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THE SYMBIOSIS OF SCIENCE PROCESSING SKILLS WITH ENTREPRENEUR SKILLS IN SCHOOL CURRICULUM

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ABSTRACT:

Changes are rapidly taking place in all spheres of life. Amalgamation of entrepreneurship in school curriculum has spurred much enthusiasm in recent times. The objective of chemistry education at school in 21st century processes entrepreneurial skills and development of physical and social abilities and competencies. Students must nurture in school system for self –employment, self-sufficient, and employer of labour. Chemistry teaching involves process skills which are mental instrument applied in the discovering and acquiring of scientific skills and knowledge. Entrepreneurship plays a

significant role in employment generation. The activity based teaching –learning should innovate ways of teaching and in classroom situations for entrepreneurial skills development, using well developed lesson contents that stimulate, motivate, orientate and foster students' interest towards entrepreneurial skills acquisition, individual sustainability and national economic development. In the present paper attempt is made on fostering entrepreneurship opportunities in our youths through Chemistry education at Senior Secondary School Level. Recommendations were made on the role of the teacher in developing entrepreneurial skills through chemistry education which will be best achieved through activity based.

KEYWORDS: Science Processing Skill, Entrepreneur Skills.

INTRODUCTION

The Chemistry entrepreneurship is required to take nation into another level of industrialization via small and medium size enterprises. The economy and education both in 21st century must be driven by entrepreneurship.

The unemployment is one of the most crucial problems of the 21st century. As per World Bank in Bakere (2013) unemployment rate is 38% with secondary school

graduates at most found among employed rural population. The unemployment has negative impact in social and economical development. Poverty is the consequence of unemployment. Poverty is common scarcity of one would deprive certain amount of the material possessions/money. Poverty is multifaceted concepts consist of social, economical, political element. The elimination of poverty in all forms and dimensions is most crucial global challenge. The poverty is the greatest challenge for economical and sustainable development. To eradicate poverty and to address the issues of the challenges, there is need of acquisition of

entrepreneurial skills for employment of youth. To acquire entrepreneur skills effectively and efficiently the knowledge of science is required. The knowledge of science education make students to actively participate and make progressive, creative, innovative, collaborative and convenient with complex problem facing society. We can understand every world around us. The knowledge of science education is significant in promoting the culture of scientific thinking, promoting citizen to evidence based reasoning for decision making, stimulating citizen confidence, attitude, knowledge and skills. It also

motivates to actively participate in complex world, nurturing problem solving abilities, innovative culture, develop analytical and critical thinking that are essential to equip citizen to lead personally fulfilling, socially responsible, actively engaged and motivate students of all age group and talent to aspire to career in science.

The entrepreneurship is the key element for economical development. Skills essentials for entrepreneurship are required to have essentially and success in taking entrepreneur skills as the basic skills required to start, develop, finance and succeed in enterprises. National Education Policy (2019) enjoins teacher's community to make classroom instructions concept-focused, project based and work related. There is a need of acquisition of entrepreneur skills in school curriculum for the benefit of society and school. Our school system should be "job creator" instead of "job seekers".

To make our education system "job creator" there is urgent need of integrated spirit of entrepreneurship in class room instructions of science which catalyzed emergence of entrepreneur chemistry students. Amalgamating of entrepreneurial chemistry to school curriculum leads to continuous and sustainable growth.

The chemistry curriculum at senior secondary school level with entrepreneurial skills will be more useful. The students may apply skills and knowledge for getting employment .

ENTREPRENEURSHIP:

According to Nickel (2005) entrepreneurship is a clear manifestation of effective manipulation of human intelligence as demonstrated in creative resources in a way of creating new business concepts or opportunities within existing firms.

Aminu (2008) "entrepreneurship is the process of creating something new with value, by developing quality the necessary time and efforts assuming the accompanying financial, psychic, social risk and receiving the resulting rewards of monetary and personal satisfaction and independence".

ENTREPRENEUR:

A person who engages and organizes a business and assume risk for the sake of profit. She or he tends to start ventures that build on specific skills acquired through term of education. Entrepreneur is a trader. An entrepreneur produces funds, trades; he is an originator, maker, creator, author and architect. An entrepreneur has competence and capabilities to find, evaluate business opportunities, collects necessary resources, initiate appropriate action to make the business venture most successful.

ENTREPRENEURSHIP EDUCATION:

Education that provides skills, experience, training, knowledge, attitude, and aptitude that is fit for the entrepreneurship endeavors. Education prepares students with knowledge, skills, attitude, competency capabilities that are required for self-reliant. Entrepreneurship building is a mission and vision of human capital development with objectives of increasing the produce of adequate entrepreneurs, who are motivated to do business successful.

ADVANTAGES:

Skill Acquisition:

It will navigate students to acquire the fundamental knowledge for proper functioning of business, develop awareness, and confront with business environment in science through skill acquisition.

Work Experience:

It will provide complementary role in developing working knowledge, on job skills and work experience among students and teachers.

Generation of Employment:

It serves as an opportunity for students to have job experience for learning, saving, investing money and resources of initial stages of life than their peers. They will contribute to their abilities to sense for self-work

Reducing unemployment:

The unemployment will be reduced at greater level. In society business ownership and self-employment will appear as a goal and vision

- Effective and efficient utilization of resources.
- Discrimination and deconstruction of business.
- Promotion of role of science.
- Nurturing entrepreneurship culture.
- Capital formation

What is Chemistry?

- Chemistry is the study of matter and its properties, why and how substances separate or combine from other substance and the way they interact with energy.
- Chemistry is a branch of physical science that study matter in terms of structure, composition, properties and change/ transformations. Matter consists of atoms and molecules. Chemistry is the study of transformations and matters. Matter cannot be created nor destroyed. Chemistry is center to science.

The fundamental concepts of chemistry is important for all branches of science such as Biochemistry/Biology, pharmaceuticals Chemistry, Food Chemistry, Agriculture Chemistry, photochemistry, Geochemistry, Radiochemistry, zoo chemistry, Astro chemistry. In fact chemistry is everything and everywhere. It is much interesting to know that chemistry is found in our kitchen, laundry, beauty parlor, fast food, garden, swimming pool, hospital, hotel, toilet, washrooms, bakery, air, water corporation, power station, photography, paints, textiles, stores, business centers, house boat, shipping car, aircraft, train, fire stations, water dump sites, artist shop, plumber shops, coal pit, carpentry workshop, quarries and all other areas of human endeavour.

It is significant to take note that everything we see, hear, taste, smell and touch chemistry is involved. Touching, seeing, tasting, hearing all involve series of chemical reactions and interaction with our body. Chemistry has such enormous range of topics and hence it is essential to have basic knowledge of chemistry to understand world around us and take significant advantages of knowledge to convert them into entrepreneurial activities.

The advancement made in 21st century in all branches/areas of chemistry, biochemistry, electrochemistry, computational chemistry, analytical chemistry, polymer chemistry, nuclear chemistry, cosmetic chemistry, synthetic chemistry, solar fuel, bio fuel, super molecular chemistry, nano chemistry, catalyst, material science, super capacitor etc., make our life more comfortable than ever.

RELATIONSHIP BETWEEN CHEMISTRY AND ENTREPRENEURSHIP:

Science is concerned with facts, principles, methodology and knowledge which are gained through deduction and observation of laws, which govern changes, connotations by testing deduction experimentally. Chemistry plays an important role in getting solutions for socio-economic problems and making society more scientifically literate. Chemistry deals with matter, its nature, properties and transformations, the study of material science which is present everywhere on earth and universe. Chemistry involves knowledge, skills and mental tools which are used for discovering and nurturing knowledge. Chemistry involves making process, conversion, production and transfiguration.

The skills are acquired or natural capabilities through specific activities. Entrepreneur skills are essential occupational survival skills. Entrepreneur skills are equivalent skills of process skills. The skills of chemistry involves process are path/ways, strategies followed by chemists in order to produce

formation. It includes observation, measurement, classification, recording, counting numbers, communication, hypothesis, predicting, experimentation, hypothesis, collection of data, controlling variables and research. The continuous use of these process skills, over the period of time, leads to accumulation of knowledge through scientific laws, theories, and principles that constitute product skills.

The skill based approach to science is the initiate with instruction begins by well defining teaching strategy and what students like to do. The process skills, reasoning skills, critical thinking skills are basic skills involved in chemistry. Acquisition of these skills will make students a successful entrepreneur. Entrepreneur skills are planning and developing.

All skills required for entrepreneur are encompassed in science skills. Entrepreneur skill assist to self direction, creating- wealth, satisfying career and add value for the society well-being. The application of natural resources and creation of artificial one is chemistry. The production of goods, such as food, medicine, textiles, metals, agricultural products, chlorine, oxygen sulphuric acid, ammonia etc., making of products, researching, consumer education, consultancy services.

The acquisition of professional qualification in chemistry, equip students with skills to be self employed because students are equipped with process and entrepreneur skills. The applied chemistry emphasizes on the transferability of gained knowledge to the immediate environment. The chemistry education provides acquisition of process skills and mental, physical and social abilities, development and competencies building to become a productive member of the society. The amalgamation of entrepreneurship in chemistry school curriculum assists students to become self-employed. Hence as a teacher we must expose our students to acquisition of entrepreneur skills through chemistry in order to promote chemistry entrepreneurship.

CHEMISTRY ENTREPRENEURSHIP:

It involves the process of application of innovation in chemistry into marketable products to manufacture for commercial gain. The establishing company provides opportunities to create small/big entrepreneurs. The innovation and investing is fun. The science based knowledge society is a panacea for development of society. The following are few listed reasons for promoting chemistry entrepreneurship.

1. **The solution for unemployment:** The enrolment in higher education is increasing now a days but job opportunity for these educated youth is limited. The unemployment situation in our nation is increasing and alarming. The unemployment problem also generates other socio-economic problems.
2. **Economic development:** There is urgent need to avoid economic retrogression. Our economy was rated as the fastest growing economy.
3. **Reduction of poverty:** The indicator of poverty is hunger. The study shows that globally one in seven persons goes bed hungry every day. Our nation rank 100 among 119 nations on human based list. The non-product youth in society resulted to our poor rating.

AWARDS FOR CHEMISTRY ENTREPRENEURS:

The Royal Society of Chemistry has instituted award (Chemistry Entrepreneurship Award) for professionals , pramition , discipline , motivation and encouragement of chemistry entrepreneurship. The annual award is given to an scholars who demonstrated innovation, creativity, vision, driving to commercial success for business. The award is meant for the scientific pioneer and serial entrepreneur. The 2018 award was received by prof. Chad Mirkin (USA) for his academic and scientific achievement in spherical nucleic acid (SAMT) nano-particles conjugates. In 2019 Prof. Tom Brocon received award for his pioneering research in nuclear acids and is successful commercialization. The question on my mind is "When will an Indian researcher/ chemist/ professor receive the next chemistry entrepreneur award?" It may only be possible when we commercialize of chemistry education through chemistry entrepreneurship which focus on sustainable development.

ENTREPRENEUR SKILLS AND CHEMISTRY TEACHER:

As a chemistry teacher we must have great source of ideas for experiential learning activities that must provide experience in entrepreneur skills. In school science teacher must be able to understand that opportunities for improving economy is by amalgamating entrepreneurship based activities in school curriculum. Since entrepreneurship may change the vision of future of many students. As a teacher, we must encourage students to think creatively. As a science teacher we should open student's eyes to the employment opportunities that are all around the world.

In 21st century as a science teacher, we need to understand that economical development is based on science innovation. Students should understand artificial intelligence based business opportunities and also understand social application of entrepreneurial skills in day to day life in classroom environment. Science teachers must create basic entrepreneurial suits that will make them functionally effective in school environment.

The integration of entrepreneurial based learning process will act as a catalyst. In science teaching based on business/entrepreneur, raw material, small manufacturing unit, role play of students as manager of resources, the interpretation of three factors will ensure entrepreneurial skills acquisition in school students. The result of the process will retain discipline in students. The acquisition of entrepreneurial skills among science teacher will foster effectiveness and efficiency in knowledge delivery. It includes leadership skills, math skills, collaborative skills, communication skills, change management skills, vision development skills, process skills, analysis skills, economic skills and education skills.

FOSTERING/ CATALYZING ENTREPRENEUR OPPORTUNITIES:

As a chemistry teacher for past 30 years and motivated by shri Jain ex-school Principal lady Anuaya singhaniya, Education Academy, Jhalai, who tried to promote entrepreneurial opportunities through chemistry curriculum, it is observed that the students are greatly influenced. Science teacher essentially have the abilities, attitude, theoretical and practical knowledge, skills and resources integrating entrepreneur skills in chemistry curriculum effectively and efficiently. The experiential learning activities, content, interaction with students, assessment criteria, demonstration skills, nurturing among students and attitude developed with positive influence, understanding abilities, knowledge, skills and attitudes.

Experiential learning emphasizes planning of teaching and assessment which focus on the need and the abilities of learner. Students active participation in hands on activities and brain involved in learning process. In active involvement of students in learning, it enables learners to manipulate, observe, measure, record, communicate etc., through science process skills.

Sustainable development is nothing but positive future, social independence, and economical, political, environmental aspect of globe. This helps to address global challenges such as economic depression, global change, e security. The following are the opportunities of entrepreneurship in science which experiential learning can be carried out.

- Formation of stands to produce alcohol. Sophistication process, hydrogenation of fats and cloth dying. It may be used for the exhibition.
- Study of impact of heat on yeast production. Students can dissolve yeast in three different temperatures, make the bread and describe result.
- Nutritional concept to prepare on advertising plan to market an idea. Make a product of nutritional snacks and prepare plan to sell them. Name the company that will be marking the nutritional snacks. Organized food Product Company. Identify career possible
- Conduct bacterial test in school. Collection of data and prepare report. Prepare herbal antibacterial soap.
- Set up the weather monitoring station, student will collect data and market in some form.
- By preparing rock candy students can learn crystal formation. Teachers can discuss with to make new product from crystals.

- To conduct experiment with emulsion. Preparing salad dressing without and with emulsifier. Prepare an emulsifier and its application in products.
- Preparing flower book mark. Collect the flower, press them and make book mark and market in school fairs. Students can prepare acid-base indicator.
- Develop water sampling kit and develop water sampling services.
- Ask students to collect, sort, weigh material from school trash such as paper, glass, metal. Collect and record data. Then describe the amount accumulated over one week, one month, problem related to disposal, business related to disposal and cash associated with trash. The teacher should discuss with students on problems of accumulation.
- Initiate reading project: Ask students to collect cans and sell to recycle center. Investigate cost and income per kg. Plan to form business format for the recycle project. Identify role of each student.
- To invite the people associated with business related to science.

AMALGAMATION OF ENTREPRENEUR SKILL IN CHEMISTRY CURRICULUM:

The 21st century experiential learning approach should innovate ways of teaching-learning and school curriculum for entrepreneurial skills development, well planned lesson content that foster, creates and motivate students interest towards acquisition of entrepreneurial skills and individual sustainability. The integration of chemistry lesson, innovative and creative approach of amalgamation of entrepreneurial skills in school chemistry curriculum involving models of learning as challenge to assisting teachers, thinks about self-reliance of teaching-learning. The following are entrepreneurial skill contents that may be included in school curriculum:

1. Preparation of flower extracts P_H indication.
2. Preparation of alcohol from potato, cassava and stem tissues.
3. Preparation of ma from plan fats.
4. Preparation of salt from sea water.
5. Preparation of sugar from sugarcane.
6. Preparation of detergent and soap from seeds of groundnut and coconut.
7. Preparation of food additives from dyes and plants.
8. Preparation of pulp and paper from Gmelina/bamboo plants.
9. Preparation of chalk from gypsum.
10. Preparation of slaked lime from lime stone.
11. Preparation of fiber from plant and banana plant peals.
12. Preparation of herbal mosquito repellent.

There are many experimental learning activities that can be conducted to ensure acquisition of entrepreneurial skills such as brain storming, discussion, games, problem solving, process-based approach, role play, drama, dance, songs, poems, speed and mimes. These experiential learning methods will nurture student's critical thinking, creativity, open mindedness, intellectual honesty. The positive attitude develops process skills, entrepreneur skills and socio-economic skills. Experiential learning based activities will yield better quality and entrepreneurial skills will be acquired.

CONCLUSION:

The objective of science education is to ensure that every student acquire good conceptual understanding and apply in daily life. Students should taught handling of materials. Students should learn about conduction of experiment, observe, classify, hypothesis, communicate, repeat, record and conclude. The acquisition of entrepreneurial skills will reduce unemployment and its attendant social vices. In the present economic depression, if young students are equipped with entrepreneurial skills in their chemistry curriculum they will be able to apply these skills to run their own business. By using this approach, students will contribute to the promotion of entrepreneurship for sustainable development.

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