Integrating an Entrepreneurial Motivated Approach (EMA) in Teaching and Learning of General Chemistry

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Abstract

The main importance of this research is to explore the importance of integrating entrepreneurship or Entrepreneurial Motivated Approach (EMA) in the teaching and learning of Chemistry course. Before doing this, related review of past studies and other sources were explored to examine the effects of entrepreneurship in different fields and discuss its taught. Quotations from students were used in considering the importance of entrepreneurship in learning Chemistry. Also, testimonies from the past students and graduates who experienced EMA were asked about the effects of the teaching strategy. Overall, EMA made an impact among students and should be part of the curriculum of science courses. Whilst there is evidence of entrepreneurship related opportunities in science, its inclusion and integration is a must across all program and curriculum in the Philippines.

Keywords: General Chemistry, Entrepreneurial Motivated Approach (EMA), integration, skills and competency, teaching and learning approach

1. Introduction

There are so many changes that are rapidly taking place in all phases of life here in the Philippines. In the academe, we have the K12 curriculum, 21st century ASEAN integration skills, and job-skills mismatch. The demand modern society has occasioned a global revolution that has resulted to some emerging issues the inclusion of entrepreneurship education and financial related subject in the curriculum. Since the curriculum is a very useful tool in changing the pedagogical landscape of the educational system. It is a blueprint, like a road map that gives direction to educational programs.

Thus as a science teacher, education and curriculum should be parallel and synonymous to one another. The work of producing innovative students in sciences that will cope with the demanding global challenges calls for a total revamp in the educational system. Therefore, the 21st century science teacher will face a lot of problems if he is not knowledgeable in the area of entrepreneurial skills. Thus it brings us the question, can integration of entrepreneurship in the curriculum enhanced the motivation of students?

1.1 Definition of Entrepreneurship

Hoit (2006) defines entrepreneurship as the process of bringing together creative and innovative ideas and exploring management and organization skills to combine people, money and resources to meet an identified need and thereby create wealth.

The Webster's Dictionary (2005) also defines entrepreneurship as a process by which one undertakes to start an enterprise or business and assuming full control and risk. Building on these definitions, entrepreneurship skill acquisition is conceptualized as a training program that is geared towards equipping student teachers or recipient with creative or innovative ideas that will enhance self-employment and job creation. Such training program also equips student's teacher or recipients with skills, knowledge, value, attitude, orientation and insights to analyze their environment in a more organized pattern.

According to oxford Advanced learners Dictionary (Hornby, 2006), entrepreneurial skills are those skills that are required to start or run a business, especially when the business involves taking financial risks. The teacher should be equipped with techniques needed for modern education. As a matter of fact, the present education policies should involve a greater portion of science and technology that should be imbibes by the learners as a method of adapting to ones environment and harnessing environmental resources for survival. According to press release by the UK-DTI (2004):

> "Entrepreneurship and innovation are central to the creative processes in the economy, to promoting growth, increasing productivity and creating jobs. Entrepreneurship is not confined to a particular business size or a particular stage in an organisations' life cycle, such as the start-up phase. In a competitive environment, entrepreneurship is an essential element in the long-range success of every business organization, small or large, new or long established."

1.2. Teaching strategies in Entrepreneurship

Many authorities in the academe have advanced ways of equipping learners thru teacher education level with entrepreneurial skills. First, they should be made to understand the need for the acquisition of entrepreneurial skills as entrepreneurs in the school environments. For instance they should be made to be aware that in the era of modernization and changing economy situation learners and teachers need to equip themselves to follow the trend in the world of science and technology. Secondly, the curriculum of teacher education should create room for internship training. An internship training should be organized on entrepreneurship skills for the student teachers so as to fully acquaint them with most skills they need to function in the classroom after graduation. Hoit (2016) suggested some strategies for linking entrepreneurship with courses and programs are as follows:

1.2.1. Developing a curriculum on entrepreneurship education.

1.2.2. Developing the learner's competence.

1.2.3. Developing students' understanding in entrepreneurship.

1.2.4. Evaluating student's experience of entrepreneurship and feeding it back into the curriculum.

1.3. Integrating Entrepreneurship in the Curriculum

In higher education the primary purpose should be to develop entrepreneurial capacities and mindsets (Achor & Kate, 2013). Entrepreneurship education programs can have different objectives, such as:

- developing entrepreneurial drive among students, therefore raising awareness and motivation;
- training students in what is needed to set up a business, and to manage its growth;
- developing the entrepreneurial abilities needed to identify and exploit business opportunities.

The purpose of the course/programs should be precisely defined, as should its expected outcomes. While the creation of graduate start-ups is therefore a desirable outcome, it should not be forgotten that entrepreneurship is also and equally about successfully managing innovation and growth. In existing business and entrepreneurship programs very often only the start-up aspect is considered, while the skills and knowledge needed to manage the growth phase of a small business are neglected. In this sense, there is in general terms a need for a shift in the focus of entrepreneurship education programs and courses across Europe (Henry, 2003).

A perceived lack of relevant experience and a lack of self-confidence are two often cited reasons for new graduates not engaging in entrepreneurship soon after graduation (Adeduso, 2004). The university experience should be capable of addressing both these needs. The learning experience needs to build depth and breadth in awareness, understanding and capacity. Although not applicable in all cases, the general approach would be to provide broad exposure and positive and motivational experiences during the early stages of university life. This then provides a platform from which to build depth and capability in preparation for an entrepreneurial career at the point of exit. The important point here is one of progression, not only through university, but also through the whole education system at all levels.

Integration of entrepreneurship into the curriculum needs to be the vision for a higher education institution as part of its wider mission. Provision should be accessible for Arts and Humanities students as it is for Business/Social Science and Science/Engineering students. Educators should

be comfortable and skilled in addressing a diversity of student groups, from different cultural backgrounds, by providing examples and role models that relate to their contexts (European Commision, 2008).

Recent data from certain European countries show that the majority of entrepreneurship courses are offered in business and economic studies, for instance in Spain and in the UK. However, it is questionable whether business schools are the most appropriate place to teach entrepreneurship: innovative and viable business ideas may be more likely to originate from technical, scientific and creative studies. In Germany, most spin-offs are from universities of applied sciences and technical universities. Therefore, the real challenge is to build inter-disciplinary approaches, making entrepreneurship education accessible to all students, and where appropriate creating teams for the development and exploitation of business ideas, mixing students from economic and business studies with students from other faculties and with different backgrounds. According to Ball (2001) in his study on the importance of entrepreneurship in hospitality industry:

> "We recommend to higher education institutions that they consider the scope for encouraging entrepreneurship through innovative approaches to programme design and through specialist postgraduate programmes."

1.4. Issues in Entrepreneurship

Sills and competencies in entrepreneurship education should not be confused with general business and economic studies; its goal is to promote creativity, innovation and self-employment, and may include the following elements (Ram & Barrett, 2000):

- developing personal attributes and skills that form the basis of an entrepreneurial mindset and behavior (creativity, sense of initiative, risk-taking, autonomy, self-confidence, leadership, team spirit, etc.);
- raising the awareness of students about self-employment and entrepreneurship as possible career options;
- working on concrete enterprise projects and activities;

• providing specific business skills and knowledge of how to start a company and run it successfully.

Entrepreneurial programs and modules offer students the tools to think creatively, be an effective problem solver, analyze a business idea objectively, and communicate, network, lead, and evaluate any given project. Students feel more confident about setting up their own.

1.5. Role of stakeholders in Entrepreneurship

Promoting entrepreneurship education in the community should be part of a common and coordinated effort. Regional development agencies and university associations should provide clear directions about what contribution institutions could make to regional social and economic development strategies. Universities should be considered as instruments of regional development (Adeduso, 2004).

There needs to be an increasing awareness that cooperation between higher education institutions and enterprises can generate a win-win situation for both parties. Teachers and students have something to contribute to enterprises, in terms of theoretical knowledge and also through the involvement of students in innovation ideas. A few possible elements of motivation for enterprises in embarking on cooperation and joint projects with universities are:

− to get a job done;
− to get expertise and advice from a tutor/professor;
− to test potential students for later recruitment;
− to get publicity or image building; and
− to establish a channel of contact with the university, making it possible to keep track of new developments.

1.6. Entrepreneurship Education as a law in the Philippines

The Senate has approved on third and final reading Senate Bill No. 2212, a measure that seeks to integrate subjects on entrepreneurship and financial literacy in the curriculum. Once passed into

law, entrepreneurship and other financial-related subjects would be taught in high-school and college.

Senator Paolo Benigno "Bam" Aquino IV, chair of the Senate Committee on Trade Commerce, and Entrepreneurship and sponsor of the bill, said he is confident the measure will "instill" business acumen among the Filipino youth. According to him:

> "Financial literacy in the basic education system is a good foundation for entrepreneurship in the future… As the number of unemployed youth in the country grows each year, we really have to create new ways of thinking to address the epidemic".

The bill will not only promote youth entrepreneurship through education but two types of financing shall be established to promote and develop competencies in teaching entrepreneurship education, as well.

(1) Capacity Building Grants for Entities Teaching Entrepreneurship shall be awarded by the Department of Education to qualified institutions to develop subjects and competencies for primary, secondary and alternative learning school students. CHED and TESDA shall likewise award grants to eligible entities in order to develop subject and competencies for post-secondary school students, train post-secondary school teachers, prepare methods and to evaluate the effect of entrepreneurial education.

(2) Project Grants and Loans shall be provided by DepEd, CHED and TESDA to qualified young entrepreneurs who are pursuing a project that tackles entrepreneurship. Financing may be provided directly or through link up with a funding agency. The Act's Implementing Rules and Regulations shall set the standards in choosing those who will qualify for the financial support and the mode of disbursement.

The DepEd, CHED, and TESDA, in cooperation with learning institutions and other players in the education sector shall likewise provide an avenue for banks, foundations, and others who are interested in funding or providing support to post-secondary school students or graduates for the incubation of their enterprise project.

2. Research Method

2.1. Research design

The faculty-researcher utilized the descriptive method in determining the effects of integrating EMA in Chemistry class. Descriptive survey research design will allow the teacher-researcher to

gather information, summarize, present and interpret for the purpose of clarification. In particular, phenomenography method which a qualitative way of understanding the student's experiences, understanding and concepts of a specific phenomenon or situation is highlighted. The research design was patterned based on the US Department of Education in a study made by Adelman (2000) in which it depicts the hierarchical relationships in performance-based learning.

Demonstrations (as an entrepreneur)

↑

Competency (as lifelong learner)

↑

Skills, abilities and strategy (as a skilled learner)

↑

Knowledge, attitude and characteristics (as a student)

The first step of this ladder is knowledge, which constitute the foundation for learning and depict the innate makeup of the learner on which further experiences can be built. Differences in attitude and characteristics help explain why people pursue different learning experiences and acquire different levels and kinds of skills, abilities and strategy in life. Thus, the second step of this ladder are developed through learning experiences, broadly to defined to include, among other possibilities, work and even participation in community affairs. Then competencies are the result of integrated learning experiences from knowledge, skills, abilities and strategy in relation to task for which they are assembled. And finally, demonstrations leading to applying competencies in which performance-based learning can be evident and assessed over a period of time.

2.2. Participants

Most of the participants are the class officers and group leaders who were responsible in coming up with their products. They are taking up either a course in BS Biology, Medical Technology,

Psychology or Nursing. The following are the topics that the teacher-researcher have covered and the product or output of the students and its placement in the course.

Topics	Product or output	Placement
Periodic table	Any school supplies with Periodic table on it.	Lecture, 1st Prelim period
History of chemistry /Famous chemist	Fan	Lecture, 1st Prelim period
Molecular geometry	Recyclable materials in frame or coffee table book	Lecture, 2nd Prelim period
Introduction to Biomolecules	Reusable bag with emphasis on Carbohydrate, Protein, or Fats	Lecture, 2nd Prelim period
Introduction to Environmental Chemistry	Organic Products	Lecture, Final period s
Colligative properties of solutions	Flavored Ice cream making	Lecture, Final period
Osmosis	Salted egg making using brine method	Laboratory, Final period
Crystallization	Fruit candy making	Laboratory, 1st Prelim period
Vapor Pressure lowering	Flavored gelatin and leche flan making	Laboratory, Final period
Water	Any refreshing beverage not alcoholic	Laboratory, 2nd Prelim period
Solutions	Any home-made dish with soup or sauce on it	Laboratory, 2nd Prelim period
Alcohols	Fruity flavored wines	Lecture, Final period

Carboxylic acid	Different kinds of vinegars	Lecture, Final period
Esters	Soap making	Lecture, Final period

2.3. Procedure

An android cellular phone was used to record the interviews. The focus group discussion was held at the end of the semester after the final grades were given to all the students, to avoid bias and confidentiality. This the step-by-step procedure during discussion to integration of entrepreneurship and presentation of outputs:

2.3.1 The usual lecture discussion method in teaching with some teaching strategies was employed by the teacher-researcher.

2.3.2 Then after the discussion, the teacher-researcher infused an application of the topic in the form of product or output.

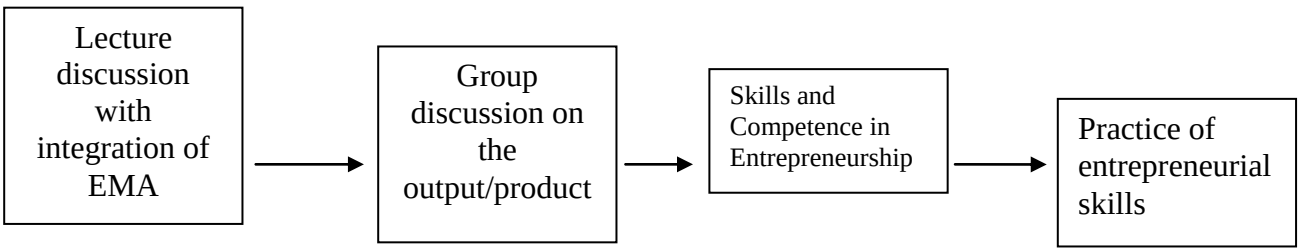
2.3.3 The students which was led by a group leader make plans for their own product and output.

2.3.4 The students have to identify a product of their own choice, estimate the cost/budget of producing it, plan the design, and where to execute (school or house)

2.3.5 At the end they need to identify the probable market to sell and how much it cost. If it is a food product, they have to know the shelf-life and proper storage.

2.3.6 All the products were presented during the Science week every 3rd week of September, but due to time constraint they presented it on the 1st week of October.

After this process, the teacher-researcher analyzed the transcripts and transcribed all recordings, looking for trends and patterns. This can be shown in a paradigm:



3. Results and Analysis

3.1. Gaining competence in EMA

Teaching should use a wide array of different strategies and approaches. In other words, it should be interdisciplinary approach, which is the ultimate objective to combine student knowledge into skills and competence with the right attitude. It should provide basic business skills and raise awareness of entrepreneurship as a potential and alternate career option. Entrepreneurship should focus on opportunities emerging through creativity and creative working, preparing graduates to work as freelancer or self-employed people and creating small enterprise and ventures. It is also important in EMA to define the precise objective in going a product that is geared to expect an outcomes. Here are some of the quotations from the students in gaining competence in the integration of EMA:

a. "It brings out our abilities to turn ideas into actions"

b. "It promotes the spirit of teamwork"

c. "It challenges our creativity and innovativeness, problem solving skills and being resourceful"

d. "It is like a project where everyone has to contribute, not only money, but bright ideas.

e. "The course becomes more interesting on my part and I can say that I am less dependent"

f. "At first it was so weird, entrepreneurship in Chemistry, but I appreciate it at the end of the course. I have to think of a sideline or my own business in the future"

Based on the students opinion and views during the focus group discussion about integrating EMA in the teaching and learning of Chemistry, they felt that they are learning much more effectively and that they are greatly appreciate the opportunities to do something for real. They have also spoken repeatedly about how much they enjoy helping one another. This teaching strategy is highly practical and students have the chance to demonstrate initiative and organizational skills which is greatly needed in the workforce. According to Bill, K. and Bowen-Jones, B. (2004), a known education activist:

> "I strongly support the need for an integrated approach of entrepreneurship in using Personality Development Planning in conjunction with the academic curriculum and wider learning opportunities in order to support the development of entrepreneurial skills, which students require to 'operate in a highly competitive, complex and dynamic workplace."

3.2. Practice of entrepreneurial skills

The use of EMA in developing entrepreneurial skills and competence should be action oriented, meaning the use of experienced based pedagogy which can be time consuming, labor intensive, costly and requires specific training. Instructors and professors should have the background and recent experience in business for them to have a strong link to their students. This will reinforce the identification of students to their products. Here are some of the testimonies from previous students in the practice of entrepreneurship.

a. "Now I owned a boutique at home selling ready to wear clothes which I designed, it gave me an additional income which I can use to finance my everyday expense."

b. "I'm making pastillas and yemas which I learn in Chemistry. I sell it at P5 each. For me, being a student entrepreneur is something to be proud of."

c. "Aside from having our own family business, a junkshop, I use recyclable materials into reusable decors like a vase from a bottle, a bag from plastic wrappers and paper mosaic from old newspapers. I earned from it and it's fun"

d. "Because of our short topics on entrepreneurship, I was able to make different home-made dishes which I can supply in a condominium near us"

e. "I can now make different desserts like ice cream, leche flan and gelatin and sell it to my relatives on an over priced because I know they won't resist"

As faculty, I realize more flexibility and options in the educational delivery systems. These options, though, require fundamental reengineering of current delivery systems, inviting debate about the traditional academic structure, the standard period of time of academic terms and the very process for certifying student learning. In many important ways, integrating entrepreneurship in the class have the potential to redistribute the power relationships between teaching and competence. As Karen Bill in 2004 (Principal Lecturer, University College, Worcester) puts this into context for education, stating that:

> "This vision is complicated by the challenges facing the industry in terms of the global economy and self-employment trends. Departments must therefore begin to acknowledge the work of the Council for Graduate Entrepreneurship, and the Lambert Review of business-university globalisation and the Robert's Report which have started to outline a forward agenda for facilitating a more entrepreneurial culture and developing graduates who are capable of operating effectively in a knowledge economy. To this end, I am in the process of validating two modules one at undergraduate and one at postgraduate level which focus on the role of the manager as a business entrepreneur, and to enable students to develop their potential to acquire an entrepreneurial capability and enhance their communication skills."

3.3. Entrepreneurship in Higher Education Curriculum

In higher education, the primary purpose should develop entrepreneurial competencies and skills. EMA can have the following outcomes such as:

a. To develop entrepreneurial drive among students

b. Training students in what is needed to set up a business and manage its growth.

c. Develop entrepreneurial competencies and skills needed to identify and exploit business opportunities

The purpose of integrating EMA in the teaching of Chemistry should be precisely defined, as should expected outcomes. The learning experience needs to build depth and breadth in awareness, understanding and capacity. In general it would able to provide broad exposure and positive motivational experiences during the early stages of university life. This will provide a platform from which to build deeper skills in entrepreneurship in preparation for the real world at the point of exit.

Integration of EMA in teaching into the curriculum needs to be the vision for Higher Education Institutions (HEIs) as part of their wider mission. Educators should be comfortable and skilled in addressing a diversity of student groups by providing good role models that relate to their contexts.

Based on the observation of the teacher-researcher, EMA aims at preparing students to acquire skills and competencies such as initiative, being independent, developing ability to assess risks. Also, it helps students with necessary knowledge, skills and attitudes to implement the pedagogy

of entrepreneurship education in the curriculum. As stated by European Commission (2008) for Higher Education:

> "Entrepreneurship in the development of new concepts and initiatives to gain a competitive edge is a key strategy as companies realign their brand vision and identity. Entrepreneurship has moved to the core of management thinking and action in many different contexts and the relevance of the concept is increasingly being recognised by educationalists in the design and delivery of their courses."

4. Discussion

4.1. Dilemma in EMA

There is a problem on the lack of awareness and motivation from the students because it is not really part of the curriculum. Therefore, it can be seen on a bigger picture that entrepreneurship within an institution is very much dependent and willingness on the vision of certain administrators.

Also, resources and findings is a clear mismatch to the demand of entrepreneurship studies. Mostly of public schools have insufficient resources to train students. Teachers should have better understanding of entrepreneurship education and the range of aims, methods and contents. There is a need for more teacher training seminars and workshop. However, there is very little or even none at all in terms of incentives to motivate teachers and reward them for getting involve in entrepreneurial teaching and activities with students. For instance, research and publication remain the main criteria for ranking and promotion while experience-based project do not receive any necessary consideration. According to Leslie Bailey, MSc MHCIMA, Division Manager Concepts, and Hong Kong in a study made by Ball (2001):

> "Essentially an entrepreneur is an individual with vision, someone who works hard and has the courage to try something new - even if it means failing".

4.2. Success in EMA

The penultimate success factors of entrepreneurship education are the transformation into an entrepreneurial university which, is characterized by a diffused entrepreneurial culture. Many universities and college in Europe are clearly moving in that direction but they are still far from the end goal because research and publication is their utmost priority. Integrating EMA in teaching should be seen as a strategic goal that there is an explicit mission and it is possible to assess how this mission is fulfilled. To have this entrepreneurial environment, there should be a collaborative approach with real business practice and industry. In doing this, young entrepreneurs like alumni and experience business people are involve in the course and activities and should contribute to their design. Practical experience by means of students cooperating with enterprises and working on concrete projects should be embedded in the curriculum. According to press released by the UK-DTI (2004):

> "Entrepreneurs sense opportunities and take risks in the face of uncertainty to open new markets, design new products, and develop innovative processes. In the knowledge driven economy this process is critical in large and small businesses alike."

4.3. Conclusion and Recommendation

In integrating EMA in teaching and learning Chemistry, it is necessary to consider the context of global crises and in the face of the need to successfully implement it in the college curriculum. Given the right framework and conditions, entrepreneurial initiatives can be highly desirable for an institution, as successful initiatives led by prestige to the institution.

An important conclusion is that traditional lecture discussion method does not complement with the development of entrepreneurial skills and competence and that multi disciplinary collaboration is an essential element of building and enterprising capabilities. According to press released by the UK-DTI (2004):

> "Small businesses are the lifeblood of the economy. They are at the forefront of this government's efforts to promote enterprise, innovation and increased productivity. Small firms are vitally important because of their role in the supply chain, the competition they stimulate and the ideas and products they bring to the market place."

The teacher researcher would like to recommend the following:

4.3.1 Science and non-science educators should use EMA in teaching as part of their pedagogy.

4.3.2 Entrepreneurship education should be the integral part of science teacher education curriculum; it should be embedded in all disciplines.

4.3.3 There is a need for greater flexibility in the design of syllabus in parallel to integrating EMA.

4.3.4 School administrators should have incentive system for motivating and rewarding faculty, office staff and researchers in supporting students interested in exploiting business opportunities.

4.3.5 Different institutions should support the spontaneous initiative of student enterprise projects.

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