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The International Journal of Instructional Technology and Distance Learning is refereed, global in scope, and focused on research and innovation in teaching and learning.

The Journal was established to facilitate collaboration and communication among researchers, innovators, practitioners, and administrators of education and training programs involving instructional technologies and distance learning. The editors and peer reviewers are committed to publish significant writings of high academic stature.

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Donald G. Perrin
Executive Editor

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Editorial

IT and Global Learning

Business and education are increasingly dependent on digital information technologies (IT) to support day-to-day operations. IT is the key to productivity, growth, and strategic advantage in the marketplace and is playing an increasing though relatively small role in education and training.

IT hardware, software, and telecommunications equipment now represent ore than 35% of domestic private business investment in the United States, up from 19% from 1980. In 2005, US firms spent nearly $1.8 trillion in IT and telecommunications equipment and software to support 23 million managers, 113 million workers, and an ultimate customer base over 300 million.

When these numbers are extrapolated to global markets and global education and training it is apparent that Information Age systems and services have reached unprecedented levels. It is also clear that new kinds of businesses have emerged, like amazon.com and eBay, that have revolutionized the way business is done. Business, industry and government information, forms, and assistance is now available almost instantly to the masses. In computer terms it is just a few clicks away.

The implications for education and training are mind boggling. Brick and mortar schools, universities and training institutes are now competing with, or becoming, virtual organizations able to supply services globally, anywhere, any-time, with high quality at a competitive price. Schools that once compared themselves with a school across town, or in another state, now compete against national and global benchmarks. The same is true of workers applying for jobs.

There is turmoil in the job market with world flattening, outsourcing, and influx of cheap migrant labor. Social systems are in crumbling because of job loss, increasing medical cost, reduction in social services, and foreign wars. Education is struggling to be relevant and effective in a period of precipitous change. Like business, industry and government it realizes that IT is crucial to being relevant and effective in a period of diminishing budgets and rapid change.

Education as we know it is being morphed to resemble the new business models, the digital firms. Will it become privatized like the medical model? Nationalized like social services? Or corporate like Dell Computer? Will learning become a mass produced commodity, or will it be customized to enhance individual opportunity? Will it be available to everyone or will there be education for the rich and education for the poor?

Industry and government have made many attempts to “fix” education ranging from standards based curriculum to technology based learning, and from “back to Basics (McGuffy Reader)” to “No Child Left Behind”. Most of these attempts failed because the educational enterprise is greatly underfunded and that situation is not likely to change.

Medical research continues to cure and eliminate diseases and conditions that were fatal to previous generations. Education research is moving forward to foster better learning opportunities for the next generation of learners. What can’t be done by governments and corporations with dollars and cents – is emerging as products of the human spirit – creativity, dedication, motivation, and concern for our children. This issue of the Journal has four articles that move us closer to learning in the future that is more personal, more effective, and more exciting than what we can offer today.

Learning is the key to a better future. Global learning is the currency of the information age.

Editor's Note: Learning Objects and Learning Management Systems are changing the face of education. Luke Skywalker's Droid R2D2 in Star Wars had intimate knowledge of everything about its master's Knowledge, Skills and Attitudes. Its responses were fine tuned to Luke Skywalker's personality, experience, vocabulary, and modes of communication. Research in Artificial Intelligence is moving us toward this model. Personalized experiential and performance databases are an essential component for excellence in diagnostic-prescriptive technology. State-of-the-art learning systems can be greatly enhanced by algorithms that customize experiences for the individual learner as described in this article.

Towards Personalization and a Unique Uniform Resource Identifier for Semantic Web Users within an Academic Environment

Muna S. Hatem, Daniel C. Neagu, Haider A. Ramadan

Abstract

With Semantic Web, Personalization is becoming extremely important. The next generation web-based systems are expected to have the capacity to adapt their structure and contents to a particular user. Personalized applications require accurate identification of the user. Expressing identity is one of the core problems that many research efforts address nowadays. The user name or identification number can change over time, written in different languages or spelled in different ways that mislead our search agent or knowledge acquisition algorithm. In addition, many users have the same name and sometimes share the same information for more than one attribute. In the work hereby presented we explore the impact of User Profiles on the Semantic Web. We introduce the concept of Unique Uniform Resource Identifier (UURI) of users; we claim that such UURI is required to uniquely identify each user, this is especially important for multi-lingual Semantic Web resources and further development. We suggest a practical method for creating and maintaining User Profiles for the Semantic Web; the idea is to have UURI for every user and provide users with the ability to update their profiles. The implementation of techniques which assist in recognizing various access patterns and interests of the Web users enable us learning more information about the user to maintain the User Profile. Such techniques will only be effective when User Profile is identified by its UURI. This paper reports on the work in progress to develop a framework for Semantic Web mining and exploration and suggests a practical method towards maintaining UURI for every user.

Keywords: Unique Uniform Resource Identifier (UURI), semantic web, user profile, multi-lingual semantic web, personalization.

Introduction

Traditionally, in knowledge engineering, knowledge acquisition has been regarded as a bottleneck. The International Data Corporation put the number of web pages on the Web at 829 million in 1998 and projected that the number would be 7.7 billion by 2002 [1]. Internet growth has always been greater than predicted; there are now nearly 10 billion web pages on the internet and nearly 10 million web pages are added everyday and this growth is speeding up [2].

The Semantic Web vision [14] demands even more knowledge to be added to Web pages; some of this knowledge is added manually while others are acquired automatically or semi-automatically. The Semantic Web has introduced new promising concepts for Web users; Web

pages in Semantic Web are enriched with machine processable information that made it possible to formalize the semantics of web resources. The existence of the Domain Ontology and Annotated Web [23,24] pages has made it possible to extract information from the environment and also relates this information to the concepts described in the domain Ontology.

In a personalized system, the content and/or the structure of the displayed Web page should be dynamically constructed. Personalization normally involves maintaining User Profile (aka User Model). A variety of techniques ranging from simple statistics to machine learning algorithms have been used for personalization and user profiling [25]. Yet, most personalization knowledge that currently exists is actually dealing more with layout customization rather than content.

With the Semantic Web, Personalization has become the crucial point of focus. Learning from the Semantic Web should outperform learning from the current Web; more accurate and more meaningful knowledge can be acquired from the Ontology, the Annotated Web pages and the triple stores. In addition, techniques which assist in recognizing various access patterns and interests of the Web users can capture the user behavior [25]. With Semantic Web, user navigation activities can reveal semantic relationships that can help in learning more validated information about the user than ever before.

Personalization is extremely important for Semantic Web applications in general and for e-business and e-learning applications in particular. Personalization is the process that should be carefully handled at an early stage. We can not only rely on learning from the Semantic Web and prepare for a personalized application; such application is only managed when the system uniquely identifies the resources (in this case, is the user profile that is handled as an important resource).

User identification is a continuous and evolving task. The user name or identification number can change over time, spelled or written in different ways that mislead our search agent or knowledge acquisition algorithm. In addition, many users have the same name and sometimes have the same information for more than one attribute.

The Uniform Resource Locator (URL) [21] is the address that let our software identify and locate a Web page to visit, it is the foundation of the Web, and it can be given to anything on the Web; a whole page, a bookmark on a page or any other object. The problem with the current URL is that anyone can create a URL and in many cases more than one URL is created to refer to the same resources. There have been many attempts to resolve the problem and to prepare for the implementation of the Semantic Web: the Friend Of A Friend (FOAF) [5] project for example implemented a Web based system to help in creating machine processable user profiles for FOAF community, the Resource Description Framework (RDF) vCard [13] is used to help in developing user profiles.

One of the concepts that is getting great importance with the expanding use of internet, e-commerce and e-learning is Web Trust. Web Trust is not only concerned about building customer confidence with a certain website security, privacy, availability, confidentiality, and processing integrity; but it also addresses the confidence of users in un harmful use of Web because of aspects like virus and worm spread or attacks to access private or restricted data. We consider that, in order Personalization to be achieved on the Multi-lingual Semantic Web, first we need to handle the growing need for Web trust. Some techniques like the Digital Signature or the use of some recently announced security tools as the enhance Web Trust Tools presented by Microsoft or Symantec. They both offer everything from remote-controlled antivirus protection to hard drive optimization in one package. These services include 24/7 remote monitoring of the user Personal Computer with automatic updates when needed [4]. Second, even if we managed to securely identify the Web user, we still need a unique identifier that helps us referring to a particular user with high degree of trust and awareness of the user profile.

One of the basic requirements of Semantic Web is adding Annotation to Web pages. These markups are the RDF or OWL instances required for Semantic Web manipulation; for the Semantic Web to become a reality, the accuracy and reliance on stable and accurate references like having UURI is vital. After all, Annotation is a data collection process and therefore, according to the general old rule for data collection processes, data should be collected as close to the source of the data as possible. This rule guarantees its validity for the Annotation process, specially now, when the domain and context are obviously at earlier stages.

Currently there is a need for a document structure that can be used as UURI and provides the following:

- Secure and continuous update for the information through web front end that allows the users to access and update their UURI documents.
- Hiding the UURI documents from other Internet users.
- Multi-lingual names processing: multiple interpretation of the same name should be allowed and maintained in the Knowledge Base (KB).
- Allow to include previous names used.
- Other names used due to different way in writing the name.
- Allow adding previous UURI address in the latest UURI document, this will enable us track users when they move to different work and change the location of their UURI to different domain name.
- UURI are to be easily created, flexibly managed and accurately reference individuals.

In the section to follow, we outline the current related work. Our method for building UURI is described in section III. In section IV, we illustrate the UURI allocation method and the system architecture. System implementation is summarized in section V. Conclusions and future work are presented in the last section.

Related Work

Many techniques have been implemented to overcome the Web identification problem in general and the Semantic Web identification problem in particular; some of these techniques can be summarized as follows:

User profile on individual sites

Internet sites like `yahoo` and `Microsoft`, for example, present the user with a form to be filled in order to construct its user profile, identified by Username and Password. This profile is then used to provide access to specific services. Although such technique has been used for a considerable amount of time and has been accepted by a considerable number of users, it has many pitfalls as it is risky because the user is giving a third party total control over the user access to the service and private data. An example is that of users proposing the same password for various user accounts (i.e. including Internet bank accounts in the same time with genuine yahoo profiles) to avoid memorizing too many passwords. A break in the security wall to one password might generate a chained security breach. In addition, a user may be requested to fill in many forms required by various service providers. Meanwhile Google has been working on personalization and trying hard to make it work. Google's Web Alerts let user sign up to receive email alerts when new interesting information are uploaded on the web. Google also provides user with the ability to create search profile to filter results and to create site profile that can help Google to tailor its search. Ask Jeeves has been trying to include personalization based on the user past search, current search and also on other people search.

However, the information collected by service providers about the user does not represent currently useful and reliable resources that fulfill the demands of the Semantic Web and the identification required [15].

FOAF project

The Friend-Of-A-Friend [5] is an application that allows expression of personal information and relationships. This application is based on the idea that states “It’s not what you know, it is who you know” [22]. FOAF is simply an RDF vocabulary where you can use to create your FOAF file on your web server so that the information on this file can be accessed by software. FOAF helps users to locate people with the same interest.

Expressing identity is one of the core problems that FOAF project addressed. FOAF uses e-mail address to identify a particular person. Although this system has been used by some applications, FOAF reliance on email address is risky because, after a period of time, this email address would no longer be valid because the person could change his email address or could use more than one email address.

RDF vCard

The **Versit Consortium (VC)** developed a comprehensive family of Personal Data Interchange **(PDI)** technologies. vCard (The Electronic Business Card) is one of these technologies: Versit consortium specification of vCard was published in 1996 [16]. VCard is based on open specifications and interoperability agreements to help meet technology need and allow users to communicate easily and accurately. vCard was specified to carry vital directory information such as name, addresses (business, home, mailing, parcel), telephone numbers (home, business, fax, pager, cellular, ISDN, voice, data, video), email addresses and Internet URLs (Universal Resource Locators). A vCard can also have graphics and multimedia objects and support multiple languages.

The vCard -ready software can run on any computer and have wide industry support [13].

VCard semantic has been represented as **RDF vCard document**; the purpose is to define an RDF/XML encoding for the format that was initially defined by VC. RDF vCard uses the XML Namespace [XMLNS] to uniquely identify the metadata schema and version as in the URL http://www.w3.org/2001/vcard-rdf/3.0#. It has been created and used over the internet in many different applications. The vCard specifications have been restricted to a well identified attributes and this vCard information is intended to be available to be downloaded by anyone on the internet.

Software Tools Used in our Approach

The implementation and first experiments at this stage are done on local machine where Internet Information Server (IIS) was installed to act as an Internet server. The following main tools are installed and used for the purpose of this current work:

1.1 Jena

Jena is a Java framework for building Semantic Web applications [6]. It is provided by HP Labs Semantic Web Program [7]. Jena is open source that includes programming environment- **Application Programming Interface (API)**- for OWL and RDF, a rule based inference engine, in-memory and persistent storage such as MySQL and Oracle databases, and the RDQL – a query language for RDF.

Ontology data sources are handled by Jena as ontology model that is created as an extension of the Jena RDF model. This model can either built from an existing Ontology written in RDF or OWL document or it can be constructed by Jena from scratch.

Jena2.3 has been downloaded and installed [6, 11] to prepare the framework for implementation.

1.2 RDF Data Query Language

Jena provided RDF Data Query Language (RDQL) which is a query language for RDF is not a formal standard, although RDQL is widely implemented by RDF frameworks. RDQL allows complex queries to be expressed concisely, with a query engine accessing the data model. RDQL's syntax superficially resembles that of SQL. Some of its concepts will be similar to relational database queries [8].

In this work we use SPARQL [12] that is a query language and a protocol for accessing RDF which is a newer and more sophisticated than RDQL. SPARQL is becoming the standard query language for RDF, it is design by the Data Access Working Group of the World Wide Web Consortium (W3C); SPARQL is built on top of RDQL and it is currently supported by Jena in its latest version 2.3.

SPARQL is "data-oriented" in that it only queries the information held in the models using Select clause to identifies the variables to appear in the query results and WHERE clause that specify a triple pattern . It returns the information needed in the form of a set of bindings or an RDF graph [9]. It provides facilities to construct new RDF graphs based on information in the queried graphs and facilities to extract information in the form of URIs, blank nodes, plain and typed literals, RDF sub graphs.

1.3 MySQL and other Tools

The database management system MySQL [10] has been used to provide for constructing the SQU RDF Repository as a persistent storage. Java is used to write special programs for handling forms submission and other HTTP events. Internet Information Server (IIS) is used for Web server, Oracle client software used to extract information from Oracle Database for initial user profile data collection.

2. UURI allocation method and System Architecture

The case of our study deals with the recently introduced Web portal of SQU , for which Semantic Web abilities are intended to be added. We use a simple, yet powerful technique to allocate UURI for each individual according to the following criteria.

2.1 SQU staff and students

Each staff member and student has a unique identification number allocated by the university. We are going to use this number to uniquely define the initial profile on SQU RDF repository. For example, the UURI of the staff member 5927 will be accessible via staff identification number and password. The static information about individuals is extracted from the university Employee System, Student Information System and WebCT.

If an individual leaves his work at SQU for some other organization, the system treats his UURI as follows:

- The individual access to his UURI is denied, but all the RDF instances in the KB are kept as they are.
- In the new organization, a new UURI is created and the user adds a reference to his previous UURI as illustrated in Figure 2. This action is extremely important because every instance in SQU KB will continue to be valid and used; somewhere in the domain ontology there is a fact stating that all UURIs that are associated with a particular individual are equivalent from the system point of view.
-

2.2 Other individuals or organizations

There are many individuals and organizations the institution (SQU University in our case) collaborate with. There might not be a specific identification number allocated for them at this stage of the implementation. For such people or organizations, we rely on their email address which includes user-name and domain; again this UURI is allocated and the profile is stored on the SQU RDF repository server.
http://www.squ.edu.om/sw/D.Neagu@Bradford.ac.uk and
http://www.squ.edu.om/sw/96895262118@mms.nawras.com.om are two examples of such UURIs.

The initial information is provided by the squ staff that collaborates with the external staff. The email address or the telephone number used as examples here pay the role of **identifier** only and do not act as web page **locator** so we need not do any change to this UURI when the user changes his email address or his other reference number that is used for his UURI. The email address can be updated with the new one but the previous will continue to be used as identifier for SQU domain usage.

2.3 Organizations that implement our proposed system

Organizations that implement the proposed system use the same method for allocating UURI as the one used for SQU staff and students, the only exception is that their UURI web pages are uploaded on their own RDF repository. For example, the University of Bradford (UoB) will implement the proposed system by building the RDF repository in the same way as it is done at SQU. This RDF repository will include facts like Dr. Daniel Neagu (DN) supervises the PhD student Muna Hatem (MH) who is a staff at SQU. Such facts are represented as RDF graph where MH is referred to by her UURI as an object of a property called **hasUURI** that is defined in the domain ontology. The property has UURI is used to denote that the UURI of this particular resource is on different server.

Internet users can issue a query like “Who supervises/d the PhD research of Muna Hatem (MH)”. The user can be in any of the following different contexts and scenarios:

The user uses SQU portal where it can be found that MH is a staff member: in this case the UURI of MH is known and can directly be used. The software agent will use the RDF triple that is associated with the property supervised to get the required result from UoB RDF repository: Figure 1 illustrates sample RDF annotations.

If the user is using University of Bradford portal, then MH can easily be identified as a student by the software agent and its UURI at the University of Bradford refers to the chosen UURI of MH which may either be on SQU or UoB servers. This particular sample query can be answered without the need to access remote server(s). For most other queries once the UURI is identified, the result will be obtained by the agent following the UURI.

If the search assumes no extra information other than the one that appears in the text of the query, then the query can be issued from anywhere including the global search options on SQU or UoB portals. Here the Agent will search for all individuals with the name Muna Hatem and identifies their UURIs. Then it will look for any UURI associated with the property `supervises` or `supervised`. Then the agent will look for facts about the user who issued the query that is related to each of individuals found. The agent uses its own algorithm to filter the results and reach the most appropriate answer to the query; even if the user is anonymous and there is nothing that can be found by the agent about that particular user, there are still many facts that the agent can derive from the context in which this query is issued. These facts can be very helpful for the agent in taking the correct decision about the way the result is filtered.

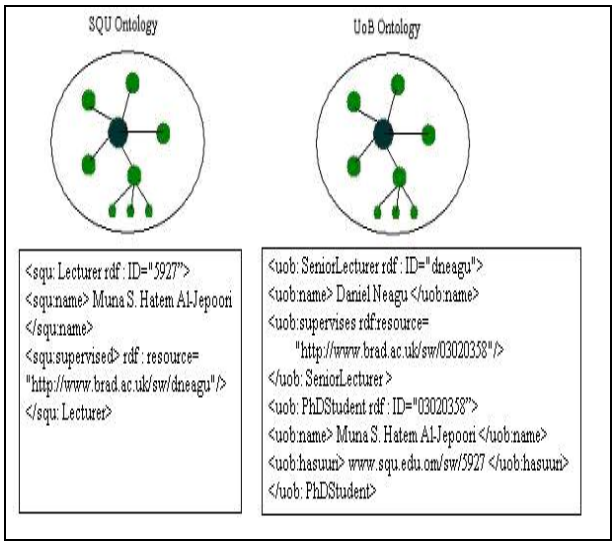

Figure 1: Sample for RDF annotations

In most cases, Internet users will be of the anonymous type though. But one of the aims of the new Internet technology in general and Semantic Web in particular is to become able to uniquely identify each Internet user; this is the key solution to the web identification problem and web security. At the same time this will make the software agents work in a more efficient way.

2.4 Manual Update of User Profiles

A Web-based front end is created to allow users to contribute with metadata. We developed a Java application that can present a familiar Web-based interface to users, accept user data, store corresponding RDF metadata, expose the metadata as HTML document.

At this stage information as to what is the previous UURI, what other names the person previously used, how the name is written in different languages or how it is spelled; such information can be added here to ensure that queries issued with any of the added data items are handled properly once these facts are included in SQU KB. Figure 2 shows a sample UURI document displayed as HTML document to allow updates. Fields marked with * are extracted in the process mentioned in section 4.1 above, other fields are entered by the user

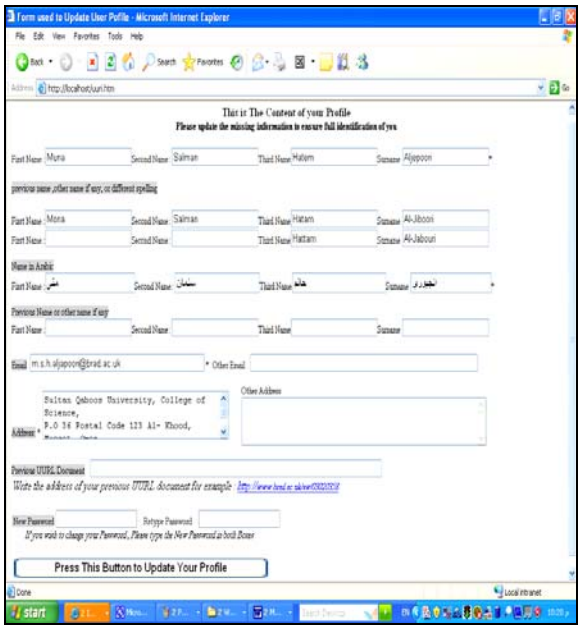

Figure 2: Sample form used for manual update of User Profile

Usage Mining, Learning and Continuous Personalization

Each time the user is involved in an activity or each time this user is refereed by another person's activity within the SQU domain, some facts are extracted and added to the data base that represent SQU Knowledge Base triple store.

The knowledge extraction program uses Jena API to build and maintain SQU KB, whereas SPARQL is used to extract the required fact whenever it is needed by any of the interrogation program or agent.

At these stages, facts like a person, for example, named Muna Hatem (MH) with ID 5927 knows or relates to some other person called Haider Al-Lawati (HA) because the departmental organization is registered in the Knowledge Base via the graphs loaded from the annotated pages or via usage mining techniques that adds RDF instances to the Knowledge Base. If MH issues a query related to HA, the result will only include required information for this specific person whose ID is (973) and not any other one who holds the same name and works in the same department, or other departments, just like a real world query to a human being asking about some person, the receiver of the query answers normally within the scope known or related to him/her. Relations with other things or persons are established depending on the facts included in the KB. Such information includes the field this person is involved in, country of origin, address, hobbies, research work, collaborations and other learned information. Figure 3 below shows a simplified illustration of the related proposed architecture.

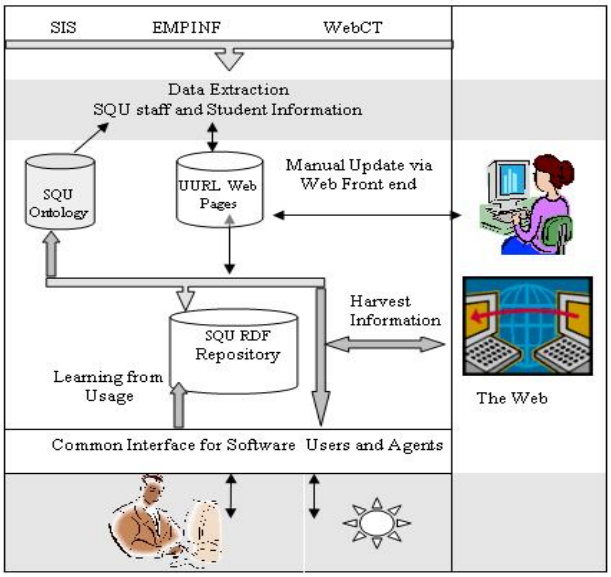

Figure 3: The Architecture of UURI System

3. System Implementation

The prototype system started with the activities that are related to the usage of Jena; the implementation was done on simple data used to construct and examine the model. The practical work implemented so far can be summarized as follows:

The SQU Ontology document has been created using OWL

Sample Web Pages were annotated using the Ontomat annotator

The RDF triples from the annotated pages were extracted into RDF document Data.rdf.

SQU RDF repository was created such that:

A database connection to the data model on MySQL database was created and a model maker for the database backed model that open the connection to the database was created. MySQL backed model **squrdf** was created and the RDF graphs of the annotated pages were loaded into it from the Data.rdf.

An empty Jena model **schema** was created and the ontology document was read into it.

An OWL reasoner was bound to the ontology model **schema** and used to create an **inference model.**

Sample queries were created and executed

All the properties of the resource found for a particular resource were printed from the inference model.

Figure 4 shows the annotations of UURI 5972 that is explicitly stating all the RDF facts recorded about MH. It includes different interpretations of the first and last name together with the name in Arabic.

```
 <Lecturer rdf:about="http://munah/5927">
        <address>
            Dept. of Computer Science, Sultan Qaboos University,
            PO. Box 36Postal Code 123, Muscat, Oman
        </address>
        <email>
             munah@squ.edu.om
        </email>
<empID>5927</empID>
        <fax>(968) 24413415 </fax>
        <first_Name>Mona </first_Name>
        <homepage>
             http://www.squ.edu.om/sci/comp/staff/munah_homepage.htm
        </homepage>
        <last_Name>Hatam</last_Name>
        <middle_Initial>S</middle_Initial>
        <name>Mona Salman Hatam Al-Jiboori</name>
        <phone>(968) 24413333 Ext.:2223</phone>
    </Lecturer>
<Lecturer rdf:about="http://munah/5927">
        <first_Name> Muna</first_Name>
         <last_Name>Hatem </last_Name>
</Lecturer>
<Lecturer rdf:about="http://munah/5927">
        <last_Name>Hattem </last_Name>
</Lecturer>
<Lecturer rdf:about="http://munah/5927">
<first_Name>منى</first_Name>
        <last_Name>حاتم </last_Name>
</Lecturer>
```

Figure 4: Sample RDF Annotations

For illustration of using the system, let's suppose that the query is " *What is the fax number of MH* ". The original query based on the corresponding UURL identification and the SQU ontology can be analyzed and interpreted to the SPARQL query "SELECT ?x, ?name1 WHERE (?x, <http://munah/squont.owl#empID>, "5927") (?x, <http://munah/squont.owl#fax>, ?name1)".

```
C:\Jenaroot>java Firstquery
com.hp.hpl.jena.rdql.QueryResultsStream@e53220
SELECT ?x,?name1 WHERE (?x, <http://munah/squont.owl#empID>, "5927")(?x, <http://munah/squont.owl#fax>, ?name1 )

-Resource: http://munah/5927   Literal:
          (968) 24413415
```

Figure 5: Result of a Sample Query

Figure 5 shows the result of this query. Figure 6 shows that for a person like MH with many different versions of the last_name (Hatem, Hattem, or Hatam), any version used will get the required result since all names belong to the same resource. The figure also illustrates other facts like the list of all the properties inferred or explicitly stated for the resource. It also shows that Jena does not seem to support Arabic language.

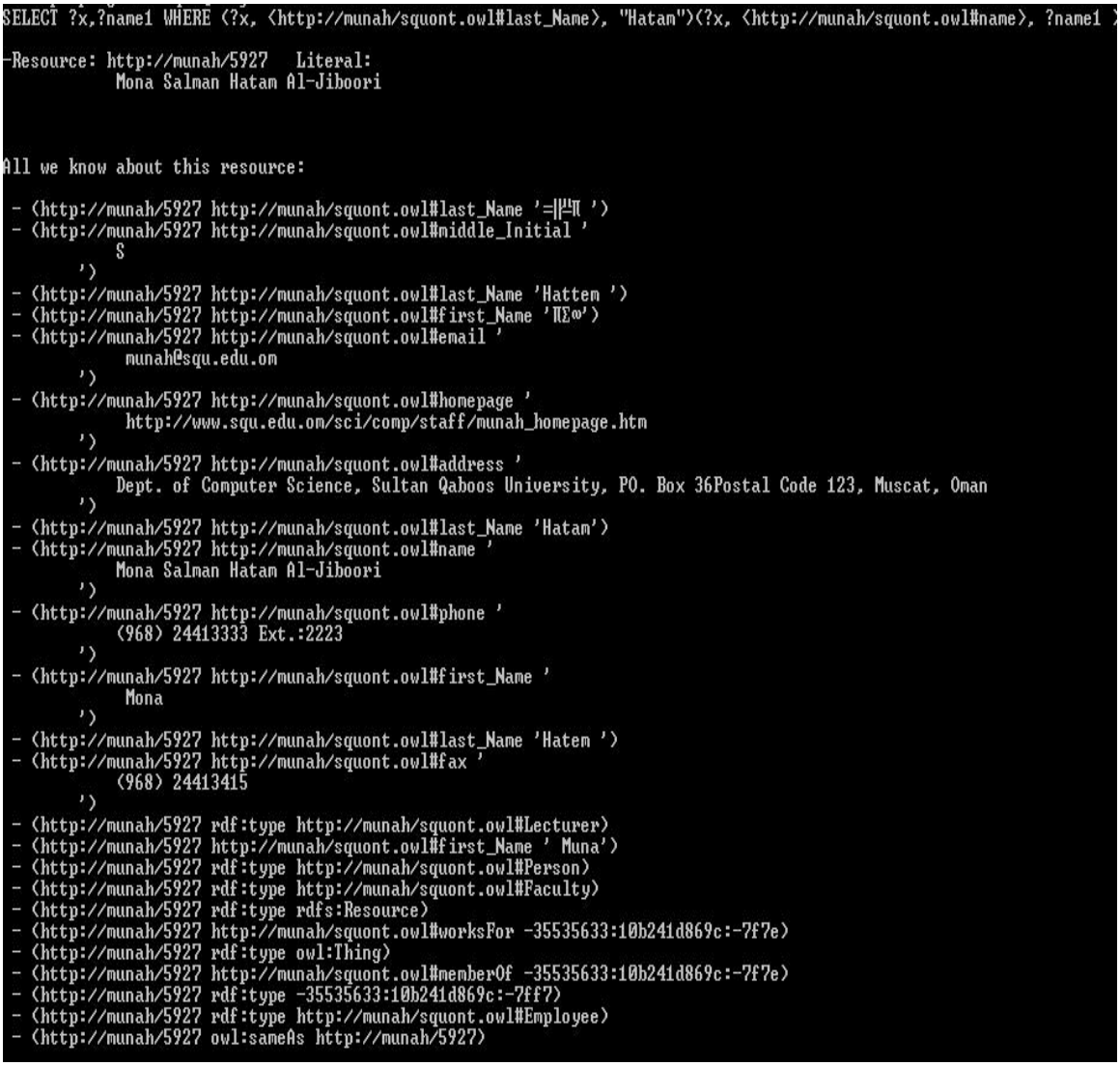

Figure 6: Sample Query and the Properties of a Particular Resource

5. Conclusions and future work

This work represents the first step towards implementing a Semantic Web application for SQU. We found that Jena is an outstanding tool for maintaining the Ontology concepts and RDF instances. Since Jena is based on Java, there are many inference programs and support tools for Jena that enables us to speed up the implementation process. We believe that the second step will easily be implemented on the RDF repository produced.

The UURI suggested in this work is used in the first step of the implementation; that is the Annotation phase of SQU web pages. This UURI will be used in all later stages of the implementation process. The UURL suggested provides for continuous update for the information through web front end that allows the users to access and update their UURI documents. This will especially help in the multi-lingual Semantic Web. UURI are easily created, flexibly managed and accurately reference individuals.

In the future work, the problem of Arabic language and Jena support need to be dealt with. At this stage the work has been implemented on test data. The next step is to complete writing the

administrative utility programs, and the user friendly web front end to start the actual implementation on real world data. The RDF repository produced is to be maintained and updated by information learned from the Web; this part of the work will be presented in a separate report.

References:

1. Shadbolt, N.R. and Burton, M. (1990) “Knowledge elicitation” J.R. Wilson & E.N. Corlett, Eds., Evaluation of Human Work: A Practical Ergonomics Methodology, pp.321-345. London: Taylor and Francis.
2. Catledge L.D. and J.E. Pitkow Characterizing browsing strategies in the World Wide Web, Computer Networks and ISDN Systems 26(6): 1065-1073. 1995.
3. H. Ramadhan, Z. Al-Khanjari, A. Al-Hamadani, and S. Kutti. Automatic Construction of the User Web Access Profiles, Transactions on Systems, Vol. 3, 5, 1497-1506, 2004.
4. http://reviews-zdnet.com.com/4520-3513_16-6429627-1.html?tag=fs
5. http://www.foaf-project.org/
6. http://jena.sourceforge.net/
7. http://www.hpl.hp.com/semweb/
8. http://www-128.ibm.com/developerworks/java/library/j-jena/
9. C:\Jenaroot\doc\tutorial\RDQL\index.html
10. http://dev.mysql.com/downloads/
11. C:\Jenaroot\doc\readme.html
12. http://www.w3.org/TR/rdf-sparql-query/#introduction
13. http://www.w3.org/TR/vcard-rdf
14. Ying Ding, Dieter Fensel, Michel Klein, and Borys Omelayenko, *The Semantic Web yet another hip*, Science Direct - Data & Knowledge Engineering, 2002.
15. http:/dsonline.computer.org/0411/d/oy002b.htm
16. http://www.imc.org/pdi/vcard-21.doc.
17. http://www.w3.org/TR/2006/WD-rdf-sparql-query-20060220/
18. http://jena.sourceforge.net/tutorial/RDF_API/
19. http://www-128.ibm.com/developerworks/java/library/j-jena/
20. file:///C:/Jenaroot/doc/ontology/index.html#cameraExample
21. http://de.wikipedia.org/wiki/Uniform_Resource_Locator
22. http://www-128.ibm.com/developerworks/xml/library/x-foaf.html
23. http://protege.stanford.edu/publications/ontology_development/ontology101-noy-mcguinness.html
24. http://www.sciam.com/print_version.cfm?articleID=00048144-10D2-1C70-84A9809EC588EF21
25. http://www.db-net.aueb.gr/magda/papers/webmining_survey.pdf#

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Editor's Note: Design of instruction requires knowledge of technology tools and skill in selection, adaptation, and application. This study determines strengths and weaknesses of specific technologies and how they can be combined for effective teaching and learning.

Interactive technologies for effective collaborative learning

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Abstract

Selecting which technologies to use and how to use them in online teaching and learning environments is a critical variable to ensure the quality of the process and the performance of teamwork. Under the framework of three different modes of teamwork (i.e., communication, cooperation, and collaboration), this study reviewed an online MBA program as a representative case study to reveal usage patterns of technologies for virtual teaming activities. Study findings indicated that technologies and tool functions that instructors and students frequently used for teamwork were in the categories of both communication and cooperation technologies. Pedagogical implications for the current states of technology use and suggestions for better usage of collaborative technologies were discussed in the study.

I. Introduction

Teamwork is one of the most widely used instructional activities in traditional classrooms as well as online learning environments. Many studies point out that teamwork activities provide a pedagogically-rich context to assist students in building meaningful knowledge in online environments (Carabajal, LaPointe, & Gunawardena, 2003; Lee, Bonk, Magjuka, Su, & Liu, 2005; Palloff & Pratt, 2005). In this sense, the use of team activities in online environments has appreciated in value as an instructional approach during the past decade.

When teamwork is introduced in online environments (where it is typically referred to as 'virtual teams'), the context for the teaming activities becomes different from that of traditional classroom teamwork. Virtual team members are dispersed in physically and culturally different environments. Idea exchanges and decision-making within such teams via technologies require more time, effort, and detailed guidelines than traditional classroom teamwork.

One distinguishable arena of research on virtual teamwork, different from those of typical classroom teamwork, is the use of technological tools on virtual teamwork. Technologies for virtual teams provide unique communicational channels, offer promise for innovative instructional delivery and activities, and highlight opportunities for jointly built accomplishments and goal-based learning behaviors. Team members adjust to the features and functions of the technological tools for enriched team operation but also adjust the tool settings to their unique team needs and preferences. In the teamwork process, team members learn strategies for problem solving and task completion from one another.

The success of virtual teams depends on the balanced integration of technologies and pedagogical activities. What virtual team members ultimately pursue during their team activities and how they pursue it determines their team behaviors, communications, and interactions in online environments. Also, the decisions about which tools are selected and which features those tools possess eventually impact the virtual team's processes and performances. However, the increased use of virtual teaming activities has not been accompanied by research efforts to better understand how interactive technologies successfully assist virtual teamwork in online environments.

In response, this study focuses on the identification of the current usage pattern of interactive technologies in virtual teaming activities. To determine this, the study classifies three different modes of technologies (i.e., communication, cooperation, and collaboration), based on two conceptual frameworks: one by Chinowsky and Rojas (2003), and the other by Himmelman (2002). An understanding the usage of different interactive technologies will clarify pedagogical implications related to effective virtual teamwork as well as assist instructors and educational practitioners in designing interactive virtual teaming experiences.

II. Theoretical Review

1. Classifications of virtual teams

What are the differences between of traditional teams and virtual teams? Virtual teams can be defined as "a group of people with complementary competencies executing simultaneous, collaborative work processes through electronic media without regard to geographic location" (Chinowsky & Rojas, 2003, pp. 98). Teamwork for educational purposes requires a group of students to pursue a common learning goal by completing certain tasks. Usually traditional teamwork is carried out in a classroom setting and students gather face-to-face in a place when they need to continue working after the classes. In contrast, virtual teams have different operation mechanisms or ways of interacting than traditional classroom teams. Virtual team members scatter and reside in different places under different time zones. They overcome distances of time and location and to pursue interdependent tasks or team projects mediated by technologies.

Teams evolve. Throughout the process of accomplishing various tasks, teams experiences their emergence and growth over time. At the beginning of teamwork, teams members get to know one another and mingle together to create their identities and norms within the teams. As teams settle down and gradually grow to a maturity, they begin to unite and concentrate on team products. The stages of team developmental process virtual teams go through assist in shaping team behaviors and overall performance. By going through these stages, teams mature to experience the peak of collaboration.

In an extended sense, collaboration can be an ideal form of teamwork for a change. Himmelman (2002) defines that "collaboration is in a relation to three other strategies for working together: networking, coordination, and cooperation" (p. 1). Interestingly, this developmental continuum of four strategies indicates from an organizational perspective that teams can be distinguished by what they are eventually seeking as a team and how they behave during teamwork.

However, this study operationally combines "networking" and "coordination" of Himmelman's terms into the name of "communication". Further, it proposes a modified framework with three modes of teamwork: (1) communication, (2) cooperation, and (3) collaboration (see Figure 1).

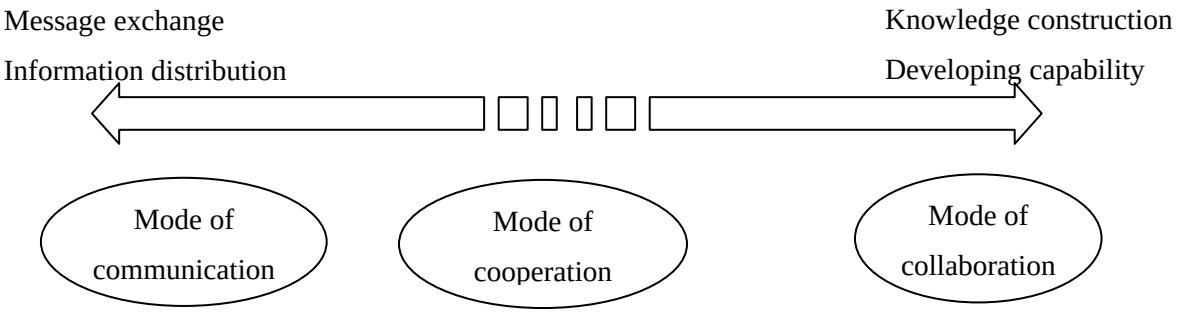

Figure 1 Three modes of virtual teams

For example, virtual teams in a communication mode can be found at an early stage of the team developmental process. Such teams mainly exchange information and change work activities that are mutually beneficial for all participants (Himmelman, 2002). Behaviors such as sending, receiving, or responding to messages are ordinary communication behaviors. Under communication modes, team members transmit information among themselves via technologies. However, they seldom go further to process or manipulate information or data (Chinowsky & Rojas, 2003). Teams naturally show basic communicational behaviors such as social interactions, information searching, and changing activities in order to smooth team activities.

However, communicational behaviors themselves do not guarantee team accomplishment or team effectiveness. Once communicational behaviors begin coordinating positive relationships among team members, virtual teams move into the next level of teamwork: cooperation. Cooperation can be defined as "exchanging information, altering activities, and sharing resources for mutual benefit and to achieve a common purpose" (Himmelman, 2002, p. 2). In a cooperative virtual team mode, they work more actively beyond the behaviors of surface communication and information distribution. Emphasis is placed on a sense of sharing resources within teams. By doing so, team members clarify the direction of team projects and divide labor and take responsibilities for a portion of the mutual tasks (Lehtinen, 2003; Roschelle & Teasley, 1995).

Finally, teams are gradually engaged in an optimal level of teamwork and their viewpoints toward teamwork become mature. They turn a direction for their teamwork onto process and growth, from a product itself. Roschelle and Teasley (1995) suggest that teamwork involves mutual engagement in a coordinated effort to solve problems together. Teams keep exchanging information, altering activities, and sharing resources to fit their mutual project needs as same as what they have done in the modes of communication and cooperation. Further, they eventually support enhancing the capacity of peer members or teams, and on achieving a common purpose (Himmelman, 2002). Collaboration mindset of teamwork pushes team members to jointly produce meaningful products and accomplish team goals (which should simultaneously meet individual goals and expectations); these experiences are typically more authentic and meaningful than traditional learning situations.

2. Classification of interactive technologies

What technologies have been used to facilitate online teaching and learning? How can we classify technologies for a virtual teaming activity? Simply, classical classifications of technologies fall into two categories, asynchronous tools and synchronous tools (Coleman, 1997) or four categories, same time/same place, same time/different place, different time/same place, and different time/different place (Duarte & Snyder, 1999). Some researchers emphasize the significant roles of collaborative writing and groupware in online learning environments (Bonk, Medury, & Reynolds, 1994). For them, the Internet not only opens up interesting and novel collaborative writing opportunities, it also provides new forms of mentoring, scaffolded learning, and cognitive apprenticeship. In addition, web-based collaborative environments open windows on how teams socially interact and negotiate meaning in shared social spaces to produce new documents and reports. It is the permanency and tracking within socially shared workspaces that gives electronic environments significant advantages over physical ones (Schrage, 1990).

It is easily expected that students prefer to select technological tools when their tool functions are understandable and easily accessible to them. Moreover, students use tools better when the use of technological tools is pedagogically well designed. When technologies are properly integrated into the design of online instructions, student will be less resistant to learn in online environments and be more engaged in team building activities. Interestingly, Chinowsky and Rojas (2003) stressed that the roles of technologies in virtual teaming activities go beyond electronic communications, transferring information, and the products of team projects. In a similar sense, Salomon, Perkins, and Globerson (1991) noted that interactive technologies can be working as

cognitive tools to prompt a mental state of students. Considering potential impacts of technologies on virtual teamwork, it is critical that instructors and students be aware of what technological tools can be used effectively under a particular circumstance, instead of being overwhelmed by technologies themselves. This knowledge will assist instructors and students to enhance instructional efforts to create meanings throughout collaboration.

Interactive technologies for virtual teamwork should allow teams to communicate, collaborate, and share knowledge and information resources with other team members and beyond (Mayben, Nichols, & Wright, 2003; Sole & Applegate, 2000). Currently many current course management systems support virtual teaming activities with advanced technological tools containing a variety of functions as well as with primitive tools for file uploading and downloading. However, the proper application of technological tools into the virtual teaming activities is not fully known or exploited. Of course, the appropriate use of technologies determines the quality of virtual teaming process and performance. And yet, many questions regarding effective use of those technologies remain unsolved. For example, just what is appropriate use? In addition, what technological tools can we consider for each of the virtual team modes (communication, cooperation, and collaboration)? And how can we use the technological tools effectively as cognitive tools as Salomon and his associates contend?

If the focus is on technology, several reports help acclimate us to what is available (see Table 1). Mayben, Nichols, and Wright (2003), for instance, list a variety of interactive technologies for online teaching and learning (e.g., email, file transfer protocol, video conferencing, discussion boards, electronic mailing list, instant messaging programs, digital imaging, web sites, phones, and word processing editing tools). Other studies have mostly relied on fairly simple and straightforward synchronous and asynchronous technology classifications or application summaries (Bonk et al., 1994; Coleman, 1997; Duarte & Snyder, 1999). However, this study examines different technologies in different virtual team modes, and it utilizes Chinowsky and Rojas' (2003) spectrum of technologies. Their classification of technologies is useful to examine the actual technology use in virtual teaming activities.

Table 1

Classifications of interactive technologies

Studies	Technologies
Coleman (1997)	▪ Synchronous (desktop and real-time data conferencing, electronic display, video conferencing and audio conferencing) ▪ Asynchronous applications (e-mail, bulletin boards, non-real-time database sharing and conferencing, workflow applications)
Duarte & Snyder (1999)	▪ Same time, same place (residence meeting) ▪ Same time, different place (audio conference, video conference) ▪ Different time, same place (chat room, bulletin board) ▪ Different time, different place (e-mailing, voice mail message)
Bonk, Medury, & Reynolds (1994)	▪ Electronic mail and delayed messaging tools ▪ Remote access/Delayed collaborative writing ▪ Real-time dialoguing and idea generation tools ▪ Real-time collaborative writing tools ▪ Cooperative hypermedia
Chinowsky & Rojas (2003)	▪ Communication technology ▪ Cooperation technology ▪ Collaboration technology

First, the essential functions of communication technologies are on message exchange and information delivery. These communication-type messages can be via either analogue or electronic channels. According to Chinowsky and Rojas (2003), traditional analogue devices such as phones can be one of tools for communication. Also, email is another representative communication technology that delivers messages in an electronic, text-based format. These tools enable students to easily distribute information and resources to one another. However, a phone does not archive their conversations and it requires additional effort to record them on purpose. Meanwhile, students exchange ideas and store information via email. They can track back to the history of email dialogues asynchronously if they save email exchanges and resources in their computers' personal folders. This limited feature of phones and emails support team communications in part, but do not fully exert team products.

Secondly, cooperative technologies feature technical advances over communication technologies. For instance, a forum-style discussion board and team file space fall into the category of cooperation technologies. The central focus of cooperative technologies is to utilize information and develop team-level ideas and solutions related to team tasks. Each team member accesses to his or her designated team workspace, stores collected resources, and updates project documentations. They asynchronously discuss, argue, and debate with team members in a discussion forum and converge on ideas for team products. However, due to asynchronicity of cooperation technologies, their functions are not effective for urgent real-time decision making.

Finally, among the key attributes of collaboration technologies[1] is to provide real-world work situations and experiences. In online environments, a sense of presence is low and students are easily isolated due to a lack of nonverbal cues and potential misinterpretation from text-based communications. Synchronous communications and data production are critical if students need to work in highly contextual learning environments similarly with face-to-face teams, and if team members need to accomplish team products in a limited time. Dual modes of delivery (e.g., visual-text or audio-text) provided by synchronous tools such as videoconferencing or web conferencing are useful for reducing team member efforts by just-in-time data manipulation and idea exchanges. In this sense, real-time chat or video conferencing tools support virtual teams to make team activities smoother and more efficient. Also, additional functions for awareness information (team members' login, teamwork progress, etc.) are critical to support the emotional flow of teamwork process. This information reduces a feeling of isolation and increases a sense of presence over teamwork in online environments. However, the use of collaboration technologies has to be followed by careful planning since it requires coordinating different time zones and additional preparation of software and hardware (e.g., computer camcorder, headset, installation of particular software). The description of different categories of interaction technologies for virtual teams can be summarized as Figure 2.

Each different technology features it own capacity. Important is that each mode of technologies can be appropriate at different stages of circumstances of virtual teamwork. As alluded earlier, many technology applications are currently in use by virtual teams, but the technology use itself does not guarantee the effectiveness of team activities. The present study attempts to identify how technologies support the process and performance of virtual teamwork. The study findings will help to verify the warnings of Kirschner and Van Bruggen (2004) who argue that from a pedagogical viewpoint, current technologies for teamwork are, generally speaking, designed for mechanical functions related to basic communications among team members, or limitedly used for support teaming activities.

[1] Chinowsky and Rojas (2003) classified virtual teaming into interactive technologies of collaboration. However, this study does not see virtual teaming as a technological tool itself, but it is an intentional instructional activity.

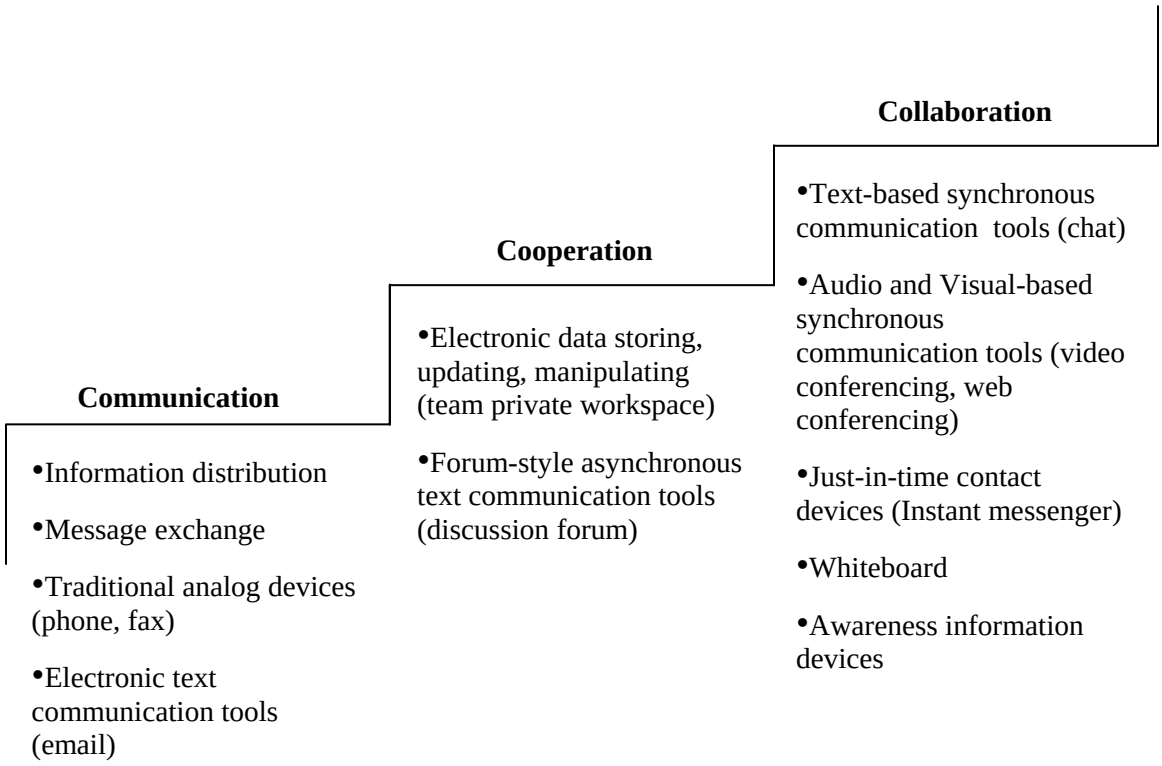

Figure 2. Three modes of interactive technologies

III. Methodology

In this study, online MBA courses in an accredited program at a top ranked business school at a large Midwestern university were reviewed to find out the current usage pattern of different technologies under the three modes of communication, cooperation, and collaboration.

Data collected in this study include: (1) 27 content analyses of course documents and class assignments including student participation in class activities posted on the course management system, (2) surveys of 102 students on their perceptions of virtual teamwork and used technologies, and (3) interviews with 27 faculty members and 12 students. All these data were collected and analyzed to triangulate the data from survey, interviews, and content analyses to identify emerging themes and issues related to technology use in virtual teamwork.

IV. Findings

According to content analyses, 78% of courses (21 out of 27) used virtual teaming activities. Overall, the findings of online student surveys indicate positive satisfaction with teamwork activities as an instructional method in online environments. More specifically, 86% of students responded that working in teams is helpful for learning online (M=4.22[2], SD=.91). Students positively mentioned that virtual teamwork contributed to build co-knowledge among themselves (M=4.18, SD=.80).

[2] 1= strongly disagree, 5= strongly agree

Regarding the use of technologies for virtual teams, 72% of students responded that online courses provided them with useful tools for teamwork (M=3.74, SD=1.01). This study explored further what technologies were used for supporting virtual teams under three categories of communication, cooperation, and collaboration as described in the literature review. The results of the content analyses are as follows:

1. Use of communication technologies

The study results show that virtual teams in the online MBA program frequently use communication technologies for virtual teams—mostly phones and emails. The usage pattern of communication technologies can be summarized into three implications below.

1.1. Easy accessibility of text-based communication tools increases frequency of use: Email is a representative communication tool for daily work and, not surprisingly, virtual teams also widely used email for their communications (27 courses, 100%). The study revealed that both instructors and students liked email due to the simple use and easy accessibility. Also, the functional familiarity of email was one of the reasons students selected email without hesitation as a major tool for interactions. Sending and receiving emails to members within a team help members get to know each other and builds an initial foundation for working together. For example, the following quote shows that an instructor in this online MBA program used email as a way of building a sense of personal cohesion within teams:

> *(Students email me and peer students) each other. Because they could sort of click on a bunch of people and send e-mails that way without going to a particular forum, and I had set them up in groups so that they could have, you know, have the people that they associated with in their group.*

1.2. Analog devices are in good use for team communications: Phones were another frequently used type of communication technology among virtual teams. Phones are a traditional analog two-way communication medium that are not embedded in the course management systems. The immediacy and just-in-time interactions enhanced the use of phones among students. However, students in this program may have used internet-based phone services such as Skype and Google Talk to enhance their team-related processes and activities; we did not ask that in our surveys.

One noticeable usage pattern of phones in the online MBA program was the selection of conference calls. Some virtual teams scheduled to have conference calls for the purpose of group communications when they needed to discuss or make decisions with several members. Obviously, the use of phones and synchronous interactions prompts quick and just-in-time dialogues with their peers whenever they think necessary.

However, the study findings indicate that students were faced with the challenge of appropriate coordination of conference calls due to joint meetings and full team participation being hindered by different time zones. As seen in the quote below, students noted the difficulty in using conference calls:

> *We've used conference calls and the mail and in one course we used conference calls but there were like 6 people on the line so it was kind of hard to do that.*
>
> *Regular phone conversation… (as international student) it's especially difficult for me because I'm on a different (location), I live so far away so the students say okay let's meet up today after work at 8:00. It's 8:00 PM Eastern is like 3:00 AM for me. It's pretty difficult for me. I have to get up, set my alarm, and get over to the clock….so mine is very expensive.*

1.3. Communication technologies are easy to use but limited to promote teamwork: The study findings demonstrate that communication technologies serve primarily to prompt communication

- in other words, message delivery and information distribution. It enables students to exchange ideas or manage simple discussions. However, students point out that these tools have limitations for deep discussions or debates among team members. The following quote illustrates the limited usage pattern of communication technologies for virtual teams.

> *Team discussion usually happen(s) via emails and what happens unfortunately is because the assignments are so big and we're working on it for so long the discussions, we just spend one day at the end on the last day before the submission to discuss. So we're not really discussing much…*

2. Use of cooperation technologies

The tools that support asynchronous activities for development of team products fall into the category of cooperation technologies (e.g., discussion forums, team private workspaces, etc.). In other words, cooperation technologies serve the goals of asynchronous creating, manipulating, modifying, storing, and retrieving team products, while communication technologies are used for information distribution. Also, text-based discussion forums are asynchronously used for elaborating ideas among team members. Implications on the use of cooperative technologies can be summarized as follows:

2.1. Features of discussion forums provide students with opportunities to think more reflectively: Both instructors and students confirmed that text-based asynchronous discussion forums are frequently used tools that make online learning interactive. As evident in the student quote below, asynchronous features of discussion forums pushed students to take time to reflect before posting to discussion topics or threads:

> *I thought the posting (in a discussion forum) was better than the live chat, only because you have more time to think about what you're going to write and to check in and really get into it, think if that's what you're trying to convey, before you post it; whereas in live chat, just like in a normal class, you don't have time to... you're off and speaking spur of the moment and it's not as effective, I don't think, because you're getting first reactions, you're not getting good, hard, solid ideas.*

2.2. Use of team private workspaces assists in management of work processes: Nine courses (33%) provided students with team private workspaces. Team private spaces served the purposes of storing team documents and resources, and exchanging questions and answers among team members.

2.3. Different instructional purposes need tailored functions of discussion forums: This particular study also found that the online MBA program provided instructors with varied types of discussion board assignments in order to support various teamwork activities. In this case study, text-based asynchronous 'court forums' were developed for effective role playing activities during which students play the role of plaintiffs, defendants, and judges. One instructor explained that court forums assist in creating real life situations as shown in the quote below:

> *What I would say is truly interactive is that court forum and it's just the way that I set up the problem I think. They have to work in small groups... They put together their best arguments and then I require them to post a summary of their argument online. And then after both sides have posted a summary of their argument then I'm always the judge and then we have a group of judges and I will begin by posting some hard questions to both sides. Their lines run separately so the plaintiff and defendants are separate. They can see what each other are doing but they don't get to post on the other side, which is my goal is to copy what happens in a real legal argument.*

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> *Less successful was the program I used last time called Q and A. You can post a question and then they post an answer but no one can see the answers until they've posted. They can't see other people's answers… They just wanted to know if they got the right answer. I don't think I'm going to do that again. I like the discussion forums where everybody can pitch in and read what everybody else says at the time is better.*

3. Use of collaboration technologies

Collaborative technologies are defined in this study as tools that serve to enhance the capabilities of team members throughout synchronous interactions. In this study, the usage of one-and two-way synchronous tools in the online MBA program (e.g., chatting tools, video conferencing, LiveMeeting, etc.) was reviewed. Implication on the use of collaborative technologies can be summarized as follows:

3.1. Proper use of chat tools prompts team discussions: Eleven courses (41%) had text-based chatting for class discussions, and five courses (19%) incorporated it into team discussions. In general, students believed that the usefulness of chats rooted from real-time discussion and immediate feedback from peer students and instructors. Providing students with chances to exchange ideas synchronously turned out to be critical to solicit team members to negotiate and make decisions and the following quote illustrates it:

> *Chat is effective and useful to manage teamwork. We used chat quite a lot…In Angel, yeah, and in fact whenever they have not turned it on for a course and always ask for the professor to turn it on because it is quite useful.*

> *It would have been a benefit to have a chat room. I don't remember which class it was, they didn't have the access of the chat room for that class, they talked about doing it, but they didn't, and so that was harder, when all you could do was email. It does help to have a chat room where you can go in and type sentences, live conversation that way, rather than trying to email, which we did one class.*

3.2. Chat discussion requires careful planning and coordination: Students and instructors expressed several difficulties in the use of chat tools similar to the use of conference calls, mentioned earlier. The study findings indicated that issues such as chat-time scheduling across different time zones, limited participation due to traveling and work schedule, slow typing skills for synchronous idea exchanges, small (or limited) text boxes, and no archive log files also hindered instructor use of the chat tools.

Another issue with collaborative technologies raised by instructors and students was flexibility. Instructors want to use specific technical functions or features for their courses. Instructors may want to activate particular tools flexibly to meet their instructional needs as one instructor noted:

> *The reason I think some of that, my understanding of the chat rooms is that's more real time discussion and we just really had a group of people that it was difficult to get all at one time. You know, I had someone in Singapore, I had someone in Taiwan, I had someone on a Navy boat somewhere. You know, that's three out of 15 people, so it was*

very difficult to establish a time and that's one of the reasons I wanted the course very flexible so the people could do it at whatever time without all having to be there at a certain time. And I kind of think that's important for an elective, when they have so many already sort of a rigorous schedule.

3.3. Visualization/awareness information devices helps for better teamwork: Currently, synchronous chats are heavily text-based and offer restricted features. Whiteboards or web cameras were suggested to enhance the sense of presence and simultaneous work. Technical functions for supporting a sense of awareness were suggested for effective use of synchronous discussions. One instructor mentioned the need for more advanced tools coordinating virtual teamwork:

If I'm doing a lecture on inventory costs, I think it would be useful using whiteboard technology and a video camera to have me do what I would do in a classroom, maybe not for everything but for key points, actually go through things on the board, or go through a problem where the problem itself appears in a window on the video screen.

The chat room that we have, it does not tell you whether any of your other colleagues or team members is actually logged in at that point in time or not. So you don't really know if somebody is logged in or not… I know once they get into chat but I may be logged in to the network and I may be doing something else so if I go to chat and I see that okay you are logged in and then I can just send you a quick note saying I want to chat with you. That would be nice because I have no real contact, don't know if you're logged in any more…Our chat is pretty basic. So I think they can upgrade email and chat to give the features that MSN has or email to give the features that Outlook web access has.

Overall, based on the study findings, courses in online MBA programs use a variety of technologies to prompt virtual teaming activities. However, concerns remain that technology use is limited to support the team member's effort to collaborate merely to communicate. Importantly, the operation of virtual teaming activities does not guarantee the effectiveness and efficiency of the teamwork. As Himmleman (2002) suggested, the different modes of teamwork can work better under specific circumstances depending on team tasks and environmental barriers that students face. However, considering the features of online environments, which technologies are being used and how technologies can support teams in different modes should be taken into consideration.

V. Discussions

Here we discuss the findings of this comprehensive study. We make suggestions for better use across the technologies to overcome the challenges against the current usage patterns of technology for virtual teamwork.

First, 'communication technology' can assist a virtual teaming activity in part, but online instructors must consider how to use it effectively for instructional purposes. This study verified Wingard's (2004) finding that instructors and students tend to use technologies for message- and information-sharing purposes. As Liu, Lee, Bonk, Magjuka, and Liu (in the press) pointed out that having students exchange information is always easier than engaging in knowledge construction. Students may start to conduct their teamwork by relying on phones and email due to ease and familiarity. Accessibility to these communication tools is high, but they do not necessarily ensure students' deep engagement and active interactions for collaborating online. Further, phone calls and email do not allow both instructors and students to track and monitor the teamwork process at any time needed. Thus, questions about how to successfully address the use of communication technologies remain to be considered.

Second, online instructors should be aware that the impact of 'cooperative technology' on virtual teams varies depending upon their instructional intention. This study's findings pointed out massive use of cooperative technologies for virtual teaming activities in an online MBA program. Key attributes for cooperative technologies (such as text-based discussion forums or teamwork spaces) include asynchronicity and text-based formats. Such capabilities can be easily seen in most any online course. However, cooperative technologies can be maximized by well-designed instructional activities that can overcome their drawbacks for effective learning. For instance, some features such as time-delay of cooperative technologies could be a barrier to an interactive discussion when students fail to respond to each other.

At the same time, instructors should realize that asynchronous features of discussion forums boast the potential to foster reflective discourse among virtual team members by allowing them enough time to think about and elaborate their ideas before participating in discussions. As described previously, this particular study provided evidence that carefully designed role-based discussions that utilized the delayed nature of cooperative technologies can have an enhanced reflective learning experience. Also, students get chances to reflect on their team learning and performance simply by re-accessing archived messages and documentation. Thus, how instructors design the features of cooperative technologies in their courses determines their successful use.

Third, appropriate use of advanced features of 'collaboration technologies' enriches the context of virtual teamwork. Advanced technologies with high media richness enhance educational experiences for online students (Bonk & King, 1998). In the online MBA program of this particular study, one instructor pioneered to experiment with the potential use of a web conferencing tool, LiveMeeting, for synchronous online learning activities. However, the use of LiveMeeting was not popular due to the unfamiliar functions and a lack of understanding of its pedagogical capabilities. In fact, he mainly used it to deliver an audio lecture (i.e., one-way and single channel communications) and was unable to use the majority of the functions to solicit interactive responses from students, implying that advanced web conferencing functions neither ensure teaching and learning, nor promise successful use. This lesson indicates successful online teaching and learning require thorough instructional planning and knowledge on appropriate usage of advanced technologies. Providing instructors with best practices or user guides via faculty workshops and training would also help instructors to have a sense of how they can utilize those advanced technologies in their courses. Without such knowledge, the collaborative technologies may not be effectively used to fully exert the benefits of their technological features.

On the other hand, advancing technology use in an online program requires leadership, risk-taking, and programmatic support from the administrators and staff. For example, the online MBA program of the present study carefully has reviewed the potential use of audio and voice messages such as webcasts and podcasts (Liu et al, in press). Pilot instructors were selected to test small scale uses of new and underutilized technologies. At the same time, the selection and adoption of advanced technologies must carefully consider issues such as accessibility, training, instructor workload, and previous technology experiences of online learners.

In addition, the synchronous attributes of collaboration technologies would be helpful for any stage of the teamwork process—for example, when students need to build team cohesion and human touch by sharing social presence at beginning of teamwork, or when instructors and students need to provide and take real-time feedback.

Fourth, the function specification of technology types should be determined by instructional, not technical viewpoint. General course management systems such as WebCT, Blackboard, Sakai, and Moodle rarely embed specific pedagogical strategies such as role assignments that assist in knowledge sharing, debate, and reflection (Bonk & Dennen, 2003). The present study provides evidence that well integrated pedagogical functions within a course management system

can enhance the effectiveness of collaboration. Text-based court forums in the online MBA program of the present study can be a good example of how technologies work as cognitive tools. The program modified traditional text-based discussion forums and tailored them into a form of court forums for role play, which were highly regarded as effective by both instructors and students. What we should remember is that this court forum worked asynchronously the same as an ordinary discussion forum but instructors and students reported that its functions were tailored well to fit into role-playing activities. As this example indicates, the strength of technologies can be maximized when instructors or course designers plan for the use of technologies according to their instructional goals and intentions.

Another good instructional example from this online MBA program is the tool that supports team assignment options in the course management system. With team builder tools, instructors could assign teams easily or allow students to self-select their preferred teams. The use of team builder tools is a prime example of how technologies could reduce instructor's administrative workload while enhancing the self-control of online learners by giving them options to choose their teams.

Fifth, the nature of team tasks should be taken into consideration when instructors select particular technologies. Each level of technologies—communication, cooperation, and collaboration—has its particular strengths and weaknesses. To effectively integrate technologies into pedagogical activities, an instructor should carefully consider the features and tasks that support appropriate learning activities.

Of course, sometimes the strengths of technologies, such as the real-time feedback of a chat discussion, could be a weakness in another context due to the requirements for synchronous accessibility and the preparation time required. It is important for online instructors to carefully balance considerations of different technological attributes with students' learning environments. As noted in the following quote, some instructors avoid the uses of innovative synchronous tools due to concerns about accessibility while students seem to have interest in engaging in a chat with online instructors:

> *I steered away from online live chats because I have students all over the world and I don't like to be time bound and they don't like to be time bound. I haven't missed it and no one has ever complained about not having chat. I think I could probably do a better job of office hours. But I'm always answering emails and if it's an email question that I think the class would have I always post it. So I don't know that the online chat really would be better.*

Sixth, online instructors should know that cultural variability impacts the use of particular technologies for collaborating online. Technologies are often called 'cognitive tools' (Jonassen, n.d.) that support the cognitive engagement of students, and further, Crook (1994) extends the application of technologies as a 'cultural amplifier'.

Often, cultural orientations of students may drive their behaviors into different communication behaviors, and may enable or hinder the facilitation of interactions via particular technologies. In this sense, the usage pattern of technologies can be influenced by cultural orientation of students. For instance, students in collectivist cultures value social interactions to build intimacy within teams (Massey, Montoya-Weiss, Hung, & Ramesh, 2001). They feel comfortable with high contexts of team work situations that provide students with verbal and non-verbal clues and information. Technologies that allow students more than two channels of message delivery (e.g., electronic whiteboard or video conferencing, etc.) would assist in enhancing contextual cues in a similar fashion to face-to-face meetings. On the other hand, students in individually-oriented cultures tend not to endure the state of uncertainty and conflict, and soon they jump directly into discussions and debates (Massey, Montoya-Weiss, Hung, & Ramesh, 2001). Their

straightforward communication patterns make them get along with lean technologies that provide with few clues of communications (e.g., email, fax, etc.).

In terms of technologies that may cause different reactions from different cultural orientations, instructors need to learn the cultural differentiation of their students since it can impact the effectiveness of virtual teaming activities. It can be suggested that establishing team norms and ground rules of what, when, and how to use technological tools for teamwork would help to reduce unnecessary tension and misinterpretation among team members (Massey et al., 2001).

In summary, each technology has its function. It is not clear-cut what technologies to use and when to use the technologies. Whether we will have the balanced use of three technologies depends upon how instructors design the virtual teaming activities from a pedagogical perspective. See Table 2 for the features, advantages, challenges, and issues related to communication, cooperation, and collaboration technologies.

Table 2

Comparison of different interactive technologies

Technologies	Features	Challenges
Communication technology	Analog devices Access available at any time Easy to use Familiar functions Impersonal media Ambiguity of text messages (email)	Asynchronous electronic communications Synchronous analog communications Heavily depend upon information transmission Limited access to archived information and conversations Limited communicational clues and contexts
Cooperation technology	Able to support various instructional activities Allowing time to reflect and elaborate thinking Effective to avoid repetitive questions through email Impersonal media Ambiguity of text messages	Time delay due to asynchronicity Limited communicational clues and contexts Needed for detailed planning for function specification
Collaboration technology	Real-time exchanging opinions Prompt feedback Providing high contextual clues Prompting dual coding of information Possible to be distracted	Work awareness information required Information on teamwork progress required

VI. Conclusion

Overall, the review of interactive technologies for virtual teaming activities shows that many technological tools are embedded in the course management systems. In practice, most online behaviors of virtual teams fall into the usage patterns of communication and cooperation. Accordingly, in this study, technologies that were in heavy use were those assisting communicative and cooperative activities. The actual use of collaboration technologies reported in the present study was relatively low, compared to the other two categories of technologies. It is

natural that virtual team members, at the beginning of the teamwork process, tend to start communicating and distributing information.

However, what to remember is the fact that communication behaviors of team members and the novelty of technologies have numerous constraints and limitations that hinder team productivity and ultimate deliverables. Communication behaviors are necessary to build a basic foundation in teamwork environments, but they do not always improve higher-order thinking and collective knowledge-building among team members. Consequently, teamwork for learning purposes should go beyond information transmission, labor division, and working independently.

As Kirschner and Van Bruggen (2004) stress, simple implementation of virtual teaming activities does not guarantee the effectiveness and efficiency of the teamwork. It is more important to guide appropriate usage of technological tools to support the whole process of collaborative learning so it can eventually lead virtual team members to improve team performance.

In this study, the use of technologies to promote virtual teaming activities was examined. The results indicate that teaming approaches have been widely used in online courses. The perceptions of instructors and students have been slowly transformed to understand the dynamics of online environments. However, sufficient faculty training support must be provided to speed up this transformation within distance education. Also, the success of online courses depends on the appropriate use of pedagogy and related technologies, not just on the introduction of technologies themselves. It is time to change the focus, alter the conversation, and shift the funding, from an emphasis on which technologies are now available to examples of interesting and effective pedagogical use of such technologies for online collaboration among participants distributed across geographic settings.

References

Bonk, C. J., & Dennen, V. (2003). Frameworks for research, design, benchmarks, training, and pedagogy in Web-based distance education. In M. G. Moore & B. Anderson (Eds.), *Handbook of distance education* (pp. 331-348). Mahwah, NJ: Lawrence Erlbaum Associates.

Bonk, C. J., & King, K. S. (Eds.). (1998*). Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bonk, C. J., Medury, P. V., & Reynolds, T. H. (1994). Cooperative hypermedia: The marriage of collaborative writing and mediated environments. *Computers in the Schools, 10*(1/2), 79-124.

Carabajal, K., LaPointe, D., & Gunawardena, C. N. (2003). Group development in online learning communities. In M. G. Moore, & W.G. Anderson (Eds.), *Handbook of distance education* (pp. 217- 234). Mahwah, NJ: Lawrence Erlbaum Associates.

Chinowsky, P., & Rojas, E. (2003). Virtual teams: Guide to successful implementation. *Journal of Management in Engineering, 19*(3), 98-106.

Coleman, D. (1997). *Groupware: The changing environment*. In D. Coleman (Ed.), Groupware: Collaborative strategies for corporate LANs and intranets (pp. 1-37). Upper Saddle River, NJ: Prentice Hall.

Crook, C. (1994). *Computers and the collaborative experience of learning*. London, NY: Routledge.

Duarte, D., & Snyder, N. (1999). *Mastering virtual teams: Strategies, tools and techniques that succeed*. San Francisco, CA: Jossey-Bass.

Himmelman, A. T. (2002). *Collaboration for a change: Definition, decision-making models, roles, collaboration process guide*. Minneapolis: Himmelman Consulting. Retrieved October 7, 2005 from http://depts.washington.edu/ccph/pdf_files/4achange.pdf

Jonassen, D. H. (n.d.). Technology as cognitive tools: Learners as designers. *ITForum Paper 1*. Retrieved December 20, 2005 from http://itech1.coe.uga.edu/itforum/paper1/paper1.html

Kirschner, P., & Van Bruggen, J. (2004). Learning and understanding in virtual teams. *Cyber Psychology & Behavior, 7*(2), 135 -139.

Lee, S., Bonk, C. J., Magjuka, R. J., Su, B., & Liu, X. (2005). Effective use of collaborative technologies for virtual teaming. ***Proceedings of the*** *Association for Educational Communications and Technology,* 336-370.

Lehtinen, E. (2003). Computer supported collaborative learning: An approach to powerful learning environments. In E. De Corte, L. Verschaffel, N. Entwistle, & J. Van Merriëboer (Eds.), *Unraveling basic components and dimensions of powerful learning environments* (pp. 35-53). Amsterdam: Elsevier.

Liu, X., Lee, S., Bonk, C. J., Magjuka, R., & Liu, S. (in press). Technology use in an online MBA program: Issues, trends and opportunities. In T. Kidd (Ed.), *Handbook of research on instructional systems and technology*. Hershey, PA: Idea Group.

Massey, A. P., Montoya-Weiss, M., Hung, C., & Ramesh, V. (2001). Cultural perceptions of task-technology fit. *Communications of the ACM, 44*(12), 83-84.

Mayben, R., Nichols, S., & Wright, V. H. (2003). Distance technologies in collaborative research: Analyzing the successes and barriers. *The Journal of Interactive Online Learning, 2*(2), 1-21.

Palloff, R., & Pratt, K. (2005). *Collaborating online: Learning together in community*. San Francisco, CA: Jossey-Bass.

Roschelle, J., & Teasley, S. (1995). The construction of shared knowledge in collaborative problem solving. In C. E. O'Malley (Ed.), Computer supported collaborative learning (pp. 69-97). New York: Springer-Verlag.

Salomon, G., Perkins, D. N., & Globerson, T. (1991). Partners in cognition: Extending human intelligence with intelligent technologies. *Educational Researcher*, *20*(3), 2-9. Retrieved October 2, 2005 from http://www.jstor.org/view/0013189x/ap040202/04a00020/0

Schrage, M. (1990). *Shared minds: The technologies of collaboration*. New York: Random House.

Sole, D. L., & Applegate, L. M. (2000). Knowledge sharing practices and technology use norms in dispersed development teams. *Proceedings of 21st international conference on information systems*, 581-587.

Wingard, R. (2004). Classroom teaching changes in Web-enhanced courses: A multi-institutional study. *Educause Quarterly, 1*, 26-35.

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Editor's Note: Three online instructors share approaches to learner communication preferences, examining mode, type, and frequency in the communication process.

Communicating with Online Learners

Sharon Bender, Jackie Brewer, Robert Whale

Introduction

Roughly 80% of all learners today prefer correspondence style learning, which we commonly refer to as "online learning" or "distance education." The biggest advantage of online learning is that assignments can be accessed anytime and anywhere that it is convenient for the learner. Learners who have participated in online courses have noted that they have time to think and reflect before formulating responses. Equally they enjoy the interaction with the instructor.

Communication between instructor and learner is paramount in their success in the online learning environment. With electronic means (the only way to communicate with learners at a distance) the matter of what means, what form, and how often has risen to the forefront in what is necessary for learners to enjoy a rewarding learning experience. Interaction lies at the very core of online education. The effective online instructor communicates with learners on a regular basis. How frequently should an online instructor communicate with class members? What constitutes effective communication? What is the learner's preferred platform? With the end goal being “active learning,” communication is at the heart of a successful learning experience.

In examining the communication component, three online instructors have analyzed their approaches to communicating with online learners based on their lived experience for a combined 20 years. Bender, Brewer, and Whale have examined three major learner preferences: 1) mode of transmission, 2) type of correspondence, and 3) frequency of communication.

Mode of Transmission

Method of transmission considers the preferential means of transmitting messages such as e-mail, electronic classroom, and telephone. Modes of transmission tend to be those most commonly used in the online learning environment, namely e-mail, electronic classroom, and telephone. The method(s) used to transmit and receive messages seems to matter to online learners a great deal. They tend to have particular needs that must be met, but there seems to be an overall consensus that ranks the e-mail, electronic classroom, and telephone applications.

When speaking of transmission modes, it is important to recognize that there is no “one best solution” for all circumstances. As in the online classroom itself, the best practices are the result of flexible adaptation to changing contingencies. The ideal scenario is where the instructor utilizes all modes of transmission prudently in order to achieve learning objectives.

Further, the preferred mode of transmission in the online education world varies from institution to institution. Specifically, the type and quality of the hosting software more often than not dictates which mode of transmission instructor and learner prefer. Since there is no uniform hosting platform for online education classes, dozens of software alternatives exist, with the end result being that different institutions foster varying tendencies.

E-Mail

Transmitting messages using e-mail tends to be the most popular method according to feedback from online learners who are typically versed in the use of e-mail. Such use is customary and a comfortable means of sending and receiving messages. This comfort leads in the learner's preference for message transmission for the purpose of interacting with instructors. The same

applies for the instructor. There is little or no learning curve involved as there may be in understanding how to properly use the electronic classroom application and there is no discomfort as there may be with a live telephone conversation.

E-mail is used to communicate feedback on assignments and to disseminate announcements. And if there is no online grade book, e-mail is the primary means to inform students of their standing in the course. According to Brewer, e-mail can be the single greatest tool for online learning. E-mail enables the instructor and learners to develop individual working relationships and to exchange information related to the course work. E-mail is a software tool that almost all working adults have access to both at home and at work. Additionally, it is often easier for learners to use e-mail at work than to access the electronic classroom. Learners often seek to communicate with the instructor from work.

Electronic Classroom

Transmitting messages using the electronic classroom tends to be favored by as many learners as those who do not favor the application. It could be said that to "force" use of an electronic classroom may only be about 50% affective in meeting the needs of the online learner. Online learning tends to draw an adult population that is already involved with extended obligations such as work and family. They are seeking a great deal of flexibility for which the cohort environment does not offer them. It seems that about one half of all learners need to work ahead or more slowly and the electronic classroom does not tend to offer such flexibility. It is typically tied to a tight schedule that forms a "cookie cutter" environment that all learners must mold to in order to be successful. But learners have noted that they have a "voice" in the online class because they are writing and posting their ideas in threaded discussions, submitting assignments for class feedback, or responding to other students' work. But for every learner who enjoys the electronic classroom, there are as many who do not, preferring to abstain from the cohort form of learning, which gives them even greater flexibility. These learners appear to be more self-directed individuals.

For those schools using high quality software that was designed specifically for the online paradigm, the tendency is to do most of the communication in the electronic classroom. The classroom acts as the "hub" of activity and it is where the syllabus is posted, where discussions are generated (both synchronous and asynchronous), where grades are posted, where e-mail is sent (but not usually read), and where student-to-student interaction primarily takes place. Many online education software providers also provide a built-in "Chat" feature which allows synchronous communication that can be scheduled according to learner and instructor availability. Because so many software packages offer a comprehensive set of features, the electronic classroom is the logical and convenient place to promote interaction and maintain order. In such scenarios, e-mail is primarily reserved for private interaction between instructor and learner. In an instance where the software is not specifically written for online instruction e-mail assumes a much more prominent role.

The electronic classroom can be a very effective mode of transmission if the instructor establishes a positive virtual community that encourages the learner's participation. A harsh or overly demanding instructor may generally achieve minimal compliance to posted requirements. However by using a more subtle approach and appealing to the learner's individual interests related to the course material the instructor is more likely to achieve high levels of participation from the majority of learners in the electronic classroom.

Telephone

Transmitting messages using the telephone tends to be the least popular method. The online learner tends to be an individual that enjoys working at a distance. This distance can mean seeking more live interaction for some and not for others. Telephone interaction tends to take

place on only certain occasions when written communication is unable to convey the message properly. For online instructors who are often adept at this form of communication, there aren't many occasions when live interaction is necessary. It may, therefore, be a matter of need rather than preference for the telephone mode of transmitting messages.

The telephone call, while minimally used, can still be a highly effective mode of communication in the online experience. For example, Whale has had great success with calling individual class members and welcoming them to class. Many students appreciate the individual attention and enjoy hearing a real voice to accompany the written word. Also, the telephone can be very beneficial when explaining technical material, as thoughts can be more readily conveyed and understanding of difficult material can be more easily assessed.

Despite its lesser popularity the telephone is often underutilized as a means of communication. Brewer has noted that talking live to learners helps establish rapport and encourages a working relationship with learners whereas electronic means of communication is a bit more impersonal. Including live conversations in the modes of transmission can provide the missing connection, especially if instructor or learners are not able to convey meaning in writing.

Type of Correspondence

Type of correspondence considers the preferential forms of corresponding such as brief notes, detailed messages, and constructive feedback. Learners thrive on interaction with the course instructor but they indicate a preference when they are given the opportunity to offer their course satisfaction. While correspondence can be informative and supportive, it can be disruptive if not done informatively. Further learners have a preference in the type of correspondence among brief notes, detailed messages, and constructive feedback.

Brief Notes

Brief notes that provide updates and reminders are preferred over the more lengthy instructional message. It is a good idea to provide all necessary instructions up front and then follow with brief reminders. Frequent brief notes in the form of announcements effectively communicate information not only for assignments, and they are also a reminder that the instructor is on the job. Notes can keep learners informed, offering nuggets of information that might otherwise equate to too much material at one time. Brief notes can serve as reminders that assignments are due or to bring to the forefront pieces of information that appears to the instructor to be a point that was overlooked by most learners in the class. In addition a brief note in e-mail to a learner is an effective method to give positive feedback and to provide consistent encouragement and moral support to learners who appear to be inclined to lag behind in their course work.

Detailed Messages

Messages that provide instructions that are informative rank high among the preferred type of correspondence, but not as high as receiving feedback. Detailed messages can be too lengthy and therefore ineffective. A detailed message that is clear and to the point offering tips, for instance, is much preferred to messages that are boring in content with too many points that are not well organized. Bullet points in a detailed message can be more effective than lengthy paragraphs, require less time to read, and are easier to reference particular information. Detailed messages are most effective for identifying the instructor's expectations for the course, but the message must be clear and concise.

Constructive Feedback

We all need to give and get feedback. Online learners expect and deserve periodic feedback that is consistently prompt, accurate, and fair. Due to the lack of face-to-face interaction that a traditional classroom setting offers, online feedback takes on added importance and must be more

frequent. The feedback is most beneficial when it is offered immediately after the behavior in question. Whale has noted that it is best to offer feedback on all direct correspondence and assignments within 48 hours. This ensures feedback that is timely and allows learners sufficient time to conform to instructor expectations. Every graded activity should include meaningful feedback particular to each individual student.

Bender stresses that providing feedback is absolutely critical for learner success. Feedback should be positive and constructive with the objective to do no harm to the learner. Feedback should provide specific guidance and direction. Letting the learner know they did a great job on an assignment for instance may not be sufficient feedback. An instructor needs to specify why the work was done well or explain what the learner could do to make improvements.

Feedback is an excellent opportunity to help each learner build better writing and/or research skills by giving concrete guidance and direction. Providing feedback within 24 or 48 hours is beneficial. According to Brewer, learners would rather wait an extra day or two for the feedback that is substantive rather than receive feedback that is of little value. However, Bender has noted that when there is little time for a more in-depth message, one that constitutes positive feedback is necessary even if it is very brief. In this sense, something is better than nothing, and time may be of the essence for some learners.

Frequency of Communication

Frequency of communication considers the preferential timing in communicating such as timely response to questions and assignments, regular announcements, and occasional updates on class progress. The frequency of communication can affect the nature and quality of all forms of communication. Therefore, a reasonable balance must be struck in discussions. Up to a point, the quality of discussions is highly dependent upon the amount of interaction. A more active degree of interaction between instructor and learners tends to spawn a deeper level of learning, creating a propensity for more disclosure of personal experiences from the instructor, as well as more self-discovery on the part of the learner. In such dynamic, the instructor seeks to facilitate the learning toward pre-determined objectives.

Due to the inherent differences between traditional learning and online learning, the degree of participation by an instructor often depends on the course, the type of activities in question, and the number of students. The tendency to establish “classroom intimacy” has very little to do with geography but much to do with degree and frequency of interaction. Too little interaction on the part of the facilitator can be a catalyst for failure in generating the necessary inertia to achieve learning objectives. Too much instructor activity can likewise yield undesirable results. In cases where instructors respond to virtually every post with an additional question, the intended result is not achieved, that of interaction with the instructor. The activity has been viewed with negativity. Although the effort to promote critical thinking is admirable, it can become a detriment if taken to an extreme. Ideally, the online instructor acts as a “guide on the side,” not a “sage on the stage," according to Whale. He has noted that the online learner must create a presence in the classroom or in any form of communication, finding that the class will invariably follow the lead of the instructor in style and substance if there is frequent involvement, but that is not excessive.

Frequency of communication can be examined in terms of timely response, regular announcements, and occasional updates. These areas can present opportunity for connecting with the learner as well as creating a community environment among the class.

Timely Response

Fast turnaround on questions and assignment submissions is critical to learner success. Bender has received praise from learners for fast response to questions as well as to providing feedback on assignments. Fast response to assignments has been her most frequent compliment. Learners want and appreciate knowing how they are doing in the eyes of the instructor. It helps build their confidence and encourages a more meaningful effort in producing course work. It also produces greater frequency in on-time assignment submissions. Taking too long to respond can instill a negative emotion in learners and potentially stall their progress. Timely responses reveal to the learner that the instructor cares about their success.

Finding a balance between timely and meaningful communication is important. Being in such a rush to meet specific timeframes, it is easy for the instructor to lose sight of the fact learners are people with real needs and emotions. Being fifteen minutes faster is not as important as taking the time to effectively communicate with the learner as an individual. For example, at the beginning of the class there should be an extremely high level of interaction from the instructor with each of the learner's to help establish expectations and to become acquainted with each other. On the other hand, during times when learners are writing major project papers, it is not the time for the instructor to be chatty with learners and send out lots of e-mail and announcements. The level of interaction should change in keeping with the flow of the course material. However, the responses should always be as timely as possible given the flow of the course materials.

Regular Announcements

One of the best things an instructor can do to create a feeling of connectedness is to post weekly class announcements. The frequency depends, of course, on a variety of factors, but announcements can be beneficial if posted on a weekly basis. Announcements can clarify existing student questions or issues of concern. Obviously, announcements should shed further light upon existing class policies and protocol, and should always be in alignment with a published syllabus.

Posting an announcement to introduce each new learning phase for instance yields positive results. It is highly appropriate to summarize what was learned in the previous phase, as well as set the proper context for what lies ahead. It is helpful to reiterate what the upcoming reading assignments and class activities are. This can be a timesaver for learners, as they don't have to check the syllabus, and it also places assignments in the proper context of what is being discussed. Whale has discovered that students welcome the redundancy, as they are more likely to read a recent announcement than refer to a syllabus that may have been posted weeks earlier.

Utilizing regular announcements along with e-mail is an effective way to practice the redundancy that is needed for learners to understand expectations for assignments. Posting an announcement reminding learners a major paper is due, then following up with an e-mail with the specific requirements is helpful for learners. In addition, posting the major paper or project requirements in a discussion area several weeks in advance provides a source of reference for learners without having to go back to the syllabus. The key to success is not only using frequent and regular weekly announcements, but also keeping the announcement as brief and concise as possible to maximize effectiveness for communication.

Occasional Updates

Learners appreciate occasional updates on course progress. They enjoy knowing what the instructor is thinking and what the instructor sees as overall class progress. Learners like to be informed and know how to relate their standing in the class to its overall progress. Occasional updates, while desirable pale in complexion to the dependable regularity of announcements, but occasional updates could be a delivered message that is less formal and personalized to show the learner has feelings and emotions. It is a chance to personalize the instructor.

While occasional updates such as a grade update are a good idea, learners need to know their grade with each assignment feedback. Sending out updated grades with an assignment only takes an extra minute or two and is a way to deliver a personalized perspective of the learner's individual progress in the course, which can be more effective than sending out occasional updates regarding course progress.

Summary

Learners are responsive in the online learning environment when there is interaction with the instructor. Instructors can encourage interaction through the various modes of transmission, types of correspondence, and frequency of communication. With more learners than ever before in history going to school online, interest in how to yield the highest and best results is consistently at the heart of concerns for universities, instructors, and learners. Learners often select **e-mail** as their preferred mode of transmission, **constructive feedback** as their preferred type of correspondence, and **timely response** to questions and assignments ranks highest among preferred frequency of communication.

E-Mail

E-mail offers and opportunity for giving and getting messages with greater speed and simplicity. However, there can be a great misuse of e-mail rendering its benefit lost. To make the best of this preferred mode of transmission consider words are the key to a successful conveyance. To deliver the intended impact, writing must be clear and comprehendible to the target audience.

To deliver effective messages begin with developing a precise subject that is clear. It is a good idea to outline or list main ideas and add details later. Bender proposes that to be sure all relevant items have been incorporated a set of questions aid in preventing any oversights that are constructed from a set of "question words." This set of terms are based on a particular use of what, when, where, who, how, and why. These six terms can be reduced to three groups of two question words each. Some examples are who/when, where/why, and what/how. Combining the six question words in various arrangements not only makes formulating ideas simpler, it helps the writer test whether all necessary information has been provided, leaving no question for the learner to struggle to answer.

Sentences can easily be formatted around question words that guide thinking, ensuring that nothing has been left out of the written discussion. Keep in mind the secret to organized writing lies in three key steps:

> **Outline:** Enumerate the purpose and major points.
>
> **Write:** Draft a rough copy of the writing.
>
> **Review:** Polish the writing through several iterations.

This application may seem extensive for the brief messages we tend to send via e-mail, but messages in e-mail have been growing to complete documentation of all forms. Writing skills have been becoming increasingly important and e-mail no longer excuses the absence of quality writing.

Constructive Feedback

Bender proposes that Instructors can provide feedback to learners more effectively, and learners can provide feedback to instructors and peers with greater results if they apply the key actions in 3Ps of feedback objectives:

> **Purpose:** State the reason for your feedback.
>
> **Perspective:** Provide your viewpoint on the issue.

Proposal: Suggest a fruitful conclusion.

Feedback development can become an easy task to master if you answer a few basic questions concerning any matter.

Why are you giving the feedback?

Who does the feedback involve?

What actions do you want to affect?

How might the suggestions be helpful?

Where can additional support be found?

When is the conclusion expected?

Timely Response

Maximizing the effectives of timely responses to questions and assignments may require a bit of time management or setting priorities. It could be a matter of preparation. Setting up a system to enable a speedy response means devising responses to the standards kinds of responses. Answering questions requires one kind of response and responses that provide feedback to assignments is another. Both must be done with time sensitivity.

Developing responses from common themes are possible using thematic griding, an application in cartographic science, a process used to explore ideas and concepts. The thematic approach organizes subject matter around a unifying theme. Ideas and concepts are integrated around the identified theme, building constructs into a whole. This approach reinforces and strengthens the concept of patterns. Users are then able to make important connections and understand more of the essential questions upon which to build problem and solution statements. In order to use this application, seek to discover those frequently asked questions and strive to develop an understanding of the major kinds of feedback used successfully in the online learning environment.

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Editor's Note: This study compares reciprocal peer tutoring to conventional classroom instruction in a class in Introductory Technology. Make your prediction of the outcome and then read on….

Effect of Reciprocal Peer Tutoring on the Academic Achievement of Students in Introductory Technology

R Uwameiye and S. E. O. Aduwa-Ogiegbaen

Abstract

This study was carried out in order to ascertain the effect of reciprocal peer tutoring on the academic achievement of students in Introductory Technology. The population of this study consisted of all public junior secondary schools class two in Esan West Local Government Area of Edo State, Nigeria. The instrument used for data collection was Introductory Technology Achievement Test (ITAT) which contains 50 multiple choice items. The result of this study indicated a significant difference between the mean posttest achievement of students' taught using reciprocal peer tutoring and those taught using conventional methods.

Background of the study

Education is the totality of life experiences that people acquire, and which enables them to cope with and derive satisfaction from living in the world. This is because it enables them to achieve social competence and optimum individual development. It is on this premise that it is believed that the quality of a nation's education is proportional to the level of its prosperity. Economically, advanced nations of the world are distinguished by the excellence of their educational system. Towards revolutionizing Nigeria's educational system, the 1969 Curriculum Conference gave birth to the national policy on education (Federal Republic of Nigeria, 1981) which brought changes into the Nigerian educational system. A major change is the one from the 6.5.2.3 system of education to the 6.3.3.4 system of education which came into prominence in Nigeria in 1982.

This 6-3-3-4 means six years of primary school, three years of junior secondary school, three years of senior secondary school and four years of university education. The 6-3-3-4 system which was introduced in 1982 brought many reforms into the educational system in Nigeria. At the secondary level, pre-vocational subjects were introduced into the curriculum while vocational subjects were introduced into the senior secondary level.

The focus of the pre-vocational was to expose students at the junior secondary school level to the world of works through exploration. Such exposure will enable junior secondary school students make intelligent career choice and also intelligent consumption patterns.

Among the prevocational subjects in the junior secondary school curriculum, are practical agriculture, Home Economics, Business Studies and Introductory Technology. Introductory Technology is an integration of components of woodwork, metalwork, basic electronics, applied electricity, water flow technology, airflow technology, food preservatives, automobile, technical drawing, physics, rubber technology, chemistry, plastics, basic building technology, and ceramics. Introductory Technology gives opportunities to students to use tools and machines, which are used in the industrial processes. This helps to develop good attitudes towards technology and the industry. Uwameiye (1993) reported that through Introductory Technology, students are helped to explore the various areas of technology towards making intelligent career choice. He/She explained further that introductory technology does not in any way provide training for specific occupations nor aims at developing competencies.

Introductory technology which is the only core subject among the pre-vocational subjects of the junior secondary school in Nigeria, involves the academic practical study of materials, and sources of energy with the ultimate intention of applying knowledge from the study to provide a comfortable environment for man. This study of Introductory Technology helps to reduce ignorance about technology. The subject has three main objectives as stated by Federal Republic of Nigeria (Federal Ministry of Education, 1985):

1. to provide pre-vocational orientation for further training in technology;
2. to provide basic technological literacy for everyday living and
3. to stimulate creativity.

Towards the realization of these objectives of Introductory Technology, adequate teaching methods must be put in place for its teaching so that optimum achievement can be guaranteed. Reciprocal Peer Tutoring (RPT) is one of such methods of instruction used in teaching.

RPT is a teaching method in which students of the same class and of the same age bracket undertake the teaching of themselves through a process whereby one student among the group teaches other students. It is a procedure that enables each member in a group to participate in the group as a tutor. According to Griffin & Griffin (1997), students function equally as both tutor and tutee in reciprocal peer tutoring system of teaching.

Since RPT is a teaching method which consists of recurrent instructional processes applicable to various types of subject matter and usable by more than one teacher. It is a pattern of interaction between the tutor and the tutee, with the experience intended to lead to a change in learner's behaviour, otherwise known as learning outcomes. Interaction here implies the verbal and non-verbal communication, which forms the basis of any teaching method.

RPT is one collaborative approach where pairs of students interact to assist each other's academic achievement by one student adopting the role of tutor and the others the role of tutee. Recognizing the benefits gained by students from acting as tutors, reciprocal peer tutoring formalizes a process enabling both students in a peer tutoring pair to participate and experience the role of tutor as well as tutee. In this dual role as tutor and tutee, students benefit through the preparation and instruction in which tutors engage, as well as from instruction that tutees receive.

Methodology

Research Design

The study employed quasi-experimental research design of pre-test, post-test control group. The effects of two strategies (RPT and conventional) on the academic achievement were examined. The design was specific with non-randomized control group and non-equivalent groups. This was because the subjects were taken as intact groups composed of mixed of low and high achievers.

Population for this Study

The population of this study consisted of all public junior secondary schools class two in Esan West Local Government Area of Edo State. There are seventeen (17) public junior secondary schools in Esan West Local Government Area of Edo State.

Sample for this Study

Purposive sampling technique was adopted and used to select schools for the study. Out of all the public secondary schools in Esan West Local Government Area, two of them were randomly selected for this study using the table of random numbers. The subjects were intact group from the selected schools. Chosen schools were randomly assigned to experimental and control group while students in the sample schools remained in their intact classes.

Instrumentation

The only instrument used for data collection was "Introductory Technology Achievement Test (ITAT) (Uwameiye and Ojikutu, 2005)". ITAT is a standardized test which contains 50 multiple choice items. ITAT has reliability index of 0.78.The topics which were chosen were taught using RPT for the experimental group while a teacher taught in the control group using the conventional method of teaching.

Procedure for Data Collection

Permission was sought from the principals of the selected schools to allow their schools to be used for the study. The teacher in the control group was subjected to training on how to effectively teach the students using the conventional method which was mostly lecture method of teaching. Students were assigned a topic each to teach to other students. A roster was prepared for the student teaching. Each of the control (conventional group) and experimental group (RPT group) was taught for six weeks. In the control group, a trained introductory technology teacher exposed the students to the usual conventional method of teaching where he/she did the talking all alone. The Introductory Technology teacher used lesson plans that were prepared by the researcher. At the beginning and end of the six weeks the Introductory Technology Achievement Test (ITAT) was administered as a pretest and post-test to the students in the two groups.

Findings

To facilitate the test of difference between the pre-test, mean achievement's scores and the Post-test mean achievement score, ITAT was used as instrument of data collection. ITAT was administered on two separate occasions (pre-test and post-test respectively) to each of the group (control and experimental groups). Two separate scores were obtained; they are the pre-test scores and the post-test scores. The pre-test scores for the two groups were used to determine the level of entry behaviour of the students in each of the groups before the administration of the different treatment to the groups. This is to facilitate the determination of the effects or other wise of the treatment on the recipient students. For each test, separate mean score and separate standard deviation were obtained to test if there is any significant difference between the pre-test and post-test mean performance scores of the experimental group on one hand and the control group on the other hand.

To test this hypothesis 3, the post-test of both groups were used. Separate mean performance scores and separate standard deviations were obtained. The calculated t-test values and the critical t-test values for the groups were compared at .05 probability level.

Pre-test, Post-test Mean Performance Scores of Students Taught with Reciprocal Peer Tutoring and Method of Teaching

Research Question 1: What is the difference in the pre-test and posttest academic achievement of students taught with the reciprocal peer tutoring in Introductory Technology

Hypothesis 1: There is no significant difference between the pre-test academic achievement of students and the post-test academic achievement of students in Introductory Technology taught with the reciprocal peer tutoring

Table 1

Mean, Standard Deviation and t-test of Students Taught with Reciprocal Peer Teaching Method

	N	X	SD	t-cal	t-Crit
Pre-test	30	35.72	7.52		
Post-test	30	69.42	6.55	18.51*	1.96

*Significant, P <. 05, Critical t = 1.96

Table 1 indicates a significant difference between the pre-test and post-test experimental group taught with reciprocal peer tutoring, in favour of the post test. This shows that the calculated t-value of 18.51 for experimental group pre-test, post-test mean achievement scores is significant at .05 probability level. Therefore, the hypothesis which states that there is no significant difference between the pre-test academic achievement of students and the post-test academic achievement of students in Introductory Technology taught with the reciprocal peer tutoring is rejected. This finding indicates that the treatment has significant effect on students' post-test mean achievement scores. This can mean that the difference in pre-test, post-test mean performance scores was as a result of the treatment given.

Pre-test, Post-test Mean Performance Scores of Students Taught with Traditional Method of Teaching

Research Question 2: Is there a difference between the pre-test and post-test academic achievement of students taught with the conventional method of teaching in Introductory Technology?

Hypothesis 2: There is no significant difference between the pre-test academic achievement of students and the post-test academic achievement of students taught with the traditional method of teaching in Introductory Technology.

Table 2

Mean, Standard Deviation and t-test of Students Taught With Traditional Method of Teaching

	N	X	SD	t-cal	t-crit
Pre-test	30	33.67	6.91		
Post-test	30	46.07	8.48	6.21*	1.96

Significant, P < .05

Table 2 indicates a significant difference between the pre-test and post-test control group taught with conventional method, in favour of post test. Thus the hypothesis which says that there is no significant difference between the pre-test academic achievement of students and the post-test academic achievement of students taught with the conventional method of teaching is rejected. This indicates a significant difference in the mean performance scores of students in their pre-test and post-test under the conventional method of teaching.

Post-test Mean Achievement Scores of Students Taught With Reciprocal Peer Tutoring Teaching Method and Traditional Method of Teaching

Research Question 3: What is the difference between the post-test academic achievement of students taught with reciprocal peer tutoring and the students taught with the conventional method of teaching in Introductory Technology?

Hypothesis 3: There is no significant difference between the post-test academic achievement of students taught with the reciprocal peer tutoring and the post test academic achievement of students taught with the conventional method of teaching in Introductory Technology.

Table 3

Post-test Mean Achievement Scores of Students Taught With Reciprocal Peer Tutoring Teaching Method and Traditional Method of Teaching

	N	X	SD	t-cal	t-crit
Post-test Control	30	46.07	8.48	11.94*	1.96
Post-test Experimental	30	69.42	6.55		

* Significant, P < .05

Table 3 indicates a significant difference between the post-test control group taught with conventional method and the post-test experimental group taught with reciprocal peer tutoring, in favour of the reciprocal peer tutoring (experimental group). This indicates that the hypothesis of no significant difference between the post test academic achievement of students taught with the reciprocal peer tutoring and the post test academic achievement of students taught with the conventional method of teaching in Introductory Technology is therefore rejected.

Discussion of Findings

Tables 1, 2 and 3 show the descriptive and inferential statistics of the study. The mean achievement scores are descriptive or representative scores of the group or variables they represent while the t-test provide premise for making inference or deductions on their relevant tested hypotheses.

Table 1 shows a significant difference between the academic achievement in the pretest and posttest of students taught with reciprocal peer tutoring method of teaching. This shows that different treatments which were given to the experimental group effected the positive changes on the students mean achievement scores in posttest achievement test. It was however noted that no treatment was given to the pre-test group before the test while treatment was given before the test in the case of the posttest. This is also reflected in table 2 which shows that the significant difference between pre-test mean scores and post-test traditional method of teaching Introductory Technology was as a result of treatment given.

Table 3 reveals that there is difference between posttest academic achievement of students taught with reciprocal peer tutoring and those taught with conventional method of teaching, in favour of reciprocal peer tutoring. In support of this, Cawelti (1999) stated that there is a long history of research on non-traditional, cooperative and student-centered instruction. The research indicates that cooperative learning may result in (a) higher student achievement and greater productivity, (b) more caring, supportive, and committed relationships among students, and (c) greater psychological health, social competence, and self-esteem. This is in line with Fantuzzo, Dimeff and Fox (1989) view which stated that reciprocal peer tutoring strategy resulted in greater improvements in cognitive gains, lower levels of subject distress, and higher course satisfaction than students who received an attention placebo or participated in an independent unstructured learning format. In a related development, Slavin (1991) stated that reciprocal peer tutoring is a form of cooperative learning, which has been found to be an effective technique for increasing students' academic achievement.

Conclusions and Recommendations

Failure rate in Introductory Technology is a performance indication of the inadequacy of the conventional method of teaching Introductory Technology. In reciprocal peer tutoring method, students no longer had to sit in straight rows and do individual work throughout the entire period, but the method allowed students to be mobile and work as a teacher and later as a student on various assignments. Following the findings of this study, the researcher recommends that:

1. government should encourage reciprocal peer tutoring method of teaching in all junior secondary schools as a teaching method.
2. teachers should be encouraged to engage their students in reciprocal peer tutoring teaching method.
3. teachers should be trained on effective engagement of reciprocal peer tutoring in schools.

References

Cawelti, G. (1999). "Improving Achievement". **The American School Board Journal**. 15-18

.Fantuzzo, J. W., Dimeff, L. A. & Fox, S. L. (1989). Reciprocal peer tutoring: a multimodal assessment of effectiveness with college students. **Teaching of Psychology Journal**, 16. 133-135.

Federal Ministry of Education, Science and Technology (1985). Curriculum for Introductory Technology. Lagos: Heinemann.

Federal Republic of Nigeria (1981). National policy on education. Lagos: NERDC.

Griffin, B. W., & Griffin, M. M. (1997). The effects of reciprocal peer tutoring on graduate students' achievement, test anxiety, and academic self-efficacy. **The Journal of Experimental Education**, 65. 197-209.

Slavin, R. E. (1991). Cooperative learning in post-secondary education: Implications from social psychology for active learning experiences. Paper presented at the annual meeting of the **American Educational Research Association**.

Uwameiye, R. (1993). Some factors militating against the effective teaching of introductory technology in Bendel State schools. **International Journal of Education Research, 5,** 16-22

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