Increasing Access to Reproductive Health Information in Low-Resource Settings: Evaluation of a Technology-Assisted Learning Center in La Paz, Bolivia

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JHPIEGO, an affiliate of Johns Hopkins University, is a nonprofit corporation working to improve the health of women and families throughout the world.

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ABBREVIATIONS AND ACRONYMS

AED	Academy for Educational Development (AED)
FP	Family Planning
ICT	Information and Communication Technology
LAC	Latin America and Caribbean
LPS	Learning and Performance Support Office
RH	Reproductive Health
ReproLine®	Reproductive Health Online Website
TALC	Technology-Assisted Learning Center
UMSA	Universidad Mayor de San Andrés
UNETE	Bolivian national communications company
URL	The address of a computer or a document on the Internet
USAID	U.S. Agency for International Development

EXECUTIVE SUMMARY

In 1995, JHPIEGO began offering a variety of technology services designed to address the need for reproductive health faculty and trainers to stay up to date in the field and communicate with colleagues. These services included a website (Reproductive Health Online or ReproLine®, http://www.reproline.jhu.edu), an e-mail discussion list, a training e-newsletter and online learning tools. While the services benefited faculty and trainers that already used computers and the Internet, they pointed to the need for wider access to electronic tools among healthcare professionals, educators, and trainers. For this reason, JHPIEGO began establishing Technology Assisted Learning Centers (TALCs), which consisted of networked computer workstations and printers, Internet connections, and health-related CD-ROM libraries including titles such as *Reproductive Health Library* and *Topics in International Health*.

In October 1999, JHPIEGO established a TALC at the Health Sciences Library of the Universidad Mayor de San Andrés in La Paz, Bolivia. JHPIEGO trained library staff and faculty to conduct Internet searches and to use basic software applications. Library staff members were also trained in maintenance of the network and hardware. During the first year, there were more than 5,300 faculty and student TALC user sessions recorded, and a successful cost-recovery system garnered US $3,600.

This report documents a March 2001 evaluation of over 300 students, faculty and library staff to determine the effectiveness of the TALC at the UMSA Health Sciences Library, and to examine to what extent the availability of information and communication technology was ensuring access to updated reproductive health information. The evaluation showed that the TALC succeeded in increasing professional and academic access to up-to-date reproductive health information, opening up the online world for UMSA faculty and students, and promoting South-to-South collaboration in a variety of ways.

Results showed that students were using the TALC to take charge of their education, find answers to their academic questions, and produce better quality coursework. While JHPIEGO expected a “trickle-down” effect of updated knowledge from faculty to students, for example, the evaluation revealed that the reverse was occurring, with students doing the bulk of the research at the TALC (while faculty seemed to be using departmental computer resources). As students grew more proficient in their use of the TALC as a research tool, they also developed more sophisticated desires for user support, which posed a challenge due to the limited ability of library staff to provide high-tech user support.

UMSA Health Sciences faculty used the TALC to access numerous reproductive health resources and websites to enhance their teaching and to make improvements to reproductive health course materials. When faculty members were asked how they usually used the TALC, almost all (90%) reported that they searched for updated/current information on the Internet, many citing JHPIEGO’s ReproLine website as being among their most useful resources. Communication with other universities and colleagues is also providing UMSA faculty an opportunity to learn from, participate in, and contribute to the broader health community. This also has the potential to filter down into improved learning for students from the improved reproductive health teaching materials developed by faculty.

In its initial stages, the TALC’s early success stimulated unexpected benefits. Access to the TALC helped university officials realize that computer skills, access to the Internet and the

ability to read English were essential tools for their students and faculty. In the first year of the TALC's operation (and because of the TALC) UMSA staff and faculty initiated three projects exploiting technology and focused on South-to-South collaboration for Bolivia: establishing a regional library network, putting Bolivian medical journals online, and developing distance education strategies. Several other key themes emerged from this evaluation:

- The shift in the academic paradigm caused faculty to become more open to incorporating Internet usage in their courses and students to become more habituated to and dependent on technology linking them to previously inaccessible resources.

- The reality of the TALC's capacity versus the demand for it meant that the high demand for computers sometimes negatively affected access and made for long waiting lines. However, users who could go to nearby Internet cafés often still chose to wait to use the TALC because of its accessibility (on campus in the UMSA Medical Library) and because of the readily available reproductive health and general medicine CD-ROM libraries and Internet site resources needed for their work.

- The effectiveness of cost-recovery issues is based on maintaining a critical number of users to cover the cost of Internet service provider fees. The TALC cost recovery scheme recouped more than 50% of the annual line-access costs in the first 6 months but fewer costs continued to be recovered over time, identifying weaknesses in business practices.

- The recognition of the TALC's unrealized potential, such as the underutilization of available hardware and software is important as are student and faculty concerns that the TALC might disappear. This would negatively affect the improved quality of academics at UMSA, specifically, course content, ability for UMSA to participate in the global health community, and overall preparation of students in the modern healthcare arena.

Even though the TALC in Bolivia is now self-sustaining (funding for the 1-year startup period ended in 2000), these results will be shared with UMSA staff in La Paz for use in planning and operational improvements. As JHPIEGO monitors TALC operations in Sucre (Bolivia), Haiti, Ecuador, Nepal, Kenya, Uganda, and Uzbekistan, and plans new TALCs in Lilongwe, Blantyre and Zomba, Malawi in 2002, results will also be applied to the planning, implementation, and evaluation of these program efforts.

Increasing Access to Reproductive Health Information in Low-Resource Settings: Evaluation of a Technology-Assisted Learning Center in La Paz, Bolivia

INTRODUCTION

In 1995, JHPIEGO began addressing the need for reproductive health faculty and trainers in developing countries to stay up to date in their field and communicate with colleagues by providing a suite of technology services called Performance Support Services. These services included a website (Reproductive Health Online or ReproLine®, http://www.reproline.jhu.edu), e-mail discussion list, training e-newsletter and online learning modules. While these services benefited faculty and trainers that already used computers and the Internet, they pointed to the need for wider access to electronic tools among healthcare professionals, educators and trainers. For this reason, JHPIEGO began establishing Technology Assisted Learning Centers (TALCs) in selected institutions within which it works. The TALC at the Universidad Mayor de San Andrés (UMSA), La Paz, Bolivia grew out of the collaboration in which JHPIEGO and UMSA were seeking technical solutions for preservice education to reach large numbers of students.

BACKGROUND

Overview of TALCs

The goal of establishing TALCs is to improve the health of women and their families by increasing professional and academic access to up-to-date reproductive health information through the establishment of TALCs in institutions with which JHPIEGO works. The specific objectives are to:

- Provide information and communication technology (ICT) access to faculty and trainers
- Provide ICT access to students and reproductive health professionals
- Increase the capacity of host institutions to fulfill their mission (e.g., deliver quality reproductive health education or training)

A TALC consists of networked computer workstations, an Internet connection, printer, and health-related CD-ROM library of titles such as Reproductive Health Library and Topics in International Health. JHPIEGO generally pays for installation, initial computer training of staff and users, CD-ROM resources, equipment maintenance and Internet connectivity for 1 year, after which the host institution assumes responsibility for sustainability. The institution provides a ready facility and staffing for the TALC. In addition, the institution and JHPIEGO sign a memorandum of understanding outlining the contributions of both parties.

Based on early experience, JHPIEGO identified TALC locations based on criteria that indicated potential for long-term success. These criteria included:

- Appropriate facility (e.g., secure, with electricity)
- Readily available user base
- Privatized Internet Service Providers in the country

- Administrative staff in the institution willing to manage the center
- Potential for financial sustainability through cost-recovery and other means

JHPIEGO's Work in Bolivia with the Universidad Mayor de San Andrés

From 1998 to 2001, JHPIEGO worked with faculty, staff and students at the UMSA medical and nursing schools in La Paz, Bolivia. The goal of this partnership was to strengthen preservice education and training so UMSA could produce medical and nursing graduates better able to meet the primary healthcare needs of Bolivia's population. Achievements included the development of a revised Obstetrics/Gynecology curriculum at the medical school and a revised Maternal and Child Health curriculum at the nursing school. Both curricula now include increased numbers of hours dedicated to family planning/reproductive health topics including contraceptive methods, counseling, infection prevention, gender, adolescents and domestic violence.

As JHPIEGO helped strengthen curricula, it became apparent that UMSA also needed assistance in the development of long-term capacity for updating learning materials that could be carried on even after JHPIEGO was no longer working in Bolivia. Staff members in JHPIEGO's Latin America and Caribbean (LAC) Office, who managed the project, began discussions with JHPIEGO's Learning and Performance Support (LPS) Office about how information and communication technology could ensure long-term access to updated reproductive health information.

According to estimates obtained by the Academy for Educational Development (AED), in the late 1990s, Bolivia had only 43 Internet users per 10,000 population (Hafkin and Taggart, 2001). Stated another way, less than 0.43 % of the Bolivian population were Internet users. While medical students and faculty are more likely to have computer and Internet access than many other segments of the population, Bolivia was and continues to be a setting that could benefit from donor-funded access to computing technology.

In 1999, JHPIEGO and UMSA determined that UMSA met the criteria for establishing a TALC. JHPIEGO and technical personnel in Bolivia installed a network (a server and eight workstations), and provided an Internet connection and supporting equipment to create a TALC at the UMSA Health Sciences Library in September 1999. Because the UMSA library had developed a plan for financial sustainability that involved charging for use, TALC administrators opened the TALC to all faculty, staff and students at the health sciences schools. Since the number of students greatly exceeded the number of faculty and staff, the user base of the TALC was different than originally expected (dominated by students rather than faculty members), which in turn led to unexpected outcomes (see the **Discussion** section).

Faculty members at UMSA attend computer training at the new TALC

Starting in January 2000, JHPIEGO, the UMSA library administrator and staff of the TALC monitored how frequently it was being used and collected anecdotal information about its use. This monitored information illustrated that establishment of the TALC in the UMSA health sciences library had improved access to up-to-date information by UMSA faculty members,

clinical preceptors and students (Asport et al, 2001). As in many resource-limited settings, the UMSA library had a very limited collection of medical texts and journals. The TALC provided UMSA faculty and students with access to up-to-date information through the Internet and health-related CD-ROM resources. In addition, the Master's in Public Health program had begun using the TALC to teach master's degree candidates how to use software applications such as Epi Info and SPSS.

While anecdotes of use were positive, routine monitoring information coming back to JHPIEGO was sporadic. By the end of 2000, JHPIEGO realized a more formal evaluation of the TALC was needed for a clearer picture of how the TALC was making a difference in the day-to-day work of faculty members and students. In March 2001, JHPIEGO staff and consultants worked with TALC administrators and staff to conduct surveys of users and administrators.

Costs and Funding

The main source of funding for the UMSA TALC was the U.S. Agency for International Development (USAID), Office of Population. Total direct costs for installation, 1 year of Internet connectivity and 1 year of support were about US $66,300.[1]

The renovation and furnishing of the room housing the TALC was provided by an in-kind contribution from a group of Bolivian physicians in the United States. UMSA staffed the center and paid for related utilities. After the first year of TALC operation, the administrator determined that a lower-bandwidth Internet connection for the second year of operation would be more affordable (at a cost of about US $4,469), given the income generated by the cost-recovery system.

METHODOLOGY

In determining specific objectives for the evaluation, the team considered its purpose in conducting the evaluation. As Hudson (2001) states in her paper on telecenter evaluation, an evaluation may serve several purposes. A *formative* evaluation looks at the process in establishing and operating a computer center. The information gleaned can provide feedback to the center administrators about how well the process is working and what can be improved. The formative evaluation can also result in lessons learned that can be applied to future centers. A *summative* evaluation collects data related to outcome and impact. It seeks to determine what difference the center made in the lives of its users.

Because both categories of issues were important to UMSA, JHPIEGO and USAID, the evaluation team decided on both formative and summative evaluation objectives.

The specific objectives of the evaluation were:

- To identify improved ways to satisfy the information needs of TALC users
- To determine if use of the TALC had resulted in improved learning for students and improved reproductive health course materials developed by faculty

[1] Approximate costs:
Internet connection (ZuperNet Internet Service Provider): $ 7,500
Hardware, Software and Shipping: $25,500
Other expenses (including initial supplies, JHPIEGO staff support, local technical support): $33,300

- To determine if the TALC is being operated effectively in order to provide feedback to TALC administrators and library staff
- To determine if TALC users are taking advantage of JHPIEGO-provided electronic resources such as the Reproductive Health Online (ReproLine) Website
- To determine the reasons for positive outcomes of the TALC in terms of the academic experience
- To identify reasons for non-use of the TALC (if applicable)

The results of the TALC evaluation will be used to identify reasons for the success of this initiative and areas for improvement. Even though funding for the 1-year startup period was over in 2000 and the TALC in Bolivia is now self-sustaining, results will be shared with UMSA staff in La Paz for use in planning and operational improvements. As JHPIEGO-Baltimore monitors TALC operations in Sucre (Bolivia), Haiti, Ecuador, Nepal, Kenya, Uganda, and Uzbekistan, and plans new TALCs in Lilongwe, Blantyre and Zomba, Malawi in 2002, results will also be applicable to the planning and evaluation of these program efforts.

Data Collection Instruments

The evaluation focused on interviews and questionnaires supported by relevant record review. Several data collection instruments were needed to gather data on operating procedures, perceptions and practices among support staff, users and non-users. Instruments also measured the effect of TALC use on the UMSA academic experience from the different types of personnel involved with the operation of and student/faculty use of the TALC.[2] To this end, four questionnaires were developed:

1. *Administration Survey* (23 questions): Gathered data from TALC administrator about the logistics of operating the TALC, including hours of operation, fee collection, technical challenges and user support.
2. *Library Staff Survey* (10 questions): To determine how the addition of TALC responsibilities affected the jobs of the library staff including issues with user technical support, delivery of computer training, fee collection and tracking TALC usage.
3. *Faculty Survey* (32 questions): Focused on the university faculty members' use or non-use of the TALC. The questionnaire was intended to collect data on awareness of the TALC, reasons for non-use, experience using computers and types of resources consulted to develop course materials (technology-based and traditional library materials).
4. *User Survey* (30 questions): Collected data on TALC usage across cadres of users. The survey included questions on prior computer experience, frequency of use, types of resources used (technology-based and traditional library materials) and perception of the usefulness of the TALC for academic advancement.

Questions were developed in such a way that they could be answered independently or through an interviewer. Open-ended questions were included in each survey to reveal how the TALC had affected the academic and professional lives of faculty and students.

All instruments were developed in English and then translated into Spanish by a US-based translator. The Bolivia TALC senior librarian reviewed the translated questionnaires, and final revisions were made before data collection began. Since responses to the open-ended

[2] Copies of these instruments (in English and Spanish) can be obtained from the Research and Evaluation Office, JHPIEGO-Baltimore.

questions were in Spanish, another translation step occurred, from Spanish to English, during analysis and interpretation of the qualitative data.

The evaluation was conducted at the UMSA TALC in La Paz over a 1-week period by a data collection team that consisted of a JHPIEGO Bolivia staff person and a US-based bilingual JHPIEGO evaluation consultant. In addition, TALC and bilingual JHPIEGO administrative staff assisted in coordinating logistics and data collection. (**Appendix A** details the administration of each data collection instrument during the evaluation and the subsequent data analysis.)

FINDINGS

TALC Location, Hours and Operating Procedures

Responses to the Administration and Staff Surveys provided insight into how the TALC is being operated and opportunities for improvement. Since the operational data was self-reported by support staff, comparisons to user responses are useful to identify differences in perceptions, although some bias can be assumed.

At the time of the evaluation, the TALC was open to users from 08:45 to 18:30 hours, Monday through Saturday, although initially it was open only Monday through Friday. As the demand for usage increased, university officials authorized hiring additional library staff so that the hours could be extended.

The TALC administrator reported that the peak hours for TALC computer use varied according to academic activity during the day, with a slight trend to heavier usage the first hours of the morning or the afternoon. Staff members collected usage statistics by having users sign in a registry book, to which staff members added the identification number of the computer being used and the length of time spent on the computer. The administrator stated that operation of the TALC could be improved by hiring an additional staff member dedicated to managing the registry and generating usage statistics so that they could better monitor trends of use.

TALC users were charged 5 *bolivianos* (approximately US $0.80) per hour to use the TALC. At the end of each day, the collected fees were tallied and deposited into the UMSA bank account. When staff members were asked if they thought the fee amount was appropriate, six stated that the fee was the right amount, while one said the fee was too inexpensive and should be 7 *bolivianos* because of the newness of the equipment. This generally agreed with open-ended responses to the User Survey, which included several statements about the TALC being less expensive than local Internet cafés. Only a few users said that the cost was too high and should be reduced.

When asked to list the three most common technical problems, the TALC administrator listed only one: the telephone lines going down because of problems with UNETE (the national communications company), reporting the frequency as “sometimes.” To handle the problem, library staff members call UNETE directly for help. From the user perspective, the most common comment by students who reported being “somewhat satisfied” with their TALC experience was that there were too few computers for the number of students and that the Internet connection was too slow.

Staff Characteristics and Computer Expertise

The seven staff surveyed worked in the following job designations:

- Administration
- Archiving/Cataloguing
- Computer Programmer
- Librarian
- Medical School Library Circulation Desk and Internet
- Messenger/Handyman
- Periodicals/Publications

Respondents to the Administration and Staff Surveys said that they helped users of the TALC every day.[3] Some respondents specified a percentage of time they spent on helping TALC users (80% and 60%); others commented "all the time" or "4–10 times a day." When asked about the type of assistance provided, staff members most often mentioned help in information searching:

- How to conduct Internet searches
- They ask for websites in specific areas or specialties
- Assist in finding articles

Staff responses generally suggested that they felt they were meeting the needs of TALC users. By comparison, many users commented that TALC staff and administrators needed to be more knowledgeable in the area of computers and Internet use so they could share information and guide students. Some users commented that often there was no one available to consult or provide help. TALC computer users also made comments that suggested that they did not feel welcome by staff.

One reason for the discrepancy between staff and user perceptions may be that users (particularly students) began use of the TALC with a higher level of computer and Internet expertise than the staff members, and thus may have had higher expectations of the potential utility of the TALC. A major reason for installing the TALC at UMSA was that university officials reported that computers were not generally available to staff and faculty, so staff may not have had extensive previous experience with computing in general, or accessing the Internet. Student pressure on the staff to provide advanced guidance on computer use, when staff members themselves had not been adequately trained and had other library duties, may have led to the discrepancies we found among staff and student attitudes about skill level, quality and completeness of technical support and guidance.

TALC User Characteristics

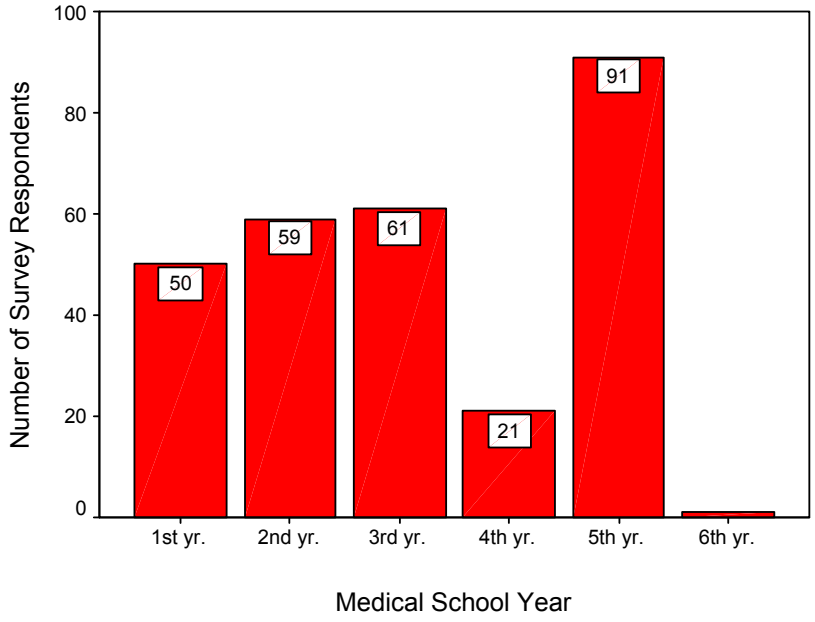
To determine whether the TALC had reached its target audience, we examined the characteristics of the user population. Respondents of the User Survey were largely medical

[3] In retrospect, it would have been helpful for the questionnaire to include questions about the staff's level of experience with computers and prior training since they were required to provide user support. This need for additional questions became apparent when comparing staff responses with user responses on the subject of user support.

students in their first 5 years of study, with an average age of 22 years. Because the vast majority (98%) of User Survey respondents were students at the medical school, we limited our analysis of these survey data to medical students.

The cross-sectional data indicate a steady increase in TALC usage as students progress through their first 3 years of medical school, lower usage by current fourth-year medical students, a rise in fifth-year use with the least frequent users being sixth-year students (see **Figure 1**). The fourth year is the first time that medical students are given clinical responsibilities in addition to their classroom instruction, possibly decreasing their time spent at the library as they learn to manage clinical and didactic study requirements. In the fifth year at UMSA, students have a mix of classroom and clinical instruction but are also required to do a research project, which may be why they are at the library and seeking TALC services more often. Sixth-year students are interns, a completely clinical year, and they have no required research projects, probably accounting for their low TALC usage.

Figure 1. Year in School by Number of Medical Student Respondents (n=288)



Missing Data: 5 students did not report year in school

The Faculty Survey reached 33 respondents, in several departments (see **Table 1**). While the primary target departments, OB/GYN and Maternal Health, are represented in the response pool, the proportion of TALC users from these reproductive health faculty was not as high as we would have wished to evaluate the impact of the TALC specifically on academic instruction in these departments. In contrast to the User Survey, where respondents were selected upon the basis of their TALC usage, not all Faculty Survey respondents were necessarily TALC computer users since they were selected instead based on participation in computer training sessions provided at the TALC. Of those surveyed, 25 (76%) faculty members had used the TALC after completing training. Figures and tables throughout this report will reflect a comparison of the 288 medical students who responded to the User Survey with the 33 Faculty Survey respondents.

Table 1. What school and department at UMSA are you affiliated with (e.g., Obstetrics/Gynecology department)?

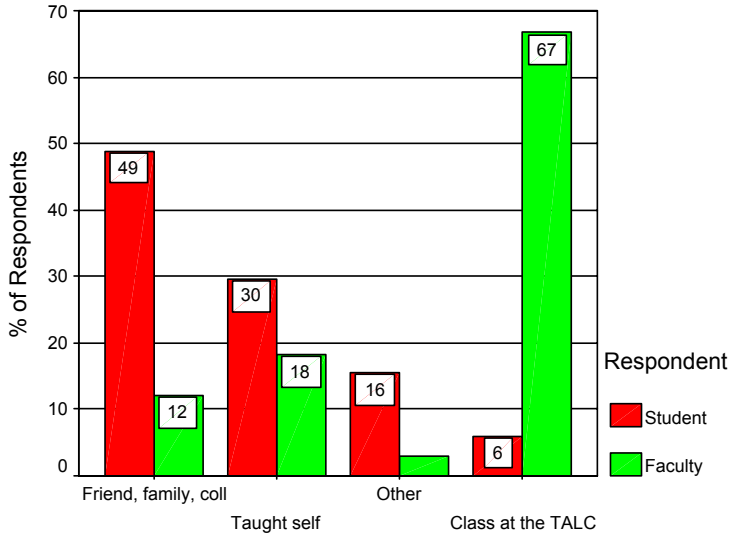
Faculty Affiliation	Number of Respondents	Number of TALC Users
UMSA Department		
Nutrition	8	7
Medicine (Not specified)	7	5
Maternal Health	5	4
Nursing	5	5
Obstetrics/Gynecology	2	1
Pediatrics	2	1
Dean	1	1
Assistant Dean	1	0
Non-UMSA		
Hospital de La Paz	1	0
Military	1	1
TOTAL	**33**	**25**

Computer Experience: Computer experience was assessed through questions addressing where students and faculty first learned how to use a computer, where they accessed computers outside of the TALC, frequency of computer use and self-assessed level of computer experience.

Over 95% of the student respondents and 97% of faculty respondents had used a computer before seeking one at the TALC. Not surprisingly, the TALC was the principal venue for teaching only 6% of student respondents how to use a computer. While the TALC was the venue for two-thirds (67%) of faculty respondents' initial computer training, over three-quarters (79%) of students learned instead from friends, family, colleagues, or had taught themselves (**Figure 2**). This is also likely an artifact of the selection process for respondents, as faculty were contacted to answer this evaluation survey based on lists of TALC training registrants, whereas students surveyed represented TALC users, and training had not been marketed to student users at the TALC. All of the training sessions held at the TALC were targeted to faculty.[4]

[4] JHPIEGO was pleased to assist UMSA in providing needed computer training to the faculty as a precursor to their use of the electronic resources that the TALC provides. Given its popularity, TALC administrators also realized that providing faculty with structured computer training might present an opportunity for cost recovery in the future.

Figure 2. Main way you learned to use a computer, Medical Students and Faculty

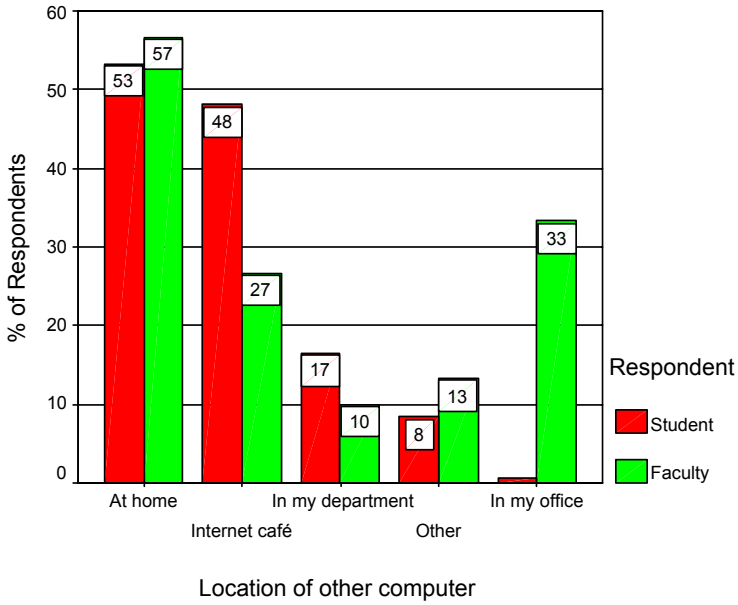


What is the main way you learned to use a computer?

Responses about prior computer use showed that, in general, the TALC did not provide an entry point for computer use. Instead, the TALC sparked the interest of computer users already aware of the benefits of technology and poised to make effective use of the TALC as a resource.

Figure 3 illustrates that, among both UMSA Medical School faculty and students, the most common place other than the TALC that individuals accessed a computer was "at home." The second most common location for students was "Internet café," while the second most common site for faculty was "in my office." Looking at other computer access points within the UMSA campus, fewer than one fifth (17%) of medical students can use a computer either in the department in which they work or study, or in their own office. These more private sites of access are available, however, to nearly half (43%) of the faculty, which may explain why students are much more motivated to seek out both the more public TALC and Internet cafés than are faculty. Whereas medical students were almost three times as likely to use a computer at an Internet café (48%) rather than at a Medical School office or department, faculty were much more likely to have access at their office rather than using a computer at a cyber café (27%).

Figure 3. Location of other computer, Medical Students and Faculty

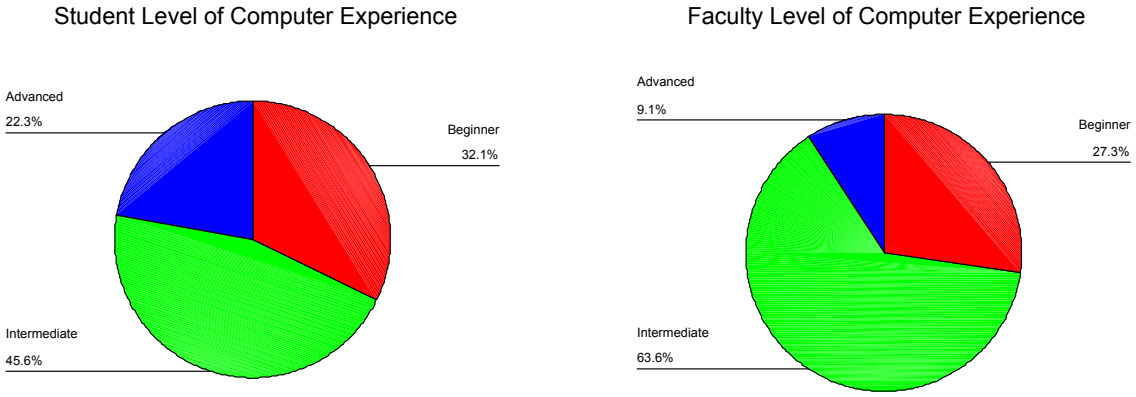


Overall, UMSA Medical School faculty are frequent-to-extensive computer users, with over 80% using computers on a daily or weekly basis. More than three-fifths (68%) of students do the same[5]. A quarter of all students use computers only a few times each month. Despite overall lower frequency of computer use (perhaps due to on-campus computer accessibility patterns described above), self-reported medical student computer expertise was comparable to that of faculty.Over two-thirds of student respondents (68%) classified themselves as intermediate (46%) to advanced (22%) computer users. Similarly, a total of almost three-quarters of faculty (73%) classified themselves as intermediate (64%) to advanced (9%) computer users (**Figure 4**). Because this was self-reported computer experience, it is difficult to explain why students were more apt to classify themselves as advanced than faculty, given their overall less frequent use of computers and informal rather than formal instruction in computers. We believe, however, that medical students used the TALC to supplement their pre-existing computer and Internet access and knowledge.

[5] When we asked faculty and students about frequency of computer use, they were given the following choices:

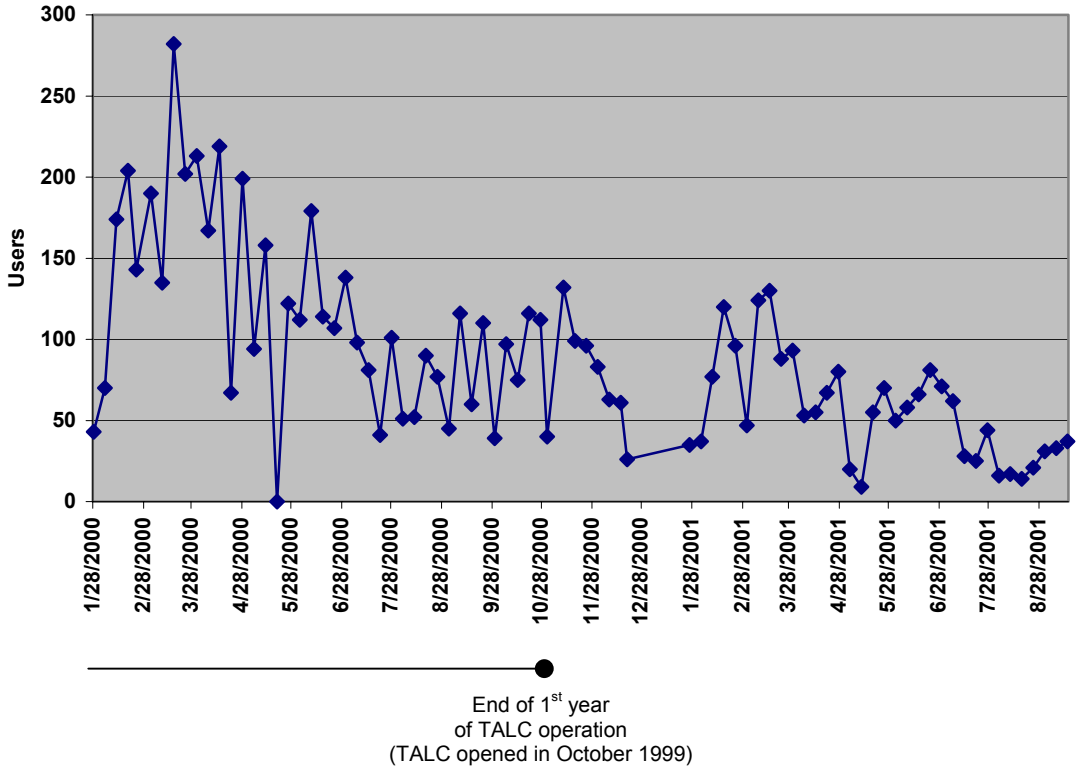
- Extensively - on a daily basis
- Frequently - on a weekly basis
- Occasionally - a few times each month
- Seldom - have used a computer 1 or 2 times
- Have only used a computer once

Figure 4. Level of Computer Experience: Students and Faculty



The TALC administrator maintains a TALC logbook, which is the data source for quarterly usage statistics reports (including those submitted to JHPIEGO in Baltimore). The TALC logbook tracks TALC computer use, including the number of users and amount of fees collected. **Figure 5** shows trends in usage data from the TALC at UMSA, from January 2000 through mid-September 2001. While the TALC began operations in October 1999, the first complete year in which monitoring data were routinely collected was January–December 2000. We have based our first-year usage and cost recovery figures on these data.

Figure 5. Weekly TALC User Statistics, UMSA Health Sciences Library, La Paz, Bolivia

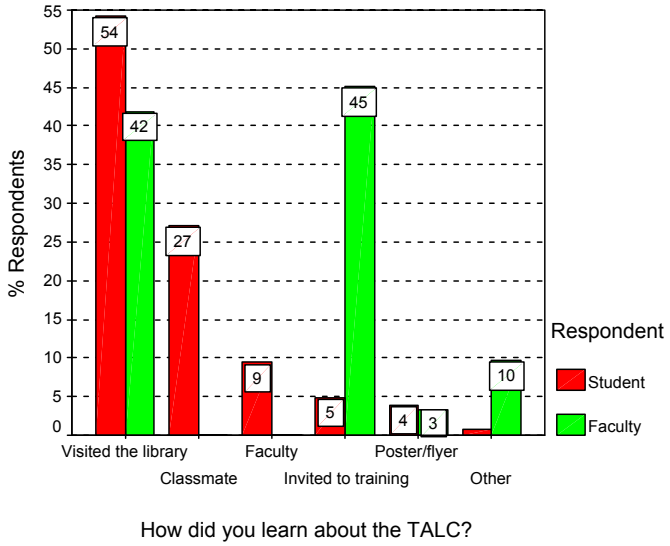


Logbook usage statistics show there were 5,293 TALC users in 2000 and 1,910 users in the first 8.5 months of 2001. Weekly statistics are shown in **Figure 5**. Usage decreased, as would be expected, during combined Summer/Christmas (November–February), Holy Week (April), and Semester Break (June–July) holidays, when students are on vacation from UMSA. The overall decline in use in the second year, however, was unexpected. This may be attributable to lower-quality logbook record-keeping in the second year, or it may be due to the opening of several Internet cafés in the immediate area surrounding the UMSA Medical School campus, offering alternative computer access points with perhaps less waiting time, faster Internet connections, and a more social rather than academic atmosphere.

TALC Promotion: Users were asked how often they visited the TALC and how they had heard about the TALC. The TALC was promoted in the UMSA faculty bulletin, on the local university television channel, at national Bolivian Health Sciences Information Network[6] meetings, and at both national and international talks and conferences. There was no financial cost to the UMSA library or to JHPIEGO for these forms of promotion. While these advertisements may have assisted in communicating the TALC's existence to the larger community of Bolivian health professionals, they did not appear to be major linkages to the student and faculty users of the TALC at UMSA.

More than promotion, the TALC's central location at the UMSA Health Sciences Center Library effected a high level of awareness among students, with over half (54%) of the medical students reporting they learned about the TALC by visiting the library and seeing it directly (**Figure 6**).

Figure 6. Means of learning about the TALC: Students and Faculty

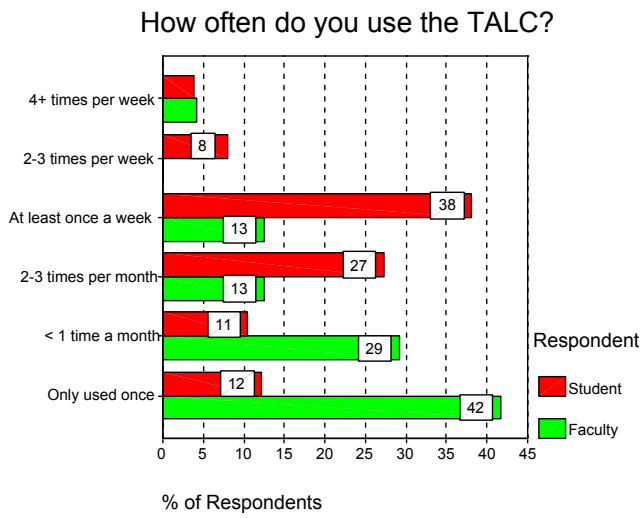


[6] REBICS, the *Red Boliviana de Información en Ciencias de la Salud*

Faculty members (45%) tended to learn of the TALC through an invitation to attend training there. The differential use of space by faculty and students, in that students are more likely to study and do research in common areas such as the library whereas faculty have dedicated office space, actually benefits the students through an increased awareness of access to the new technology and resources at the TALC, situated in the medical school library. Social networks aided student awareness much more than a trickle-down effect through their instructors. Nearly three times as many TALC student users learned of its existence through another classmate (27%) than through a faculty member (9%). The last 10% of students were either invited to attend training, saw a poster or flier, or learned of the TALC by another method. In contrast to the students surveyed, faculty members were equally as likely to learn about the TALC by receiving an invitation to attend training (45%) as by seeing the TALC while at the library (42 %).

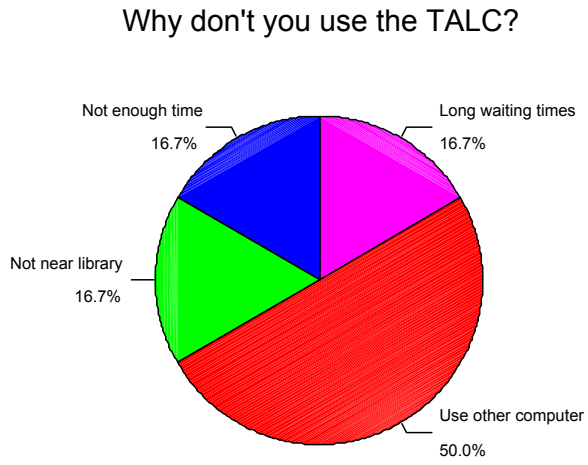
TALC Use/Access: In line with the tendency for greater TALC awareness among the students, not surprisingly, students were more frequent users of the TALC (**Figure 7**). Fewer than 5% of students accessed the TALC four or more times per week, but nearly half the student respondents reported using TALC computers one to three times per week. The other half of all student respondents used the TALC less than once a week, and 12% reported having used the TALC only once. Nearly half (42%) of faculty respondents reported using the TALC one to three times per month. Another 42% had only used the TALC once, despite their overall frequent computer use. Fewer than one-fifth of faculty respondents used TALC computers more than once per week.

Figure 7. Frequency of TALC use: Students and Faculty



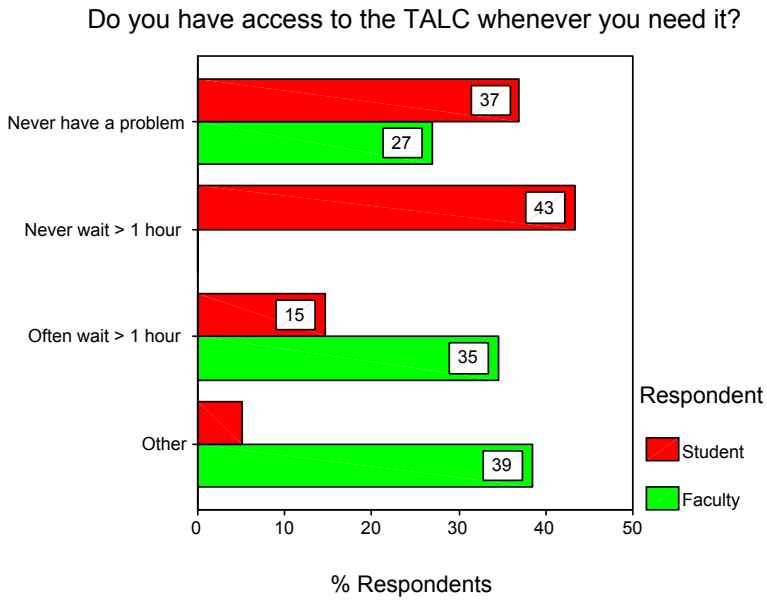
Reasons that faculty reported for not using the TALC included access to computers elsewhere and long waiting times at the TALC (see **Figure 8**). Difficulty accessing a computer once arriving at the TALC may have had an impact on overall user satisfaction with its services, a likely determinant of repeat visits.

Figure 8. Reasons for not using the TALC: Faculty



As illustrated in **Figure 9**, both students and faculty were more likely to have to wait than to consistently get access to a computer immediately upon entering the TALC. Waiting time perceptions or experiences differed, however. Faculty members (35%) were more likely than students (15%) to report frequent waits of longer than an hour. Meanwhile, 43% of students, but no faculty, reported never having to wait longer than an hour for a computer.

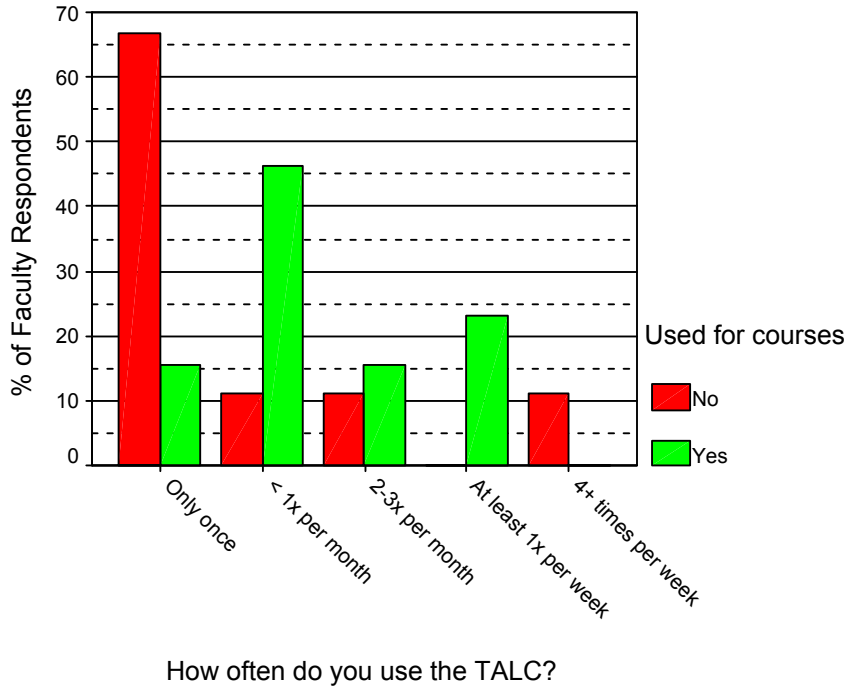
Figure 9. Access to the TALC: Medical Students and Faculty



Of 20 faculty members that completed qualitative questions on TALC usage, eight reported that they had not yet or did not use the TALC. The only specific reasons given for not using the TALC were “use other computer services, public or private” or “it is usually full of students.”

Use of TALC Materials: Faculty members were equally as likely as not to use TALC materials for their courses. There is a relationship with frequency of TALC use, in that faculty members who use TALC materials to prepare courses they teach tended to use the TALC more often. Those who have used the TALC only once were likely not to have used the materials for course preparation (see **Figure 10**). Overall, responses showed students to be more frequent TALC users than faculty members.

Figure 10. Use of TALC Materials for Courses by Frequency of TALC Use: Faculty



The Staff Survey asked questions about changes in faculty and student use of the TALC over time. The descriptions that staff offered about these trends corresponded with the differences in computer expertise and usage suggested by the cross-sectional faculty and student responses. UMSA library staff reported that faculty became more confident in their use of information technology and increased their skill level from proficiency in using basic applications such as e-mail to searching for information, a more complex skill. This agrees with responses to the Faculty Survey concerning level of computer expertise, with 27% reporting a beginner level, 64% an intermediate level, and only 9% an advanced level (compared with 22% advanced student users). Library staff stated that training provided at the TALC for faculty had improved their comfort level with computers as tools in the academic setting. Staff recognized that faculty members now “feel part of technological advances, current information and feel the support (and part of) worldwide contacts.”

Library staff described that over time, medical students improved their ability to use the TALC for effective health information retrieval. Staff expressed that students “have gradually gotten

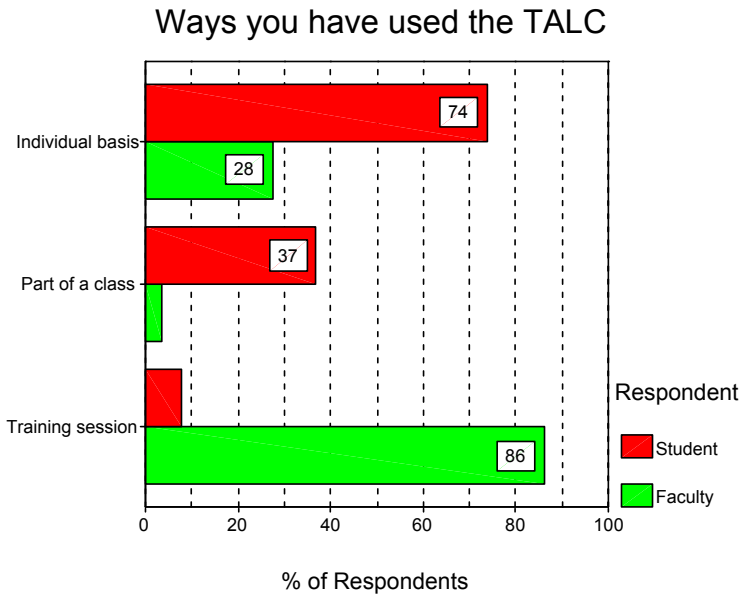
used to downloading (current) information… most of students' work is now done with the help of the Internet combined with traditional means (books and journals)." Other staff remarks pointed to increased expectations of the TALC, as medical students reportedly "look for current/up-to-date information and require complete databases... in terms of bibliographies, they also need the most current information." The tone of these statements suggests an interesting progression from the students using the TALC as a helpful resource to them demanding certain functions as a necessity for academic progress. In addition, staff reported a common theme that all types of users (faculty, students and administration) increasingly perceived the TALC as a resource for training and workshops.

How the TALC is Being Used

The evaluation also looked at how the TALC services are used by the target population: type of use, type of resources accessed and type of information accessed.

Respondents were given three choices regarding how they used the TALC (see **Figure 11**) with multiple responses. The most common response among students was using the TALC on an individual basis (74%), while the most common response among faculty was having participated in training session (86%), with very few having used it on an individual basis (28%). Thirty-seven percent of students also reported using the TALC as part of a class or group project although the survey did not reveal if TALC usage was specifically assigned by faculty or whether the students used the TALC on their own initiative. Recall, however, that only 9% of student TALC users learned of the TALC from faculty.

Figure 11. Ways TALC is used: Medical Students and Faculty

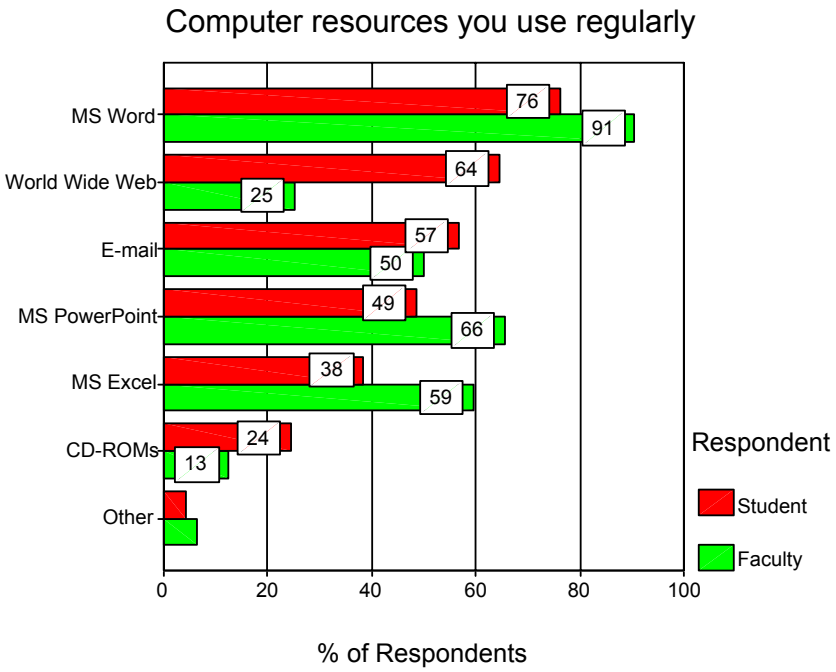


To determine whether faculty members made improvements to reproductive health course materials as a result of using the TALC, they were asked how they usually used the TALC. Almost all (90%) reported searching for updated/current information on the Internet. About one-third (30%) reported using the TALC for preparing class materials such as handouts and transparencies, and another third used the TALC resources to e-mail friends and colleagues. We can presume that if 90% of faculty TALC users are accessing updated reproductive health

and medical science information using the CD-ROM and Internet resources onsite, this will have a beneficial effect on their knowledge and what they convey to students while teaching, even though only a third reported direct use of TALC materials for class preparation.

The TALC focuses on providing reproductive health and general medicine CD-ROM libraries and Internet sites to the UMSA community. The use of TALC resources may parallel the perceived utility of these reference materials versus other uses of computers in an academic setting. It is worthwhile to note that medical informatics researchers have found that internationally, "aside from word processing, electronic mail is by far the commonest computer application" (Lindberg, 2000) When asked about the types of computer resources faculty accessed regularly, 60–90% of faculty used Microsoft Office applications such as Word, PowerPoint and Excel. Half of faculty used e-mail, while only a quarter of faculty respondents used the World Wide Web, and one-eighth used CD-ROMs. Medical students had slightly lower rates of Microsoft Office application use (see comparison in **Figure 12**), but more students used the World Wide Web (64% of students versus 25% of faculty) and CD-ROMs (24% vs. 13%, respectively). Over half (57%) of students used e-mail.

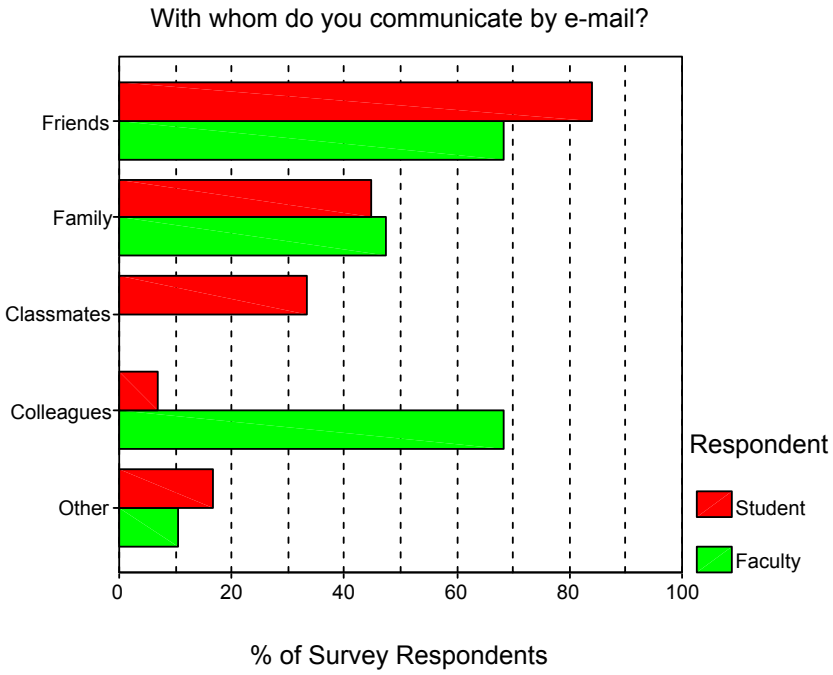
Figure 12. Computer Resources Used Regularly: Students and Faculty



Since the TALC at UMSA does not promote/allow extensive MS Office application use, TALC usage may not be as high by users who tend to seek computers specifically for that purpose. Since it does promote Internet and CD-ROM use, medical students may be more apt to seek the TALC than faculty as they are ready consumers of these information sources. Or, these results may reflect that, as more frequent TALC users, students' general computer resource usage reflects what they are able to access at the TALC; whereas, faculty resource use is reflecting what they use in their primary computer venue (i.e., use of MS Office applications and e-mail from their offices and departments).

More than three-fifths of medical students (69%) and faculty (61%) at UMSA reported that they have e-mail access. Perhaps these responses reflect only those that have actually established such an account since all TALC users have e-mail access if they log on to any of the Internet sites that offer free web-based e-mail, such as Yahoo, Hotmail, or others. Advanced computer user respondents were more likely to acknowledge access to e-mail services than beginner respondents (perhaps because the more technically savvy had already established their own accounts). Of those reporting current e-mail use, students communicated by e-mail predominantly with friends (84%) and family (45%), whereas faculty members tended to exchange e-mails with colleagues (68%) and friends (68%) most often (**Figure 13**). Only one-fifth of students surveyed at the TALC subscribed to e-mail discussion lists or listservs, whereas no faculty subscribed.

Figure 13. E-mail communication: Students and Faculty



The evaluation team also assessed the types of reproductive health and medical information that users examined at the TALC. They focused on the tools for accessing information such as favorite websites, search engines and CD-ROMs, and the content area of information retrieved.

When the UMSA TALC was opened, program administrators were concerned that the center would begin to be used for non-health-related purposes by the medical students. Indeed, review of the early electronic proxy logs (which showed the web addresses [URLs] of sites visited by the TALC users) revealed frequent visits to music and book websites. For this reason, the evaluation surveys included the open-ended question “If you use the web, which health-related websites do you use most frequently?” to gauge use of the TALC for its intended purpose (reproductive health and medical coursework and research). Over 240 (85%) of the medical students and 10 (30%) of the faculty surveyed supplied websites in response to this question. The remainder either could not remember the names or skipped the question completely. As many respondents listed search engines rather than websites, **Tables 2** and **3** reflect only the health-related websites listed most frequently by both user populations. **Appendix B** provides a complete account of websites listed in response to this question, including non-health specific

sites. The tables below show that three of the top seven websites listed by faculty, and two of this group listed by students, are available exclusively in English.

Students provided many more total (690) and unique (170) web addresses than did faculty members (21 total and 15 unique). Though part of the discrepancy was clearly due to the different number of respondents, other information gathered in the survey suggested that students were more comfortable searching the Internet for information, while faculty members tended to use productivity applications (e.g., Microsoft Word) to prepare class materials.

Table 2. Top Seven Health-Related Websites Listed by Medical Students, in Rank Order

Website Cited	Language(s)
1. Iladiba	Spanish
2. Diario médico	Spanish
3. MedLine	English
4. Medicina	Spanish
5. ReproLine	English Spanish French Portuguese
6. Medscape	English
7. Doyma	Spanish

Table 3. Top Seven Health-Related Websites Listed by Faculty Respondents

Website Cited	Language(s)
1. ReproLine*	English Spanish French Portuguese
2. Atheneum: Club Virtual de Atención Primaria	Spanish
3. MedicoNet	Spanish
4. MedLine	English
5. Medscape	English
6. MedSpain	Spanish
7. Virtual Hospital	English

*While ReproLine was the most often mentioned site (five faculty listed this), the remainder cannot be ranked as there was only one faculty member that listed each site, so they are listed in alphabetical orer

JHPIEGO's ReproLine website appeared in the top five websites listed by UMSA medical students and faculty alike, most likely because the home page of each computer in the TALC is set to ReproLine. Another interesting aspect of the responses was that both students and faculty listed a mixture of English and Spanish language websites, suggesting that users were willing and able to research information in English as well as their native Spanish. This use of multilingual resources may be related to the UMSA Medical School having English language proficiency as a graduation requirement.[7]

When students were asked about their favorite search engines, their responses followed the trend established by their listing of websites. The search engines they listed were a mixture of English and Spanish language websites (AltaVista, Google, and Yahoo at 27%, 23% and 19%, respectively, and Iladiba and Yupi at 17% and 5%, respectively)[8]. Similarly, the CD-ROM resources that students listed included a variety of health and medical resources in both English and Spanish. **Table 4** lists top five CD-ROMs mentioned by UMSA medical students; a complete list is included in **Appendix D**.

Table 4. Most Commonly Mentioned CD-ROMs Listed by Medical Students, in Rank Order

1.	**Medicina Interna Farreras**
2.	**Encarta**
3.	**Merck Manual**
4.	**Medicina Interna Masson**
5.	**Medicina Interna Harrison**

To further determine intended use of the UMSA TALC and how user information needs could be better satisfied by trainers or technical support staff, respondents were asked to specify "three topics for which, in the last three months, you consulted an external resource for more information." The question also asked respondents to list the resources they consulted. Since the TALC was intended in part for use by UMSA faculty to update reproductive health (RH) and maternal and neonatal health (MNH) curricula, evaluators were particularly interested in relevant topics listed by faculty and whether the faculty consulted electronic sources to find their information.

[7] See Asport *et. al.,* 2001 for a description of the effects that the TALC had on UMSA, including English as a graduation requirement.

[8] Based on the outcome of Web research, the need for portals referencing known and useful sites on health and medical topics is apparent: "Lawrence and Giles analyzed the capabilities of six well-known Internet search engines and found that the coverage of any single engine was quite limited, with none of them indexing more than about one-third of the resources that were actually available on the Web at the time of the study… one could submit the term "fibromyalgia" to four different search engines… There were significant differences in the number of items returned from the four engines. AltaVista returned 88,291 items; Excite returned 13,447; Google returned 4,166; and Yahoo, after choosing the health category, returned 68 items… A comparison of the top ten items returned by each of the engines showed very little overlap. AltaVista and Google had two items in common, though they were ranked differently." (McCray, Alexa T., Ph.D., "Digital Library Research and Application," in E.A. Balas, *et al. (Eds.), Information Technology Strategies from the United States and European Union,* IOS Press, The Netherlands, 2000, pp. 54-5.)

Table 5 shows faculty responses on RH and MNH topics researched, categorized by the type of resource accessed and format (electronic or print). Topics that could be related to RH or MNH are also listed (e.g., infection prevention is relevant to providing many RH and MNH services such as insertion of IUDs). Electronic resources consisted of the Internet (including online journals and articles) and CD-ROMs.[9] Print resources included textbooks, journals and articles.

Table 5. Reproductive Health and Maternal and Neonatal Health Topics Researched by UMSA Faculty, by Type of Resource Accessed

Resource Type	Topic Listed
Electronic	Adolescent health AIDS and pregnancy Infection prevention Maternal and child health Neonatalogy Neonatal sepsis Problems in the first trimester Reproductive health Use of prostaglandin
Print	Adolescent health Infection prevention Nutrition for women Nutrition during pregnancy Ovarian tumors Premature births Reproductive health and family planning Sexuality

Cases where a topic was only associated with print resources may point to an opportunity to better satisfy the information needs of TALC users. Staff or advanced users could compile a list of related web addresses and post the list as a web page on TALC computers, in addition to locating CD-ROMs that could be loaned to TALC users. Topics in this list would include general nutrition for women and nutrition during pregnancy, sexuality, and ovarian tumors.

How TALC Information is Being Used: One objective of the TALC evaluation was to assess whether creation and access to the TALC had resulted in improved learning for students and improved health course material developed by faculty. A prominent medical informatics expert has observed that "systems are needed that help deliver modern scientific information at the time and place that it is most useful. In medicine, that is with the patient and the physician, at the point of medical decision making" (Lindberg, 2000).

In preservice settings, the case can be made that access to updated information is crucial to the learning process and it is important that a system be in place to support that learning, using the health sciences library to the fullest extent possible. Students and faculty mentioned several ways in which the TALC has helped them as a resource for schoolwork, teaching or professional development. The majority of the remarks from students and faculty alike related to accessing current scientific information in their medical field or specialty area. Comments from both students and faculty indicated that the TALC was utilized by students in their coursework

[9] In a number of cases, topics were listed but the type of resource accessed was not specified, so these responses are omitted. In other cases, both electronic and print resources were listed for a topic. Based on misunderstanding revealed in the answers received, piloting and revised wording of this question may assist researchers if this item is to be used on a future questionnaire.

and group projects. Faculty responses indicated that the TALC was utilized for preparation of course materials as well as individual academic research.

The following list provides the most common ways in which UMSA medical students perceived the TALC as a beneficial academic resource:

- Access to up-to-date and current information in field of study
- Quick and easy access to information
- Conduct literature reviews and content specific searches
- Clears up doubts/confirms information; it is a back up that did not exist before
- Communicate with/e-mail colleagues and be part of the international arena
- Broaden scope of personal knowledge
- Assist in professional development via access to recent advances in specialty areas, latest research and current information
- Improves quality, efficiency and overall knowledge gained from coursework and studies

Three main topics surfaced from faculty responses regarding how the TALC has helped teaching or professional development:

- Coursework/lecture development
- Professional communication and development
- Conducting research

> "For some time now it has been a fundamental and very important support tool in the preparation of courses and lectures."
>
> – UMSA faculty member

Many faculty members reported that they used the TALC to assist in "preparation of coursework and up-to-date course content and lectures." One comment summarizes the responses of most faculty respondents, "I use it to get new and available information that I need to prepare my classes/lectures and to provide my students with reference materials."

In terms of professional benefits, some faculty commented that the TALC services are useful when preparing presentations for professional conferences. Also, one faculty member described use "to incorporate up to date and current information for lectures and presentations to the Chair."

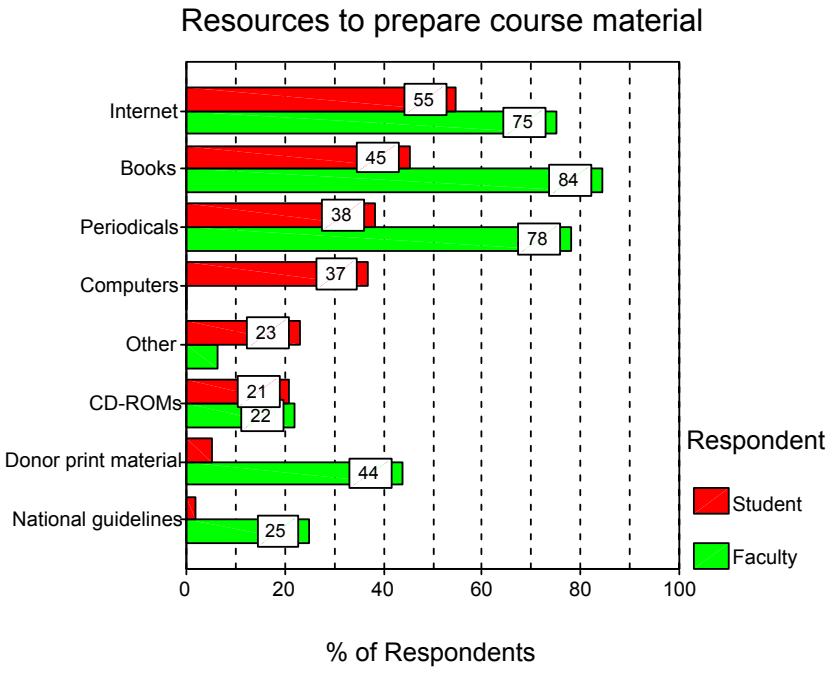
Professional communication and development surfaced as a common way in which faculty use the TALC. Faculty included e-mail and use of new software or technology in this category. Common uses mentioned by UMSA faculty members included: e-mailing colleagues, academic and professional development and updating information, literature reviews, Internet searches, and bibliographies.

> "I have learned how to use several software packages. I use [the TALC] to prepare my own professional work and to access the most current information."
>
> – UMSA faculty member

The availability of electronic resources for academic research is another way in which TALC has had an impact on the UMSA faculty. Many mentioned "conducting research" or "studies" as ways in which the TALC has helped in professional development. Faculty mentioned several specific research areas including reproductive health.

When faculty and students were asked about the types of resources they consulted in preparing course materials, their responses followed trends established by other questions regarding the students' greater comfort with electronic tools. Faculty turn to print resources - first books (84%), then periodicals (78%) - and then to the Internet (75%), while students are inclined to consult the Internet (55%), followed by books (45%), then periodicals (38%), as shown in **Figure 14**. Because 37% of students also answered "computers," which was not an option on the Faculty Survey, it is likely that student Internet usage was actually underreported as a resource, exacerbating the print-electronic differential between these two groups.[10]

Figure 14. Resources Used to Prepare Course Material: Students and Faculty



One benefit of establishing TALCs is to provide access to JHPIEGO's electronic resources. This evaluation included questions on awareness and use of specific JHPIEGO services: a reproductive health website, trainer e-newsletter and reproductive health e-mail discussion list (listserv). This was particularly helpful since evaluation of e-resources accessed remotely by users is challenging due to the difficulty in acquiring individual usage information (Norton and Magarick, 2001). Over one-fifth (22%) of medical students and one-third (33%) of the faculty had used JHPIEGO's ReproLine Website (available at http://www.reproline.jhu.edu and on CD-ROM) at the TALC.[11]

[10] Pretesting the questionnaire would have brought this to light earlier.
[11] We expected the measurement of "use" in this question to be higher.

As illustrated in **Figure 15**, medical students found the Related Health Topics section of ReproLine most useful (60.9%). This contains information on topics such as infection prevention, HIV/AIDS, maximizing access and quality of healthcare, and sexually transmitted diseases. Their second preference was Maternal and Neonatal Health (MNH, 32.6%), followed by Cervical Cancer (30.4%). Faculty favored the MNH (55.6%), Family Planning (44.4%), and Related Health Topics (44.4%) sections. The strong faculty preference for the MNH section corresponded with their responses on topics researched, especially by those faculty with MNH or Pediatrics departmental affiliations. See **Appendix E** for a complete list of topics researched and resources consulted by UMSA faculty. Reviewing this information in detail can help to identify topics that should be included on the TALC website links pages mentioned above. If faculty see their interests represented, they are more likely to increase TALC usage and get the benefits of up-to-date topical information.

Figure 15. Most Useful ReproLine Website Sections, Medical Students and Faculty

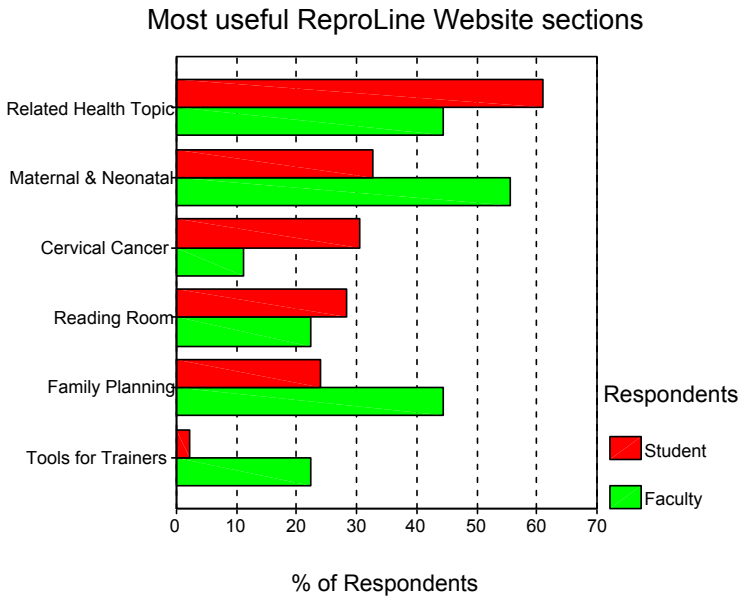
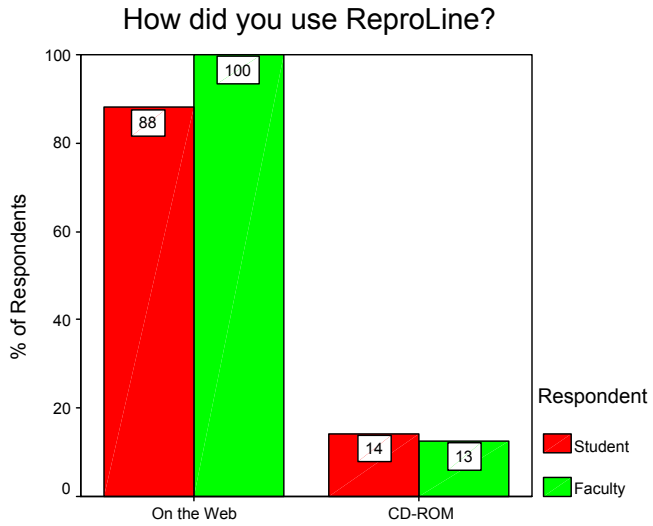


Figure 16. How ReproLine is Used: Students and Faculty



Of those who had accessed ReproLine, many more students and faculty had used the web version (100% of faculty and 88.1% students) than the CD-ROM version of ReproLine (12.5% of faculty and 14.3% of students). This agreed with the responses to the question about CD-ROM resources used, where neither students nor faculty mentioned ReproLine (see **Appendix C**). This trend of responses suggests that the Internet connection at the TALC was fast enough to encourage online browsing of the site even when a CD-ROM of the information was available. In addition to the content browsing and links to other useful websites, the ReproLine Website offers the opportunity to sign up for an e-mail discussion list and an electronic newsletter.

UMSA faculty members surveyed in this evaluation were not using any e-mail discussion lists, including ReproLine's listerv as described above. However, when medical students were asked if they subscribed to JHPIEGO's REPRONET-L listserv on reproductive health training, 49.1% of students who subscribed to any e-mail discussion list said yes.

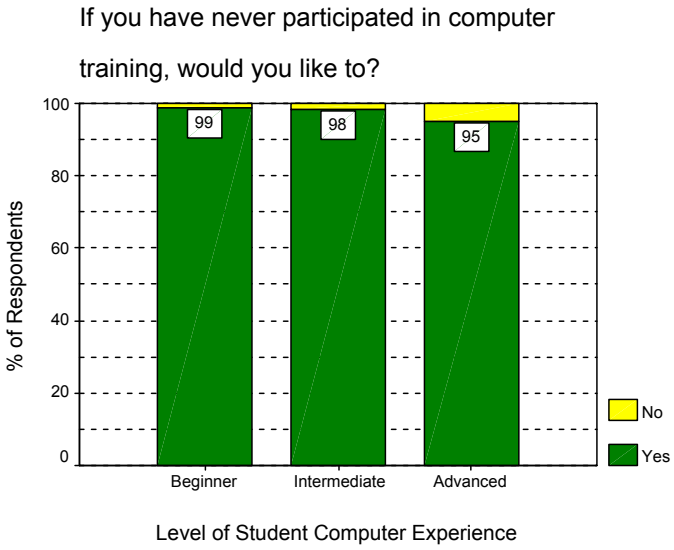
There was a similar lack of awareness about and use of the JHPIEGO monthly e-newsletter *JHPIEGO TrainerNews* by UMSA faculty and medical students. Only 5% of medical students and 3.6% of faculty subscribed to the newsletter. On a positive note, when given the opportunity on the survey to subscribe, many faculty and student respondents supplied e-mail addresses and JHPIEGO subsequently subscribed them to the *JHPIEGO TrainerNews* newsletter.

Improvements Needed in the TALC

When asked about what improvements could be made to the TALC, many users had positive things to say. Most comments documented appreciation of the TALC as a resource and asset to UMSA. A number of positive comments were made with reference to staff such as, “they attend to the users very well” and “they do a good job of maintaining the TALC.” Many who had positive comments mentioned the need for regular workshops for staff to update them on current computer and technical advances. Students also suggested that a designated technical support person for the TALC be hired. According to students, this full-time technical support person should be dedicated to assisting users and have strong technical/computer skills including Internet use.

Over 95% of all student respondents would like to attend a computer training course, showing that there is an interest in enhancing computer skills even among those with substantial previous knowledge and experience (**Figure 17**). Several faculty emphasized the importance of computer skills in their work or specialty area and expressed a related need to expand and/or improve their computer skills. Students stated a need for an expanded training course including updated and advanced technical skill components. Faculty and students alike stated that training ought to be practical and have a follow up or refresher component.

Figure 17. Level of Computer Experience by Interest in Computer Training, Medical Students



Students and faculty alike provided various suggestions on "ways to improve the TALC." (Respondents' suggestions were categorized based on content according to the frequency of responses.) Summarized in **Table 6**, students' suggestions are presented first and have been divided into three categories followed by faculty responses, which are represented in two categories.

Table 6. Most Needed Improvements at the TALC, Medical Students and Faculty

Students	*Faculty*
1. Increase number of training courses offered and diversify training content	1. Increase network capabilities and/or expand the TALC
2. Expand TALC facility and upgrade equipment	2. Increase number of training courses offered and incorporate them into the UMSA curriculum
3. Improve hours of operation and technical assistance provided	

Students mentioned a need to increase the number of training sessions and diversify course content. Students stated that training courses should be offered on a routine basis and suggested offering ongoing courses that fit within the academic calendar. The most frequently suggested training topics were conducting Internet searches and carrying out literature reviews. Additional topics included:

- Downloading current information and statistics
- Accessing a variety of websites
- Advanced computer skills
- Internet use

In many cases when training was suggested as an improvement area, the importance of having a qualified trainer with advanced technical skills was emphasized. Students stated that highly skilled computer experts with a wide range of computer/Internet experience should conduct training. Students also felt that trainers should be aware of computer technology and recent advances. Many medical students directly stated or implied that current TALC staff did not yet have this level of skill, so outside trainers might be needed at first until internal capacity is built.

The information, education, and communication aspect of training came up when students suggested information-sharing, education and dissemination. Medical students proposed the creation of a centrally located resource area at the TALC where lists of useful information could be posted. These lists would comprise:

- TALC operational and policy updates
- Health-related technology updates
- Medical and health websites, including new health sites recently discovered and accessing password-protected sites
- Online journals
- Recent publications and studies carried out by UMSA faculty and students
- Other useful health resources

According to students, this information should be updated regularly and include details on changes in TALC policies and other relevant UMSA administrative issues.

Respondents felt the TALC needed to be expanded to include more computer workstations. The frequency of this response suggests that both medical students and faculty strongly believed the TALC would be improved by installing at least two more computers. Written comments also indicated the room was already too small for the volume of users. Solutions included adding more tables and chairs and expanding into the vacant room directly in front of the TALC.

Many expressed the need for equipment upgrades such as installing printers, scanners and video conferencing. Lack of equipment, especially computers, is a widely felt frustration and a potential barrier to utilization for many students. Some students suggested that the network connection be upgraded to handle the high volume of users. At times, students said, the Internet connection was slow and this contributed to long lines and increased waiting time.

The two primary operational suggestions made by students were to revise the TALC schedule and to post hours of operation in a central location. Respondents wanted the TALC schedule to complement the UMSA academic calendar and schedule, to facilitate use by both medical students and faculty. The TALC schedule at that time was variable and inconsistent; it did not operate on a set schedule and was often closed during the established hours of operation. Students suggested developing and posting a fixed schedule, so that users had a clear idea of TALC hours of operation. Likewise, several students mentioned the need for an improved sign-in and registration process, and regulation of users.

Some technical support issues surfaced from student users as well. Many expressed a need for improved technical and administrative support during hours of operation. Students felt that staff needed to be more computer knowledgeable, share new technological advances and educate students. Several respondents noted, “Oftentimes, no one is there and if you need help there is no one to consult.” Others were of the opinion that the TALC needed additional staff trained in computer technology. A few users suggested inviting UMSA students and faculty members skilled in computers as volunteers to assist TALC users and to conduct training workshops, especially given the demand for more frequent courses and a diversification of training content. Many respondents wrote in positive remarks about the TALC staff, but a need for advanced technical skills was the overriding staff-related concern.

UMSA faculty repeatedly suggested expanding the network connection to include hospitals and UMSA academic departments. Increased access, many stated, would encourage more faculty to use TALC computers as a resource. Echoing the sentiment of students, faculty pointed out the insufficient number of computers in comparison to user volume and they suggested adding computer workstations. (This, of course, needs to be balanced with the survey findings showing that many faculty have access to computers in their departments and some even in their offices.) Due to the high volume of users, access was difficult, especially during peak hours; this made the network run slow, created lines and increased waiting times.

Computer training surfaced as an improvement area among the faculty. Whether they had already participated in a TALC training course or not, many wanted more frequent training courses offered, preferably on a routine basis. Suggestions included offering a training course every semester to improve overall computer skills of students and faculty. Likewise, faculty emphasized the need for follow-up training courses, hopefully increasing exposure to current health/medical studies, as well as research and technological advances via medical journals. Respondents said the number and variety of subscriptions to electronic medical/health journals at UMSA should be increased as well.

Benefits of the TALC at UMSA

Perceived benefits were assessed in part by asking participants, "What are the two most important things that have resulted from having access to the TALC?" Several themes surfaced. The TALC was viewed as a very necessary and valuable resource. Users felt that the TALC filled a noticeable gap by serving as both a professional and personal resource to the UMSA community. Internet access revealed a host of tools that were previously unavailable to medical students, faculty and administrators at UMSA. **Table 7** shows both student and faculty responses.

Table 7. Top Benefits of the TALC, Medical Students and Faculty

Students	***Faculty***
1. Access to current information	1. Professional communication
2. Ease and speed of accessing important information for coursework	2. Access to current health information
3. Use of information for ongoing learning	3. Improved personal computer skills
4. Increased knowledge	4. Access to journals
5. Improved quality of coursework	5. Fortify teaching / academic responsibility
6. Enhanced communication	6. General benefit
7. Convenient location and affordable cost	

Access was mentioned by both students and faculty—access to local and international colleagues, a wide range of health and medical information (a variety of journals, articles, research studies), and medical graphics. The majority of users stated that the convenient location of the TALC and ease of access to vast amounts of information was a valuable asset to users and the UMSA at large. Many noted the importance of easy access to needed information. If a user needed information quickly or if they needed to update information for a class or presentation, they just "go to the TALC and get it."

In the following section we discuss briefly each theme that surfaced among students and faculty.

Students' perceived benefits of the TALC

Accessing Current Information: Convenient and easy access to up-to-date information were frequently referenced benefits of the TALC. Many claimed that, prior to the TALC, access to the magnitude of information now obtainable from Internet access did not exist because the only available bibliographic resource was the outdated UMSA medical library (books and a few journal subscriptions).

When mentioning access, students almost always included the phrase "up-to-date" in responses which included accessing current data, statistics, journals/magazines, and reference texts. Health/medical research and studies were also frequently mentioned.

Students often commented on the ease and speed of acquiring information needed for coursework. They mentioned the wide scope of information that they could find or download. Many students noted that because print resources in the UMSA medical library were outdated and limited, information needed for assignments or group projects was obtained via the Internet at the TALC. Students could now fortify papers, assignments, presentations and general work with current statistics and graphics retrieved from the Internet. Some noted how the TALC has enhanced personal knowledge in their area or field of study.

Personal development: Many respondents said that access has enabled them to keep current in their particular field of study, read current journal articles and access the most up-to-date information in their specialty area. Various respondents stated that Internet access represented a significant improvement to the quality of coursework and output. They associated this with increased personal knowledge and expanded knowledge in their field of study. Students' comments indicated appreciation for increased potential for learning and acquiring knowledge.

Academic/professional development: The general perception among students was that the quality of coursework had improved because of the TALC. Specifically, respondents said that nearly all medical students utilized current information, graphics and a broader scope of information when preparing assignments. This applied to work assigned by professors, group projects, presentations, and literature reviews.

Many students' comments reflected that communications were enhanced; because of the TALC, they could communicate with other medical students, colleagues in the field and international organizations (including other medical schools). Many said they also communicated with family and friends electronically. Expanded communication has enabled medical students to keep current in areas like general medicine, medical research, current affairs, and social activity. Students reported that Internet access enhanced communication within UMSA as well.

> One student summed up this topic well, "[The TALC] saves time and money, two things, that … [make] it precious to medical students."

The TALC's location was seen as convenient and timesaving: "Students do not have to leave the UMSA and go to an Internet café." One student captured the opinions of many when he said, "You can access current information and do it without leaving the UMSA." The majority of students felt that TALC computer user fees were economic and cheaper than most Internet cafés. Only a few said that fees were too high and should be reduced.

Faculty's perceived benefits of the TALC

The faculty perspective on TALC benefits focused on professional development (expanded communication capabilities and contacts with colleagues, increased access to current health related information, improved personal knowledge and computer skills, access to health-related journals, and contributed to lecture development and academic responsibilities) and overall benefits to the UMSA community.

Accessing Current Information: Like medical students, many faculty use the TALC to access the most current and up-to-date information. Faculty members used the TALC to access professional journals and specialty journals. As one faculty member put it, "[The TALC] helps keep me current and up to date on what is going on in the field of health." Another faculty member reflected the opinions of many when he wrote, "It allows us to stay up-to-date and learn about new things that are happening and that we would not know about otherwise."

> "I have learned about publications and now have direct access to them"
>
> -- UMSA faculty member

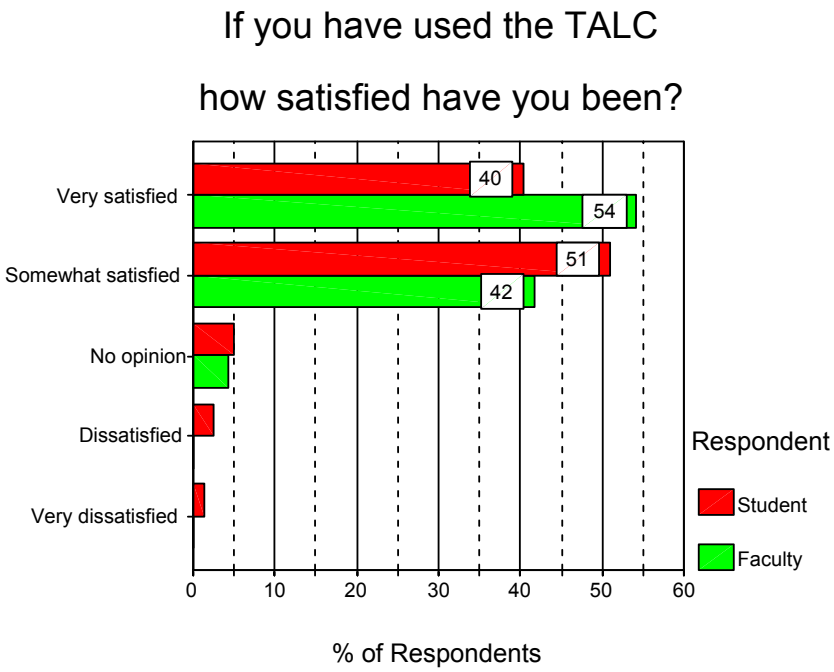
Personal development: Numerous faculty mentioned using the TALC as a learning tool to enhance personal computer skills: how to use the Internet and new software and improving general computer skills. One faculty member stated, "I learned how to use a computer because of [the TALC]."

Academic/professional development: Faculty viewed the TALC as a professional tool that facilitated communication with colleagues within the UMSA and in the broader health/medical arena, nationally and internationally. Various faculty also mentioned increased communication with students as a result of the TALC. A number of faculty stated that because of the TALC they could access large amounts of health data and information from other universities and use the TALC to communicate with scientific societies and health organizations. As one faculty member said, "[The TALC] provides access to a new way of communicating." Faculty comments spoke to the direct benefits of accessing information on reproductive health and maternal and child health, nutrition, pediatrics, and surgery.

UMSA faculty felt that the TALC had assisted them in "teaching and lecturing," "improvements," and "strengthening lectures and presentations." Some mentioned that they are often asked to help with dissertation topics and that the TALC has helped to prepare materials. Many believe that the TALC is a benefit to the UMSA community and feel it is imperative that it be maintained. One faculty member said, "It is something very important, especially in the area of training UMSA faculty." Others mentioned the importance of keeping UMSA students and faculty updated with what is happening in the rest of the world.

Figure 18 shows that overall TALC user satisfaction is good to very good and this is supported by user and faculty responses to the question, "What would happen if the TALC did not function anymore?" Responses varied in detail, but resonated an overriding sentiment: it would be a significant loss and "devastating" to the entire UMSA community, including medical students and faculty, if the TALC no longer existed.

Figure 18. User Satisfaction with the TALC, Students and Faculty



The comment, "it would be a step backwards," surfaced repeatedly in both groups. This referred to scope of course content, ability for UMSA to participate in the global health community, and overall preparation of students in the modern healthcare arena. Students and faculty alike mentioned several quality issues:

- If the TALC did not function anymore it would be a great loss and a "step backwards" for medical students, UMSA faculty, and Bolivia in general
- Quality would be negatively affected; specifically, quality of course materials and student output
- UMSA would be at a disadvantage in the national and international health arena
- Access to current information would be cut off
- Efficiency would decrease

Students said that the quality of UMSA academic life would decrease without the TALC. Quality would suffer because students would no longer have convenient and timely access to a broad variety of information and they would only have access to the outdated materials and reference texts in the medical school library. Likewise, if students needed to look for more current information, they would have to go to an Internet café, which would take more time and which would cost them more. Coursework quality would consequently suffer, which would lead to an overall decrease in the quality of UMSA in relation to other medical schools and the international health community.

About half of faculty respondents mentioned that closing the TALC would be a step backwards for the medical school and the larger Bolivian health sector. Issues such as decreased quality, a loss for the students and putting the UMSA at a disadvantage in the international health world,

were common responses to the questions. Faculty comments indicated that UMSA would be at a disadvantage within in the medical field and global arena. One professor summarized the thoughts of his colleagues when he said, “It would set us back, we would be behind in a lot of ways such as current information (studies/advances) and we would be at a disadvantage compared to the rest of the medical/health community.”

The issue of global standing was represented in this comment, “This [closing the TALC] should not happen because it is a vital aspect of participating in a globalization.” Other quotes that reinforce how the general faculty sentiments in terms of a professional and global positioning include: “We would be excluded from all the advantages that come along with current and new technologies,” and, “It would be a loss and disadvantage for the entire UMSA. We would be isolated from other institutions and from the current/new information and what is happening in the field of medicine/health.”

As with medical students, UMSA faculty felt not having the TALC would mean spending more time looking for up-to-date information and resources from some other facility such as an Internet café or another university. One professor captured this concept well with these words, “It would really hurt the UMSA, both students and faculty. It would mean that students and faculty would have to spend the time looking for somewhere else and then pay for the service at a commercial facility.” Another professor wrote, “It would mean we would have to spend a lot more time looking for and getting to another place to find the kind and scope of information that we all need.”

DISCUSSION

Several key themes emerged from this evaluation:

- Technology Changes the Academic Paradigm
- The TALC’s Early Success Stimulated Unexpected Benefits
- Demand Outstrips TALC Capacity
- TALC Progress in Cost Recovery
- Maximizing TALC Potential: Additional Uses

Technology Changes the Academic Paradigm

This evaluation showed that, after a year of the TALC’s operation, medical students felt the TALC clearly changed the way they progressed in their academic studies. Students quickly grew dependent on the technology linking them to previously inaccessible medical resources. They then had higher expectations of their own knowledge development, expecting that they should be seeking the most up-to-date information from any sources available to them. And their perception was that state-of-the-art references were available from the Internet and on CD-ROM rather than UMSA library print resources. With access to searchable and focused medical electronic resources, students felt they were more equipped to complete coursework. In fact, by the time of this evaluation, some medical school assignments were requiring Internet use, indications that faculty members were beginning to incorporate Internet use into coursework.

Students were more frequent TALC users than faculty members, further evidence of the importance of the TALC to student computer access. Thus, medical students stand to benefit more than faculty from the electronic reproductive health and medical science reference materials available at the TALC. Faculty, however, have access from their own computers to electronic resources such as ReproLine so their lack of TALC use does not necessarily mean

that they aren't using updated electronic resources. In fact, their awareness of those resources, increased dramatically because of the TALC initiative.

UMSA Health Sciences faculty used the TALC to access data and research conducted at other universities nationally and internationally, thereby enhancing their own research and increasing the potential that they would incorporate current information into the classroom and class assignments. Communication with other universities and colleagues is providing UMSA faculty an opportunity to learn from, participate in, and contribute to the broader health community. This also has the potential to filter down into improved learning for students from the improved reproductive health teaching materials developed by faculty.[12]

One electronic resource, however, that could be better used are e-mail discussion lists, otherwise known as listservs. Listservs exist on a wide variety of topics and, within the health arena, vary from from reproductive health to medical informatics. These could be a valuable mechanism for North-South and South-South linkages for UMSA medical faculty. But only one-fifth of students surveyed at the TALC subscribed to listservs, whereas no faculty subscribed. This presents an awareness issue; JHPIEGO and UMSA library staff need to promote the benefits of peer-to-peer remote collaboration via focused discussion lists.

The literature has pointed to the need for more linkages among developing country scientists to advance the quality of relevant research in their settings. While "developing countries encompass 24.1% of the world's scientists, most leading journals publish far smaller proportions of articles by authors from these regions" (Gibbs, 1995). In the mid-1990s, scientists based in Bolivia were publishing only a 0.010% share of global mainstream journal articles, fewer than those published by authors in Sri Lanka (0.019%) and Indonesia (0.012%) (Gibbs, 1995). Internet access to medical and health science bibliographic gateways, listservs that discuss recently published research results, and reliable access to web-based e-mail services could provide needed lines of communication to bridge gaps between Bolivian medical school faculty and advanced students, and resources important for conducting research.

Access to state-of-the-art telecommunications technology such as available at the UMSA TALC could provide an opportunity for UMSA medical faculty to benefit the Bolivian population by sharing their knowledge with more remotely located practicing health professionals. This is only possible if the correct training or "retooling" is taking place to encourage these practices. The TALC at UMSA is well positioned to facilitate this training.

It is worth noting that in the first year of TALC operation, many departments at UMSA had incorporated use of the TALC into their curriculum (Asport et al, 2001). For example, the MPH program uses the TALC for epidemiology and biostatistics classes as well as for the web-based National Health Information System (SNIS)[13] course for 2 weeks each year. The Masters programs for higher education, family medicine, forensic medicine and biochemistry/nutrition have also been using the TALC computers. In addition, the medical school implemented a curriculum change in 2001 so that first year medical students would complete a public health module on the Internet (to allow for online research on anatomy and social medicine).

[12] A focused evaluation tracking changes in medical school family planning/reproductive health course content and teaching materials over time since the TALC was opened could be done to test this hypothesis.

[13] Sistema Nacional de Información en Salud

The TALC's Early Success Stimulated Unexpected Benefits

This access to technology and the Internet influenced additional graduation requirements at UMSA, and provided incentive for faculty to hone their own skills (Asport et al, 2001). Weak skills in English and computers put faculty and students at a distinct disadvantage. Because such skills are often prerequisites for scholarships, for example, faculty and students were often unable to apply. Medical students at UMSA were subsequently required to have computer skills as well as the ability to read English before embarking on their internship year. UMSA library officials believed these requirements were one indication of the TALC's influence. Access to the TALC helped university officials realize that computer skills, access to the Internet and the ability to read English were essential tools for their students and faculty.

In the first year of the TALC's operation, UMSA staff and faculty initiated three projects exploiting technology and focused on South-to-South collaboration for Bolivia.

- **Library Network** – The UMSA Medical Library is the designated coordinating center for a network of health sciences libraries in the Latin America and Caribbean (LAC) region. Since the TALC opened, the Biblioteca Regional de Medicina (BIREME)[14] worked with UMSA and the Library to create a virtual medical library to be shared among other schools in the Bolivian BIREME network, including Sucre, Santa Cruz and Tarija.

- **Online Journals** – UMSA library staff worked with Proyecto SCIELO (the Scientific Electronic Library Online) to post journals online. This gave students and faculty online access to a variety of Bolivian journals: the Bolivian Medical Journal, the Sucre Medical Journal, the Bolivian Food and Nutrition Journal, and the Journal of the Bolivian Medical College.

- **Distance Education** – A consultant worked with a group of UMSA faculty (Dean of the Faculty of Medicine, the Vice-Dean, Chief of Nursing, Chief of the Medical School, and Chief of the School of Public Health) to develop a distance education course for Bolivia, submitted for funding to various agencies.

Demand Outstrips TALC Capacity

Complex social interactions theory states that "the way technology is ultimately implemented and utilized in a particular organizational setting depends on conflicting objectives, preferences, and work demands" (Anderson, 1994). While the goal of the TALC initiative was to increase faculty and student access to updated information resources for reproductive health, the high demand for computers negatively affected access and made for long waiting lines. Faculty were less likely to want to wait in these lines. Low TALC utilization by faculty, however, was because faculty did not want to work in the same area as students and because many had their own computers. It was more convenient for them to use computers in their academic departments or hospital offices for Internet access.

There were striking differences in perceptions between student and faculty users versus staff about the supply and demand of quality support services, including training, at the TALC. Library staff assigned to the TALC believed they were providing extensive user support and training. Faculty had actually received structured training, but still communicated unmet needs

[14] Regional Medical Library, in English

for additional formal training and post-training refresher workshops. TALC users expressed desire for ongoing technical support, even if they had already attained an intermediate or advanced level of computer skills. Students felt that UMSA should provide much more computer training and use-aids in addition to more experienced staff for routine support. Given that existing library staff were assigned TALC responsibilities, and that library staff access to computers had been limited before the TALC, there was likely no advanced user support or training available because the TALC staff's computer skills learning curve coincided with that of the students. In other words, computers were new to the staff assigned to provide the computer training. We did not ask how staff perceived their own level of computer knowledge; however, to meet TALC end user needs for support, it is clear that staff will need to advance to a higher level of computer knowledge and skill to retain their TALC responsibilities.

TALC Progress in Cost Recovery

Intrinsic to improving technical support is a paradigm shift toward seeing the TALC as a business enterprise with standard operating procedures. Oestmann and Dymond (2001), on telecenter experiences, note that the most common business model for computer centers in low-resource countries is to have them sponsored by development agencies and run by nongovernmental organizations. This model results in operating procedures dictated more by specific development objectives than sound business practices in the areas of pricing, marketing, competition, human resources and training. While cost recovery was an expectation of the TALC from its initiation, the TALC cost recovery scheme recouped more than 50% of the annual line-access costs in the first 6 months (Asport et al, 2001). Although costs continued to be recovered, weaknesses in business practices were seen at the UMSA TALC.

The use of cost-recovery mechanisms to make the TALC self-sustainable is dependent on maintaining a critical number of users to cover the cost of Internet service provider fees. If less money is collected, only Internet service of a lower bandwidth may be affordable, and this may have a negative spiral effect on attractiveness of the TALC as a computer resource, given that there are now other commercial options at similar prices in the neighborhood. The TALC's financial accounting includes comparison of income generated to number of TALC computer users. While current usage logs do not include duration of use, upon which charge calculations would be based, they do track amount of money collected and number of user sessions per day, which is a very functional system.

The evaluation showed the TALC at UMSA filling a niche for on-campus medical student access to electronic educational resources. If TALC usage fees remain competitive, the UMSA library could earn revenue while providing students with access to more relevant electronic learning materials than would likely be found in the average La Paz Internet café, benefiting the academic institution as well as being convenient for students to access between classes and clinical rotations.

This project began as a "turn-key" operation so that after the first year, the TALC would be fully operated by UMSA. When that first year was over, JHPIEGO was still somewhat involved in the TALC, providing technical assistance. Results indicated that library staff and management need to be developed to effectively administer the TALC for sustainability, with an eye to efficient operations, demand-driven training (could be a potential future cost-recovery mechanism), recruitment of non-users, and increasing user satisfaction. Internet Service Provider fees at the Bolivia TALC were paid from this TALC initiative through October 2001. Thereafter, cost-recovery mechanisms (currently consisting of charging hourly usage fees) have been the sole source of income to pay these Internet access fees, unless the UMSA administration or other donor agencies can provide funding. Proper accounting and monitoring will aid TALC

administrators in planning income and expenses within a self-sustaining operation, as well as to prepare reports and presentations to UMSA administrators and for inclusion in proposals to donors, with funding requests.

Maximizing TALC Potential: Additional Uses

The TALC at the UMSA Health Sciences Library has succeeded. It has opened up the online world for UMSA faculty and students alike and promoted South-to-South collaboration in a variety of ways. Access to the technology in the TALC influenced academics at UMSA for both faculty and students alike. This evaluation documented all this and more.

The original intention of the TALC focused on electronic access to updated RH information and research, primarily for faculty; usage has been focused on Internet-based resources. As users become more facile with computers, it will be difficult to respond to pressures not to restrict the TALC to information resources. E-mail exchanges with colleagues and students were identified as important by those surveyed in this evaluation (even though a high percentage of faculty and student users thought they did not have access to an e-mail account), but this begins to go beyond the original intention of the TALC. Users cited the convenience of the location as very important but, as computer needs increase (especially for word processing and spreadsheet use), students may turn to the less convenient and more costly Internet cafes, if the TALC cannot meet their needs. This, of course, has implications for the cost recovery projections.

Since Microsoft Office is available on all computers, TALC administrators could use MS Excel and Word for creating and maintaining several basic tracking tools to manage the TALC. For example, users could fill out registration data only once and be assigned an ID card and number. Usage by ID number could then be tracked in a database.

Some of these needs can be addressed by staff training since staff need the capacity to recognize the areas where improvement is needed in routine operations and to feel they are empowered to make changes. Creative thinking is needed, such as marketing electronic family planning/reproductive health materials by collaborating with an OB/GYN professor at the school in creating a workshop to teach students about these resources. A monthly or quarterly TALC newsletter or fact sheet that provides students with up-to-date information in the areas of technology and computing, reviews and recommends specific health related websites, and provides essential information on current TALC policies, upcoming trainings and hours of operation could be made available at the UMSA Library. Giving staff the responsibility to produce this newsletter would demand that they use and demonstrate their computer and Internet skills targeted to health science student and faculty needs.

Study Limitations

The low number of faculty users participating in the survey, leading to lack of faculty representation overall in the results, meant that our plan to compare User Survey responses for both faculty and students could not be carried out. This reinforced the anecdotal evidence that faculty were using the TALC less frequently than students. There were fewer responses to the Faculty Survey than expected (this despite repeated visits to faculty to enlist their participation in the survey), but this data set was, nonetheless, sufficient for comparative analysis with student responses from the User Survey.

The evaluation team was very interested in the use of electronic reproductive health/family planning resources at the TALC, both on the Internet and CD-ROM. Because of the way that surveys were administered, there was not an opportunity to elicit usage of these resources if respondents did not recognize or list them by name. Users of such resources may not know or recall specific electronic products or services by name, but may have recognized and reported use if the resource were described by an interviewer. Another limitation to the study design was lack of follow-up interviews to fill in sections answered improperly or incorrectly. Some questions were not well understood by some respondents and their answers could not be used. Pilot-testing the data collection instruments may have prevented this problem.

All survey data are self-reported, and we only have one corroborating data source, the TALC administrator's logbook on usage statistics, and even this source may not be as reliable as we would like. Some of our research questions could also be answered, or self-reported data validated, by administrative data sources such as logs of websites accessed, CD-ROMS borrowed, and examples of curricula or class assignments that reference the TALC or material accessed at the TALC, including ReproLine documents. We also didn't corroborate data such as student reports that the TALC was less expensive and more convenient than the Internet cafés, important since library staff implied that the cyber cafés were reducing usage of the TALC. Only outside data on the cost of Internet use at the local cafés, and exact timing of their opening in relation to reliable TALC usage statistics will show whether there has been an impact.

RECOMMENDATIONS

The Recommendations section is divided into those recommendations important for the UMSA TALC along with those recommendations arising from the UMSA TALC that would influence any TALC initiative.

Recommendations for the UMSA TALC

- *Improved awareness of the full range of electronic tools.* Library staff who train faculty members need to emphasize the benefits of the electronic tools available, with an introduction to listserv technology and examples of a variety of health and medical e-mail discussion lists available. Because many faculty had their own computers, there is also a need to find mechanisms to ensure faculty access to the same electronic resources found at the TALC, especially those on CD-ROM but also updated website addresses and online reference databases.

- *Decreasing waiting time.* One strategy to address the issue of long waiting times might be having medical students transform their complaints into solutions, by forming user groups and compiling lists of favorite websites (starting with those listed as responses to this survey). These sites could be posted in the room on paper and electronically on a TALC network web page for easy access, reducing search times for all who access the TALC. Given that faculty and students alike are accessing many of the same health Web portals, online journals, and medical websites, this would streamline use once users were assigned to a computer.

- *TALC staff can increase their customer-service orientation.* In addition to providing ongoing reliable hardware maintenance for the TALC computers and network, staff members need to learn customer service skills to provide targeted and responsive technical support and

training to both faculty and student users. Supervisors need to allocate sufficient staff time and funding to maintain and support the TALC, including resources for professional development courses that will help staff attain skills needed for satisfactory job performance.

- *Monitoring TALC usage as part of the cost-recovery plan.* Administrators and staff must also have the resources to implement and maintain instruments to monitor:
  - TALC training events, participants, and trainers
  - TALC usage (by cadre) and fees collected
  - Websites visited
  - CD-ROM resources used
  - Internet connection speed

- *Marketing and promotion of the TALC to increase cost recovery.* Influencing attendance at the TALC as well as convenience of the location and affordability is the perceived utility of the resources found there. If medical students and faculty are not aware of the added value of using the TALC over any other computer access point, they will be likely to use the most convenient computer available to them, for example in their office or department or at a nearby Internet café. The UMSA Health Sciences Library should consider offering a more extensive introduction to the ReproLine® website, electronic medical journals, and other CD-ROM and Internet references specifically and sometimes exclusively available at the TALC to raise this awareness among both faculty and students. Access to updated reproductive health and medical science information, not just basic computer access, is the potential benefit that should be reflected in marketing the TALC to the target audiences.

UMSA TALC Recommendations Influencing any TALC Initiative

Recommendations arising from this evaluation focus on the importance of strategic planning as an integral part of implementation and throughout the life cycle of the TALC. The likelihood of operating successful and sustainable TALCs is greatly improved if a business plan that considers proper management, monitoring and maintenance is in place from initiation. Key considerations for a business plan are outlined below and were derived from student and faculty comments and suggestions. The plan addresses stages of development and focal points within each stage as described below.

All Stages of Development

In all phases of the TALC life cycle, the following considerations play an important role in the success of the TALC.

- *Be sensitive to the political environment*. Political support or "buy in" from the host agency and local gatekeepers is critical during the startup phase as well as throughout the growth of the project.
- *Provide technical support and oversight*. Computer systems support needs to be put into place early in the process and a plan needs to be implemented to provide ongoing routine maintenance (e.g., computer virus scanning, data backups) and more sophisticated troubleshooting. If technological needs outgrow the internal host agency capacity, then contracting local external IT expertise should be explored.
- *Promote the TALC*. Creative marketing is needed on an ongoing basis—not just after the initial launch—to keep TALC services in the minds of users and to counter the effects of competition (e.g., from local Internet cafés).

- *Develop staff computer and management skills*. Staff members responsible for TALCs have skills needs which grow throughout the life of the TALC in the areas of computer use and business management. Staff members need to be trained in basic computer skills at the launch of the TALC and later receive refresher training on advanced techniques to support more sophisticated users. In addition, staff members may not begin their role as TALC administrators with the necessary business skills to run the TALC as a commercial enterprise and may need training and mentoring to ensure success of the operation. Training should focus on project management, including strategic planning, recordkeeping, monitoring, financial management and needs assessment methods.
- *Evolve the donor-host agency relationship*. Business procedures need to be put into place early in the TALC life cycle to ensure that the project collaborators work explicity toward a relationship where the host agency takes on full responsibility for operation of the TALC. Planning for long-term technical and financial assistance throughout the TALC life cycle is fundamental.
- *Continue to develop cost-recovery approaches to meet changing market needs*. TALC administrators and the host agency need to continually explore new ideas to generate funds to sustain the TALC, from hourly rates for TALC use to services for a fee. Charging for services from basic typing or document preparation in MS Word, Excel, or PowerPoint, to transcription and bibliographic research could generate funds to partially defray TALC operational costs.

Pre-Launch

- *Define the target population.* As with any business plan, identification of target consumers and their characteristics is a critical first step. Recognizing gatekeepers and understanding their influence on the target population is an integral part of planning. Useful questions to ask are, “What changes may occur within the target population over the life of the project, and will that influence change over the life of the project?”
- *Examine technical infrastructure.* A realistic assessment of the technical infrastructure is important to launch and maintain a well-functioning TALC. Specific assessment points include Internet connectivity, existing telecommunications infrastructure, and potential for expansion. Influencing factors such as the immediate and future political climate need to be considered. Early in the process, initiate discussions of overall maintenance, future funding, long-term host agency support, and general management.

New Operations

- *Administrative committee decision-making.* In a move toward sustainability, an administrative committee should be established and convened on a regular basis to discuss operational activities, strategic planning, management and IT needs. Specific issues to consider are identification of staff training and continuing education needs, adjustments to technical and administrative infrastructure, and fiscal matters. Although initial donor inputs enable the project to begin, local ownership will determine success over time.
- *Ability to adapt to dynamic environment.* The increased number of Internet cafés near the UMSA has created a competitive environment, making it necessary for the TALC to adapt by broadening the scope of services offered and craft innovative ways to compete with Internet cafés.

- *Training.* The administrative committee should pay close attention to training needs and offer regularly scheduled courses on basic computing, Internet use, conducting advanced searches, and accessing reliable medical and health science references. User comments suggest that the desire to further develop computer and technological knowledge exceeds the capacity and skills of TALC staff. Maintaining skilled staff and offering contextually diverse training increases user satisfaction and likewise, promotes staff confidence.
- *Daily management (monitoring tools).* Standardized monitoring tools are vital for running an efficient and effective TALC. There must be local expertise and staff time allocated for maintaining a monitoring database. The database acts as tool for monitoring of TALC activities, income generation, cost recovery, targeting long-term activities and assessing the dynamic needs of users.

Progression to Sustainability

- *Build accountability for overall sustainability of the TALC into job roles.* Clearly defined roles and responsibilities need to be established for all TALC staff. When determining staff roles and responsibilities, individual interests should be considered in addition to needed areas of expertise, as interested staff are likely to be motivated to perform well.

Troubleshooting

In an IT project in the health sector, several externalities can affect the success of even the most well-conceived implementation plan. Some of the more common causes of disruption and suggested mechanisms to offset the potential damage are listed below:

- *Economic fluctuations.* Alternative funding mechanisms and innovative income-generating ideas are recommended to counteract economic fluctuations.
- *Viruses.* The threat of new and harmful computer viruses is an unfortunate reality in the world of IT. A proper virus protection plan needs to be in place and running at all times. One staff member should be responsible for virus protection, but all staff should be aware of the system and be able to troubleshoot when and if necessary.
- *Sudden changes in staff.* Defined roles and responsibilities and staff cross-training is recommended to minimize operation downtime in the event of unanticipated changes in staff. Similarly, host agency investment in staff time allocated to the TALC is critical to avoid any operational lapses in service.
- *Theft or damage to equipment.* It is of utmost importance to insure all TALC equipment to reduce donor and host agency financial risk in the event of theft or damage to computer equipment.

CONCLUSION

From 1998 to 2001, JHPIEGO and UMSA faculty, staff and students worked together to strengthen preservice education and training to better meet the healthcare needs of Bolivia's population. In doing so, they realized that a key element in sustainability would be the ability to update the knowledge of faculty, staff and students on an ongoing basis. To meet this goal, in October 1999, JHPIEGO worked with UMSA to establish a technology-assisted learning center with Internet connection in the Health Sciences Library. In March 2001, JHPIEGO conducted an evaluation of the TALC to determine how effective it had been. The results showed that the TALC was a success in a variety of ways for improving access to FP/RH information in the preservice education arena. The results also indicated lessons learned and opportunities for improvement of TALC services.

In addressing specific objectives of the evaluation, JHPIEGO was able to:

- Reveal ways to better satisfy the information needs of users (e.g., development of content portals, targeted advanced training)
- Collect qualitative data about improved learning by students and improved teaching by faculty
- Identify strengths and areas for improvement in TALC administration
- Determine the extent of use of JHPIEGO-provided resources
- Identify contributing factors to the success of the TALC (e.g., location, receptiveness of students)
- Reveal barriers to use by faculty members (e.g., co-use considerations with students)

The initial expectation for the TALC was that the primary users would be faculty members researching health topics to update their teaching sessions. In practice, however, the evaluation pointed to students as the most enthusiastic users of the TALC. This may have been due to youthful enthusiasm and/or prior exposure to computer technology as well as to the finding that many faculty had access to computers in their offices or departments. Surveys of students, faculty and library staff revealed a new academic paradigm where students were using the TALC to take charge of their education, find answers to their academic questions, produce better quality coursework, and improve their chances for a successful professional life after graduation. While JHPIEGO expected a trickle-down effect of updated knowledge from faculty to students, the evaluation documented student reports that the reverse was occurring, with students doing the bulk of the research at the TALC.

As students grew more proficient in their use of the TALC as a research tool, they also developed more sophisticated desires for user support that were only partially being met. The students' growing desires for higher-level support posed a challenge in a setting where the support staff had started out with limited knowledge of computer technology. The importance of planning for adequate technical support structure to meet the growing demands of a successful technology implementation was a lesson learned in Bolivia. Human resource investments must go hand in hand with the technological investments for implementation of new systems.

Survey comments also revealed unexpected social dynamics in use of the TALC. While JHPIEGO had expected the TALC to be a shared resource among faculty, staff and students, in practice, faculty were reluctant to sit at computers to prepare course materials alongside students. This reluctance led to underutilization of the TALC by the faculty, although not necessarily less overall use of computers. Faculty members recognized the value of the TALC

resources and were motivated to seek out computers in less public settings than the UMSA's central library.

Finally, a common thread running through the evaluation data was like the old real estate adage: the importance of location, location, location. While the success of the TALC was due to several factors, including enthusiastic users and staff, the synergy realized by locating the TALC in an academic institution amidst the intended users cannot be underestimated. The location of the UMSA library is especially significant, as this is the place students and faculty seeking information happened upon readily available resources over the Internet. The challenge for the TALC administrators and staff will be to continue to leverage this competitive advantage, as well as provide improved learning services, in the face of growing competition from local cyber cafés.

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APPENDIX A

Administration of Data Collection Instruments and Data Analysis

Administration Survey: Because the UMSA chief librarian and senior TALC administrator was responsible for oversight and management of TALC operations, she completed the Administration Survey. The survey was a combination of a self-assessment and one-to-one interview conducted by the JHPIEGO consultant.

Library Staff Survey: Staff of the UMSA library work with the TALC in a variety of ways. They provide technical support to users, assist in daily management and track usage. Because of their involvement with daily operations of the TALC, these staff members were asked to complete the Library Staff Survey, which identifies how the TALC has changed roles and responsibilities of library staff at UMSA. The chief library administrator, Cecilia Camacho, distributed the surveys during a staff meeting. Surveys were completed by all seven staff members and returned within one week.

Faculty Survey: The Faculty Survey was designed to collect information from faculty that had participated in an Internet training course given at the TALC. The training registration lists were used to contact faculty and distribute surveys. Forty-one faculty members appeared on the registration lists and were given a survey. Marilin Sánchez and the data collection team hand-delivered surveys to faculty or their administrative assistants and requested that completed surveys be returned to Ms. Sánchez's office. To facilitate the TALC evaluation, the Dean of the Medical School made an announcement during a faculty meeting, urging faculty to support the evaluation by completing and returning the surveys. Due to a low initial survey return rate from faculty, the data collection team revisited faculty in person to collect the surveys. The team took this opportunity to interview faculty, clarify open-ended responses and record additional comments. Clarification and interviewing were not done with all respondents; it was only done with those that did not return the surveys in a timely manner. Ultimately, thirty-three faculty members completed and returned surveys.

User Survey: Participants in the User Survey were chosen from a pool of potential respondents who came to use the TALC in the library. The selection criteria for completing the User Survey were use of the TALC on a regular basis and use of the TALC within the past two weeks[15]. These screening parameters were applied to each potential respondent, and if they answered "no" to either one, they could not participate in the survey. This information was self-reported by potential participants. User Survey data were collected over 2 consecutive days at the UMSA Library. A total of 293 surveys were completed by TALC users.

The data collection site was an unoccupied meeting room located directly across from the TALC. Both the TALC and the meeting room are located within the UMSA library, which is in proximity to the medical school main entrance. The TALC and the meeting room have glass walls and are highly visible upon entering the UMSA library. Signs announcing the survey were placed near the main entrance of the medical school, at the library entrance and on the meeting room door.

[15] Use of TALC "on a regular basis" was not explicitly defined to potential respondents.

Due to the high volume of TALC users interested in completing evaluation questionnaires, participants were asked to form a line in the hallway outside of the meeting room while surveys were conducted with small groups of 10-15 users inside the meeting room. The JHPIEGO evaluation consultant gave a brief explanation of the study objective to each small group before distributing the surveys. Then, upon completion, the data collection team reviewed each questionnaire with the respondent. The surveys were reviewed for completeness, and ambiguities of open-ended responses were clarified. After the surveys were reviewed, the team thanked the participants and gave them their incentive gifts. These gifts were a combination of the following three items: a ReproLine pen/highlighter, key chain and a pregnancy wheel. This process was repeated for each group of users.

Data Analysis

JHPIEGO Data and Information Services staff in Baltimore created a blank database, with Spanish data entry forms matching each survey, in Microsoft (MS) Access 2000™. The electronic MS Access file was e-mailed to the JHPIEGO Bolivia office. Since the responses to the open-ended questions were handwritten in Spanish, JHPIEGO Bolivia staff entered all qualitative data and some coded fields (from multiple-choice questions), and then sent the MS Access file by e-mail and hard copies of all completed surveys to JHPIEGO Baltimore via courier. Remaining coded answers were then entered in Baltimore into the same electronic data file.

The four Spanish MS Access data tables were each imported into SPSS version 10 by non-Spanish-speaking staff, where a bilingual JHPIEGO evaluation researcher translated the coded data from Spanish to English SPSS databases, ran frequencies, and produced graphs for review by the evaluation team. The team met in Baltimore to discuss the descriptive results. Based on suggestions brought out during the meeting, the researcher generated cross-tabulations of further value in answering the original study questions. The data files are archived in both MS Access 2000 (Spanish) and SPSS 10 (Spanish and English) format, ready for future analysis if ever required. If this evaluation is repeated in whole or part in another TALC setting, Bolivia TALC responses will be useful in a comparative analysis.

For analysis of open-ended responses, there are various methods of analyzing qualitative data but all share one common objective: data reduction.[16] The evaluation team chose thematic analysis to synthesize and analyze the qualitative information collected during the TALC evaluation. JHPIEGO Baltimore data analysts generated a report from the Spanish SPSS database for each of the four TALC assessment tools, listing the respondents' identification (ID) number and all corresponding comments and responses to open-ended questions. Duing the qualitative analysis process, the lists were reorganized according to emergent themes by the bilingual evaluation consultant.

[16] Several software packages are available and useful when analyzing qualitative data. Qualitative software packages also have some notable limitations such as difficulties managing large data sets and problems with consistent interpretation of bilingual or multilingual information. The TALC assessment information constitutes a large data set and responses were recorded in Spanish. When working with the bilingual data set, much of the coding was done manually to reduce the risk of error or data loss that might occur due to misinterpretation of slang or low sensitivity to multiple definition words. Identification of themes, reorganization of data by theme and data synthesis was done manually, and lists were edited and reorganized using MS Word 2000.

The first step in analysis was to review all responses for each qualitative question and search for common and recurrent themes. Once themes were identified, the data were grouped according to evolving themes. Secondary themes and subtext were fleshed out during this step. Finally, all primary and secondary themes were summarized to illustrate attitudes and perceptions as they relate to each theme and study objective.

Due to a large sample size and the amount of data collected from the open-ended and "other" comments, synthesis of information was intricate and required several reviews and reorganization of information. A three-tiered thematic analysis process was repeated for all qualitative information. The Faculty Survey (n=33) had six open-ended questions and four questions that included a write-in "other" option. The User Survey (n=293) contained eight qualitative questions and one "other" option.

Responses from the Administration (n=1) and Library Staff (n=7) Surveys were read in their entireties then regrouped and summarized by theme. Little coding and thematic analysis was needed because the questions directly addressed specific administrative or staff issues: the questions themselves served as the theme and hence yielded minimal subtext.

APPENDIX B

Health-Related Websites: Medical Students and Faculty

Medical Students

242 medical students (85% of the 288 respondents) supplied 690 answers to the question, "If you use the Internet, which health-related websites do you use most frequently?" They identified 170 unique websites, after the evaluation researcher mapped listed responses to actual sites using Internet Explorer. For example, some respondents misspelled site names, but if a very similar name was found with a Google or MSN search using Internet Explorer, we counted the site as valid, and listed the correct site address below.

153 (90%) of the 170 websites listed below can be accessed as of 3 July 2002 with the address listed herein, and a prefix of http://www. Responses not map-able to active websites are indicated with an asterisk (*). The majority of websites listed are health and medical websites, with several useful general search engines mentioned and listed below, as well.

Websites are listed in decreasing order of frequency of mention, going across rows. This list could serve as a starting point for the Internet jump page to be set up at the Bolivia TALC, linking users to commonly sought websites, more quickly directing users to the resources they need.

If you use the Internet, which health-related websites do you use most frequently?		
Websites mentioned 10 or more times		
• altavista.com	• google.com	• yahoo.com
• iladiba.com	• diariomedico.com	• gateway.nlm.nih.gov/gw/Cmd (MedLine)
• yupi.com	• medicina.com	• reproline.org
• medscape.com		

Websites mentioned 3–4 times		
• doyma.es	• medspain.com	• elmedico.net
• ncbi.nlm.nih.gov/entrez/query.fcgi (PubMed)	• hotmail.com	• saludlatina.com
• salud.org	• lafacu.com	• monografias.com
• smu.org.uy/publicaciones/rmu/publicac.htm	• ine.gov.bo	• who.int/home-page/index.es.shtml
• paho.org	• thelancet.com	• merck.com/pubs/mmanual/sections.htm
• jama.ama-assn.org	• sld.cu	• buenasalud.com
• terra.com	• bmj.com	• espanol.yahoo.com
• medynet.com	• medicine.com	• metacrawler.com

Websites mentioned 1–2 times		
• physiology.org	• excite.com	• citeline.com
• saludymedicina.com	• cdc.gov	• bibliomed.com
• mama.com.mx	• yapues.com	• dsg.harvard.edu/old/public/intermed/InterMed_Collab.html
• metabusca.com	• e-medic.com	• ecomedic.com
• med.com	• users.com	• drscope.com
• masson.org	• msn.com	• netscape.com
• minh.gou.com*	• virtualisimo.com	• atencionprimaria.org
• jrmorrins.com*	• biho.int*	• igloo.com
• latinguia.com	• doctor.com	• medico.org
• psiconet.com	• MIN.vol*	• sep.com
• becas.sre.gob.mx	• oncologia.com	• culturagalega.org/lg3/
• index.org	• Hoppy*	• scm.com
• sav.com*	• ops.org.bo	• vh.org
• mode.com	• imel.com	• ed.gov
• buscopio.com	• radiology.rsnajnls.org	• Dmcoline*
• wustl.edu	• data.com	• medigraphic.com/espanol/e-htms/e-fisica/em-mf.htm
• galenics.com	• elsevier.com	• medired.com/svrmef
• tuotromedico.com/temas/primeros_auxilios.htm	• sn.com	• imp.edu.mx
• us.med*	• uiowa.edu	• genetica.com
• disaster.info.desastres.net/desplazados/	• bolivia-industry.com/sia/home.html	• medidata.com.br
• unicef.org	• intmed.org	• rdiris.es/list/info/patologia.es.html
• infodoctor.org	• ocenf.org/fss/present.htm	• ginecologia.net
• flasog.org	• dermatologia.com.mx	• ctv.es
• dental worf.com*	• sns.gov.bo	• guiawebchile.cl
• elsitio.com	• members.tripod.com/sibumce/elec.html	• mumasmed.com*
• bireme.br	• unimed.com	• dataren*

Websites mentioned 1–2 times		
• aap.org	• torremedica.com	• latinmail.com
• jphysiol.org	• tribunamedica.com	• health.discovery.com
• obgyn.net	• cinis.org	• quadernsdigitals.net
• act-med.com	• emedicine.com	• journals.uchicago.edu
• encyclopedia.com	• buscamed.com	• cubanet.com
• cv.terra.cl	• dsc.discovery.com	• jcrm.iespana.es
• bvs.sld.cu/revistas/enf/indice.html	• idex.org	• encarta.msn.com
• socra.org	• lcweb.loc.gov	• sosfaim.be/esp
• medicare.com	• lbimed*	• nature.com
• bago.com	• diccionario-medico.com	• barcelo.edu.ar
• ulceras.net	• internacional.medical.com.us*	• indy*
• graciasdoctor.com	• medi.com	• Scielo.com*
• oncomed.net	• tecnologia.starmedia.com/tecnologia/	• latina.com
• educacionmedica.com.mx	• redmedica.com.mx	• vea.com
• ltav*	• webdemexico.com.mx	• netsalud.sa.cr
• medicinainterna.com	• dochouse-bo.com	• medalternativa.com
• odontologia.com	• endocrinology.org	• sns.gov.bo/causmuer.html
• goytia.com*	• oncolink.com	• agendamedica.be
• unr.edu.ar	• unsa.edu.pe	• amazon.com
• impcdsm.edu.mx		

Faculty Members

10 faculty members (30% of the 33 respondents) supplied 21 answers to the question, "If you use the Internet, which health-related websites do you use most frequently?" They identified 15 unique websites, after the evaluation researcher mapped listed responses to actual sites using Internet Explorer. Some respondents misspelled site names, but if a very similar name was found with a Google or MSN search using Internet Explorer, we counted the site as valid, and listed the correct site address below.

All 15 of the websites listed below can be accessed as of 3 July 2002 with the address listed herein, and a prefix of http://www. The majority of websites listed are health and medical websites, with several useful general search engines mentioned and listed below, as well.

Websites are listed in decreasing order of frequency of mention; however, after ReproLine and Yahoo, the sites were each listed by one faculty member each. This list could serve to add to the Internet jump page to be set up at the Bolivia TALC, linking users to commonly sought websites, more quickly directing users to the resources they need.

If you use the Internet, which health-related websites do you use most frequently?
• reproline.org
• yahoo.com
• cnn.com
• umsanet.edu.bo
• gateway.nlm.nih.gov/gw/Cmd (MedLine)
• hotmail.com
• atheneum.doyma.es
• mediconet.com.mx
• medscape.com
• harvard.edu
• hollisweb.harvard.edu
• fepafem.org
• vh.org
• altavista.com
• medspain.com

APPENDIX C
Health-Related CD-ROMs: Medical Students

Table C1. Health-Related CD-ROMs, Medical Students	
CD-ROM	**# Respondents**
Medicina Interna Farreras	20
Encarta	10
Merck Manual	6
Medicina Interna Masson	6
Medicina Interna Harrison	5
Anatopatologia “Pathology” and Pharmacology	3
Interactive/Multimedia (Atlas and Anatomy)	3
Reproductive Health (OB/GYN)	2
Medicina Interna Mosby	1
Pediatria	1
CD of Bibliographies (Lit. Reviews)	1
CD DSM IV	1
Medicina Interna	1

APPENDIX D

Health Topics Researched and Resources Consulted, Faculty

Table D1. Topics researched and external resources consulted in last three months, UMSA Faculty

ID	Topic #1	Resource #1	Topic #2	Resource #2	Topic #3	Resource #3
2	Pre-operative care	Textbooks/references and journals	Drug administration	Textbooks and journals	Infection prevention	Books, journals
3	Reproductive health	ReproLine	Violence	ReproLine	Psychiatry	Nursing journals
4	Infection prevention	Internet				
5	Adolescent health	Textbooks/MOH refs	Nutrition in pregnancy	Textbooks	Sexuality	Textbooks, journals
7	Human genome	Internet, journals	Anorexia	Internet, journals, textbooks	Biotechnology	Journals
8	Neonatology	Internet	Pharmacology	Internet	Internal medicine	Internet
9	Neonatal sepsis	Internet, journals	IRA-EDA	Internet	Reproductive health	Internet, journals
10	Adolescent health	Textbooks/reference	Nutrition in pregnancy	Textbooks	Sexuality	Textbooks, WHO journals
11	Oncohematology	Web and others				
13	AIPEPI	Internet	Enteroparatosis		Neonatal sepsis	BAGO laboratory
14	Micronutrients	Textbooks, journals, Internet	Anemia	National guidelines	Anthropometrics	Textbooks
15	Maternal and child health	Lilacs, Yahoo				
16	School Nutrition	Textbooks	Program evaluation	Textbooks, Internet	Anemia	Textbooks

Table D1. Topics researched and external resources consulted in last three months, UMSA Faculty						
ID	**Topic #1**	**Resource #1**	**Topic #2**	**Resource #2**	**Topic #3**	**Resource #3**
17	Diabetes		Cardiopathy		Vegetarian nutrition	
19	Management	Libraries	Genetic syndromes	Internet	Cancer	Internet
20	Systemic arterial hypertension (SAH)		Andropause		Hyperthyroid	
21	SAH	TALC	Migraines	TALC		
22	Reproductive health		Arterial hypertension		Endocrinology	
23	Internal medicine		Rhuematology			
27	Use of prostaglandin	Internet	Ovarian tumors	Articles		
28	Adolescent health	Lilacs	Menopause	Lilacs		
29	Neonatology	Textbooks	RH/ FP	Textbooks		
30	AIDS and pregnancy	Internet	Syphilis and pregnancy			
31		Internet				
32	Problems in 1st trimester	Internet	Nutrition for women	Internet, literature searches		
33	Genome	Textbooks and journals	Colic	Internet		