“Rose-Hulman’s Homework Hotline: Supporting Indiana Math and Science Education Using Telecommunication and Computer Technology”

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Abstract—The Rose-Hulman Homework Hotline, a division of the college’s Learning Center, provides free math and science tutoring for Indiana students in grades 6-12. In 2002-2003, the program began a statewide expansion and in 2004-2005 included all major metropolitan areas in Indiana, supporting the needs of approximately 250,000 students in 80 Indiana school districts. This expansion was funded through financial support from Lilly Endowment, Inc. Through this community outreach program, Rose-Hulman Institute of Technology has successfully demonstrated the use of telecommunication and computer technologies to effectively reach students, parents and educators.

Program Rationale

Indiana students and teachers must not only meet but exceed the math and science standards outlined in the nation’s No Child Left Behind Act (2001) and Indiana’s Public Law 221 (1999). This legislation ensures all Indiana students achieve at higher levels to be competitive in an interconnected and technologically advancing world. It also requires teachers to be more knowledgeable and incorporate research-based practices into their classrooms (Indiana’s Educational Roundtable, 2003).

To promote an increased understanding of mathematics and science concepts, the institute’s Homework Hotline, expanded its efforts to strengthen the math and science skills of Indiana students in grades 6-12 by providing tutorial assistance throughout all major metropolitan areas. Through our partnership with math and science teachers, we are helping students develop the competencies required for successful placement in the Indiana workforce and providing a strengthened foundation for students to pursue post-secondary educational opportunities.
Overview of the Homework Hotline

Rose-Hulman’s Homework Hotline employs 100 students as tutors for the free-to-user math and science tutoring program. Tutors, recommended by the faculty, have completed a training process to learn how best to answer questions via the phone and internet and how to use their expertise to help younger students. The intent of the program is to develop tutors who will work through problems with middle school and high school students as opposed to simply giving them the answer.

Approximately 30 tutors answer the Homework Hotline phones each Sunday through Thursday from 7 p.m. – 10 p.m. (EST), September through May. In addition to on-line reference materials, tutors have access to state-adopted math and science textbooks. Tutor supervisors monitor tutoring via real-time displays by agent (tutor) or application (subject), and collect caller survey assessment data nightly. Students may call toll free 1-877-ASKROSE to receive math and science homework support or submit homework questions and access reference materials from our website at www.askrose.org.

In addition to its commitment to provide math and science tutoring for Indiana schools and their students, the Homework Hotline has provided innovative teaching grants to Indiana teachers and innovative technology integration grants to not-for profit community organizations serving youth. Grant guidelines require that programs or projects model a novel way of utilizing technology to support educational activities for middle and high school students.

The Homework Hotline Web site includes an on-line tutoring option via e-mail, as well as reference materials for students, parents and teachers. The Web site also offers monthly program statistical reports for participating schools

Teachers, students, and parents become aware of the Homework Hotline's existence and purpose through marketing collateral materials including: brochures, posters, fliers, and educator kits that are distributed to schools and youth organizations. Rulers, magnets and pencils are distributed to students during school visits. Media coverage has included articles in more than 35 newspapers, news stories on major Indiana radio and televisions stations, and paid radio advertising in targeted markets.

We have also made important connections between K-12 educators, students, and higher education, by visiting over 235 public, private, and parochial schools in 2003-2004 and more than 320 schools during the 2004-2005 academic year. In addition to visiting schools to network with principals, guidance counselors, and teachers, we attend 40-50 special events each year. These include making formal presentations at local, regional, and national education conferences, participating in faculty meetings and teacher in-service days, attending school open houses, meeting with parents during conference days, and participating in teacher workshops.
Program Statistics

Homework Hotline tutors answered 29,578 during the 2003-2004 academic year. Table 1 shows a breakdown of calls by month and subject area for September through May 2003-2004.

Table 1: Homework Hotline Statistics 2003-2004

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</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>2,422</td>
<td>3,238</td>
<td>2,866</td>
<td>2,095</td>
<td>3,259</td>
<td>2,908</td>
<td>2,258</td>
<td>1,852</td>
<td>1,469</td>
<td>22,367</td>
</tr>
<tr>
<td>Science</td>
<td>765</td>
<td>864</td>
<td>684</td>
<td>431</td>
<td>697</td>
<td>620</td>
<td>416</td>
<td>341</td>
<td>268</td>
<td>5,086</td>
</tr>
<tr>
<td>Misc.</td>
<td>319</td>
<td>348</td>
<td>238</td>
<td>176</td>
<td>293</td>
<td>202</td>
<td>240</td>
<td>181</td>
<td>137</td>
<td>2,134</td>
</tr>
<tr>
<td>Total</td>
<td>3,506</td>
<td>4,450</td>
<td>3,788</td>
<td>2,702</td>
<td>4,249</td>
<td>3,730</td>
<td>2,914</td>
<td>2,374</td>
<td>1,874</td>
<td>29,587</td>
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</tbody>
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<tr>
<th></th>
<th>91-92</th>
<th>92-93</th>
<th>93-94</th>
<th>94-95</th>
<th>95-96</th>
<th>96-97</th>
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<th>00-01</th>
<th>01-02</th>
<th>02-03</th>
<th>03-04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>276</td>
<td>399</td>
<td>755</td>
<td>465</td>
<td>383</td>
<td>456</td>
<td>474</td>
<td>641</td>
<td>4,120</td>
<td>5,810</td>
<td>8,026</td>
<td>17,090</td>
<td>22,367</td>
</tr>
<tr>
<td>Science</td>
<td>50</td>
<td>66</td>
<td>134</td>
<td>101</td>
<td>94</td>
<td>105</td>
<td>123</td>
<td>130</td>
<td>880</td>
<td>1,557</td>
<td>1,546</td>
<td>3,799</td>
<td>5,086</td>
</tr>
<tr>
<td>Misc.</td>
<td>2</td>
<td>11</td>
<td>22</td>
<td>14</td>
<td>14</td>
<td>18</td>
<td>7</td>
<td>16</td>
<td>563</td>
<td>713</td>
<td>733</td>
<td>1,765</td>
<td>2,134</td>
</tr>
<tr>
<td>Total</td>
<td>328</td>
<td>476</td>
<td>911</td>
<td>580</td>
<td>491</td>
<td>579</td>
<td>604</td>
<td>787</td>
<td>5,563</td>
<td>8,080</td>
<td>10,305</td>
<td>22,654</td>
<td>29,587</td>
</tr>
</tbody>
</table>

In addition, tutors responded to over 2,200 email requests for homework assistance during the 2003-2004 academic year.

Program Assessment

Methodology

Each year, members of the Homework Hotline (HWHL) staff work with Rose-Hulman’s Office of Institutional, Research, Planning and Assessment (IRPA) to develop and administer a set of assessment instruments and methodologies that will provide information regarding the effectiveness of the HWHL program.

During the 2003-2004 academic year, three assessments were conducted which included 1) focus groups with newly-hired and experienced tutors, 2) a focus group/personal interviews with incoming Rose-Hulman (RHIT) freshman who called or emailed the HWHL prior to coming to RHIT and 3) a questionnaire randomly administered by supervisors to callers of the HWHL.

Table 4 represents the target group, method of assessment, timeline and focus of assessment for each instrument administered in the 2003-2004 academic year.
Table 4: 2003-2004 Assessment Instruments

<table>
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<tr>
<th>Target Group</th>
<th>Method</th>
<th>Timeline</th>
<th>Focus of Assessment</th>
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</table>
| Tutors       | Focus Groups | Nov./Dec. | • General satisfaction  
• Training/preparedness issues  
• Document value of the tutor experience  
• Human interest information (i.e. humorous stories, biggest surprise) |
| RHIT Students who have used HWHL | Focus Group/Personal Interviews | October | • How they learned about HWHL, motivations to call, frequency of calls.  
• Experience with HWHL, impact in classroom.  
• Impact of HWHL experience with decision to attend Rose-Hulman.  
• Suggestions for the HWHL. |
| Student Users -Phone | Interview Survey | Sept.-May | • General satisfaction with tutoring session  
• Confidence in ability to solve similar problems  
• Whether the students will use again and/or recommend to others  
• Awareness and use of website  
• How they learned about the HWHL. |

Summary of Results

- **Tutor Focus Groups**

According to IRPA, while each of the tutor focus groups presented general themes unique to each group, themes common to both focus groups included…

- Tutors reported that they saw a personal academic benefit of reviewing basic concepts and a perceived increase in the development of their interpersonal communication skills as a result of their work with the Homework Hotline. In addition, they felt that being a tutor was personally enriching, and they felt good about helping others.

- Successful tutoring sessions were described as those when the students are made to feel comfortable, a relationship is established, confidence is built up in the students, and the students express the “eureka” moment when they understand the problem.

- The biggest challenge reported was the difficulty in explaining visual elements over the telephone.

- **Freshman Focus Group and Personal Interviews**

In September 2003, staff members of the Office of Institutional Research, Planning and Assessment Office (IRPA) assessed 480 of 491 freshmen. The freshmen were asked to complete the Student Information Questionnaire. Two questions were asked that pertain to the Homework Hotline (HWHL). The first question read, “Prior to coming to Rose-Hulman, had you heard of the Homework Hotline?” Two hundred and ninety-six of 480 freshmen or 61.7% had heard of the Homework Hotline prior to attending RHIT. The second question read, “Prior to coming to Rose-Hulman, did you call or email the Homework Hotline?” Twenty-seven of 480 freshmen or 5.6% answered “yes.”
In October 2003, staff members of IRPA contacted the twenty-seven freshmen who utilized the HWHL while in high school and invited them to attend a focus group. To accommodate student schedules, IRPA conducted a focus group and personal interviews. The purpose was to assess the Homework Hotline services from the perspective of student users. For both the focus group and the interviews, the participants were fully engaged throughout the meetings, and each participant contributed significantly to the process.

A summary of the focus group and personal interview findings included:

- The freshmen reported that they had heard about the Homework Hotline from a variety of sources including posters, teachers putting the number on the classroom chalkboard, fliers and local newspapers.

- The students were initially motivated to call the Homework Hotline because they were frustrated with a science or math problem. However, there was hesitation in calling the HWHL because of a feeling of embarrassment and concerns of not being able to be helped.

- Students reported that the process was smooth, successful and helpful when assisting them with their homework problem. In fact, they reported that they shared with their friends how helpful the HWHL was and encouraged their friends to call.

- While looking at different colleges, the students reported that they associated the HWHL as a representation of how friendly and helpful Rose-Hulman was and stated that the HWHL did have some influence on their decision to come to RHIT.

- The students reported that their experience with the Homework Hotline influenced their decision to consider or become a Homework Hotline tutor as well as use the Learning Center resources.

- **Student Users-Phone Interview Survey**

In order to assess the services and caller satisfaction of the Homework Hotline (HWHL), a telephone survey of randomly chosen callers was conducted from September of 2003 to May of 2004. Student supervisors conducted each of the survey interviews consisting of ten service/satisfaction questions and seven background questions. A total of 391 respondents, representing 1.6% of the 29,587 callers during the survey period, participated in the survey. Key findings from the Student–User Phone Interview Survey are shown in Table 5.
Table 5: Final Phone Survey Results for 2003-2004  (391 respondents)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
<th>Yes %</th>
<th>No %</th>
<th>Unsure %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Have you called the Homework Hotline before?</td>
<td>315</td>
<td>76</td>
<td>0</td>
<td>80.6%</td>
<td>19.4%</td>
<td>0%</td>
</tr>
<tr>
<td>2) Did the tutor spend enough time helping you?</td>
<td>386</td>
<td>1</td>
<td>4</td>
<td>98.7%</td>
<td>0.3%</td>
<td>1.0%</td>
</tr>
<tr>
<td>3) Were you comfortable with how the tutor talked you through the problem?</td>
<td>381</td>
<td>1</td>
<td>9</td>
<td>97.4%</td>
<td>0.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>4) Did the tutor help you to understand how to find the right answer?</td>
<td>377</td>
<td>3</td>
<td>11</td>
<td>96.4%</td>
<td>0.8%</td>
<td>2.8%</td>
</tr>
<tr>
<td>5) Will you be able to answer similar problems on your own?</td>
<td>360</td>
<td>5</td>
<td>26</td>
<td>92.1%</td>
<td>1.3%</td>
<td>6.6%</td>
</tr>
<tr>
<td>6) Will you call the Homework Hotline again?</td>
<td>381</td>
<td>1</td>
<td>9</td>
<td>97.4%</td>
<td>0.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>7) Would you recommend the Homework Hotline to others?</td>
<td>386</td>
<td>0</td>
<td>5</td>
<td>98.7%</td>
<td>0%</td>
<td>1.3%</td>
</tr>
<tr>
<td>8) Did you know the Homework Hotline has a website?</td>
<td>173</td>
<td>218</td>
<td>0</td>
<td>44.2%</td>
<td>55.8%</td>
<td>0%</td>
</tr>
</tbody>
</table>

When asked how they learned of the Homework Hotline, 50.6% of respondents cited school promotions (i.e., posters, flyers, brochures, announcements, supplies, school newspaper); 37.9% cited school personnel (i.e., teachers, principals, guidance, counselors); 17.1% cited friends and family; and 10.7% cited media sources (i.e., radio, television, city newspaper, Internet).

Conclusion

The Rose-Hulman Homework Hotline has developed broad collaboration with and support from diverse constituencies, including educators, students, parents, youth advocates and community leaders from across the state. We actively promote our free math and science tutoring program in 80 school corporations and their surrounding communities. In particular, the continued success and growth of the program has enabled us to understand and keep abreast of best practices and current educational trends through our network of educators, as well as assist more and more students as they learn to inquire and discover knowledge. We will continue to seek innovative ways to strengthen and improve math and science education in the state of Indiana.
References


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