# Face-to-face vs. Real-time Clinical Education: no Significant Difference

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**Abstract:** The main objective of this pilot research project was to determine whether the use of an internet broadband link to stream physiotherapy clinical education workshop proceedings in "real-time" is of equivalent educational value to the traditional face-to-face experience. This project looked at the benefits of using the above technology as an educational tool and its impact on educators only, it did not investigate possible related factors such as the cost of employing this technology nor the technicalities of setting up the proposed technology as these objectives were beyond the scope of the study. In 2006 three physiotherapy educators' workshops were selected for streaming at the University of Canberra. Two groups of educators attended the workshops at geographically separate venues, face-to-face (on-site) and real-time internet streaming (off-site). Group one (on-site) attended face-to-face lectures at the Canberra Hospital ACT Australia; lectures were streamed using a standard personal computer and digital camera to group two (off-site) at the University of Canberra and Calvary Hospital ACT. At the end of the workshops all participants completed the questionnaire survey. Obtained results were analyzed using t-tests. No significant difference was found between the participants' assessment of the educational value derived from either off or on-site attendance at the workshop.

**Keywords**: face-to-face, real-time, educators, clinical education, interactions internet broadband, telemedicine, videoconferencing

## 1. Introduction

This pilot research project evaluated the feasibility of real time video streaming as a clinical education workshop tool employing a broadband internet link; and determined if it was of equivalent, greater or less educational value to a traditional face-to-face clinical education experience. Therefore, the main objective of this project was to test the hypothesis that the educational value of the real time video streaming is of equivalent to face-to-face experience.

### 1.1 Research motivation

Lack of access to face-to-face clinical education environments is becoming a critical factor in the education of health care workers in Australia( Markova and Roth 2002), (Kamel and Batainah, 2004), (Crosbie et al.2002) and (Wiecha et al. 2003). Health care students have been traditionally required to attend and practice in real life situations in order to gain practical, clinical experience.

The shortage of health care workers across all the professions is placing increasing pressure on the capacity of education institutions to satisfy this component of the education process. This situation may be made easier by the use of real-time interactive video linkages that will facilitate the sharing of practical clinical knowledge between educators, students and health institutions nationally and internationally.

This pilot project will be of interest to health professionals and clinical educators working in rural and remote centers (Halit 2005) which require continuous update or refresher courses in order to maintain performance standards. This technology may also serve to enhance the capacity to support health care workers in regional areas when specialized support is required when faced with complex cases which otherwise may require transferring the patient to the nearest capital city hospital. Furthermore, follow-up patients have to travel to capital cities to see a specialist health care worker.

In many cases health educators in capital cities plan workshops where participation can tend to be limited to the health professionals living within that city. Other professionals on assignment in remote rural areas/other cities cannot attend such workshops due to geographical remoteness, financial and time restraints. This pilot project could potentially enable anybody anywhere in the world (Douglas et al.2004) to participate in a workshop.
Providing potential participants can access the internet they will be able to interact with the workshop organizers audio-visually in real time with potential associated reductions in cost of travel and time off the job ( Zhe and Feng, 2006). Traditionally presentation of multiple versions of lectures for different sites is time consuming (Streaming video in the enterprise, 2006) and can be reduced (*The Australian IT,* 2006) because only one lecturer/presenter has to prepare the presentation.


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A search of the literature has found no similar project has been researched in Australia especially in the area of real time interactive video streaming medical education using the internet.

### 1.2 Research question

Is a real time clinical education video link of equivalent educational value to traditional face-to-face clinical experience?

### 1.3 Limitations of this pilot research

This pilot research has looked at the benefits of using real time video streaming as an educational tool compared with traditional face-to-face clinical education. Therefore, this pilot research did not evaluate possible related factors such as the cost of employing this technology; neither did it focus on the technicalities of setting up the proposed technology as these objectives were beyond the scope of the present study. Furthermore, the results of this study were limited to the collected data from Calvary Hospital, the Canberra Hospital and the University of Canberra.

Due to the broad scope in the area of telemedicine, and the different names and definitions that exist for telemedicine; this research was concerned only with the comparison between real-time (synchronous) education and traditional face-to-face education in the area of clinical education employing an internet broadband link.

## 2. Method

### 2.1 Target audience and survey design

The aim of this research project was to determine whether a real time video link streaming of a clinical education workshop is of equivalent educational value to the traditional face-to-face workshop experience. An eight question survey was developed aimed at assessing the impact of this technology on a group of physiotherapy clinical education staff taking part in a regular series of clinical educator meetings in the ACT. The survey form was based on other similar studies,(Richard K. Ladyshewsky, 2004), (Nilsen 2005 ), (Russell, 2004), (Saeki et al. 2004) and (Sawada et al. 2000), however the questions were specifically tailored to assess the impact of the technology on the participants and therefore focused more on the overall experience of the technology, rather than, for example, assessing the academic achievements of participants using face-to face contact compared to those utilizing “off-site” technology.

The survey questionnaire layout and format were the same for both groups of educators. Method of participation in the study, either “off-site” or “on-site” was identified by a tick box on the top of the questionnaire form. Personal details were not required to be included on the form in order to protect the identity of the participants.

Given that the target audience had strong educational facilitating experience and were therefore in a position to critique the technology, the questions were designed to assess the opportunities and benefits of the technology. The survey questions examined the following issues:

1. Ease of attendance;
2. Opportunity to interact with the speaker;
3. Opportunity to interact with other participants;
4. I could clearly see the speaker and the speaker’s gestures;
5. I could clearly hear the speaker;
6. I had access to the speaker’ resources;
7. Ease of comprehension of the session; and
8. The overall educational benefits of attending the session

The educators were asked to answer each question using a scale from 0 to 10, with 0 being the least positive response and 10 being most positive response as illustrated below for question one:

 

| Q1 | Ease of attendance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| very inconvenient | | | | | convenient | | | | | very convenient |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**Figure 1:** Example of question format.

Prior to commencing the data collection approval to conduct research with human participants was obtained from the Committee for Ethics in Human Research (University of Canberra).

## 3. Conducting and planning the workshops

This section discusses the protocol for hardware assembly and setting up the software used to enable the workshops to be successfully streamed and then outlines the workshops conducted.

### 3.1 Computer interface requirement: "Software"

The following computer interface software was required for the workshops:

- Microsoft Windows XP or above
- Microsoft .Net Framework 2.0
- Microsoft DirectX 9 or above
- M-view software V2.0/2.1 (Developed by Momentum Technology Group In Melbourne Australia )

### 3.2 Computer interface requirement: Hardware

The following computer interface hardware was required at the streaming site:

- A laptop or a desktop personal computer with 1.2GHz or higher processor
- 128MB RAM (minimum)
- 20MB free hard disk space (minimum)
- Available Universal Serial Bus 2 port (USB 2/ USB 1)
- High-colour display card (16-bit colour at screen resolution of 800x600)
- Broadband Internet connection, eg. ISDN, ADSL, cable, or wireless
- Audio teleconferencing unit
- Active telephone line

To optimize audio interactions, a teleconferencing unit was added to the video streaming package and used during the three workshops. The audio visual information was relayed through a laptop/PC into an overhead projector where it was projected or displayed to a wall or laptop/pc to the viewing group

The following computer interface hardware was required at the secondary site ("off-site"):

- Internet connection
- Windows 2000 and above
- Internet Explorer or Mazola Firefox with ActiveX plug-in capabilities
- DirectX 8.1 and above
- Administrator or Power User rights over the PC
- Active Telephone line.
- Data projector
- Laptop.

### 3.3 Local Area Network (LAN) security setting

To transport the video streaming through a server either a User Datagram Protocol (UDP) or a Transmission Control Protocol/Internet Protocol (TCP/IP) protocol was used. Normally large institutions prohibit live video streaming on their network infrastructures. In order to resolve the issues of the video streaming getting blocked by the network's firewall (intranet security Software that safeguards the outbound/inbound traffic of

information) the rules of the firewall had to be reset by the Network Administrator. Also, as a third party server was used during these pilot workshops these rules were set up at the primary streaming site. The IP address was 202.125.160.61 (media.m-view.com.au) which ran over ports 6116, 5012, 8008 and 80.

During the trialling of this pilot project, a server (a PC that controls the flow of information traffic and houses the firewall that stopes malicious intruders/hackers) was required to allow the rerouting of the real-time streaming audiovisual components from and to the internet. Momentum Technology groups' server in Melbourne was used and all trials were routed through their server. This pilot project was assigned an account; user name and a password by the LAN administrator.

### 3.4 Conducting the workshops

To achieve the objective of determining whether a real time clinical-education-video-link is of equivalent educational value to the traditional face-to-face experience, the above mentioned system was trialed at three clinical educator workshop sessions which were conducted as part of the on-going clinical educator training sessions provided by the University of Canberra Physiotherapy Discipline. Every workshop was preceded by at least one trial session to enable operators to assess the system and prepare for any unwanted eventualities that might disturb the streaming of workshop proceedings.

At least one technical assistant per site was required to be available during the streaming in order to assist in the following:

- arrange and operate the electronic communication equipment;
- ensure the availability of an internet physical connection and telephone line;
- direct the participants to the site;
- distribute the questionnaires to the participants; and
- collect the surveys at the end of the workshop

The details of the three workshops are detailed below.

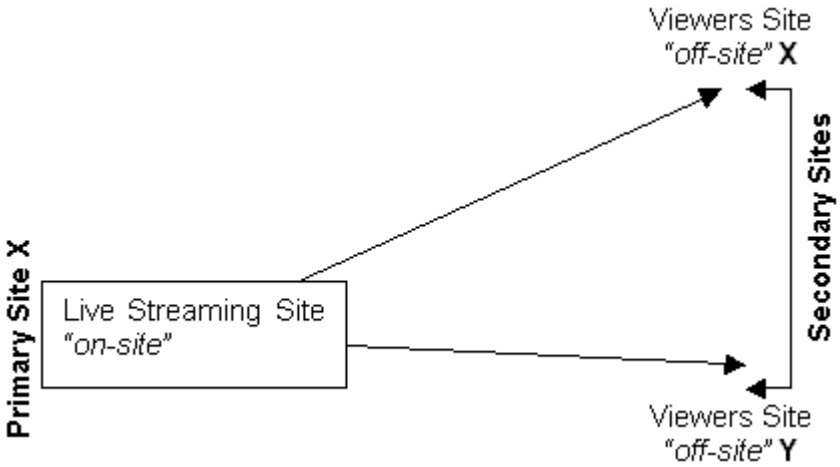


**Figure 2:** Diagram showing the streaming and viewing sites

## 4. Data collection

### 4.1 Data collection one

The first video streaming session was conducted on June the 27th 2006 at 01:00 pm and ran for two hours with the theme of this workshop being "Rehabilitation".

The primary streaming site or "on-site" venue was designated as the meeting room at The Canberra Hospital where the workshop took place and the University of Canberra and Calvary Hospital were designated as the secondary viewers' sites "off-site". For the face-to-face component, a group of educators attended a workshop in the meeting room at the Canberra Hospital ACT ""on-site"" and a second group of educators attended a meeting room at Calvary Hospital ACT ""off-site"". (Refer to Figure 2)

 

The hardware system detailed above was set-up and the face-to-face (primary streaming site/"on-site") workshop in the meeting room at The Canberra Hospital was streamed in real-time over the internet using a broadband internet connection, via the Momentum server in Melbourne, to the second group (secondary receiving site/"off-site") at the meeting room at Calvary Hospital. The streaming allowed the participants at the "off-site" to interact with the participant and lecturer at the primary streaming site "on-site".

At the end of the workshops all participants ("on-site" and "off-site") were provided with a questionnaire form to fill in accordance with the details discussed above.

### 4.2 Data collection two

The second video streaming session took place at a workshop conducted on June the 28th 2006 at 01:00 pm and ran for two hours. The subject of this workshop was "Cardiothoracic Physiotherapy" and as above, the video streaming session was coordinated and conducted as occurred in workshop one.

### 4.3 Data collection three

A third video streaming session took place at a workshop, titled "General Clinical Educator's Workshop – Introductory," which was conducted on September the 5th 2006 at 07:30 AM and ran for approximately two hours. The workshop was coordinated and conducted in a similar fashion to the previous two with the exception that the primary site ("on-site" ) was the University of Canberra Physiotherapy Department and the secondary sites ("off-sites ) were The Canberra Hospital and Calvary Hospital .

At the end of each of the three video streaming sessions all participants ("on-site" and "off-site") were given a questionnaire form to fill in accordance with the details discussed above.

## 5. Results

Twenty three completed questionnaires were returned. Thirteen responses were obtained from the face-to-face sessions and ten from participants in the offsite session. The difference between the mean values of the *off-site* and the *on-site* scores were examined using t-test analysis to determine the presence of any significant difference between the mean responses for each condition. The t-test determines whether the two response groups differ because of chance errors, or is there a significant difference between these two groups. Basic factors that impact on determining whether an apparent difference between two groups is a significant difference or just an error due to chance include:

1. the larger the difference between the two means, the less likely the difference is due to sampling errors
2. The smaller variance among the participants, the less likely that the difference was created by sampling errors.

The mean response scores for each question are shown in Table 1 and Table 2.

**Table 1:** "On-site" mean response

"On-site"

| Questions | OnQ1 | OnQ2 | OnQ3 | OnQ4 | OnQ5 | OnQ6 | OnQ7 | OnQ8 |
|---|---|---|---|---|---|---|---|---|
| Mean response | 7.92 | 8.69 | 7.62 | 8.00 | 8.54 | 8.54 | 8.92 | 8.54 |

**Table 2:** "Off-site" mean response

"Off-site"

| Questions | OffQ1 | OffQ2 | OffQ3 | OffQ4 | OffQ5 | OffQ6 | OffQ7 | OffQ8 |
|---|---|---|---|---|---|---|---|---|
| Mean response | 8.6 | 7.3 | 6.4 | 5.8 | 7.9 | 7.1 | 7.5 | 8.2 |

**Table 3**: participant responses summery

| on-site responses |
|---|

| participants | OnQ1 | OnQ2 | OnQ3 | OnQ4 | OnQ5 | OnQ6 | OnQ7 | OnQ8 |
|---|---|---|---|---|---|---|---|---|
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 7 |
| 3 | 9 | 9 | 7 | 10 | 10 | 10 | 8 | 6 |
| 4 | 2 | 9 | 7 | 10 | 6 | 8 | 9 | 9 |
| 5 | 9 | 9 | 7 | 9 | 10 | 9 | 9 | 10 |
| 6 | 8 | 8 | 4 | 4 | 4 | 4 | 8 | 7 |
| 7 | 8 | 9 | 9 | 9 | 9 | 8 | 8 | 9 |
| 8 | 8 | 7 | 5 | 10 | 10 | 10 | 10 | 10 |
| 9 | 9 | 10 | 9 | 0 | 10 | 10 | 10 | 10 |
| 10 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 11 | 7 | 9 | 8 | 7 | 7 | 8 | 9 | 8 |
| 12 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 13 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| mean response | 7.92 | 8.69 | 7.62 | 8.00 | 8.54 | 8.54 | 8.92 | 8.54 |

off-site responses

| Participants | OffQ1 | OffQ2 | OffQ3 | OffQ4 | OffQ5 | OffQ6 | OffQ7 | OffQ8 |
|---|---|---|---|---|---|---|---|---|
| 1 | 9 | 7 | 6 | 9 | 8 | 5 | 8 | 8 |
| 2 | 7 | 7 | 8 | 9 | 8 | 6 | 8 | 8 |
| 3 | 8 | 9 | 7 | 10 | 9 | 5 | 7 | 8 |
| 4 | 9 | 5 | 6 | 8 | 9 | 7 | 9 | 8 |
| 5 | 8 | 7 | 5 | 7 | 8 | 4 | 7 | 7 |
| 6 | 8 | 8 | 5 | 3 | 8 | 8 | 6 | 7 |
| 7 | 10 | 7 | 7 | 5 | 7 | 10 | 8 | 8 |
| 8 | 8 | 6 | 7 | 5 | 6 | 7 | 7 | 10 |
| 9 | 9 | 9 | 7 | 2 | 8 | 10 | 9 | 9 |
| 10 | 10 | 8 | 6 | 0 | 8 | 9 | 6 | 9 |
| mean response | 8.6 | 7.3 | 6.4 | 5.8 | 7.9 | 7.1 | 7.5 | 8.2 |

Table 3 above depicts the responses of the participants in each question for both offsite and onsite. The difference between the mean values of the ""off-site"" and the ""on-site" "scores were examined for the relative spread or variability of their scores using a t-test to determine the question: do the two groups ("on-site", "off-site") differ because of chance error, or is there a significant difference between the two groups. Commentary on the differences between to the groups is included in the Discussion section.

## 6. Analysis of the results

Analysis of the results of each question follows:

### 6.1 Question 1: Ease of attendance

The question sought to establish how convenient it was for clinical educators to attend workshop and whether the real time video link was significant. The mean response for the offsite for this question was 8.6 SD=(0.93) whereas for the "on-site" it was 7.9 (5.08), indicating the "off-site" was more convenient to attend. Using the t-test [alpha=0.05, df= 21, t-stat= -0.89] P (T<=t) at 0.19 suggests no difference between the group responses for ease of attendance.

 

### 6.2 Question 2: Opportunity to interact with the speaker

This question examined whether the opportunities available to interact with the speaker "on-site" in a traditional seminar environment were similar using the real time video link. The mean result for "on-site" for this question was 8.6 (2.06) compared to 7.3(1.57) for "off-site "using t-stat [alpha =0.05, df=21, t-stat=2.433] P (T<=t) at 0.012 suggests no significant difference between the group responses for Opportunity to interact with the speaker

### 6.3 Question 3: Opportunity to interact with other participants

This question examined the respondents' opportunity to interact with other participants during the sessions. The mean result for "on-site" was 7.61(4.09) and 6.4(0.93) for "off-site". . Using the t-test [alpha=0.05, df= 21, t-stat= 1.75] P (T<=t) at 0.048 suggests that the opportunity to interact with other participants was higher "on-site" than "off-site".

### 6.4 Question 4: I could clearly see the speaker and the speaker's gestures

This factor assessed the participant's ability to clearly see the speaker and the speaker's associated gestures. The mean response was 8(10) for "on-site" and 5.8(11.29) for "off-site". However looking at the t statistic at the 95% significant level [alpha=0.05, df= 21, t-stat= 1.61, P (T<=t) = 0.061] suggests no difference between the group responses for the participant's ability to see the speaker and its gestures.

### 6.5 Question 5: I could clearly hear the speaker

This factor assessed the participant's ability to clearly hear the speaker. The mean response was 8.54(4.94) for "on-site" and 7.9(0.77) for "off-site".

The t-statistics [alpha=0.05, df= 21, t-stat= 0.855, P (T<=t) = 0.20] suggests no difference between the group responses for the participants' ability to hear the speaker.

### 6.6 Question 6: I had access to the speaker's resources.

This question examined the respondents' opportunity to access the speaker's resources. The mean response was 8.54(3.94) for the "on-site" and 7.1(4.54) for the offsite.

The t-test [alpha=0.05, df= 21, t-stat= 1.67] P (T<=t) at 0.055 suggests no difference between the group responses for the opportunity to access the speaker's resources was higher using "on-site" than "off-site".

### 6.7 Question 7: Ease of comprehension of the session

For ease of comprehension the "on-site" mean score was 8.9(2.08) compared with 7.5(1.17) for "off-site". Using the t-test [alpha=0.05, df= 21, t-stat=2.6] P (T<=t) at 0.01 suggests that Ease of comprehension of the session was higher "on-site" than "off-site".

### 6.8 Question 8: The over all educational benefits of attending the session

The question sought to establish the overall benefit of attending the workshop for clinical educators and whether the real time video link was significant. The mean score was 8.54(3.10) for "on-site" and 8.2(0.84) for "off-site". Using the t-test [alpha=0.05, df= 21, t-stat= 0.55] P (T<=t) at 0.29 suggests no difference between the group responses for perception of the educational benefit attained by attending either session.

## 7. Discussion

### 7.1 Ease of attendance

Although the results for ease of attendance responses were not significantly different between the groups the participants overwhelmingly remarked on the increased "accessibly and convenience" that the availability of the "off-site" clinical education workshop afforded. This draws on a very important element of universal good practice, i.e., minimizing barriers to access to maximize benefits. For example, although the educators commented on the increased accessibility and convenience of the *off-site* session, not having the technology or the relevant technical expertise to set-up the technology will result in no attendance.

As this is a pilot study there was potential for improvement in many aspects of the streaming and presentation process. For example not all the workshop lecturers have adequate exposure to the computers, internet and telecommunication technology or the relevant technical expertise to set-up such system. It can also be confidently stated that with better physical arrangement and provision of better environment ( lighting, extra software and hard ware components) a huge benefit will be realized by both technically-skilled and non-technically-skilled educator/participants .

High levels of required technical support may also be a barrier that might prevent the service from being used in the future. It is therefore imperative that for “off-site” education benefits to be fully realized, technical barriers, financial costs and other constraints must be minimized.

### 7.2 Opportunity to interact with the speaker & other participants

Opportunities to interact with the speaker were higher for the face-to-face session than for the offsite session. This indicates that “off-site” teaching may lead to a decrease in communication between participants and the lecturer and a reduced opportunity to ask questions. This position is supported in research on large class teaching which identified participant reluctance to ask clarifying questions, exacerbated by the channel limitations in interpersonal communication via synchronous audio-visual systems.

Halabi, Tuovinen and Maxfield (2000) indicated that technology has progressed significantly to minimize barriers to access. It perhaps should be a goal of the instructors to adapt to the new technology and actively attempt to engage the audience. Moreover, despite the fact that “off-site” venue presented educators with less interaction than “on-site”, the fact that an opportunity was given to interact and conduct the session is significant in itself. This is particularly the case where sessions may be conducted in rural areas or where it is simply not feasible to travel to the workshop “on-site”.

The participants also ranked the opportunity to interact with the other participants higher for the face-face session than for “off-site”. Despite the participants preferring “on-site”, some respondents ranked “on-site” as low as 4, and 5 for this question. The variance between the scores between “off-site” was not as great. It is pertinent to note that other studies have indicated that results of their research in the same area did not reveal significant difference between “on-site” and “off-site” (Ladyshewsky et al 2004).

With further planning and facilitation of the off-line workshop, for example using a live discussion board, particularly where there is more than one “off-site” venue, could allow “off-site” classes to be more effective in involving a larger percentage of students in discussion than face-to-face classes. This could occur where the session includes technology such as online discussions which would allow participants to be more analytical and reflective in their response.

### 7.3 Visual clarity, audio reception and access to lecturer resources

Although there was no significant difference between the mean responses for the two groups, comments from the participants, for example; that the slides were not designed well for video streaming as the colors were fairly dark etc, suggest that technical issues may significantly impact on these criteria. However both visual clarity and audio clarity can be improved with further investment in technology, for example each participant could view the sessions on their own pc/laptop rather view a projected image as well as better planning, Also educating the lecturer in the methods of enhancing the presentation for this environment could be of benefit.

The opportunity to access the speaker’s resources was reported as being easier using “on-site” than “off-site”. Mechanisms for enhancing the “off-site” experience could include for example, providing a copy of the slides to be presented to the participants prior to commencing the session or an editable softcopy which may arguably provide further benefits than the traditional face-face-to sessions.

### 7.4 Ease of comprehension and overall benefits of attending the session

There was no significant difference found in this study between the perception of benefit obtained from the sessions whether on or off-site. On the whole, survey questions were specifically developed to generate a valid data set so further research and trialing can be undertaken using these results as a foundation for a larger research project that could include/involve groups from different profession, level of education , technology exposure and normal laymen.

The groups who participated in this current project were from the same profession and almost similar level of education this may have positively contributed to the accuracy of the data collected and the relative closeness of the results .

Other factors that might have negatively affected the overall benefit scores of the participants for example may include issues such as venue lighting, the preferred study mode of students, for example some students might be morning learners while other might be evening learners etc… Kuznar et al. (1991)

This is supported in a study conducted in 2004 by Ladyshewsky from the Curtin University of Technology, Australia who concluded that there are many other factors that may affect the results, for example gender, age, geographical location, level of knowledge of communication, information technology literacy and participants' preferred mode of study. The study confirmed what many studies have indicated: results using online technologies and traditional face-to-face education delivery modes are at least the same. As some students prefer verbal instruction (Barnett and Aagaar, 2005), while other learn best through written instruction. The challenge of incorporating various learning styles into an online setting needs further attention.

Lecturers should examine the objectives of the course and whenever possible, seek to provide background about the subject that going to be streamed. For example sometimes the lecturers distribute a study guide or subject outline before the live session takes place which, when undertaken during the course of our pilot project, enhanced the participants capacity to follow up the streamed component and provided a reference to refer to for more detail and explanation during the session.

## 8. Conclusion

Audiovisual streaming over the internet has been used in many areas of education, training and monitoring utilizing different levels of bandwidth capacities and modes for example, real-time and store-and-forward and has been proven to be very useful tool especially in delivering and receiving training/refreshing courses.

It seemed that telecommunication in parallel with computer information technologies have been very rapidly advancing. These reportedly have enhanced the internet audiovisual capabilities and facilitated more possibilities for expanding the distance education and E-learning potentialities and diversities.
Off-site/remote participants' experience and benefits are as good as the traditional onsite classrooms/face-to-face experience and benefits with an insignificant difference. This difference could be attributed to some other factors such as facilitator's online teaching abilities/experience, unreliable communication hardware and/or participants' mode of study.

Utilization of the internet combined with Telecommunication and information technologies is promising a wider range of uses and a radical transformation of traditional education delivery methods.

The result of this study is a good indication of the usefulness and versatility of these technologies in allowing groups of educators to exchange ideas and participate in interactive real-time live seminars at geographically different parts of the world; yet it still requires further and wider research involving undergraduate and post graduate academics and students.

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