



THE EFFECTS OF TEACHER-DIRECTED AND STUDENT-DIRECTED BIOLOGY INSTRUCTIONAL STRATEGIES ON PRE-SERVICE STUDENTS' ENTREPRENEURSHIP SKILL: AN IMPLICATION FOR HIGHER EDUCATION

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Abstract

Education in Nigeria is devoid of the element crucial to averting the surging rate of unemployment in the country. Increase in violence, poverty and segregation amongst citizens occur

Keywords:

Biology, Teacher-directed instruction, Student-directed instruction, Entrepreneurship Skill, Conventional Biology instruction

because the – quasi experimental $p < 0.05$). Gender and educational system design using $3 \times 2 \times 2$ parents' business itself fails to empower factorial matrix. 360 involvement did not those executing it, students were selected have significant main therefore not catering from six Pre-service effect on students' for the economy. colleges in Nigeria. entrepreneurship Hence the need to Five instruments used skills. Teacher-employ teaching were: Students' directed and student-strategy that will Entrepreneurship Skill directed biology enhance Operational Guides instructional entrepreneurship for; Teacher-directed strategies had positive culture in pre-service Biology Instruction, effects on and students, molding Student-directed therefore encouraged them into becoming Biology Instruction among senior job creators and not Biology Instruction and Conventional secondary school job seekers for and Conventional students. It is peaceful co-existence. Biology Instruction. recommended that This study, Two null hypotheses topics that may investigated effect of were tested at 0.05 enhance teacher-directed and level of significance. entrepreneurship student-directed Data were subjected to skills for teachers to instructional Analysis of Covariance emphasise during strategies on biology and Scheffe post hoc teaching, so that students' significant main effect graduates may be entrepreneurship skills. The study on students' gainfully employed for adopted pretest-entrepreneurship peace to reign in our posttest, control group skills ($F_{(2,347)} = 516.01$, society.

INTRODUCTION

The problems facing the country include high rate of poverty, youth and graduate unemployment, overdependence on foreign goods and technology, Low economic growth and development, among others. Unemployment is one of the developmental problems that faces

every developing economy in the 21st century. Our educational institutions keep turning out graduates every year without adequate employment opportunities. A careful look at the current state of affairs in Nigeria reveals that we are in a 21st century economy with a 19th century education system. A system whereby much emphasis is still placed on the conventional classroom environment with much reverence for certificate for graduates who in most cases are trained to be job seekers as evidenced in present high unemployment rate in the land.

International statistics portray that industrial and service workers living in developing regions account for about two-thirds of the unemployed. (Patterson et al, 2006). In recent years, many countries have come up against problems of unemployment and many have plunged into a mission of creating new business opportunities for their citizens. (Deveci and Seikkula-Leino, 2018). Herein lies the need for Entrepreneurship education. Then, what is Entrepreneurship education?

According to Omolayo (2006), Entrepreneurship education is the act of starting a company, arranging business deals and taking risks in order to make a profit through the education/ skills acquired. Another view of entrepreneurship education is the term given to someone who has innovative ideas and transforms them to profitable activities. In the same vein, Nwangwu (2007) opined that entrepreneurship is a process of bringing together the factors of production, which include land, labour and capital so as to provide a product or service for public consumption. While entrepreneurship education is narrowly defined as preparing students for the business world, it is also identified as the process by which a number of characteristics that will primarily provide individual social and economic benefits are acquired (Deveci and Cepni 2017).

IDEAS for Entrepreneurship Education in schools is published by the Consortium for Entrepreneurship Education in the Entrepreneurs' views. According to the Consortium for Entrepreneurship Education (2008), IDEAS for entrepreneurship activities in schools are entrepreneurship-related learning activities that provide experience in entrepreneurial skills and can be infused in students' regular course of study. It includes IDEAS in social studies and entrepreneurship, science and entrepreneurship,

arts/performing arts and entrepreneurship, mathematics and entrepreneurship as well as language arts and entrepreneurship. For science and entrepreneurship, the Consortium for entrepreneurship education (2008) reported the following contributions by teachers in a brainstorming activity as part of the New Jersey school to work coordinators' meeting, asking teachers to implement them in the classroom. They include making bread, setting up a nutritional company, selling antibacterial soap to students, doing bacterial test round the school, setting up a weather station, and making salad dressing. Also making book mark, making a student run water sampling, collecting refuse and making a recycling project. In this study, biology students were exposed to fishery, snailry, beans powder production, horticulture and refuse disposal under the appropriate biology topics

Table 1. Biology Topics, Associated Entrepreneurship Content and Activities

Biology Topics	Associated Entrepreneurship Content	Entrepreneurship Activities
Biology and Living Things	Snailry	Students visit an entrepreneur to learn snailry.
Animal Nutrition	Fishery	Students visit an entrepreneur to learn fishery
Relevance of Biology to Agriculture	Beans powder production	Invite an entrepreneur to teach the students how to make beans powder
	Horticulture	Students visit an entrepreneur to learn horticulture
Pollution	Refuse collection and disposal	Invite an entrepreneur to teach refuse management and disposal on the school compound.

Students visit a refuse dump site.

Source: Abiona (2007), Amusan (2002) and Consortium for Entrepreneurship Education 2008: IDEAS for Entrepreneurship Education Furthermore, there is a broad array of entrepreneurial skills needed by an entrepreneur in today's competitive market. Regrettably, these skills are lacking in the active population of Nigeria as observed by Martins (2008). European Commission (2007) puts the skills needed as creativity, innovation and risk taking as well as ability to plan and manage projects in order to achieve objectives. More specifically, Growthinks Incorporation (2008) lists entrepreneurial skills as focus, vision, leadership, persistence and passion, technical skills and flexibility. For the purpose of this study only the technical skills for each entrepreneurial or business opportunity were used, as shown in Table 2.

Table 2. Skills in Different Entrepreneurial Opportunities

S/N	Skills	Snailry	Fishery	Beans Powder Production	Horticulture	Refuse Collection
1	Technical skill 1	Cleaning the snail house	Cleaning the pond	Picking	Planting	Locating refuse dump site
2	Technical skill 2	Feeding the snails	Feeding the fish	Grinding	Watering and tendering	Packing refuse
3	Technical skill 3	Harvesting the snails	Harvesting the fish	Packing	Transplanting	Loading refuse
4	Technical skill 4	Selling the snails	Selling the fish	Selling	Selling	Burning of refuse

Sources: Growthinks (2008) and data base from consultant entrepreneurs in fishery, snailry, beans powder production, horticulture and refuse collection.

Also, it is commendable that the Federal Government of Nigeria in its quest for scientific inquiry formulated goals in the National Policy on

Education (FGN, 2013) which reflect, amongst others, the acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as requirement for the individual to live in and contribute to the development of the society. Educational activities are expected to be centered on the learner for maximum self- development and self -fulfillment. This study therefore focused on entrepreneurial skills brought out of biology topics and which can be applied to other subjects and not entrepreneurship or trade as a subject which will only increase the number of subjects the students would have to pass.

Teacher-directed instruction is any instruction initiated and guided primarily by the teacher. Wales (2009) believes that the conventional approach to teaching is defective and makes students passive but the teacher-directed instructional strategies that call for more active responses from students are good for the delivery of instruction in classrooms. Good and Brophy (2004) believe that teacher-directed instructional strategies implemented as intended is useful for a variety of educational contexts. Demant and Yates (2003) found out that teachers themselves support the approach. Wales (2009) further expresses the opinion that some aspects of most subjects taught in schools are better taught using teacher-directed method. Wales (2009) then listed teacher-directed instruction as “lectures and readings, advance organisers, recalling and relating prior knowledge, elaborating and extending information, mastery learning, direct instruction and Modeling Hunter’s effective teaching model”. The basic thing is that the teacher gives the instruction.

As regards student-direscted instruction, Wales (2009) stressed that student-direscted instruction shifts some of the responsibility of directing and organising learning from the teacher to the students. Student-directed instruction is based on the belief that active students’ involvement in the learning process increases learning and motivation. According to Tanner, Bottoms, Ferragin and Bearman (2007), good student-centred learning values foster the students’ role in acquiring knowledge and understanding. This approach empowers students to ask questions, seek answers and attempt to understand the world’s complexities.

Wood and Gentile (2003) and Blair, Schwartz, Biswas and Lewlawong (2007) express the opinion that the conventional method of teaching science is inadequate for effective learning of science. Olatoye and Adekoya (2010), James and Olajide (2011) and Oludipe and Oludipe (2010) in previous studies related to methods of teaching science in Nigerian secondary schools also express the opinion that the conventional method of teaching science is ineffective.

The phenomenon “Entrepreneurship” and “Entrepreneur” have a gender label too – a male one. However, women play a substantial role in entrepreneurship throughout the world. Jalbert (2000) report that in advanced market economies, women own 25 per cent of all businesses and the number of women-owned businesses in Africa, Asia, Eastern Europe and Latin America are increasing rapidly. Luthy, Richards, Bryd III and Ryan (2004) state that women and men aspire to entrepreneurial undertakings if given the opportunity to do so. Male and female entrepreneurs have also been found to be motivated by similar needs for autonomy and achievement, a desire for job satisfaction and other economic rewards for improving their financial situations. However, there have been differences captured in motivating factors and values (Luthy, Richards, Bryd and Ryan 2004). It is therefore necessary to find out the effects of teaching entrepreneurship education using different instructional approaches on both male and female students to inform the plausible ways of bridging the gap.

Moreover, the present economic situation creates the necessity for women to be involved in generating wealth and be self reliant. If a woman is trained, a nation is trained. This study therefore made use of male and female students with the aim of finding out the difference that entrepreneurship teaching has on both and suggest possible ways of closing the gap if any. According to Pradeep (2010), there was a significant difference between male and female students in their knowledge of entrepreneurship with the male students scoring 65% and the female, 54% on the average. Furthermore, since female students were more aware of their deficiencies, they may be less confident in their ability to succeed in starting a business.

Parental involvement in business and attitude towards entrepreneurship may also affect students' skills in entrepreneurship. Ramon (2008), while answering a question "why is the rate of entrepreneurship among African Americans so low?" asserts that it is because many black Americans still have a slave mentality. This mentality is one of dependence on the government, a defeated skills and one that does not allow one to rise above difficulty. He went further to argue that the other reason is the way and manner parents raise their children. He opines that if more of our children are going to be entrepreneurs we must train them early about business, economy, working hard, saving money, making wise choice and learning from failure. He then concludes that entrepreneurship is not for everyone – when we have well educated children who are trained to be responsible, respectful, resourceful and hard-working then we will have more black entrepreneurs. The present study, therefore investigated the effects of teacher-directed and student-directed biology instructional strategies on pre-service students' entrepreneurship skills with its implication on higher education.

Statement of the Problem

Unemployment prevails in the country, hence, the growth of violence, poverty and segregation amongst citizens, because the educational system itself fails to empower the ones passing it, therefore not catering for the economy. Thus entrepreneurial development through education will advance the economy of the nation and much credence should be given to it and ingrained with focus on profitable personal development.

It is therefore, necessary to investigate the effects of teacher-directed and student-directed biology instructional strategies on pre-service students' entrepreneurship skills with its great implication on higher education.

Hypotheses

The study tested the following null hypotheses:

Ho₁: There is no significant main effect of treatments on pre-service students' entrepreneurship skills.

Ho₁: There is no significant main effect of gender on pre-service students' entrepreneurship skills.

Ho₃: There is no significant main effect of parents' business involvement on pre-service students' entrepreneurship skills.

Methodology

The study employed a pretest, posttest, control group, quasi-experimental design, using a 3x2x2 factorial matrix. The participants for this study was taken from N.C.E II Pre-service teachers studying Biology as teaching subject in the government owned eleven (11) Colleges of Education (four owned by the Federal government while the remaining seven by the State government) in South West Nigeria. From these Colleges Six (two federal and four state) was purposely selected based on their relative distance from one another. The Colleges were randomly assigned to treatment. Two colleges were exposed to Teacher-Directed Strategy another two to Student-Directed Strategy and the remaining two to the Conventional Teaching Strategy.

From the selected Colleges, intact classes of N.C.E II Biology students were used for the study.

Research Instruments

Five instruments were constructed and used for this study.

- 1 Students' Entrepreneurship Skill Test (SEST)
- 2 Operational Guide for Teacher-directed Biology Instruction (OGTBI)
- 3 Operational Guide for Student-directed Biology Instruction (OGSBI)
- 4 Operational Guide for Conventional Biology Instruction (OGCBI)
- 5 Researcher's Assessment Sheet for Teacher-directed Biology Instruction (RASTBI), Student-directed Biology Instruction (RASSBI), Conventional Biology Instruction (RASCBI)

Students' Entrepreneurship Skills Test (SEST)

The instrument which contained 20 items was designed to measure pre-service students' entrepreneurship skills in biology. The skills were reduced to measurable forms. Each item attracted five marks.

Validity and Reliability of SEST

The instrument was shown to two sets of entrepreneurs on fishery, snailry, beans powder production, refuse collection horticulture and two biology

lecturers. Each set of entrepreneur dealt with the business applicable to him or her. This enabled the determination of the suitability of the instrument in terms of clarity of ideas, language, coverage and relevance. The instrument was then administered to 60 Pre -service students not used for the study. A Cronbach alpha coefficient of 0.842 was obtained.

Operational Guide for Teacher-directed Biology Instruction (OGTBI)

This instrument consists of lesson plans on four selected topics in NCE 300 level biology courses. The topics are Biology and Living Things, Animal Nutrition, Relevance of Biology to Agriculture and Pollution. The steps followed are:

Introduction; Presentation; Explanation; Visit to a snailry, fish pond and making of beans powder; Summary; Evaluation and Assignment

Operational Guide for Student-directed Biology Instruction (OGSBI)

The instrument consists of lesson plans on four selected topics in NCE 300 level biology. The topics are Biology and Living Things, Animal Nutrition, Relevance of Biology to Agriculture and Pollution. The steps followed were; Introduction, Presentation by the pre-service students with the teacher as the facilitator only, Hand-on activities/visits/invitations of entrepreneurs suggested by the pre-service students. Summary by the students with the lecturer as a facilitator, Evaluation by the pre-service students, Assignments suggested by the pre-service students

Operational Guide for Conventional Biology Instruction (OGCBI)

This instrument consists of lesson plans on the selected topics in biology.. The steps to be followed are: Introduction, Presentation, Explanation, Summary, Evaluation, Assignment. The lessons are to be taught the conventional way without entrepreneurship being discussed.

Researcher's Assessment Sheet for Teacher-directed Biology Instruction (RASTBI)

This is used to assess teacher's performance during lessons using the teacher-directed instructional strategy. This was used to assess teacher's

performance during lessons using the Operational Guide for Teacher-directed Biology Instruction as a guide.

Researcher's Assessment Sheet for Student-directed Biology Instruction (RASSBI)

This is used to assess teacher's performance during lessons using the Student-directed instructional strategy. This was used to assess teacher's performance during lessons using Operational Guide for Student-directed Biology Instruction as a guide.

Research Procedure

Table 3 Summary of Research Activities

Weeks	Topics	Teacher-directed	Student-directed	Conventional
1-2	Training	Training of research assistants and teachers by the researcher. Objectives of the lessons were given to students in the student-directed group.		
3	Pre-test	Pre-test conducted by the researcher, assistants, teachers and entrepreneurs		
4-5	(a) Biology and living things (b) Animal nutrition	Lesson directed by the teacher. Entrepreneurship defined with at least two entrepreneurs invited.	Lesson directed by the students. Entrepreneurship discussed and entrepreneurs invited.	Conventional classroom lesson without entrepreneurship.
6-7	Snailry and fishery	Visit to the snail farm and fish pond with the snail/fish farmer as instructor. Students learnt how to breed; feed and market snail and fish. The students actually feed snail/fish, cleaned	The students suggested and directed a visit to the snail farm/fish pond where the snail/fish farmer is the instructor. Students learnt how to breed, feed	Animal nutrition continued. No mention of snailry or fishery.

		snail house/fish pond and sold the snail/fish	and market snail/fish.	
8-10	Relevance of biology to agriculture	The teachers taught the topic with horticulture and beans powder production taught by the entrepreneurs. The students planted, transplanted, nursed and sold ornamental plants. They also made and sold beans powder.	Students suggested the entrepreneurs in horticulture and beans powder production. The entrepreneurs taught them. They planted transplanted, nursed and sold ornamental plants. They also made and sold beans powder.	The teacher taught the topic without entrepreneurship being discussed.
11	Pollution	The teacher taught pollution while the refuse manager/entrepreneur taught students refuse disposal. The students packed disposed and burnt refuse on the school compound	The students discussed pollution and visited an entrepreneur who taught refuse disposal. The students packed disposed and burnt refuse on the school compound.	Teacher taught pollution without entrepreneurship being discussed.
12		Post-test conducted by the researcher, assistants, teachers and entrepreneurs		

Data Analysis

The data obtained was analysed using Analysis of Covariance. The pre-test scores were the covariates. The Multiple Classification Analysis (MCA) was used to show the magnitude of the performance of the various groups using posttest mean scores and the Scheffe post-hoc analysis was used to determine the direction or sources of the observed significant differences.

Results

Ho₁: There is no significant main effect of treatment on students' entrepreneurship skills.

Table 4: Summary of 3x2x2 Analysis of Covariance (ANCOVA) of Students' Posttest Entrepreneurship Skills by Treatment, Gender and Parents Business Involvement

Source	Sum of Squares	DF	Mean Square	F	Sig.	Eta
Covariates	548.716	1	548.716	4.505	.055	
Pretest	548.716	1	548.716	4.505	.055	
Main effects	126111.793	4	31527.948	258.849	.000	
Treatment	125699.592	2	62849.796	516.006	.000	.86
Gender	68.740	1	68.740	.564	.453	.15
Parents' Business Involvement	343.461	1	343.461	2.820	.094	.09
Explained	127543.023	7	18220.432	87.262	.000	
Residual	42264.752	347	121.800			
Total	169807.775	359	473.002			

* Significant at $p < 0.05$

Table 4 shows that there was a significant main effect of treatment on students entrepreneurship skills ($F_{(2, 347)} = 516.006, p < 0.05$). This means that there was a difference in skill acquisition between the students exposed to entrepreneurship and those not exposed to it. Hence, the null hypothesis is rejected.

Table 5: Multiple Classification Analysis on Students' Entrepreneurship Skills by Treatment, Gender and Parents' Business Involvement Grand mean = 55.53

Variable + Category	N	Unadjusted variation	Eta	Adjusted for independent + covariates deviation	Beta
Treatment Groups:					
1. Teacher-directed	120	13.15		13.15	
2. Students-directed	120	13.33		13.34	
3. Control	120	-26.48		-26.31	
			.86		.86
Gender:					
1. Male	164	-3.46		-.49	
2. Female	196	-2.90		.41	
			.15		.02
Parents' Business Involvement:					
1. Involved in business	267	1.17		.58	
2. Not involved in business	93	-3.36		-1.66	
			.09		.05
Multiple R-squared					.746
Multiple R					.864

In Table 5, teacher-directed has a mean score of 68.68, student-directed has a mean score of 68.87, while the control has a mean score of 29.22. It shows that the student-directed instructional strategy contributed most to the observed significant difference followed by the teacher-directed while the least contribution is from the conventional instructional strategy. The Scheffe Post-Hoc tests reveals the sources of the observed significant difference as shown in table 6.

Table 6: Scheffe Post-Hoc Test on Students Entrepreneurship Skills

Treatment	Mean	Teacher-Directed group	Student-Directed group	Control group
Teacher-directed group	68.68			*
Student-directed group	68.87			*
Control group	29.22	*	*	

* Pairs significantly different at $p < 0.05$

Ho_{2c}: There is no significant main effect of gender on students' entrepreneurship skills.

Table 4 reveals there is no significant main effect of gender on students' entrepreneurship skills ($F_{(1,347)} = 0.564, p > 0.05$). Ho_{2c} is therefore not rejected.

Ho₃: There is no significant main effect of parents' business involvement on students' entrepreneurship skills

Table 4 shows that there is no significant main effect of parents' business involvement on students' skill in entrepreneurship ($F_{(1,347)} = 2.820, p > 0.05$). The null hypothesis is not rejected,.

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

Treatment affected skills in entrepreneurship. The student-directed group has the highest post-skills mean score, followed by teacher-directed while the conventional group (control) has the least. The hands-on activities the students in the two experimental groups were exposed to made them to have higher post-skills mean scores than the students in the control group. The students in the two experimental groups were exposed to skills in fishery, snailry, beans powder production horticulture and refuse collection and disposal. This supports Catalyst (2006) and Nnazor (2005) that entrepreneurship education equips learner with entrepreneurship skills.

The skills developed in the students were due to their exposure to entrepreneurship. This goes with the submission of Fredua-Kwateng (2006) that the inclusion of entrepreneurship in tertiary institution curricular would be to develop the skills, knowledge and attitudes necessary for starting and manning a business.

The student-directed instructional strategy had more impact on the students' entrepreneurship skills than the teacher-directed because the students in the student-directed group were more involved in the planning and teaching of the concepts. They suggested the training themselves and this made them more interested. They were able to demonstrate what they themselves gathered for the lessons during the practical exposure to entrepreneurial opportunities.

The treatment, whether through the teacher-directed or the student-directed instruction had impact on the students' entrepreneurship skills because the instruction was experiential, things happened, and the students were able to link what they read or were told to the real life situation. They had their hands on the skills. Students even sold the products to their mates, teachers and other people around them thereby demonstrating that they can really be entrepreneurs. It was clear that biology is not just for the academics alone but a subject that can be applied to life, living and sustenance.

Consortium for Entrepreneurship Education (2008) published IDEAS for Entrepreneurship activities in schools which are entrepreneurship related learning activities that provided experience in entrepreneurial skills. It includes IDEAS in social studies, science, arts/performing arts mathematics, language arts each with entrepreneurship. This study can be said to be "IDEAS in biology and entrepreneurship". However, there was no significant main effect of gender on students' entrepreneurship skills. Also there was no significant main effect of Parents' Business Involvement on students' entrepreneurship skills.

The study has shown that the teaching of entrepreneurship in biology is capable of equipping tertiary students with entrepreneurship skills which when developed after school can make them self-reliant. This is in accordance with the submission of Wales (2007) that entrepreneurship does not have to a course on its own but can be taught in school subjects.

Biology therefore should be taught with entrepreneurship consciousness involving the students actively in the selection of content, materials and resource persons. The teaching should be devoid of teacher domination as this can make the students loose interest in the whole idea. According to Wales (2007), students are yearning for experiential learning which they are not getting in the school. Hands-on activities should be carried out for every business and it should be stressed that the students are being prepared for the future, not only for those things done now but also for what they would come across in the future especially in the post college job activities.

It has been revealed that the gender of students in entrepreneurship skills has no significant effect. Teachers should therefore pay particular attention to both male and female students to make them yearn more for entrepreneurship skills.

Parents' business involvement has been found to have no significant effect on students' entrepreneurship knowledge attitude or skills. When teaching entrepreneurship, students should be equally treated irrespective of their parents' business involvement.

On the basis of the findings of this study, the implication of this study shows that.

It is impossible to consider economic development or reduction of unemployment in Nigeria, without first considering the indices that create its existence.

Competitiveness, innovation and economic growth depend on being able to produce future leaders with the skills, attitudes and behaviour to be entrepreneurial and to act at the same time in a socially responsible way. Entrepreneurship is not only about creating business plans and starting new ventures. It is also about creativity, innovation and growth, a way of thinking and acting relevant to all parts of the economy and society as well as the whole surrounding ecosystem. This interdependence comprises both institutional rules and environmental conditions that define the range of socially and economically viable entrepreneurial opportunities and the way in which entrepreneurs and other stakeholders shape these surrounding institutional and environmental conditions.

Entrepreneurship programmes and modules can have various objectives, such as

- :a) Developing entrepreneurial drive among students (raising awareness and motivation)
- b) Developing the entrepreneurial ability to identify and exploit opportunities
- c) Training students in the skills they need to set up a business and manage its growth (European Commission, 2008).

Without the influence of education in introducing entrepreneurship to the average Nigerian pre-service student, it will be difficult for unemployment to be reduced in the country, as it is important to encourage students to think and act entrepreneurially as well as ethically and be socially responsible.

Also the importance of higher education in Nigeria is gradually becoming an increasing enterprise judging by the rise of new private institutions being licensed. The impact of education on the rise in unemployment is however negligible, else unemployment should be on the decrease in the country. Nigeria being a developing country follows the educational systems established since the colonial era. This brings about a dearth in local content and application to the economic and economic development in Nigeria.

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