

Impact of collaboration on research and teaching activities of academic scientists in federal universities in North East Nigeria.

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Abstract

This study was designed to determine the impact of collaboration on research and teaching activities of Academic Scientists in Federal Universities in the North- East Nigeria. Survey research design was used for this study and the population comprised of all academic scientists of the three universities. The population of the academic scientists in the three universities was 275 and their entire population was used for the study. One research question and two hypotheses were formulated to address the three objectives of the study. Questionnaire was used as instrument for data collection. Data collected were analyzed using descriptive statistics (frequency counts, percentages) and chi-square statistical tool was used to test hypotheses. Major findings show that collaboration among the academic scientists in Federal Universities in North East Nigeria is high and appreciated among them; Collaboration has significant impact on the research and teaching activities of the academic scientists in Federal Universities in North East Nigeria.

Introduction

Collaborations are generally formed for a common purpose, which benefit those who belong. They may be practice-oriented comprising of individuals who have similar training or professional interests. These collaborations provide true intellectual and professional stimuli for new ideas and innovations. Hence, belonging to the right collaboration, will open doors for the acquisition of valuable information which would not otherwise be forthcoming. This consequently leads to improved decision-making or allows

corrective or appropriate action to be taken to avoid undesired outcomes. It can equally provide support and can influence outcomes. The relevance of collaboration as observed by Janssen (2014) includes:

- a. enhancing productivity among members
- b. facilitating easy and quick information accessibility
- c. promoting familiarization and strengthen relationship among members.
- d. enhancing the sharing of ideas between and among members

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- e. saving cost and time, which would have been incurred by individualism
- f. bringing about efficiency and avoidance of duplication of efforts
- g. increasing effectiveness and specialization among members, and
- h. bringing about up-to-datedness among members in their field of interest.

In his opinion, Gamble (2002) postulated that if one is able and willing to communicate with most, if not all, the members of his group, he can be said to occupy a central position in the group. Hence, in contrast, if he relates to only one person or few people in his group, he occupies a peripheral position. Thus, it is the group's collaborations or patterns of communication, that determine the communication paths open to members and the effectiveness of their interaction. In the same vein, Newman (2000) in his study found a number of interesting properties of information collaborations, such that scientific communities seem to constitute a small world. He further observes that laboratory or university department forms collaboration in science. Information collaboration among professionals especially in the field of science is a desirable element for productivity. Communication is one form of the activities which usually takes up a significant fraction of a scientist's working life.

The establishment of sustainable collaboration opens up the horizon of information sharing wider. Hence those belonging to the collaboration enjoy unlimited information. Therefore, scientists obtain much of their information from their colleagues through formal and informal ways as observed by Olabisi (2004). In his own contribution, Newman (2001) found that a number of differences are apparent between the fields of sciences. Researchers in experimental disciplines are found to have larger number of collaborations on average than those in theoretical disciplines. This is so because of the higher demands in experimental researches.

Collaboration offers several opportunities in education. First, it can be used as a means of preparing the current generation of students for future workplace. Today's students live in a global knowledge based age, and they deserve teachers whose practice embraces the best that collaboration can bring to learning. Through teachers' use of collaboration, students can be given the opportunities of becoming a part of the knowledge age and skills imparted to the young people in an increasingly complex world. Lecturers will need to use collaboration in order to equip tomorrow's employees and customers with the

requisite competence and knowledge to use collaboration within their work (Davis: 1989). Second, collaboration can make the school more efficient or more productive, engendering variety of tools to support and facilitate teacher's professional activities. Finally, collaboration is seen as means to reform teaching; that is to stimulate learners to learn actively and independently in collaboration with others (Kirschner: 2003). It can be deduced that collaboration can be used to enhance learning and teaching within a university system. It is not enough to appreciate collaboration into the University system without its proper integration in the delivery of quality instruction. Even in advanced countries, knowledge of the potentials of collaboration and competence in its use do not guarantee their use with students.

Objectives of the study

The objectives of the study were to:

1. Determine collaboration among academic scientists in Federal Universities in the North East Zone, Nigeria.
2. Determine the impact of collaboration on research activities of the academic scientists in Federal Universities in the North East Zone Nigeria.

3. Determine the impact of collaboration on teaching activities of the academic scientists in Federal Universities in the North East Zone Nigeria.

Research questions

The Research Questions for the study was:

1. How do Academic Scientists in the Federal Universities in North East Zone Nigeria collaborate?

Hypotheses

The following null hypotheses of the study were tested:

Ho1: There is no significant impact of collaboration on research activity of academic scientists in the Federal Universities in North East Zone Nigeria.

Ho2: There is no significant impact of collaboration on teaching activity of academic scientists in the Federal Universities in North East Zone Nigeria.

Literature review

Collaboration entails the development of formal and informal ties between any two or more people, and groups whereby information can be obtained and disseminated. Bryson (1990) defined collaboration as natural coalition, i.e, groups whose joint interests, viewpoints and preferences need to be protected. Thus within collaborations information is freely and positively given. Collaboration can also be closed group

phenomena, with those belonging to the collaboration having the same predisposition, values and norms. The concept of collaboration, however, manifests itself in the form of, cooperation, connection and association. In scientific community for instance, informal communication regarding research findings, research in progress, and research techniques represents one way in which members of a scientific area are linked to one another. In case of formal collaboration, communication between two or more scientists about their research receives formal recognition in journal publications. This collaboration occurs before the research reaches the stage of formal publication. Another form of collaboration takes place when a student writes a thesis under the direction of one or more teachers. Other teachers not formally directing the thesis may play a role in the development of the thesis. This relationship also represents a kind of collaboration. However, the success of these collaborative collaborations depends on the level of tolerance and cooperation among those involved. Citation references in journal articles are also direct indications of intellectual linkages represented by the influence of one scientist's work upon that of another.

Aliyu (2011) in his study on author productivity and collaboration observed

that the most productive scientists are also the most collaborative among them. This is because the study revealed that most productive authors have 96.6% of their publication in collaboration during the ten years period the study covers. Collaboration includes both internal and external. Internally means to be visible at your job – don't hide in your office or cubicle, volunteering for projects and making yourself available, expanding partners, meeting and talking with new co-workers, and communicating with them on a regular basis. Considering brushing-up one's skills or broadening knowledge leads to external collaboration. This can also enhance current situation. An easy way to do this is by joining a professional organization within your field.

It is a common knowledge that collaboration is either necessary or highly desired in many activities that are complex or difficult to deal with for an individual. Despite its natural appeal and situational necessity, collaboration in information sharing is an understudied domain. The nature of the available information and its role in our lives have changed significantly, but the methods and tools that are used to access and share that information in collaboration have remained largely unaltered. People still use general-purpose systems such as email and for doing Collaborative projects, and there

is a lack of specialized tools and techniques to support it explicitly. Teevan *et al.*, (2009) characterized two classes of collaboration, task-based vs. trait-based. Task-based collaboration corresponds to intentional collaboration; trait-based collaboration facilitates the sharing of knowledge through inferred similarity of information need. Morris (2008) using a survey with 204 workers at a large technology company found that people often like and want to collaborate, but they do not find specialized tools to help them in such endeavors. Shah (2010) similarly, using personal interviews, identified three main reasons why people collaborate.

1. *Requirement/setup.* Sometimes a group of people are "forced" to collaborate. Example includes a merger between two companies.
2. *Division of labor.* Working together may help the participants to distribute the workload. Example includes a group of students working on a class project.
3. *Diversity of skills.* Often people get together because they could not individually possess the required set of skills. Example includes co-authorship, where different authors bring different set of skills to the table.

What is interesting to note is that often, collaboration could begin by letting a group of users communicate with each other. For instance, Donath (1994) presented a system that allows a user to know that others were currently viewing the same webpage and communicate with those people to initiate a possible collaboration or at least a co-browsing experience. Providing communication capabilities even in an environment that was not originally designed for carrying out collaboration is an interesting way of encouraging collaboration.

In their study on the collaboration between university and industry in Turkey, Sendogdu and Diken (2013) found that there is no enough level of collaboration degree. Similarly, Choo *et al.* (2013) in their study on pattern of interaction among students during online collaboration, reveals that co-construction of knowledge was evident among the students. Nevertheless, they were chiefly engaged at the lower levels of interactive phases. In his own contribution Newman (2001) found that a number of differences are apparent between the fields of sciences. Researchers in experimental disciplines are found to have larger number of collaborations on average than those in theoretical disciplines. This is so because

of the higher demands in experimental researches.

Sonnenwald (2013) introduced the concept of "contested collaboration" to emphasize that individuals and groups often maintain an outward stance of cooperation but also work to further their own interests or knowledge claims. Social or department-level sharing practices may also have the function of veiling and smoothing contests or differences in perspective. If research groups overtly competed with each other, it would result in increased stress in a situation where scholars already face many kinds of pressures and anxiety about "producing enough." In social sharing, information about the contents of documents is less often shared, as scholars may not know exactly how the discussion of a specific document is related to the colleague's topic. Relevance (especially in humanistic and social scientific fields) is often relational and context-dependent.

Scholars preferred to collaborate with colleagues and students they trusted to have previous knowledge of the field and of the way information are connected with their research problems. As Solomon (2009) noted, people prefer to cooperate with those they trust to speak the same specialized language. He pointed out; scientific research is bound up with social

interaction. The need to acquire information, to select, distill, and modify ideas, all involve scientists in communication, and "communication is, by definition, a communal activity. Very few ideas and very few projects of any significance are implemented by one person alone. Hence any group's ability to accomplish its task is related to the interactions among its members. It is therefore impossible for a group to communicate well unless the members are comfortable in speaking with one another, feel free to express their ideas and feelings to each other, and have an opportunity to receive feedback about how they are coming across.

Allen (2002) pointed out the significance of scholars' communication collaborations. He developed the concept of invisible colleges, and showed that the most productive members in these collaborations have more social ties, influence, and visibility than those who are less productive. Stoa (1991), among others, found that the amount of scholars' contacts with other researchers is the strongest predictor of their publication efficiency. Sonnenwald (1997) found that communication behavior and success in collaboration in project teams correlates positively with perceived individual effectiveness and project performance. Charles (1971) pointed out

that a developing country needs adequate flow of information through all levels of the society. This denotes that information is needed to enable people to play an active part in modern life. It is needed in the society to regulate tension, free people from ignorance, and bring them together in order that they can participate in programmes that will enhance the development of the society. As a result of the success of information collaboration in the form of invisible college in disseminating information, one would be constrained to say that scientific libraries are not measuring to expectations in that respect. Jean (1991) observed that libraries are among the last place scientists look for information. This is particularly so, considering the side tracking of libraries by scientists to fill their information gap. By increasing the number of contacts, a scientist has naturally increased the extent to which he carries out his research work in collaboration with others. Therefore, the more productive scientists also tend to publish more joint papers. Collaboration in the production of a research paper can follow a variety of paths, but necessarily takes the form either of co-operations between near-equals or between a senior and a junior scientist.

A number of studies have identified a significant increase in the

number of co-authored papers by individuals at different academic institutions and in different countries, as well as in the number of co-authors per paper. An analysis of approximately 13 million published papers in science and engineering from 1955 to 2000, for example, found an increase in team size in all but one of the 172 subfields studied, and average team size was found to have nearly doubled, going from 1.9 to 3.5 authors per paper, (Wuchty et al: 2007). Adams et al. (2005) found similar results for the top 110 research universities in the United States, reporting that the average number of authors per paper in the sciences grew by 53.4%, rising from 2.77 to 4.24 over the period 1981–1999. Growth in the number of authors on a paper is due not only to a rise in collaboration within a university—and an increase in lab size—but more importantly to an increase in the number of institutions collaborating on a research project. A study of 662 U.S. institutions that had received National Science Foundation (NSF) funding one or more times found that collaboration across these institutions in science and engineering, which was rare in 1975, grew every year between 1975 and 2005, reaching approximately 40% by 2005 (Jones et al. 2008).

Group of researchers, scholars, academics and scientists have built up

informal, but sometimes elaborate, system for the exchange of information through letters, mailing lists, conference schedule and preprints, known as invisible college. Through this and other informal means, a high proportion of information is shared and disseminated before formal publications. Garvey (1980) observes that the flow of information through the informal channels is relatively free of filtering or monitoring. Thus it is commonly abstracted, frequently incomplete and often vague. The invisible college therefore, forms another forum of information collaboration by integrating ideas, establishing ties, and sharing of research result.

A lot of information exchange takes place at conferences and seminars. In outlining the importance of conference in scientific exchange of information, it can be observed that the usefulness of conference in the eyes of scientists lies less in their official intention, but rather, in the ability to bring scientists with like interests together in one place. Hence scientists who attend conferences derive more benefit from the fact that they make new acquaintances which become useful sources of information in their area of specialization. In a study of scientific and technical conference in the United States of America, Meadows (1974) found that one third of scientists who presented

papers or research plans modify them as a result of the public discussions after the presentation of the paper or in consequence of subsequent private discussions. He also reported that half of those who attended scientific conferences picked up worthwhile information from sources other than the official presentations.

Some scholars are super-sharers: they see collaborative seeking as an integral part of their research style and success as researchers. Scholars usually belong to many different kinds of collaborations with different levels of information sharing. They can simultaneously work with different research themes and topics, each topic enabling different patterns and levels of collaboration. As technology continues to create more ways for effective communication people are afforded opportunities for collaboration as asset for the creation of better results (<http://www.linkedin.com/pub/matthew-askren/65/738/793>).

There are studies that suggest that collaboration, in combination with specific configurations of professional development, may result in increased student learning. For example, Johnson (2007) conducted a study on collaborative professional development and student achievement in science. Results indicated

that students of teachers in collaborative professional development showed significant gains in science scores over students in schools without this type of professional development. A second study by Edmondson (2005) involving collaboration through cognitive apprenticeship and technology demonstrated such promise. A study by Pounder (1999) also demonstrated that teacher collaboration can enhance teacher perceptions of professionalism and sense of efficacy. The study compared teachers who worked as part of teaching teams with similar teachers working independently. It found that those working on teams reported higher levels of: Skill variety in their work ; Knowledge of students (their educational characteristics, history, and personal life circumstances) ; Growth satisfaction ; General satisfactions ; Professional commitment ; Work group helpfulness and effectiveness ; Internal work motivation and Teacher efficacy.

Literature related to teacher collaboration in online environments is sparse and suffers from a problem common to virtually all literature on the use of technology in education: it is a moving target for which the velocity of that movement is increasing exponentially. With the advent of Web 2.0 technologies, the opportunities for Web-based collaboration and the diversity of the tools

for supporting collaboration are increasing at a rate that seems to make the researchable platform of this week the historical reference of the following week. Just as studies began to appear for teacher use of traditional courseware platforms such as Blackboard or Moodle, teachers had moved on to platforms such as Wikispaces and Ning, which more closely mirror the type of interaction found in social collaboration sites such as Facebook and Space. Serious research related to the impact of these new collaboration environments is also difficult because the exact nature of teacher collaboration within these environments is poorly understood. It can therefore be said that collaboration also provides researchers with ready avenue for the exchange and dissemination of research reports and findings. It provides ready means for production of research reports.

Methodology

The survey research design was adopted for the study. The population of the study comprised 275 academic scientists in three Federal Universities in the North East of Nigeria. The three universities in the region are Abubakar Tafawa Balewa University, Bauchi, University of Maiduguri, and Modibbo Adama University of Technology, Yola. The study covered only Scientists

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(Lecturer I to Professor). Because the four ranks, are actively involved in research

and teaching. The target population of the study was 275 (see table 1)

Table 1: Distributions of scientists in the universities studied.

University/Rank	Professors	Readers	Senior Lecturers	Lecturer I	Total
Abubakar Tafawa Balewa University, Bauchi	38	20	22	18	98
University of Maiduguri, Maiduguri	40	15	25	27	107
Modibbo Adama University of Technology, Yola	21	11	18	20	70
Total	99	46	65	53	275

Source: Departmental Staff lists/MIS record

Because the population of 275 was manageable, the researcher adopted it for the study. Since all the elements in the population are used as sample, then the sampling technique for this study is purposive. The researcher used self-developed questionnaire as the instrument for collecting data. In order to determine the reliability of the instrument for data collection, a pre-test was conducted using Cronbach's alpha. The result of the test was 0.916, which was found to be of high reliability. Two statistical methods were used to analyze the data collected from the respondents. Descriptive statistics using frequency distribution mean and simple percentages were used. All hypotheses

were tested using Chi-Square at 0.05 level of significance.

Findings and discussion

Research question 1: What is the extent of Collaboration among Academic Scientists in the Federal Universities in North East Zone Nigeria?

The researcher provided the respondents with statements on extent of collaboration among academic scientists. They were requested to indicate their level of agreement with the statements. The data collected in this regard were analyzed and presented in the following table:

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Table 2: Collaboration among academic scientists in federal universities in North East Zone Nigeria.

S/ N	Statement	Type of response					Mean
		SA (4)	A (3)	U (0)	D (2)	SD (1)	
1	I usually collaborate with scientists in my area when conducting research:	36	55	12	17	77	2.132
2	I usually collaborate with scientists outside my area when conducting research:	39	49	15	47	47	2.2538
3	As a result of collaboration with other scientists I was able to publish papers that I might not have been able to publish.	65	83	24	25	0	2.8376
4	I collaborate with scientist in my field than with those in other fields.	72	52	6	37	30	2.7817
5	I collaborate with scientists in Nigeria than with those in abroad.	10 1	73	6	13	4	3.3147
6	I prefer to work alone than to collaborate with other scientists.	17	33	47	30	70	1.5076
7	Collaboration enhances my productivity	11 5	68	0	10	4	3.4924
8	Collaboration facilitates easy and quick information accessibility for me.	97	67	4	16	12	3.269
9	Collaboration Promotes familiarization and strengthen my relationship with other Scientists.	95	58	0	23	21	3.1523
10	Collaboration enhances the sharing of ideas between myself and other Scientists	78	82	12	15	10	3.051
11	Collaboration saves cost and time for me, which I would have incurred by individualism	55	93	14	32	3	2.8731
12	Collaboration brings about my efficiency and avoidance of duplication of efforts	83	65	10	23	16	2.9898
13	Collaboration increases my effectiveness and specialization among Scientists	86	71	9	16	15	3.066
14	Collaboration brings about my up-to-datedness among Scientists in our field of interest.	10 2	60	12	4	19	3.1218
Mean of means		2.8					

Key:Cut off point: 2.00 (mean of 5-point scale);

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Table 2 shows that the academic scientists in Federal Universities in the North Eastern Nigeria collaborate with their colleagues when conducting research as well as with those outside their areas of specialization. This is evident from the mean score of 2.1 and 2.3 respectively. The result on the table also revealed that the respondents rejected the statement that they prefer to work alone than to collaborate ($x=1.5$). It can also be deduced from the table that collaboration improves the academic scientists' authorship, as they have indicated that as a result of collaboration with other scientists they were able to publish papers that they might not have been able to publish. This is represented by the mean score of 2.8. The table also shows that collaboration enhances their productivity ($x=3.5$). The table also revealed that collaboration increases their effectiveness and specialization, with the mean score of 3.1. However, it can be seen that the academic scientists collaborate more with scientists in Nigeria than with those abroad as evident by the mean score of 3.3. Some of the benefits of collaboration to the academic scientists as evident in the table, shows that collaboration facilitates easy and quick information accessibility for them ($x=3.3$). It also saves cost and time for them, which they would have incurred by individualism ($x=2.9$). The table also

revealed that collaboration promotes familiarization and strengthen relationship among the scientists ($x=3.2$). It also enhances the sharing of ideas between the scientists ($x=3.1$). In terms of efficiency and up-to-datedness, the table revealed that collaboration brings about efficiency and avoidance of duplication of efforts among the academic scientists ($x=3.0$). As revealed from the table, collaboration brings about up-to-datedness among the scientists in their field of interest ($x=3.1$). On the overall, collaboration among the academic scientists in the north eastern Nigeria is appreciated among them. This is represented by the mean score of 2.8 which is higher than the mean of five point scale being 2.0.

The findings of this study in respect of research question one revealed that academic scientists in Federal universities in the north eastern Nigeria collaborate with their colleagues when conducting research as well as with those outside their areas of specialization. This position is also backed by their rejection of the statement they prefer to work alone than to collaborate. It can also be deduced from the findings that collaboration improves the academic scientists' authorship, as they have indicated that as a result of collaboration with other scientists they were able to publish papers that they

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might not have been able to publish. This finding is further buttressed by the scientists that collaboration enhances their productivity. This finding is in line with the investigation carried out by Price and Beaver as reported by Meadows (1974) that no scientist in the National Institute of Health in the United States, who published papers by himself, or with only a single co-author, produced more than 4 papers over a period of five years. This is unlike the authors with more than 12 collaborators who produced 14 or more papers. Hence individual scientists, due to their resultant collaboration with one or more of the highly productive scientists, were able to publish papers that they might not have been able to produce by themselves.

The finding also corroborates with that of Aliyu (2011) in his study on author productivity and collaboration, in which he observed that the most productive scientists are also the most collaborative among them. This is because the study revealed that most productive authors have 96.6% of their publication as a result of collaboration during the ten years period the study covers. The finding also corroborates with Shah: (2010) in which he observed the reasons for collaboration to be among others, the diversity of skills; often people get together because they

could not individually possess the required set of skills, example includes co-authorship, where different authors bring different set of skills to the table. The findings also revealed that collaboration increases their effectiveness and specialization. That is why scientists in developed countries as observed by Olabisi (2004) deliberately establish information collaborations in order to facilitate their significant breakthrough and to be productive in the field of science.

This finding also aligned with Aliyu (2011), who opined that scientists stand to increase their productivity by intellectual intercourse, particularly with their colleagues within their specialized areas and by those outside it. However, academic scientists collaborate with scientists in Nigeria more than with those abroad. Some of the benefits of collaboration to the academic scientists as evident in the findings show that collaboration facilitates easy and quick information accessibility for them. It also saves cost and time for them, which they would have incurred by individualism. The findings also revealed that collaboration promotes familiarization and strengthen relationship among the scientists. It also enhances the sharing of ideas between the scientists. These findings support the assertion of Allen (2002), who pointed out

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that the most productive members in these collaborations have more social ties, influence, and visibility than those who are less productive.

In terms of efficiency and up-to-datedness, the finding revealed that collaboration brings about efficiency and avoidance of duplication of efforts among the academic scientists. This finding is in line with Aliyu (2011), who observed that scientists should communicate their research results to one another. It is only in this way that unnecessary duplication of scientific efforts can be avoided. A knowledge of what other scientists are doing can be of enormous benefits in stimulating thoughts and provoking new ideas. As revealed from the findings, collaboration brings about up-to-datedness among the scientists in their field of interest. This finding is in line with Stoa: (1991), who observed that the amount of scholars' contacts with other researchers is

the strongest predictor of their publication efficiency. Based on the above analysis, it could be seen that collaboration among scientists in the Universities under study was highly accepted. This finding corroborates with Olabisi: (2004) who observes that scientists obtain much of their information from their colleagues through formal (conferences, workshops and seminars) and informal ways (preprints). On the overall, the extent of collaboration among the academic scientists in the north eastern Nigeria is appreciated among them.

Ho1: There is no significant impact of collaboration on research activities of academic scientists in Federal Universities in North East Zone Nigeria.

In order to test this hypothesis, chi square test was applied, the results of which are presented in table 3.

Table 3: Cross tabulation distribution on the impact of collaboration on research quality of observed and expected frequencies

Components of collaborative research quality	Responses									Total	
	U(0)		SD(1)		D(2)		A(3)		SA(4)		
	F0	FE	F0	FE	F0	FE	F0	FE	F0		FE
Enhance access to information	15	29	36	44	33	46	109	98	82	68	275
											275

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Awareness of on-going research	20 29	0	34	40	46	135	98	80	68	1375
Improve quality of research	17 29	21	34	61	46	98	98	78	68	
Motivation to conduct research	55 29	48	34	40	46	95	98	37	68	
Influence type of research	38 29	65	34	56	46	53	98	63	68	
Total	145	170		230		490		340		

Chi-square contingency table for the test of the impact of collaboration on research activity.

Options	0	1	2	3	4	TOTAL	X ²	Df	P-Value	Decision P< 0.05
Observed	29	34	46	98	68	275(100)	356.395	4	000	S
Expected	55	55	55	55	55	275(100)				

Significant at 0.05 level of significance

The null hypothesis stated that there is no significant impact of collaboration on research activity of academic scientists in the Federal Universities in North East Zone Nigeria. The result revealed that there is significant impact of collaboration on the research activities of the academic scientists in federal universities in the north eastern Nigeria. This is because the calculated value at df of 4 is 356.395 which is higher than the table value of 9.49 at df of 4. Therefore, the hypothesis is rejected. The findings on hypothesis one revealed that although the null hypothesis stated that there is no significant impact of

collaboration on research activities of academic scientists in the Federal Universities in North East Zone Nigeria, the findings revealed that there is significant impact of collaboration on the research activities of the academic scientists in Federal universities in north eastern Nigeria. From the finding, it can be said that since the close interaction of the scientists in the form of collaboration is important to their research works, this finding supports the assertion. It can therefore be assumed that no field of research will be left untouched by collaboration and information sharing.

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Ho2: There is no significant impact of collaboration on the teaching activities

of academic scientists in the Federal Universities in North East Zone Nigeria.

Table 4: Cross tabulation distribution on the impact of collaboration in teaching activities of observed and expected frequencies

Components of collaborative teaching quality	Responses									Total
	U(0)		SD(1)		D(2)		A(3)		SA(4)	
	F0 FE		F0 E	F	F0 E	F	F0 FE		F0 FE	
inputs from colleagues for lectures	30 29		7 24		80 86		81 74		77 62	275
inputs from colleagues for lecture notes	26 29		12 24		80 86		80 74		77 62	275
Collaborate with colleagues in teaching	27 29		16 24		83 86		90 74		59 62	275
Get relevant materials for teaching	32 29		69 24		102 86		30 74		43 62	275
Influence method of teaching	30 29		16 24		85 86		89 74		54 62	275
Total		145		120		430		370		1375

Chi-square contingency table for the test of the impact of collaboration on teaching activities.

Options	0	1	2	3	4	TOTAL	X ²	Df	P-Value	Decision
Observed	29	24	86	74	62	275(100)	354.182	4	000	S
Expected	55	55	55	55	55	275(100)				

Significant at 0.05 level of significance.

The result of the test revealed that there is significant impact of collaboration on the teaching activities of the academic scientists in federal universities in the north eastern Nigeria. This is because the calculated value at df of 4 is 354.182 which is higher than the table value of 9.49 at df of 4. Therefore, the hypothesis is rejected. The findings on hypothesis two revealed that there is significant impact of

collaboration on the teaching activity of the academic scientists in federal universities in the north eastern Nigeria.

The findings on the two hypotheses are that collaboration has significant impact on the research and teaching activities of the academic scientists. One can therefore postulate that Collaboration has the potentials of not only ensuring effectiveness and efficiency

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in teaching and learning; it has the potentials of easing the administrative duties as well. It is also in line with Kirschner (2003), who stated that collaboration is seen as means to reform teaching. That is to stimulate learners to learn actively and independently in collaboration with others. It can be deduced therefore that collaboration can be used to enhance learning and teaching within a university system.

Summary of Findings

From the results of the analysis, the following findings were made:

1. Collaboration among the academic scientists in federal universities in the north eastern Nigeria is high and appreciated among them.
2. Collaboration has significant impact on the research activity of the academic scientists in federal universities in the north eastern Nigeria.
3. Collaboration has significant impact on the teaching activity of the academic scientists in federal universities in the north eastern Nigeria.

Conclusion and recommendations

Based on the findings of the study, the following conclusions are drawn; the extent of collaboration among the academic scientists in federal universities in the north eastern Nigeria is high and appreciated among them. It can be concluded that they deliberately establish information collaborations in order to be productive in their various fields of science and to improve their performance through intellectual intercourse, particularly with their colleagues within their specialized areas and by those outside it. It can be concluded collaboration is therefore an integral part of the activities of the academic scientists in order to be efficient and effective in research and teaching activities.

Based on the findings of the study, the following recommendations were made;

1. Collaboration activity among the academic scientists in Nigerian Universities in North East Nigeria should be sustained and encouraged.
2. Nigerian University's management in North East Nigeria should provide more conducive environment for easy and quick establishment of collaboration for research purposes among academic scientists.

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3. Nigerian University's management in North East Nigeria and the NUC should encourage collaboration and information sharing by the scientists. This will enhance and stimulate teaching quality within the university system.

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