questionnaire was ranked by using the modified priority needs index (PNI $_{(modified)}$; Silsawang, Boosabong, & Ajpru, 2014; Wongwanich & Wiratchai, 2005). To get standard scores, the needs were assessed by finding the differential value between the desired outcome (I) and actual results (D; Wongwanich, 2005). The formula for the calculation is as follows: PNI $_{(modified)}$ = (I - D)/ D, where PNI = priority needs index, I = mean desired outcome, and D = mean actual results.

Results

Data analysis and the subsequent results were divided into three sections. Section 1 was comprised of a comparison of the mean scores of the Thai 7th-grade student achievement and creative skills from both the experimental group and control group. The analysis made use of the *one-way MANOVA*. Section 2 of the analysis was involved with the comparison of the mean scores for achievement and creative skills for the experimental group. The analysis also made use of the *one-way MANOVA*. In Section 3, the students' satisfaction concerning the creative thinking skills curriculum was analyzed using the mean ($\overline{x}$) and standard deviation (S.D.).

However, before the data analysis of the three sections, we conducted a preliminary test of the MANOVA. These results are shown in Table 5.

Table 6 shows the mean and standard deviation of learning achievement and creative thinking skills after class completion, classified by group. The analysis was undertaken by using the *one-way MANOVA*. Furthermore, the Table 6 test results show the differences in mean scores on academic achievement and creative thinking skills between the sample groups. Results indicated that Wilks' Lambda were $\Lambda = 0.41$, $F = 56.32$, Sig. $= .00 < \propto$ (.05) (Everitt & Dunn, 1991).

The results showed that the mean scores on learning achievement and creative thinking skills after class completion between the samples differed significantly (0.05), and overall the experimental group (EG) had an average score of achievement and creative skills after course completion higher than the control group (CG; see Table 7). This is consistent with the research hypothesis H1.

Table 8 shows the results of Section 2 of the evaluation. In it, results show that the EG students achieved higher marks in both learning achievement and creative thinking skills in the post-test at the end of the class session. The analysis was undertaken using the *one-way MANOVA*. Furthermore, Wilks' Lambda testing found that L=.234, F = 129.069, and the Sig. $= .000 < \propto$ (0.05). This was confirmed as the statistical difference was at a significant level of 0.05. This is consistent with hypothesis H2 in which the experimental group of Thai 7th grade students' learning achievement scores and creative thinking skills before and after the experimental course are different.

Table 5
Preliminary Test Results of the Multivariate Analysis of Variance (MANOVA)

Statistical Testing Method	Assumption	Data analysis		Test Results
		1st time	2nd time	
Barlett's Test	Sig. $< \propto$	.00*	.00*	According to a preliminary agreement
Box's M Test	Sig $> \propto$	.06*	.01	Variance-covariance matrix between the are equal / Rule of Thumb
Shapiro-Wilk	Sig. $> \propto$	>.05	>.05	Normality

Note: $\propto = .05$

Table 6
Results of Creative Learning Achievement and Creative Thinking Skills Testing after Class Completion (Classified by Group)

Dependent Variable	Independent Variable	n	$\overline{X}$	S. D.	F	Sig.	Compare
Learning Achievement	Experimental	41	28.07	4.35	56.32**	.00	EG > CG
	Control	41	20.59	2.84			
Creative Thinking	Experimental	41	28.02	7.73			EG > CG
	Control	41	21.54	7.10			

Note: $\Lambda^* = .41$, F = 56.32, Sig. = 0.00, $\propto = 0.05$, $\overline{X}$ = mean, S.D. = standard deviation, EG = Experimental Group, CG= Control Group

Table 9 shows the results from Section 3 of the evaluation, in which hypothesis H3 was also accepted. From the results, it can be determined that the EG students were satisfied with the creative thinking skills course at the highest level ($\overline{x}$ = 4.77, S.D. = 0.62). Of the six aspects evaluated, an overview of the learning management model ($\overline{x}$ =5.00, S.D. = 0.00)

was ranked as the most important, this was followed by the documentation course ($\overline{x}$ =4.88, S.D. =0.35), the teacher instructor ($\overline{x}$ =4.77, S.D. =0.59), measurement and evaluation ($\overline{x}$ =4.71, S.D. =0.69), course learning activities ($\overline{x}$ =4.70, S.D. =0.68), and finally, media and learning resources ($\overline{x}$ =4.53, S.D. =0.82).

Table 7
Results of Creative Learning Achievement and Creative Thinking Skills Testing after Class Completion (Classified by Group)

Dependent Variable	Independent Variable	n	$\overline{X}$	S. D.	F	Sig.	Compare
Learning Achievement	Experimental	41	28.07	4.35	56.32**	.00	E > C
	Control	41	20.59	2.84			
Creative Thinking	Experimental	41	28.02	7.73			E > C
	Control	41	21.54	7.10			

Note. E = Experimental Group, C = Control Group

Table 8
The Results of the Comparison of Learning Achievement and Creative Thinking Skills of the Experimental Group (Classified by Measurement)

Dependent Variable	Measurement	n	$\overline{X}$	S.D.	F	Sig.	Compare
Learning Achievement	Pre-test	41	16.10	3.14	129.07	.00*	Post > pre
	Post-test	41	28.07	4.35			
Creative Thinking	Pre-test	41	22.10	5.63			Post > pre
	Post-test	41	28.02	7.73			

Note. L =.23, F = 129.07, Sig. = .00*, $\propto$ =.05

Table 9
Mean and Standard Deviation of Student Satisfaction with the Creative Thinking Skills Curriculum (n=41)

Student Satisfaction	$\overline{X}$	S.D.	Satisfaction Level	Order
1. Documentation course	4.88	0.35	Most	2
2. Teacher instructor	4.77	0.59	Most	3
3. Course learning activities	4.70	0.68	Most	5
4. Media and learning resources	4.53	0.82	Most	6
5. Measurement and Evaluation	4.71	0.69	Most	4
6. An overview of the learning management model.	5.00	0.00	Most	1
Average	**4.77**	**0.62**	**Most**	

Conclusion

The study confirmed the study's three research hypotheses and verified the validity of the new proposed creative thinking learning management model's eight steps. The need now is for new out-of-the-box thinking, which is critical for both educators and students if Thailand wishes to meet any of the recently outlined goals for education, technology (IoT, 4IR, Thailand 4.0), innovation, and a 21st-century workforce.

To achieve these goals, however, a multitude of obstacles must be overcome. These include cultural issues, ability to question teachers, old-school attitudes from senior educators and administrators, placement and use of educational funding, and the development of an atmosphere in which questioning "why" is not viewed as rebellious.

If these obstacles are not overcome, however, the future is far from bright as Thailand's population is aging and its economic might is being tested by younger and aggressive workforces in its ASEAN neighbors, such as Vietnam and the Philippines. Some might say that Thailand is in the twilight of its golden age, and if true, it will be the responsibility of a new generation to create a new era by use of creative thinking and innovative ideas.

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