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## THEORIES OF CREATIVITY AND INNOVATION AS A CURRICULAR COMPONENT WITHIN THE SCOPE OF TEACHER TRAINING

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**Abstract:** Thinking about the changes that Brazilian education has undergone, it is understood that teaching requires teachers who are more autonomous, creative and capable of facing the challenges of the 21st century in search of solving educational problems. In this sense, the present work seeks to present research results within the scope of Teacher Training with a perspective of using Creativity Theories as a theoretical-methodological subsidy for the development of arguments in favor of a reorientation of the Teacher Training process. The results point to offering curricular components (disciplines), as a way of establishing a relationship between Creativity Theories and Teacher Training with the expectation of improving the conditions for exercising the creative process within the scope of undergraduate courses and for future activity teacher.

**Keywords:** Autonomy. BNCC. DC-GO. Active Methodologies. TDICs resources.

## INITIAL APPROXIMATIONS

Brazilian education has undergone changes and there is a need to carry out research that investigates the main aspects of Teacher Training for the 21st century. We need teachers capable of dealing with resources that explore different skills, problem solving, creativity and innovation. To this end, the demands of innovative and creative education require that its participants value and mobilize creative processes.

In this sense, using theoretical models of creativity<sup>1</sup> such as: The Dimensions of Creativity according to Paul Torrance; Teresa Amabile's componential model of creativity; Robert Sternberg and Todd Lubart's creativity investment theory; Mihaly Csikszentmihalyi's systemic model of creativity; Lev Vygotsky's model of creative imagination and, also, the proposal of the Cultural Psychology of

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<sup>1</sup> Read the item: Neves-Pereira; Fleith (2020).

Creativity, constitute a space for improving the understanding of the Training of Teachers prepared to face the challenges of the 21st century.

The objective of this work is to present research results within the scope of Teacher Training with a perspective of using Creativity Theories as a theoretical-methodological subsidy for the development of arguments in favor of a reorientation of the Teacher Training process, given that research in this area have been incipient or rarely address this perspective.

This work is justified to the extent that its understanding allows it to offer adequate conditions, within the scope of Training courses, for the exercise of the creative process, with the expectation of Training Teachers capable of facing the challenges of the 21st century in search of solving educational problems.

## STRATEGIES AND METHODOLOGICAL PATH

The presentation of the strategies and methodological path will be divided into two parts. The first of these consists of the preparation and conduction of a curricular component (discipline) and the second involves the conduction of a mini-course. Both activities had as their main theme the Theories of Creativity, Innovation and Teacher Training.

First part: a subject was created that could meet current demands for Teacher Training, which was called Innovation and Theories of Creativity, and was offered to students, mostly graduates, of a degree course in Chemistry.

In total, 12 students enrolled. The syllabus was created collectively by the teacher and students. The objective of the subject was to offer space for in-depth study and discussion of the most current topics in the educational

environment with perspectives for the development of creativity and innovation within the scope of Teacher Training.

The main basic reference book used was: *Theories of Creativity* (NEVES-PEREIRA; FLEITH, 2020), which organizes and contextualizes theoretical production on creativity, classic and emerging, and offers material, in Portuguese, for understanding the main models theoretical and epistemological, their divergences and convergences, in short, about the state of the art of creativity theories.

The main strategy used to conduct the activities was based on the use of Digital Information and Communication Technologies (TDICs), such as Google Classroom, Google Meet, WhatsApp Group, among others. It is worth noting that the virtual meetings were all recorded.

To analyze the degree of satisfaction and agreement with the strategy, 20 items were created on a Likert scale (PASQUALI, 2013) in which participants could mark 1. I completely disagree to 5. I completely agree. The survey/questionnaire was associated with a space in which participants had the chance to write their opinion about the discipline, providing the opportunity to generate more information. All of this was made available through the Google Forms resource. The items can be read according to Table 1, below.

To investigate opinions, spaces were provided for: i. Write about what you learned most during the Innovation and Creativity Theories course; ii. Write about the advantages and disadvantages [...]; iii. Write your opinion about the possible relationships between Teacher Training and Creativity Theories; iv. [...] point out suggestions that you consider important to change/improve in the strategies used in the discipline and; v. Space intended for free writing.

At the end of the course, a discussion group was held (WELLER, 2010), to analyze both

the course and the answers/results arising from the survey/questionnaire. All material was recorded using Google Meet resources.

Second part: a theoretical-practical mini-course was prepared with the title: *Theories of Creativity and Teacher Training*, with a total workload of four hours, divided into two days, conducted during the XVIII Central-West Meeting of Debates on Teaching of Chemistry (ECODEQ). The first day of the mini-course was intended to present the theoretical-methodological foundations using audiovisual resources and dialogue management. On the second day, problem situations were presented, about which participants were invited to make proposals and discuss them.

In total, 21 people signed up for the mini-course. A virtual classroom, Google Classroom, was created, which served as a repository for teaching materials and associations with links and different forms of interaction. We used Google Meet to open multiple rooms so that participants, divided into groups, could carry out the activities. The basic theoretical-methodological principles for conducting the mini-course followed the same reasoning used to conduct the aforementioned discipline. To generate information, some Likert items were modified, as shown in Table 2, below.

## RESULTS AND DISCUSSION

First part: because it was constructed collectively, we understand that the course syllabus became an interesting result because it demonstrates and reflects a democratic exercise that allows student autonomy from a perspective of teaching autonomy. The text of the menu is as follows:

The concept of innovation. Entrepreneurship and Teacher Training. *Theories of Creativity and Teacher Training*. Basic Fundamentals of the National Common Curricular Base – BNCC, Curricular Document for Goiás – DC-GO and the New High School from a Creative Teacher Training perspective.

Number	Item
1	During the course of the subject I learned more about the concept of innovation.
2	The teacher's work strategy provided me with support for my understanding and for me to act autonomously according to creative processes.
3	The teacher's work strategies brought me closer to Creativity Theories.
4	I understand that subjects such as Innovation and Creativity Theories must be part of the curriculum of undergraduate courses.
5	Creativity Theories contribute to Teacher Training suitable for the 21st century.
6	The subject of Innovation and Creativity Theories contributes to "Creative Teacher Training".
7	People are not born creative, but they can become creative.
8	The strategy developed by the teacher provided significant improvement in terms of my understanding of how creativity can enable educational processes.
9	Creativity is a social, cultural and historically constructed process.
10	Creativity Theories contribute to teaching autonomy in order to enable the development of student autonomy within the teaching-learning process.
11	Degree courses must focus on teaching curricular content with a focus on traditional methods of the teaching-learning process.
12	Creativity Theories do not apply to official documents such as BNCC and DC-GO.
13	The teacher's work strategy helped me feel empowered to carry out teaching activities with autonomy and creativity.
14	Digital Information and Communication Technologies (TDICs) not only can but must be used in association with the creative process.
15	I understand that creativity is a process that begins (already) in childhood.
16	Teachers trained in a "creative" perspective will certainly contribute to the development of the educational process in schools.
17	Degree courses that have subjects linked to Creativity Theories have educational advantages over others.
18	The concept of innovation is related to creative capacity.
19	A creative teacher will certainly be a good teacher.
20	I understand that the Theories of Creativity, studied during the course of the subject, will help me in the process of establishing the activity that I will develop as a future teacher, including teaching autonomy.

**Table 1:** Likert items for poll: Innovation and Creativity Theories.

Source: prepared by the author.

Number	Item
4	I understand that subjects (curricular components) such as Innovation bias and Creativity Theories must be part of the curriculum matrices of undergraduate courses.
6	Creativity Theories contribute to "Creative Teacher Training".
12	Creativity does not occur inside people's heads, but is the result of the interaction between the individual and the sociocultural context. It is a systemic phenomenon rather than an individual one.

**Table 2:** Likert items modified for poll: Theories of Creativity and Teacher Training.

Source: prepared by the author.

In total, six students actually participated in the survey/questionnaire. Regarding Likert items, for the percentage or tendency of agreement, the sum of those who “partially agree” and those who “completely agree” was considered. The results showed that most items tended to reach 100% agreement. Except for items that have a bias of disagreement, for example: item 12. The only item that differed in analysis was item 11 as shown in Figure 1 below.

In conversation with the discussion group, the participants said that they were a little confused on this item because they understand that traditional methods must exist because many of these methods contribute to good development in the Teacher Training process. But, at the same time, degree courses need to undergo modifications that enable access to other and/or new methods, including Creativity Theories, Active Methodologies and the use of TDICs resources. It was concluded that the most correct option would be to mark “partially disagree” because the disagreement occurs in the word “focus” and not in the traditional methods themselves.

Regarding the questionnaire, the selected excerpts underwent textual analysis in search of the text content (BARDIN, 2011). “About what you learned”, one of the answers draws attention:

I understood that there are some theories regarding innovation and creativity. Although they differ on some points, I realized that the main focus is to describe factors that influence being innovative and creative, such as the environment, the social environment, motivations, social facts, personality and cognitive factors. The most interesting thing is to synthesize these theories and adapt them to the realities we encounter, whether in the education of our children or in teaching practice.

It is noted that there was a certain appropriation of concepts and knowledge associated with Creativity and Innovation Theories, which reflects the scope of the discipline as a curricular component. But, more than that, writing reflects something that goes beyond the objective and utilitarian function of the discipline, which is the transformative and enabling function of a lifelong training process, details that are even part of documents such as the BNCC and DC-GO.

Another student responded “[...] this subject inspires us to think beyond what already exists, thus creating possibilities to solve problems.” For us, this demonstrates the potential of the curricular component (subject) as a space for discussing current themes for education from the point of view of autonomy, creativity and problem solving.

During the discussion group, when we started the conversation about item 20, one of the participants said the following:

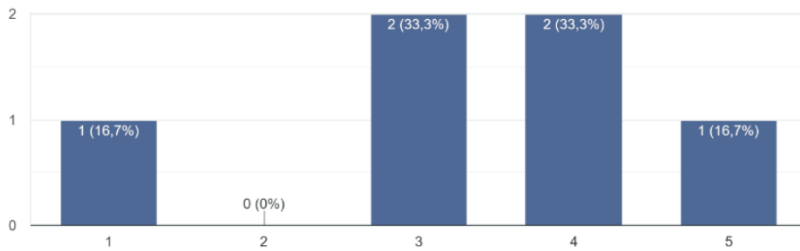
Yes, professor, you’re already reflecting... I’m already teaching and I’ve absorbed a lot of information from these theories and, although my school doesn’t give much space for this, whenever I can, I’m trying to be creative. I’m even noticing good results [speaking excitedly]. (Emphasis I made in this stretch).

The lack of “openness” represents challenges and obstacles that need to be faced so that new methods can be used in schools. The resistance can be attributed to the fact that educational leaders/managers generally have a traditional background, which, to some extent, makes teaching activities that use resources based on current trends unfeasible.

Finally, the student concludes in “free writing”, saying the following:

This theme was quite challenging and innovative for my teaching-learning process.

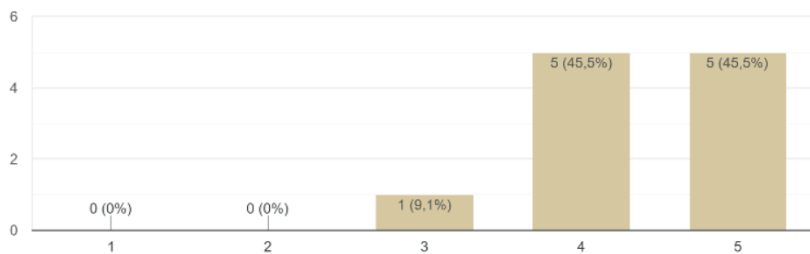
11: Degree courses in general focus on teaching curricular content with a focus on traditional methods of the Teaching-learning process  
6 answers



**Figure 1:** Divergence in Likert analysis.

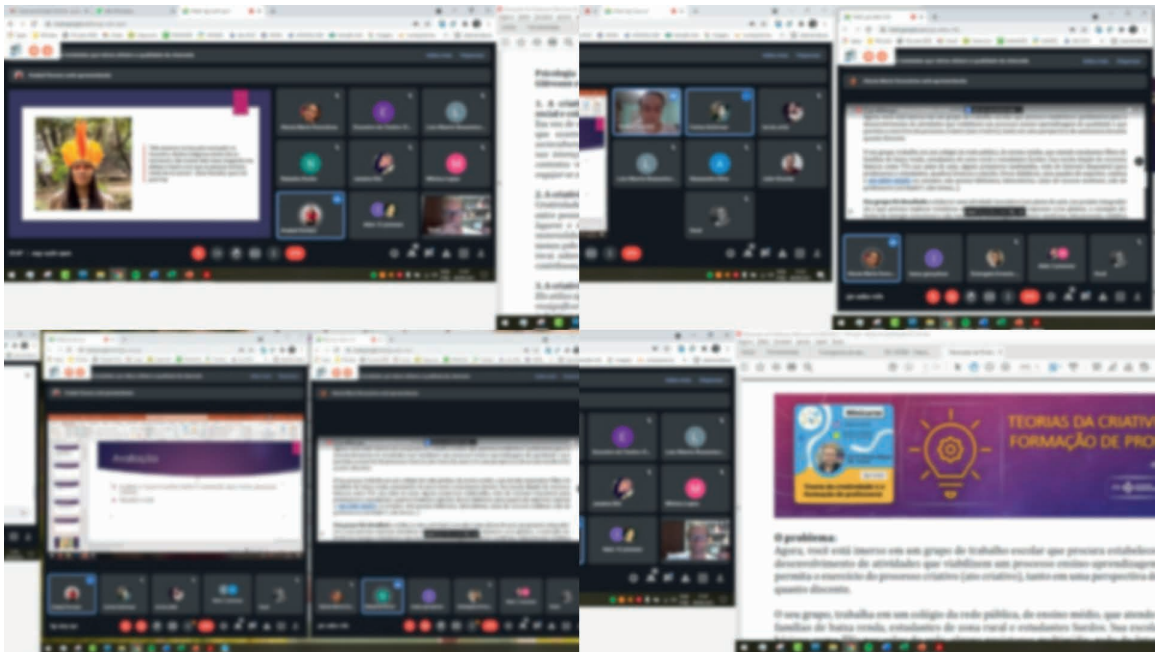
Source: prepared by the author. Google Forms Features

11: Degree courses in general focus on teaching curricular content with a focus on traditional methods of the Teaching-learning process  
11 answers



**Figure 2:** Agreement with item 11.

Source: prepared by the author. Google Forms Features



**Figure 3:** Virtual rooms for group meetings.

Source: prepared by the author. Google Resources

I am very happy to study this subject and I saw the importance of this especially when I went to the classroom as a teacher. I realized that creating environments, motivating and encouraging creativity in students contributes intensely to their critical, cognitive and autonomous development. It made me even more interested in studying about it and gaining more knowledge to improve myself as a teacher.

Analyzing the content of the student's text, it is possible to minimally perceive that the discipline offered theoretical-methodological support for the development of arguments in favor of establishing a relationship between Theories of Creativity and Teacher Training. The fact of arousing the student's interest (Initial In-Service Training) can demonstrate the impact that the discipline had on her training process and, at the same time, give us an idea of what her teaching role will be like in the future.

Second part: the short course opened space for discussion on the topic and the participants, being from varied groups, that is, undergraduate and postgraduate students, basic education teachers and higher education teachers, maintained a constant dialogue with the teacher/researcher. In total, 11 participants responded to the survey/questionnaire.

Regarding item 11, Figure 2 shows us that their understanding was different from that of the participants in the course. Practically 100% of participants agreed with the statement.

Regarding the other items, which were modified for the short course, the results were as follows: item 4, 91% tended to agree, item 6, 100% agreed and item 12, 100% agreed. For this work, this demonstrates that we are on the right path.

In relation to the activities carried out through multiple virtual rooms, I highlight the interaction and collectivity due to the different groups formed (see Figure 3). Participants remained focused on resolving

the problem situation (see Appendix) and presented creative solutions that were later discussed by all participants.

And, in relation to the survey/questionnaire, I highlight the following responses that indicate possibilities and impact on Teacher Training. For example, "Creativity needs to be implemented in higher education courses, so that these teachers in training also make use of it in the basic education network," "Essential, as it expands the perspectives of methodologies that serve training for the 21st century," "I believe that teacher training must include the subject of creativity theory in order to train teachers who will truly contribute to the good teaching of subjects."

These contributions corroborate the fundamental aspects of the creation of the subject and the short course because they announce the potential and current nature of the teaching-learning process, whether in the context of higher education or basic education.

Furthermore, we must pay attention to the theoretical-methodological foundation associated with the development of strategies for Teacher Training in this century, as one of the participants in the mini-course says.

I believe that the two must go together and be presented in teacher training, we see a lot of research work in the area and we are often presented in teaching classes with the concepts and practices of playful activities, games, investigative cases and argumentation, which are linked the creativity and innovations of teachers and in research, however, the Creativity Theories, what is behind, what drives this search for innovation in teacher training are not presented. There is certainly a great relationship between Theories and learning to teach.

I also highlight the words of another course participant who helps us to continue the work and understand that we are on the right path,

because when he says that he will put it into practice, it means that he has intentions of experimenting with new ways of carrying out and conducting the teaching activity, from the example we gave.

The words spoken, how to create pairs and discussion about the activity. The professor was an example of how we must act if we have a diploma. I liked the professor's attitude and how patient he is. He explained it well and he has a lot of creativity. With this I will put it into practice and look forward to participating in this mini-course again...

Finally, the course participants were asked: **If you had to define CREATIVITY in a single word, what would it be?** The words they used were the following: Diversity, Autonomy, Spontaneous, Reinvent yourself, Create (experiment), Achievement, Change, Innovation, Creation, Possibilities and, Future.

These words have a tonality or a guiding gradient that ranges from changes in individual stance to transformational reasoning and which, I would say, towards a Teacher Training that is more suited to educational changes and the 21st century itself.

## **NOT TO END**

Understanding Creativity Theories and their different conceptual positions can contribute to Teacher Training by promoting autonomy and the ability to solve problems. The creative process involves a multiplicity of factors, including personality variables, environmental conditions and intellectual processes. By incorporating Active Methodologies and TDICs resources into undergraduate courses, future teachers will be able to experience training that allows them to analyze, reflect and solve real education problems with autonomy.

Unlike traditional Teacher Training models, which are often based on fragmented continuous training aimed at updating specific

knowledge, Permanent Teacher Training seeks to develop autonomy, creativity and problem-solving capacity in teachers.

It is important that they are prepared to study autonomously and proactively, being able to identify problems and develop solutions to everyday school challenges.

Offering adequate conditions, within the scope of Teacher Training courses, for the exercise of the multiple process that is the creative process, means expanding the possibilities so that we have teachers capable of facing the challenges of the 21st century in search of solving educational problems. Hence the importance of offering subjects in the curricular matrices of undergraduate courses that take into account the use of Active Methodologies resources, TDICs, in addition to incorporating, in the Pedagogical Projects of the Courses (PPCs), these reasonings as a scope of the teaching-learning process.

Offering curricular components (subjects) that use Creativity Theories as a theoretical-methodological foundation is an essential condition for the development of strategies towards Teacher Training suitable for this century. This will enhance the development of a new experience in Teacher Training, Permanent Teacher Training and the development of Creativity as a strategy for overcoming educational obstacles.

And, not to conclude, it is necessary to rethink Teacher Training and the teaching-learning process at school, in order to update them according to current demands. There is an immediate need to change the school, not to end it, but to radically remake it, bringing it up to date. Successful experiences, such as the offering of subjects on Creativity and Innovation Theories, have shown that it is possible to promote more up-to-date training suited to the 21st century, using TDICs resources, Active Methodologies, aligned with curricular guidelines.



However, it is necessary to provide other actions so that teachers are engaged and prepared to deal with constant changes in schools. Teacher Training is seen as a means of enabling the necessary updating in education, aiming to train professionals capable of making a difference in pedagogical practice and meeting contemporary education demands.

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## APPENDIX

### PROBLEM SOLVING

#### Mini-course program:

The changes that have occurred in Brazilian education, such as the National Common Curricular Base – BNCC, the Curricular Document for Goiás – DC-GO, among others, have provoked demonstrations and discussions in different educational areas. In this sense, the Training of Natural Sciences Teachers will require careful attention, as this area of knowledge demands interactions between the curricular components of Biology, Physics and Chemistry. In that regard, Teacher Training prepared to face the challenges of the 21st century needs to include teachers capable of dealing with resources that explore different skills, problem solving, creativity and innovation. To this end, the demands of innovative and creative education require that its participants value and mobilize creative processes. Therefore, the objective of the mini-course is to provide a space for discussing the topic, more specifically Teacher Training for the 21st century from a perspective approximating classic and emerging theoretical models of Creativity Theories.

#### Cultural Psychology of Creativity according to Glăveanu and Neves-Pereira (2020):

##### 1. Creativity is a fundamentally social and collaborative process

Instead of a usual view of creativity as a phenomenon that occurs in the mind or brain, sociocultural approaches have positioned creativity as originating in interactions between people in different relationships and in varied contexts. In this sense, creating always means engaging in co-creation.

##### 2. Creativity is also a material process

Creativity does not only happen in collaborative actions between people, as those who create also depend on objects, places and institutions that give the creative act its materiality. The sociocultural approach is less interested in the study of creative ideas themselves. Its focus is on

the ways in which ideas emerge and contribute, in turn, to sociomaterial practices.

### **3. Creativity is also a symbolic process**

It uses signs and symbols to signify and, more importantly, re-signify reality, opening new perspectives for individuals, groups or broader communities. In other words, there is always a sense-making element in a creative expression.

### **4. Creative actions are always markedly situational and/or contextual**

What can be inferred from the first three is that the creative process is much more understood as a form or quality of action, and that this action is always permeated with a certain context. Therefore, sociocultural researchers consider creativity more linked to the specific domain than to the general domain.

### **5. Creativity is a developing process**

This premise can be understood in two ways. Firstly, creativity develops over (a) historical time, such as the evolution of ideas in a society; (b) ontological, such as the flowering of creativity throughout the subject's life and (c) microgenetic, such as the transformations of creative practices through ongoing interactions. Secondly, creativity is a factor of central importance in human development, as it constantly adds new elements to our repertoire of knowledge and actions.

### **6. Creativity is part of our everyday lives**

If, on the one hand, a good part of research explores the creativity of geniuses and revolutionary creations, on the other, sociocultural researchers focus on everyday acts of creativity. The cultural psychology of creativity considers that there is a continuum, not a break, between eminent creativity and everyday creativity. What unites these two poles is precisely the fact that both are, in different ways, permeated with culture and everyday life. The genius and the creative subject in everyday life inhabit sociocultural scenarios and are mutually co-constituted by them. How each person will signify their existential experience and act in the world is what represents the factors that promote differences in relation to creativity.

### **7. Creativity contributes to society and its transformation**

Finally, creative action cannot be disconnected from its impact on the world. Creativity is necessary to solve personal, group and social problems, and this type of impact needs to be understood and taken advantage of by researchers and creative agents [teachers].

#### **The problem:**

Now, you are immersed in a school work group that seeks to establish parameters for the development of activities that enable a quality teaching-learning process and that allow the exercise of the creative process (creative act), both from a perspective of teaching autonomy and student.

Your group works in a public high school, which serves students from low-income families, students from rural areas and Deaf students. Your school has basic resources such as TVs in the classrooms, some multimedia projectors, an Internet network available for teachers and

students, whiteboards and brushes, textbooks, a sports court, canteen and a large courtyard, however, it does not have library, laboratories, multipurpose resource rooms, teachers' room (true!!!, we don't have any...).

Your group was challenged to develop an innovative activity (a lesson plan, an integrative project, etc.) that needs to explore current themes with local, regional and/or global biases, such as: renewable and non-renewable energy sources; future technologies: medicine; educational; robotics and artificial intelligence; neuroscience, astronomy and astronautics resources: protecting the planet; astrobiology; astrophysics and/or astrochemistry. The activity must contain the introductory aspects of the theme, competencies, skills and learning objectives, the methodological resources to be explored (active methodologies, Digital Information and Communication Technologies, experimentation in teaching, playfulness and games, etc.) and evaluation mechanisms.

Taking into consideration, the seven aspects of the Cultural Psychology of Creativity (Glăveanu and Neves-Pereira, 2020) and taking into consideration, the new guidelines and official documents of national education, such as the BNCC and/or State Curricular Documents. Present to the general group, participants of the short course Theories of Creativity and Teacher Training, an activity that covers all the aspects mentioned above and that seeks to solve the problem in a creative way. The time gradient for presentation will be five to ten minutes.

Good studies and good work.

*For questions, visit:*

*Our meeting room (during the mini-course) or our virtual classroom by clicking on the following icons:*



## SOURCE OF CONSULTATION

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