

Creative Education as an Engine of Innovative Talents Cultivation

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Abstract: *To create a place where knowledge and skills in Mining, Material and Metallurgical Education will be transferred from one generation to another, thereby producing sustainable economic development of the country, the university becomes a center of training innovative talents, scientific research and consultancy services in the areas of Earth Sciences and Engineering. The current development strategy is to penetrate teaching, research and industry with constructive but creative education which can play an advantageous role as an engine of innovative talents cultivation. This position paper explores innovative teaching methods that have the potential to excavate creative talents.*

Keywords: Creative Education, Discipline Construction, Talents Cultivation, Mineral processing, Tanzania

1. Introduction

The Geological Survey of Tanzania shows that the country has 103 million tonnes of iron ore, 2.222 million tonnes of gold, 13.65 million tonnes of copper, 209 million tonnes of nickel, 50.9 million carats of diamonds, tanzanite (12.60 million carats) and 911 million tonnes of coal. Tanzania's mineral potential can be harnessed to make a significant contribution to the national economy and the benefits may reach a wide spectrum of the population [1]; however, the country needs to have an effective institutional framework in order to take advantage of this potential. This entails putting in place a modern, service-oriented institutional structure in order to ensure the availability of competent professional and technical staff.

University earth science graduate history in Tanzania can be traced back as far as the late 1960's (the first geologist joined geo-survey in 1968). Their number was limited to a few tenths even towards the end of 1990s. It was only around 1995 when a significant number of graduates entered the job market. Most of these were from the University of Dar-es-Salaam and The Zambia School of Mines [2].

Mining, Material and Metallurgical Education in Tanzania has experienced constant and considerable change over the last ten years. To create a place where knowledge and skills in Mining, Material and Metallurgical Education will be transferred from one generation to another and produced a sustainable economic development of the country, the university becomes a center of training innovative talents, scientific research and consultancy services in the areas of Earth Sciences and Engineering. The University of Dodoma (UDOM) is a government owned university that was established in March 2007 under the Universities Act No. 7 of 2005 and the Universities Regulations of 2007. The College of Earth Sciences is one of the six campus colleges of the University of Dodoma and it is offering cutting edge knowledge and skills in all areas of geo-sciences [3]. Since

the College of Earth Sciences intends to become a regional centre of excellence in Mining, Material and Metallurgical Engineering disciplines, then the College will continue to develop and run new professional and academic programs based on the concept of Creative Education and Talents Cultivation [2].

2. Translating Education or Creative Education

The progress of science and technology as well as the current economic and social problems indicate that currently mankind stands at the crossroads of two choices. Either following the traditional methods of education in which we would not be able to foresee non-standard situations and would not be able to propose effective solutions to such situations, or to look for the way to apply concepts which stimulate the growth of manpower for development and improvement [4].

Nowadays the world's education is based on two theories. Firstly, it is proposed to practice the theory of appropriation of the old experience by the new generations. This concept of translating education is the means of conservation of the former achievements and can cause suppression of further societal development, the main goal of which is adaptation to the social life. In this case initiative, creative thinking and self-dependence are the obstacles to the effective organization of the translation process. According to this theory even the development is limited.

Many specialists are trying to solve these problems. They considered improving the system by modernization, teaching by means of creative decision making [5]. It is proposed to elaborate modern methods and techniques of teaching [6],[7]. The analysis of teaching gifted and talented students has been made [8],[9]. All these theories are the vital instruments for imparting knowledge and skills at the higher level but are based on the concept of appropriation and even block the creative abilities of

students transforming them into the adaptive one [10].

On the other hand, it is proposed to rebuild the structure of translating and adaptive education into the structure of generative and creative education which is understood as the self-dependent creation of new knowledge by students [4].

It appears that the creativity is the ability to create the new product, to generate the new and unusual idea, to find the original and adequate solution, avoiding the traditional scheme of thinking [11]. This definition of creativity is out of date. Contrary to this opinion, the modern understanding of the creative action comes into being as the man's ability to make himself. More specifically he is the product of generation. The development process supporting by the creative education is the process not only of quantitative accumulation of skills and knowledge but also the qualitative changes in the abilities developed [10].

The author did not fail to understand the importance of this statement. In the opinion of the author, each student has creative abilities which can exist without limits but some educational environments suppress and block his/her talents.. It is necessary that creative education is allowed to assist students to break all obstacles in the way of their growth and development, and comes into action as an engine of innovative talents cultivation.

3. Research Subjects

The aim of this study is to create the development strategy based on the advantage of Creative Education in order to excavate potential creative talents and to focus on the factors which influence innovative talents cultivation.

4. Methodology

The study used interviews and questionnaires conducted to involve students of Mineral Processing Engineering in a discussion of talents cultivation and to encourage them in their own creative development and improvement. The participants of the control group were the second and third year students who took part in an interview, questionnaire and Debate Club presentation. For future studies it is suggested to expand the number of students from 57 up to 90 in order to obtain more diverse data for analysis. The analysis was carried out using percentage scores.

5. Results and Discussion

5.1 Stages of creative development

The essence of creative education is transformation by the students of the historical logics of cultural development into logics of their own creative development [10]. Table 1 represents the widespread point of view on the meaning of self-improvement or the student's own creative development indicating various characteristics for successful establishment.

Table 1: Self-improvement

Characteristics	Percentage (%)
Self-dependence	28,00%
Self-	40,00%
Self-control	10,00%
Self-motivation	10,00%
Self-assessment	12,00%
Total	100,00%

As Table 1 shows, self-development gave the value of 40 % indicating that this had the greatest importance for the students. The comparison revealed no essential significance of either self-control or self-motivation emanating from the proceeding from the common difficulties for students in self-improvement; however, self-development is correspondent with other stages of creative development:

Stage 1. Individual self-development

The new type of meaning inspires the student to be personally interested in the construction of his own development.

Stage 2. Self-dependence, control and assessment

Self dependence in creation of the approach and criterion of self-control and self-assessment

Stage 3. Equal rights and possibilities creation

Own position and own point of view ,which take into account the polar point of view, provide for a successful educational process. The student enjoys his equal possibilities with others.

Stage 4. Cooperative self-development and responsibility

The necessity to obtain the common result on the base of the principle of joint possibilities and responsibilities .

Sir Ken Robinson, an internationally recognized leader in the development of innovation and human resources, said : "Human resources are like natural resources; they are often buried deep. You have to go looking for them, they are not just lying around on the surface. You have to create the circumstances where they show themselves" [12] . Creative Education can play a significant role as a driving force in exploration, excavation and cultivation of innovative talents for further creative development.

5.2 Factors affecting innovative talents excavation and cultivation

Which factors are the most important for high-quality talents cultivation?

Table 2: Factors influencing Talents Cultivation

Characteristics	Percentage (%)
Subject construction	17,00%
Teaching method	18,00%
Supervisor	8,00%
Innovative culture	2,00%
Research project	10,00%
Personnel training	10,00%
Self-motivation	3,00%
Student innovation	3,00%
University support	5,00%
Guidance of industry experts	13,00%
International cooperation	11,00%
Total	100,00%

According to Table 2 the results indicate that the majority of respondents agreed with the following factors which can motivate students for development.

5.2.1 Creative Dialogue as Foundation of Innovative Thinking

The creative dialogue is the universal approach to formulate new meaning. Self-dependent decision making is the result of constructive discussion. The role of a teacher or a master is to facilitate a conducive environment for individual student participation. Conversely, the teacher does not have to assist students to make decisions, moreover, to induce decision making by the students.

An excellent teacher can cultivate an excellent student [13]. Table 3 shows the professional and personality virtue requirements for academic masters which were discussed by students.

Table 3: Who is a Master?

Characteristics	Percentage (%)
Knowledge	17,00%
Teaching	28,00%
Personality	25,00%
Language	5,00%
Enthusiasm	8,00%
Innovative spirit	7,00%
Inner Culture	10,00%
Total	100,00%

By using relevant teaching methods (28%) the professionally competent (17%), personally strong (25%) master with inner culture (10%) and innovative enthusiasm (15%) can stimulate the students towards successful task completion. It is a safe assumption that each student possesses his / her point of view and has the ability to express this. The students become part of the educational process by participating in the construction of their own solutions to the educational problem. Needless to say, thinking is pleasure. Specifically, the third year

students from the College of Earth Science (UDOM) had this to say about the topic discussed:

“Talent is just a unique ability to do something. Not necessary for two people to have the same talent but talent exists in everyone. Talent Cultivation is just to excavate and motivate this ability”.

“Talent can create new ideas, thoughts, tools. Talent Cultivation is the ability to facilitate this intention”.

“Talent can achieve the goal no one else can. Talent Cultivation is a process which is resulting in good yield or high performance of new ideas and thoughts to improve the development of the society “.

“Talent Cultivation is our ability to interact with our talents for more innovations and improvement “.

5.2.2 Collaboration in Building Platform for Self-Expression

New individual creative action may be implemented only when the students interact with each other with this goal in mind. The highlight is the group-work aspect of the relevant course or subject, which is essentially significant. Both positive and negative experience of cooperative creative action contributes to student learning, creating the opportunity for developing critical review skills. Students are learning to rely on their own judgment but they must take into account their responsibility for the joint result from the educational group.

Table 4: Why do we need collaboration?

Characteristics	Percentage (%)
Hypothesis	11,00%
Aim Formulation	28,00%
Solution Construction	35,00%
Self-expression	15,00%
Mutual Control	5,00%
Results Analysis	6,00%
Total	100,00%

As Table 4 indicates, the comparison revealed that more than half of participants (63%) consider the importance of collaboration in formulation of their aims and construction of solution which determine the success and concrete results of creative action. However, only 5% of students recognized the necessity of mutual control, the result of which is correction of cooperative methods. For Mineral Processing Engineering students the subject cooperative activity involves students in critical and innovative thinking by means of participating in Debate Club and stimulating them to work in a team . In this manner students can compare individual and cooperative interests, searching for compromises between the individual and the joint interests.

5.2.3 New Initiatives and Progress in Program Structure

Exploring innovative teaching methods for excavating the potential creative talents of students should be a key point

of consideration. Many Universities have made good progress in talent development constructing new academic programs and research curriculum systems. The pioneering academic programs in Indian Institute of Science opened up a new area of study in mineral processing, namely bio-hydrometallurgy and bio-mineral process [14]. A study conducted by American (US) specialists indicated the necessity of the realignment of the education strategy establishing a cooperative education program that is based in the University but includes industry in designing and delivery of the curriculum [15]. Chinese Universities have made considerable achievements on discipline construction suggesting to create the research subject curriculum system. It has formed a series of national key disciplines with its own characteristics [13],[16].

The Tanzanian Government recognizes Mining and Mineral Processing Engineering as disciplines of national interest and is providing the appropriate level of educational investment in teaching and learning capabilities anticipating higher enrollment of students into the mineral industry.

The University of Dodoma chose to address these issues by implementing creative, well-structured, intensive educational programs for students. The programs are specialized courses designed to provide engineering knowledge relevant to Mineral Processing and added to the existing skills of graduates. It is proposed that all Mineral Processing students study the basic technical courses in the first and second years including scientific methods in comminution, classification, separation, flotation and hydrometallurgy and take part in the training practice. At the end of the second year the class can be divided into streams for a mineral processing specialization, for example, Mineral Processing of Diamond Containing Ores and Materials, Design of Mineral Processing Plants, Flotation Agents Chemistry and Technology, Coal Processing, Process Modeling and Simulation. It should be taken into consideration that not all students are able to show the same amount of progress in the same areas and academic criterion of assessment has to be created to allow them to make their deliberate choice with respect to the different progressive course in the third year. This method provides a pathway for further professional development.

5.2.4 Industry Involvement in Creative Education and Talents Cultivation

Industry involvement facilitates the delivery of undergraduate programs that equip students with high quality technical and decision making skills. Australian Universities explored the benefits of industry engagement through a national innovative collaboration [17].

In the opinion of the author mining companies can form the Metallurgical and Educational Partnership with Universities and support the teaching of Mining and Mineral Processing Engineering by funding academic positions at Universities, awarding the talented students

and creating industry-relevant educational projects in this field. Industry experts can provide both guidance and specific technical information for students who work in teams on their design projects. The goal of the design project is to give final year students the experience of applying their knowledge of mining and mineral processing and to integrate the technical content of education with creating designs for specific processing plants. The author believes that it is only through specialized and appropriate personal training and talents cultivation that can lead to serious innovations in exploration, mining and mineral processing. Enhancing this may increase the contribution of the mining sector to the country's economic growth.

5.2.5 International Experience in Innovative Problem Solving

It is the opinion of the author that in spite of some developments and improvements in talents cultivation the universities should be to strengthen by adsorption the international educational and industrial experience.

The current strategy is suggested:

- Encouraging interaction between students of the University of Dodoma and International Universities to exchange information about development in world mineral industry.
- A student group using e-mail could share knowledge and experience.
- International training programs in Mineral Processing.
- Participation of visiting professors
- Recruitment professors and Mineral Processing professionals
- Study abroad for young teachers to learn foreign advanced concepts and to transfer knowledge from distinguished professors.

Although some factors did not reach a significant level of importance, the mean value showed that they should be taken into consideration to achieve a certain level in talents cultivation improvement.

6. Future Scope and Implications of the Study

The paper discussed the main principles of creativity, the modern understanding of which is the student's ability to make himself, the stages of creative development and factors influencing innovative talents cultivation. It was proposed that all Universities should support students in their own creative development leading them through four different stages of self-improvement which are strongly correspondent with each other. To explore, excavate and cultivate innovative talents the University becomes the place where knowledge and skills not only transfer from one generation to another but the transformation of cultural development into student's self-development can occur. The Universities can take into account the key factors influencing talent cultivation such as Creative

Dialogue as Foundation of Innovative Thinking, Collaboration in Building Platform for Self-Expression, New Initiatives and Progress in Program Structure, Industry Involvement and International Experience in Innovative Problem Solving.

Therefore the study will applaud Universities to improve the educational strategy through paying more attention on creative development of students by constructing the suitable environment for innovative talents cultivation. For future studies it would be necessary to investigate the connection between talents cultivation and career development for better understanding the contribution of higher education in economy of Tanzania and improvement of social life of population.

7. Conclusion

With industrialization going on at its present rate, Tanzania is one of the countries in Africa which intends to increase the contribution of higher education in attainment of economic growth and improved social well-being of population through innovation, generation and application of knowledge. The University of Dodoma can be the supporter of Innovative Talents Cultivation to build the vital educational system based on the principles of creativity. Creatively thinking graduates can play key roles in representing the rights and interests of current and future generations. Currently the University of Dodoma is on its way to talents exploration and cultivation and we realize that it is the long way to go but encouraging.

“EVERYONE HAS TALENT BUT TALENT IS ONLY THE STARTING POINT!”

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Author Profile



Olga Ibragimova received the MS degree in Mineral Processing Engineering from the Moscow Institute of Steel and Alloys, Russia in 1986. During 1986-1994 she stayed in Ore Dressing Laboratory, Institute of Chemistry, Tajik Academy of Science to study the phenomenon of the effect of combination of sulfur-containing collectors on non-ferrous ores flotation using spectroscopic methods. Then she has been an associate professor at the Samara State Technical University, Russia, over the past 15 years. Presently, she is teaching at the University of Dodoma, Tanzania. Current research interests include the Methodology of Material and Metallurgical Education, Talents Cultivation, Career Development.