

# ELECTRONIC COMMUNICATION AND SOCIAL CHANGE IN CONTEMPORARY SOCIETY: IMPLICATIONS FOR EDUCATIONAL TECHNOLOGY

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## ABSTRACT.....

*This article describes some of the web-based tools of electronic communication in modern society. Some of the advantages and disadvantages of these electronic communication tools such as facebook, twitter, myspace and yahoo messenger are highlighted.*

*The author sees these web-based interactive tools as spin-offs of digital technology of this information age of ours.*

*The paper compares the new interactive media with traditional ones such as newspapers, radio and television and cautions that except these new tools are incorporated into the Nigerian curriculum and implemented in the teaching learning processes, the country may lag behind other nations in technical and socio-economic development. The paper concludes that this information revolution will usher the world into an unprecedented demand for new media products, evaluators, educational technology teachers' media administrators and technocrats locally and globally.*

## INTRODUCTION

Electronic communication refers to all channels of human interactions through web-based or internet services, these include, twitter, facebook, skype, yahoo messenger and others. At times, electronic communication channels are referred to as social media. Merlin (2001) defines social media as a group of internet-based applications which enable human interactions based on the technological foundations of web 2.0.

These allow the creation and exchange of user-generated content.

Electronic media are relatively cheaper and readily accessible to anyone with access to the internet. This is in contrast to traditional media such as newspapers, radio and television which require substantial amount of resources to purchase and use.

The traditional media are in most cases highly centralized in both production and dissemination of information. The modern electronic tools of social media on the other hand are highly individualized, decentralized and mainly uses computer as its main tool.

With the advent of educated youths of modern society, electronic media tools have grown in popularity and uses. In the United States electronic networking accounts for 22% of all time spent online. (Osei 2011) Also, twitter alone processed over one billion tweets in December 2009.

Electronic media enhances faster interpersonal communication. Today many businesses and companies such as BMW, shell BP and other oil companies use electronic media to promote their businesses and client relationship through a twitter account. (Osei, 2011).

Social media such as facebook, and twitter played significant roles in the political upheavals in Egypt, Tunisia, Libya Yamen and other parts of the world which eventually led to the overthrow of dictatorial regimes. Such revolutions would have been unthinkable if the old forms of media newspapers, radio or television were the dominant and only forms of expression. This is because the government of the day would have been able to keep them under tight controls.

Electronic media are also been used today for dating and marriage, career counseling, spiritual (faith) healing, health, medical and industrial consultancy and many more. Also electronic media cut across national frontiers and help to reduce social barriers such as racial, social, religious or ethnic segregation.

In such cases electronic communication is helping to create and facilitate a global egalitarian society which is the bedrock of the Nigerian Philosophy of Education. (NPE 2009).

Facebook allows us to search for new and old friends. It also allows people to form associations, based on their likes and dislikes. This implies that students or lecturers who are in the same department/faculty or living within the same area can use the medium to socialize with one another.

Twitter is very simple to operate and this makes it user-friendly and attractive to educated youngsters of modern society. For example it takes less than a minute to create an account with tweeter and start tweeting. This makes it easier and more

attractive than facebook, Myspace or skype. Twitter limits its updates to 140 characters so no user can type in long winding essays like sending an e-mail.

Unlike facebook which insists that you use your "real name" twitter allows you to choose any available username you like without the mandate to share your information. Despite its numerous advantages, electronic communication has its own drawbacks. For example to belong to the "electronic media club" one needs access to a computer, reliable connectivity and technical maintenance services.

These tools and services are commonplace in the developed countries of North America, Europe and Asia, but are expensive and difficult to get in the developing countries of Africa where there is constant erratic electricity supply and acute shortage of technical manpower.

Although electronic communication offers unbridled freedom of expression and political emancipation, it could still be used by totalitarian regimes to consolidate their power base and clamp down on the opposition.

The use of the internet and other related electronic media can be reduced through "jamming". This is a process whereby electronic communication can be distorted by transmitting a counter signal of a similar frequency and modulation (Bitnner, 1981).

### **Disadvantages of Twitter**

Tweets are everywhere. It can be hard to weed through all the Twitter updates popping up around the web.

You can't count on the timely integrity of other tweeters' information either. As far as you know, a robot wrote their tweet.

You may not have any idea who is really following you.

Without the advantage of selectively specifying your target audience, your message is in danger of being diluted among the masses. Chances are that most of the people who follow you on Twitter aren't really paying attention to what you have to say.

Because Twitter is so simple, there is little sophistication to the presentation. Your profile is lean and mean. You can only have one photo attached to your profile at a time, and little detailed information about yourself. It's not a reliable way for people to get to know you, unless you are very good at expressing yourself in 140 characters or less.

Because Twitter is so easy to join, virtually everyone has a Twitter account, so their server tends to get overloaded easily. It's not uncommon to have trouble connecting to Twitter's site.

Twitter can consume your time. Work, real social interactions and rest can all suffer if you are constantly tweeting and following other tweets. You can check Twitter updates from your phone and send messages from anywhere. In theory, many people use this as an escape from their own surroundings, paying more attention to Twitter updates, rather than reading that pertinent work email or report sitting on their desk.

As with any social platform provided through an online service, subscribers can fall prey to predators. As a subscriber with followers, you may not realize exactly

who is following you, whether it is an ex-boyfriend, a stalker sex offender. The use of Twitter has increased the level of accepted social voyeurism, where people are comfortable sharing "bowel movement schedules" to their list of followers. In addition to social predators, there are career and financial interests watching your every move. If you pose the wrong image online, you may be passed up for a promotion, considered undesirable for hire or, even, denied disability benefits for having too much fun.

Twitter has no applications rather than other sites like Facebook, Friendster and MySpace. It also has no groups, videos, blogs, classified ads, forums, marketplace and other unique and popular social networking menus. You can only upload one picture, which is your avatar and must be small, compared to other social networks which you can upload pictures as many as you want. You also cannot upload music files here on Twitter, but you can upload on the other social networks.

### **Disadvantages and Limitations of Myspace**

It's worth mentioning that myspace has significant disadvantages and isn't intended for every need. Those who want to present themselves professionally and want complete control over their page design should certainly set up their own websites. The advertising is extensive and fairly annoying. It remains to be seen whether the myspace advertising business model will actually allow them to remain in business in the long run. And myspace has experienced security and growth-management problems in the past, with the site often running slowly or breaking down temporarily.

Myspace has been criticized extensively in the past, mostly with regard to stalking incidents and issues surrounding teenagers with myspace profiles. Myspace does require users to be at least 14, and you can't search for users under the age of 18 good policies, but they work only if kids don't lie about their age.

Parents need to educate their teenagers about the need to keep personal information off their myspace profile. Some parents may choose to forbid their teens from maintaining myspace profiles at all. Know your kids, limit their access in an age-appropriate way, and keep their computers in the living room right next to yours.

### **Uses of Yahoo Messenger**

It is used to send SMS

It is used to receive instant messages

It is used to make advertisement

### **Advantages of yahoo messenger**

It is the easiest way to chat with friends and families

Discussions carried though yahoo messenger are very fast

It offers writing services and speech services.

### **Disadvantages of yahoo messenger**

It is hard for learners to use

It cannot be used to talk to AOL instant messages

## Implications for Educational Technology

The world information system today is rapidly undergoing a revolution due to improvements in the design and use of modern electronic reception equipment in electronic communication. The single most important of such reception devices are digital satellites which is now ushering the world into interactive and multimedia services. Web tools such as facebook, twitter, myspace skype, yahoo messenger etc. are offshoots of such interactive services.

The new electronic communication tools have given rise to new breed of children who are digitally oriented.

It should also be noted that banks, supermarkets hospitals, industrial establishments, political organizations educational institutions and others are now adopting these electronic services for most of their businesses. Electronic communication has therefore become a world culture.

These new techniques and concepts must be incorporated into the Nigerian curriculum as a matter of urgency, because delay or failure will lead to technological and hence economic backwardness in the global community.

In order not to create unnecessary gaps between the school and community, the web-based communication techniques must be utilized to register, admit teach and evaluate students in secondary and tertiary institutions.

The present teaching of General studies courses (GNS) should be supplemented by ICT in which these web-based electronic communication tools are integrated.

Technical schools, polytechnics facilities of Educational Technology should take up the challenge of the training aspect of these skills and tools by including them in their course outlines and making it compulsory for all students who are admitted, in line with the practice in Europe, China, India, Japan and North America (Simpson, 1999)

Electronic Communication tools such as twitter, facebook myspace, yahoo messenger, skype and others are educational tools which and fall squarely within the domains of Educational Technology. This new trend in interpersonal communication necessitates a complete overhaul of the educational technology syllabus and course outline for technical schools polytechnics and universities. New concepts in electronic communication need to be integrated into ICT and General studies (GNS) courses and applied in every facet of our educational system for students admission, registration, teaching marking, publishing results, graduation (including staff recruitment) and certification. In most universities in Ghana today, almost all processes including the issuing of students assignments circulars and notices are done online.

Electronic communication is relevant and applicable to educational technology in many ways. The advent of digitization in radio and television programming will revolutionise educational television by offering learners with varied convenient time and language options to supplement part-time on-the-job training and regular classroom learning. Like the television, radio, fax machine, teleprinter and other forms of electronic media, electronic communication can be adapted to supplement formal learning. It facilitates computer-mediated instruction and enhances computer

more general concepts are usually located more centrally while the more specific concepts are placed peripherally.

A connection on a concept map is in the form of a proposition which shows how two concepts are connected. Generally, concept maps are tools which help to represent someone's knowledge and are used flexibly. They are used as diagnostic tools which elicit knowledge structures. Standard tests offer only a limited insight into students' understanding. Investigating students individually to elicit their problems can be intimidating and time consuming. A more time-efficient and less stressful approach is to ask students to prepare a concept map of their understanding of a topic. It reveals which key ideas are present or missing, alternative conceptions that they hold how well they have integrated ideas within the topic and the extent to which the student links the concepts with key ideas from related topics. Students who master concept mapping are able to use it as a technique to test their knowledge of topics while revising and find it a very helpful technique to enable them judge their own progress (Taber, 1994). Concept maps have their origins in constructivism. Constructivism is derived from the field of cognitive psychology and the paradigm is based on the work of Jean Piaget, Lev Vygotsky, Jerome Bruner, Howard Gardner and Nelson Goodman (Fosnot, 1996).

Analogies are used as anchors to conceptual bedrocks. Analogies or metaphors are ways of comparing the unfamiliar with the familiar and thus make it seem familiar. Using similes is also an effective way of making the unfamiliar seem familiar. There is an explicit effort to make a comparison between the unfamiliar and existing knowledge. In using analogies, students construct their own knowledge and apply them to new situations.

Constructivist science teaching takes into account what is discovered in the process of learning as that which enables first-hand learning to take place. Teaching sequences should be designed in such a manner that they will first elicit students' current ideas about a subject through inquiry or by production of concept maps to brainstorm for a topic in small groups. Active exploration of the limitations of students' existing thinking is often necessary to move students towards the accepted scientific view. Stay (1991) stated that using analogy to overcome misconceptions about *conservation of matter* was an effective tool in teaching chemistry. The main assumption of constructivism is that knowledge does not exist *out there* in an objective reality. It is actively constructed from within by the learner (Hendry & King, 1994).

### **Purpose of the study**

This study examined the changes in SHS 2 students' conceptions about acids and bases based on analogy and conceptual change through concept maps. This new approach was designed to encourage conceptual conflict and to investigate the effects of the new method on student's achievement. A second group studied the topic based on the traditional method. The topic under study is one of the basic concepts of chemistry; thus student's misconceptions about this topic can affect their learning of

other topics such as solubility, chemical bonds and properties of the periodic table. Again, this topic is important as it gives information about the nature of the changes that take place as a result of using the conceptual change methods which are simple and practical to use in the teaching environment.

### **Research questions**

1. How would the new teaching technique of concept maps and analogies promote conceptual change, concerning acids and bases?
2. What effect does the conceptual change approach have on the post-test mean achievement scores of the acid-base concept on the two groups?
3. How does conceptual change instruction compare with traditional instruction in eliminating acid-base misconceptions?

### **Methodology**

#### **Design**

This was a pre-test control group design (Campbell and Stanley, 1966). It is based on multiple and varied sources of evidence, it minimizes the plausible alternative explanations for the hypothesized cause-effect relationship its major emphasis is on ruling out alternative explanations by adding treatment or control groups and waves of measurement. It emphasizes the use of comparative data as context for interpreting findings, experimental designs increase our confidence that observed outcomes are the result of a give situation or innovation instead of a function of extraneous variables or events.

#### **Sample**

The sample for the study was 80 SHS 2 students from two different science classes of the same teacher in a public SHS. Two different teaching methods were randomly assigned to the two classes. The experimental group (EG) which consisted of 40 students received conceptual change oriented lessons through concept maps and analogies of real life situations of acids and bases. The control group (CG) of 40 students received traditional instruction. Here the usual teacher- centred approach which employs mostly lecture method, question and answer as well as dictation of notes were employed.

#### **Instrumentation**

An acid-base misconception test (ABMT) was developed, validated and used for the research.

The items were based on misconceptions which had been researched into by Taber 2001; Ross & Munby, 1991, Bradley & Mosimege, 1998, and Cros & Maurin, 1986. The content validity of the instrument was determined by three senior chemistry colleagues. Its reliability was 0.8. Some misconcepts which were tested have been shown in Table 1.

Table 1: Taxonomy of some Acid-base Misconceptions used in the ABMT

Item No.	Students' Misconceptions
1	A strong acid does not dissociate in water because it has very strong intra molecular bonds
2	A strong acid is always a concentrated acid.
3	A weak acid is a dilute acid.
4	Acidity increases with increasing pH.
5	Basicity decreases with increasing pH.
6	Acid strength depends on the number of hydrogen atoms while strength of a base depends on the number of hydroxide molecules.
7	Water cannot act as a base or acid as it is a neutral and universal solvent.
8	Strong acids have higher pH than weak acids.
9	Acids are corrosive and harmful.
10	pH is a measure of acidity and alkalinity.
11	All chemical salts are neutral.

### Procedure

The study was to compare the advantages of conceptual change oriented instruction to traditional instruction in eliminating SHS 2 students' misconceptions on the acid-base concept. The Experimental Group received conceptual change instruction through the use of analogies and concept maps. The Control Group received traditional instruction. Treatments were randomly assigned to the two groups. Both groups wrote the ABMT as a pre test and later again as a post test after the treatment to determine whether there would be significant differences between them.

The study which involved a total of 80 students was conducted in a public High school in Cape Coast, Ghana. Students in the Control Group were instructed with traditional methods as assigned in their chemistry text book approved by the Ministry of Education. Basically, the lecture and discussion methods were used. Problems in the text and activities were embarked on as is done traditionally. A summary of the day's lesson was written as core points on the teaching board and students copied them into their exercise books. Their attention was drawn to important facts, equations and symbols that they had to note carefully. The teaching was mainly teacher-centred.

Students in the Experimental Group were taught using the student-centred approach. They were given literature on a collection of some students' misconceptions of acids and bases. These misconceptions were analyzed in class through probing questions and discussions so that the errors in them could be identified and brought to



the fore for scientific re-structuring. Through guided discussions the aim of the exercise was achieved as some students came out with correct explanations of the concepts. They were able to establish analogical thinking between real life examples and the unknown as they learnt new information and discarded misconceptions. In this study, students were asked specifically about strengths of acids. Students were to brainstorm on the relationship between the number of hydrogen atoms in an acid and its acid strength. Most students gave reasons that  $H_3PO_4$  had a lot more hydrogen atoms and so would have a higher acid strength. Answers were further probed through guided questions till a correct response was arrived at. Then, in order to establish an analogical thinking with real life experiences they were asked about how the strengths of bulbs were determined at home, without reading inscriptions of the wattage inscribed on them or on their boxes. They indicated that the brightness of the light it gave could be used. *If a bulb gave off a lot of light, it was stronger than one which gave little light.* The term ionization was introduced and students made to understand that if an acid ionized to a large extent it was classified as a strong acid; but if it ionized to a little extent then it was a weak acid just like the brightness of given bulbs. A little confusion still remained in the minds of a few students as a couple of them still explained that  $H_3PO_4$  contained three hydrogen atoms, then it would have three times the strength of the  $HCl$  acid which had only one hydrogen atom. Analogies had to be provided for students to appreciate that sometimes one bulb, as in the compact fluorescent lights used in Ghana, could give more light and so was more powerful than two or three tungsten *onion* bulbs of the same capacity. This was linked again to the acid strength and number of hydrogen atoms, that  $HCl$  was a stronger acid than  $H_3PO_4$  because it gives more hydrogen ions than the latter when it dissociates in water regardless its one hydrogen atom. Students were also encouraged to use concept maps to express any ideas that they had about acids and bases. Ideas they arrived at as shown in their constructed concept maps were discussed when individual groups put up their concept maps for critique. These different views from the groups were discussed during their presentations. The important part was asking members of each group to try to relate some of their linkages or propositions on their maps to real life situations. They were encouraged to select analogies which were familiar to most students and could be drawn from their environment.

For example, in the case of acids, students chose examples such as hibiscus from their environment on their concept maps. Other students also used plantain ash as an example of a base (in place of  $NaOH$ ) for a reaction between a base and acid to produce a salt.

The misconception test was given to participants again at the end of the treatment period. Each question was scored as a point. Independent t-test was used to determine the difference between post mean scores of students who received conceptual change oriented tuition and those who received traditional tuition with respect to their achievement in the misconception test.

## Results

Table 2: Pre test and Post test scores of students in ABMT

Groups	Pre test					Post test				
	Mea n	Standar d deviati on	F	t	P	Mea n	Standar d deviati on	F	t	P
Control	48.0 9	22.03	4.1 0			15.8 2	12.84	1.40		
Experimen tal	47.8 2	18.89	3.7 7	1.3 0	>0.0 5	7.09	5.75	0.32 3	5.5 2	<0.0 5

The results of the pre-test showed no significant mean differences between the experimental and the control groups in terms of their cognition of acids and bases. That means their basic knowledge was the same at the start of the research. ( $t=1.30$ ,  $p>0.05$ ) Results of the post-test indicated a significant mean difference between the performance of students in the experimental and the control group. ( $t=5.52$ ;  $p<0.05$ ).

Students who were taught through the conceptual oriented instruction scored higher conceptually correct ideas than those who were taught by traditional instruction. The mean percentage misconception for the Experimental Group was 7.09 % while that of the Control Group was 15.8 %. This means that the mean correct concepts for the Experimental group in the post test was 92.91 % while that for the traditional/Control instruction group was 84.18 %.

## Discussion

Table 2 above, indicates the pre test - post test scores of chemistry students in an Acid Base Misconception Test. The pre test scores shows that the difference between the mean scores of the control and experimental groups is non- significant ( $t = 1.30$ ). The prevalence of high standard deviation among the Control group indicates the incidence of high achievers among the group as opposed to the Experimental group which is relatively more homogenous. Also, the lack of significant difference between the pre test mean scores in the ABMT shows that both groups were almost at a similar misconception level at the onset. It also shows the effectiveness of the randomization process used by the researcher during the sampling stage.

The post test scores however, show a different scenario. The Experimental group had lower misconception scores, indicating that they understood the concepts better than the Control group which had a higher mean misconception score.

A 2-tailed t-test which was used to compare the two post test mean scores showed that the difference was significant and not be chance. This significance can be attributed to the differential treatment (that is the conceptual approach) to which the Experimental group was subjected. Again, the prevalence of low standard deviation in the post test mean scores of the EG indicates the homogeneity in achievement of the concepts. This means that the treatment reduced the disparity in the understanding of

the concept among the EG. It also implies a cluster of ideas and understanding of the concept among this group due to the treatment which they received.

The researcher compared the four main scores of both groups at the pre and post test levels to find out if there were any significant differences. The F-ratio which is an index of this variability yielded a value of 0.323, which was found to be significant at the 0.05 probability level.

A learner comes into any new situation with prior knowledge based on past experiences. New knowledge is learned through integration with prior knowledge. (Hendry and King, 1994). It is always important to consider and collate students' prior knowledge on all topics before teaching them. These data should be discussed and the errors in them explicitly brought to the fore. After that, students will have to be involved through the teacher's guidance and relationships to familiar situations in the environment to come out with scientifically correct ideas. Teachers must be flexible in using conceptual change approach in their teaching as the direction of their outlined instruction could be student driven - based upon the discovered misconceptions about the topic - from what is planned. This could be drastically reduced if the teacher would design his lessons after gathering students' prior ideas. In this way he will be able to help students to reconstruct new information in a deliberate and well organized manner.

In this study, lessons and materials about the acid and base concepts were planned with this aim in mind. The four-week intervention which used the conceptual change approach helped students to acquire a deeper knowledge of the concepts. It helped participants to review their prior knowledge, realize their common misconceptions and then correct them. The use of analogies served as a bridge between everyday life phenomena and classroom science. It enhanced better conceptual understanding. The use of concept maps helped students to form more realistic relationships between terminologies used in discussing the acid - base concepts. This gave them a better understanding of hitherto confusing and difficult terms and concepts.

### **Answers to research questions**

In answer to the first research question of how the new teaching technique of concept maps and analogies would promote conceptual understanding of acids and bases, results indicated a positive change. It reduced students' misconception levels significantly. (See table 2;  $t = 5.75$ ). In answer to question 2, while the misconceptions of the Experimental group declined that of the Control group did not change significantly. Also, while the understanding of the Experimental group converged and caused homogeneity in their understanding of concept that of the Control group diverged. This means that there was high heterogeneity of conceptual understanding among the Control group.

The superiority of the conceptual change approach in eliminating acid-base misconceptions answers the third research question. Evidences from the post test mean scores of the Experimental group was higher in quantum to that of the Control group ( $t = 5.75$ ;  $P < 0.05$ ) The conceptual change approach also caused a cluster of

ideas among the Experimental group. They had similarity of views and conceptual understanding of the topic than the Control group.

### **Conclusion**

This study has indicated the superiority of the conceptual change approach to teaching over the traditional approach. Students who were taught with the new approach understood the acid-base concept better as results indicate. The use of the traditional instruction was not as effective as the conceptual change instruction in eliminating misconceptions about the acid-base topics as has also been documented in other studies by Andre and Chamber, (1997) and Mikkila (200 I). In the traditional method, knowledge is only transmitted from teachers to students in a unidirectional stream. It is therefore important that teachers become aware of alternative teaching strategies such as the use of conceptual change approach which allows for collating and correction of students' prior knowledge. This suggested approach is flexible to use and makes lessons more interactive. It is recommended that curriculum developers and textbook writers focus on a few common misconceptions for some central topics as it is common knowledge from research that students are generally unable to learn effectively all the concepts and materials in their lectures.

Teacher training institutions and organizations must use this approach and impress upon their students and members respectively to adopt them also. Teachers should be aware of students' prior knowledge and conceptions on acids and bases because they are strong predictors of students' achievement. Besides, most life reactions occur in acid or base media. Thus the acid - base topic is a basis for the proper conceptual understanding of other topics such as equilibrium reactions. It is therefore important that students gain mastery over this concept. When suitable strategies such as concept maps and analogies are used to impart this knowledge, they are more likely to significantly remove misconceptions and lead to the acquisition of scientifically sound concepts.

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