i-irasshai: An Immersive Cultural Learning Experience

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ABSTRACT

i-irasshai (http://www.peachstar.org/i-irasshai) is a unique Japanese cultural learning experience for English speaking students delivered through a combination of CD-ROM and Internet technology. The educational approach taken is a constructivist one, where meaning and knowledge acquisition is rooted in experience. The goal of the program is for students to gain insight into Japanese culture by allowing them to explore Japan within an authentic context, but without the knowledge of a foreign language. Through the integration of photographs, video, and audio captured on location in Japan, students walk through twenty locations including a school, market, temple, shrine, sushi restaurant, and residences. 360-degree virtual reality images are enhanced with sound and "show me" hot spots that portray modern daily life realistically, much as a visiting student might experience in Japan. Current and historical information is accessible via the immersive environment or through a Guidebook.

To encourage a goal-directed exploration, students are invited to choose from fifty "to-do lists" that cover different aspects of Japanese culture. Certificates reward successful completion of each list. Students may also engage in an open exploration with or without the aid of the lists. During their exploration, students may experience up to sixty interactive activities simulating various cultural situations, such as removing shoes before entering a home, arranging tatami mats for certain occasions, and decorating a tokonoma (alcove).

This paper describes the three-year process of project development including instructional design, content development, and technological decisions that brought the project to completion. The development stages include: the proposal process, instructional design stage, planning of content and technology, implementation, and evaluation.

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PROPOSAL PROCESS

Since 1996, Georgia Public Broadcasting (GPB) has broadcast its own award winning Japanese language teaching series via satellite to numerous high schools in the United States. This series, "Irasshai: The Japanese Language and Culture Distance Learning Series," teaches two years of Japanese language and culture to high school students. The *Irasshai* series features a master teacher on video, weekly audio lessons via telephone (speakerphone), printed lesson materials, and the accompanying *Irasshai* web site (http://www.peachstar.org/irasshai).

GPB recognized that cultural immersion, or experiencing content in an authentic setting, was a missing component of the *Irasshai* series. *The Standards for Foreign Language Learning: Preparing for the Twenty-first Century* challenged educators to provide opportunities for students to experience cultural content in authentic settings so that students could begin to understand and internalize the perspectives from which another culture's customs, arts, and language have emerged.

Recognizing that this form of cultural immersion could provide significant educational benefit, GPB sought to add to the cultural experiences already in the curriculum by using technology to simulate and deliver an immersion model.

A project that addressed these curriculum needs should include a high degree of student interactivity with content, yet the content could not rely on the Japanese language for this immersion (since the students were spread across beginning and intermediate Japanese). GPB also anticipated that students who were not learning Japanese would also gain a greater appreciation of Japanese culture through this non-language-based approach. Thus the task was to build an authentic context for interaction, but one that was not language dependent.

Conception, Proposal Preparation, and Goals

A 1997 Request for Proposals by the National Endowment for the Humanities called for proposals that dealt with innovative technology approaches to education. This Request for Proposals provided the critical point of convergence for what would become the *i-irasshai* project.

GPB staff, educators, Japanese language experts, and technology and instructional design specialists from the Georgia Institute of Technology fashioned a proposal that promised a highly interactive cultural immersion experience based in technology. The educational approach would be a constructivist one; the design of the learning experience would present a rich contextual experience to the learner who then must be an active problem-solver within that (virtual) environment. It would provide a here-and-now experience with authentic life situations, as if a student were visiting Japan as an exchange student. The emphasis in each scenario would be on the learner as a participant in the environment, making choices and decisions, learning from mistakes, not merely a viewer, listener or reader. It would not rely on knowledge of the Japanese language, but it would support students who did know the language. The proposed product should stimulate ample interest in learning, so that students would be

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motivated to revisit the program multiple times.

The technology would need to be delivered for use in the instructional setting (usually classroom or school media center). The content and format would need to meet Standards 2.1 and 2.2 in the National Standards for Foreign Language Learning. These call for student understanding the relationship between 1) the practices and perspectives of the culture being studied and 2) the products and perspectives of the target culture. The content would also have to address the national social studies standard that calls for instruction to include experiences that provide for the study of culture and cultural diversity.

Since technological advances were proceeding at a rapid rate and there was a three-year grant period, a CD-ROM/Internet or DVD/Internet combination was tentatively proposed to achieve the educational goals. However, the authors reserved the right to make the final technological decisions at the point of funding, based on advances anticipated in the three-year grant period.

PLANNING
Once the National Endowment for the Humanities funded the project in 1998, the project staff was formed and included Japanese content experts, educational and instructional design specialists, and technology specialists. Discussion centered on the main content to be pursued and how that content should be presented to achieve the educational objectives. Critical questions related to the technology emerged such as: What would the technology allow? What could be done with the technology to provide a realistic, highly interactive

experience? What technologies would allow for the broadest dissemination of the product? Addressing these technological concerns and constraints had an enormous impact on the approach that would need to be taken by the content and instructional design experts who would identify and portray the content in a realistic context.

Technological and Educational Considerations
In order to provide a cultural immersion experience, the project needed to present rich interactive content. Technology that incorporated virtual reality scenes, video, audio, and interactive activities was envisioned to meet this requirement. Although the content would be delivered predominately via CD-ROM technology, the availability of high-bandwidth Internet connections promised to increase over the three years of the grant. Thus, the project was to be designed for playback from both CD-ROM and the Internet. This required the content to be Web browser-based and to target the most popular Internet browsers (Microsoft Internet Explorer and Netscape Navigator) for both Apple Macintosh and Microsoft Windows platforms. DVD was ruled out as a potential medium due to its small installed base (particularly in schools) and the lack of computer format standards.

A key goal of the project was to immerse the student in a culturally rich authentic environment. The proposed method of accomplishing this goal was to place the student in the center of 360-degree photographs taken of various locations in Japan. Within each photographed location, the student could look around, travel to another location, or examine content-rich objects within the scene. Selection of a particular

object would provide in-depth information about the object and its cultural significance including a comparison with related Western customs. Japanese customs would be presented through interactive activities, video, audio, photographs, animations, and text. A map, showing various locations, would orient the student within this virtual environment and allow him/her to navigate quickly from one location to the next.

Although students could explore the site on their own, a task list (the 'to-do list") was proposed for those students who preferred a goal-driven environment, or for teachers who wished to specify one approach over the other. The "to-do list" would be a short compilation of related tasks in a cultural area and would require the student to visit several locations in search of the information necessary to complete each task. To aid students in exploration, an assistant was planned that would instruct them on their next possible move. Upon completion of all tasks in a "to-do list," a printable certificate page would be provided. This certificate could serve either as proof of the student's completion of an assigned cultural area or as a reward to the student.

The use of the "to-do list" and the assistant's instructions or "hints" were proposed to offer a type of coaching or scaffolding for the student who must manage his/her own interactions in this immersive learning environment. Yet students would be free to ignore this assistance if it were not needed. The Guidebook could provide yet another form of scaffolding for the learner who needs to reduce the complexity of the tasks.

Content Creation
The grant proposal outlined the charge for content creation as follows:

"The Curriculum and Production Teams will carefully script each scenario represented in a virtual environment and determine the actual details for each. Four to six themes or units in authentic settings will include home, school, marketplace, different modes of transportation, and community settings for such events as holidays and festivals. Each unit will stand alone; however, a story line will connect them to add interest."

The choices for actual selection of the content of *i-irasshai* within these units were guided by the three subcategories of culture proposed by Hammerly: informational (the societal impact of the target culture's geography, history, heroes and villains), behavioral (everyday routines including customs, conversations, formulas, and kinesics), and achievement (artistic and literary accomplishments).

Using these guidelines, Japanese education consultants compiled a list of locations, including: residences, a school, a market, a temple, a shrine, a sushi restaurant, train stations, and a typical Japanese marketplace. The consultants then drafted scripts of cultural interactions related to each location and cross-verified the content for accuracy. For example, upon entering any residence or school, the student would be required to follow the proper steps to remove their shoes. In order to determine which actual locations to photograph and what information to incorporate, the main consultant visited Japan on a "scouting

mission" in search of the possibilities. Japanese reference materials, consultants, contacts in Japan, personal experience, videotapes of possible locations of interest, and the Internet, were also used in this research. A list of the media needed to create each interaction was prepared that would act as a guide for the media collection.

Prototype

In an effort to ascertain all concerns for the pending content acquisition trip to Japan, a local Atlanta sushi restaurant was used for the proof of concept and as a testing ground for the work that would take place on location in Japan. The selected restaurant closely resembled the sushi restaurants found in Japan. Japanese educational/content consultants visited the restaurant, drafted a list of video, audio, and photo shots and secured the appropriate permissions. Japanese actors were brought in to make the scene genuine, as well as an authentic chef to prepare various sushi dishes.

After the prototype scripts were written, the content needed for the interactions was collected. Digital video cameras were used to capture action shots such as the chef making sushi dishes and the actors eating the sushi. 360-degree photographs of the main areas of the restaurant were photographed using a panoramic camera. Audio of the actors saying phrases often used in Japanese sushi restaurants was recorded using a Digital Audio Recorder. Still photos of every piece of food, food-related object, and other restaurant items were shot using both film and a digital camera.

Prototype Lessons Learned

From the restaurant shoot, a number of lessons were learned that would be used for the trip to Japan. The use of both the digital and film still image cameras

during the prototype helped determine the quality and the convenience of each modality. The digital camera was simple to use, with instant preview results, but the film camera provided much higher quality images and control and did not require numerous battery changes. One disadvantage of using film is the requirement for different films for indoor and outdoor shots. Ideally, a photographer will carry two or three film-loaded cameras for flexibility (and in case of breakage). Three film cameras would be used in Japan. Additional lighting equipment would need to be rented in Japan for the indoor photography. Also, a more comprehensive list of media would be required, especially where the interaction scripts called for staging correct and incorrect customs, such as an activity that required the student to choose an image of the correct arrangement of shoes when entering a home.

When shooting on location space for setting up lights and cameras could be very limited. It was also discovered that in public places crowd cooperation would be impossible; thus, particular shots might take longer than anticipated or have to be skipped altogether. Where possible, content would be shot at a later time in a more controlled environment, such as a studio. This would limit the time needed at the shoot location and the time required of other people, such as shop owners. Priority of the shoot was also critical. The shots for the day would need to be ordered by importance, so that less important shots could be left out if time became limited. The equipment taken to Japan would have to be carefully reviewed for necessity since the crew would hand-carry all needed equipment on streets, subways, buses, or in taxicabs. Finally, flexibility by the

content and script developers would be necessary to deal with last minute changes, additions, or missing props.

IMPLEMENTATION

During the implementation stage, the media and permissions for their use were collected on location in Japan. The media was then processed and organized for use in the project. The specific technologies required to present the material were determined and the interface elements designed. Then, according to these provisions, each project section was developed. The final research on content information to be presented was incorporated at this stage.

Media Collection

With the locations chosen and the list of media required for the interaction complete, a team was sent to Japan to collect the necessary media. The team consisted of four people; a content scriptwriter, (who doubled as an interpreter and organized shoot times, locations and permissions), two representatives from the development team (responsible for video, panoramic photography, and audio), and a representative from the educators' team (also responsible for standard 35mm photography). The trip to Japan that included shoots in Kobe, Nara, and Tenri lasted for three weeks, but in the case of the scriptwriter, the trip was five weeks in length. The scriptwriter embarked for Japan ahead of the crew in order to line up the necessary details for the crew's shoots. In Kobe, the scriptwriter worked with JETRO (Japanese External Trade Organization) to secure arrangements and permissions.

During the shoots, the scriptwriter often had to modify the shoot list if additional objects and locations were found that could be incorporated into the scripts or certain anticipated shots were not

possible. Film was developed daily to ensure that all shots were usable (checking for bad shots or problems during developing). In the case of the panoramic photography, many of the shots were bracketed (taken with three different exposures) to guarantee a usable photo. Film, audio, and video were cataloged daily as time permitted. By the end of the trip, approximately one hundred and forty rolls of film, five sixty-minute videotapes, and four Digital Audio Tapes had been used.

Processing and Organization

Upon return to the United States, all of the media from the Japan trip was logged and processed. The development team began cutting filmstrips, scanning, and saving the files to disk, referencing film roll numbers and negative numbers. Files were checked to ensure the images were not corrupted during the scanning process. Video and audio were digitized and saved to disk. All media was catalogued to provide a thumbnail for the media and ease of retrieval using Extensis Portfolio™ (media management software). The scriptwriter assisted the development team in identifying and labeling all media. The interaction scripts were stored in a Claris Filemaker Pro™ database and flowcharts using Micrographix's Flowcharter™ were created to show how interactions related. All development information was accessible by the project team (working on and off-site) via an Internet interface and searchable by database fields.

The scriptwriter then assigned media files to the various scripts in the database. Keywords were entered for all the media within the media database to allow quick searches by filename, content, date, and type. Additional Japanese photo CD-ROMs were

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cataloqued in the media database to fill in gaps where the script called for media that could not be captured on location.

Content

The scriptwriter, educators and several Japanese content experts worked together to research the information to be presented in the activities as well as in the informational pages. The physical locations of these consultants varied from on-site to several states away. The Internet was used to bridge these physical gaps through email, by posting information to temporary web pages for review and comments, and by off-site access to relevant databases on the server.

At times it was difficult for the scriptwriter and the consultants to separate regional differences in customs from customs that pervaded the entire society. Much time was devoted to these considerations. The depth of information provided and its presentation for high school and middle school students were also considered carefully. All images, activities and textual information were subject to research using multiple bibliographical references as well as review by a number of content experts and high school teachers. Content was proofed repeatedly for correct matching of all objects with text, accurate Japanese language present in the activities, and proper English spelling and grammar.

Technology and Delivery

Decisions had to be made regarding which software applications would be used to implement the different elements of the site. Apple's QuickTime™ technology was chosen for its support in the playback of both normal video and interactive 360-degree panoramas. Thus, the creation of the interactive panoramas

would be accomplished using QuickTime VR™ Studio. The interactive map and the assistant, *Tomo* (Japanese for "friend") would be developed using Macromedia's Flash™ software that allows smooth scaling of graphics, creates a small file size, and supports interoperability with Internet browsers. The "to-do list" feature would require dynamic text for the display of the tasks to be completed and information about these tasks. Macromedia's Shockwave™ was chosen to implement the "to-do list."

A main Shockwave application incorporating all these components would become the control center for the immersive portion of the site. Since Shockwave supports communication with the browser window via JavaScript, JavaScript would be used to handle the communication between the browser window and Shockwave applications. This communication would allow the main Shockwave application to launch additional browser windows and to send and receive information from those windows.

The informational pages would be written using basic HTML with embedded images, video, and audio. Since some of the activities were simply multiple choice and true-false quizzes, these would be designed as HTML pages, also. More involved activities would be prepared in Shockwave to provide greater control over the interactions. The informational and activity pages would be accessed through the clickable hotspots in the panoramic images and open in a separate browser window. JavaScript contained within these pages would send information regarding the student's progress back to the main Shockwave application. Macromedia's

Dreamweaver™ was chosen for developing the HTML pages, since it simplifies site management and HTML authoring while allowing direct editing of the HTML files.

The final consideration was the printable certificate for the completion of the "to-do list" tasks. Since Shockwave doesn't support printing, this page would be designed using HTML and open in a separate window from the main application. The text for the certificate would include the number of: locations visited, information pages viewed, and activities completed, as well as a description of the cultural area covered by the completed "to-do list."

Design
The next step was to design the interface for the main Shockwave application, the information pages, and activities. First, a palette of colors for the site was created. After researching the color preferences of the Japanese, green was chosen for the main interface color. Other colors found throughout the site, such as yellow and purple, were chosen as complements to the green.

Next the main Shockwave application interface [Figure 1] was addressed. The goal was to make the QuickTime VR panoramic images the most prominent piece of the application by positioning them in the center of the interface and spanning the full width. For the student, this would maximize the sense of being in an authentic environment. Once the QuickTime VR was positioned, the map, Tomo (the assistant), and the "to-do list" were located beneath it, with the map requiring slightly more real estate than the other two components. The "to-do list" was located in the center slot due to its functional importance. The final addition to the interface was the *i-irasshai* logo and four buttons that were

positioned on a bar above the QuickTime VR with the logo left justified and the buttons right justified. This arrangement on the bar balanced the overall design. Three of the four buttons functioned as links to: the Tutorial (teaching how to use the interface, the Guidebook (functioning as an index to all the pages available in the site), and the Help page (FAQ containing information on issues that may be encountered while using the site as well as suggestions on how to use it effectively). The fourth button allowed the user to restart the Shockwave application.

Figure 1: Main interface with interactive scene, map, "to-do list," and assistant

Design of the information page [Figure 2] followed the design of the main interface utilizing the color treatment and graphic style. The pages were divided into a column for images and video and a column for text. At the bottom of each page, a bar separates the informational content from the hyperlinks to related information (residing on the GPB *Irasshai* course web site). A Japanese-style texture tiles the background with colors derived from the main green interface.

The design for each activity [Figure 3] was left more flexible and determined by the content, but would retain the shades of green from the main interface when feasible. The screen size of the activities was based on the desire to have both the activity and some of the main interface visible at the same time on an 800 pixel wide screen.
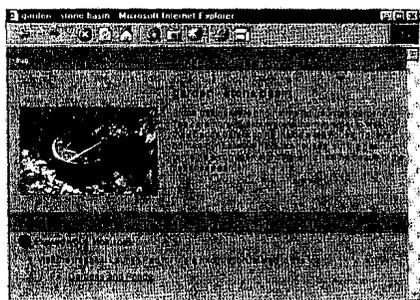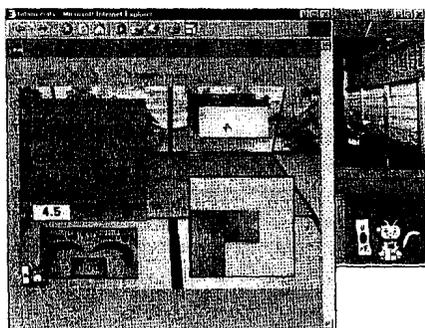

Figure 2: Informational page

Figure 3: Activity page overlapping the main window. This particular activity tests students on their knowledge of the tatami mat arrangement.

Development

With the specific applications determined and the interface design complete, the development of the site began. The work was divided up to facilitate development. The main Shockwave application was organized to

allow each location to be added easily. Dreamweaver Web page templates were created to produce each quiz and all informational pages (including their links to the *Irasshai* course website with its massive selection of cultural URLs). The interactive map was developed using Flash. Flash was also used to animate different behaviors for the assistant such as: walking, talking, bowing, and applauding. The panoramic photos needed for the QuickTime VRs were prepared, the clickable hotspots for each panorama defined, and the movies generated. As each component was completed, it was added to the main Shockwave application.

Throughout the development process, additional features were added to the main Shockwave application to improve the user interaction, navigation, and guidance. Tomo's text bubble was used to provide additional information about the interface. When the student moves the cursor over a clickable object in a panorama, a description of the accessible information appears in this bubble. Similarly, the text bubble describes the functionality of all interactive components of the interface. As a result of an activity being completed in another window, the main window moves to the front and Tomo congratulates the student upon completion of a task. Once all scripts and content had been developed and reviewed, a list of fifty scenarios, or themes, was drafted with each theme providing three or four related tasks for the user to complete. Upon entering the main site, students could choose one of these scenarios from this list. The related tasks then appear in the "to-do list" to guide the user during exploration. Tomo's text bubble is used to display text to help the students find and complete each task.

Cultural Activities

Some of the most rewarding components of the site are the interactive activities that teach both cultural and everyday situations. These activities were also more fun to implement, although they required more production time. This section provides some examples of the types of cultural activities found in the site.

In the tatami mat arrangement activity [Figure 3], the student is given three sizes of tatami rooms measuring 4.5, 6, and 8. The measurements for rooms in Japan are often given in relation to the number of tatami mats (measuring approximately 6 feet by 3 feet) that will fit in the rooms. The students are given an image of the room and the images of the mats that would fill the room. Then they are instructed to arrange the mats in the rooms so they do not overlap. Since different rules for tatami mat arrangement are used in different areas of the country, only the funeral ceremony arrangement is considered incorrect. In this case the student is asked to rearrange the mats for a happier occasion.

Another activity teaching cultural traditions in Japan is one where the students must decorate a tokonoma. A tokonoma (alcove) is a common part of a tatami room. Seasonal flower arrangements, scrolls, and other special items or works of art are displayed in a tokonoma. The items are often changed periodically to reflect the season or the occasion. This activity provides the student with six objects (a scroll, wedding kimono, cat doll, funeral drum, statuette, and flower arrangement) on the right side of the screen and a tokonoma on the left. They decorate the tokonoma by dragging the objects into the space of the tokonoma. The student

learns that the scroll can be displayed in a tokonoma throughout the year and that the flower arrangement is often displayed in the tokonoma as a seasonal decoration. The wedding kimono is only displayed in the tokonoma in the six months prior to a daughter's wedding. The other three objects are never displayed. Most students who visit Japan will ride a train. The ticket purchasing activity [Figure 4] teaches students how to purchase the correct ticket. In the site, when the student chooses to travel to the mountains, seaport or city, a train ticket must be purchased. The ticket purchasing activity features a graphic version of the machines used in Japan and a rail map above. The student first finds his destination on the map. The student then inserts the proper amount of money for the destination by dragging images of Japanese bills and coins to the currency slots on the machine. As each bill or coin is inserted, buttons light up showing the ticket amounts available. The sound of money being deposited is heard. When at least the proper amount has been inserted, the student must press the correct button to complete the transaction. The ticket slides out and proper change is produced, all with appropriate sounds. Finally the student takes the ticket to continue on to his/her destination.
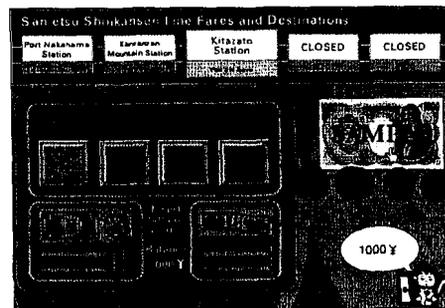

Figure 4: Train ticket purchasing activity

EVALUATION PROCESS

The evaluation process began with a focus group of four middle school students. They represented students with no familiarity with the Japanese language and culture, students currently enrolled in a Japanese language course (*Irasshai*), and students enrolled in an exploratory course created by GPB called "Irasshai Explorer." The group represented both genders and several ethnic groups. At the start of the focus study, students were introduced to the site through the tutorial, then given a "to-do list" to accomplish. The students were monitored with their actions and difficulties noted. After the allotted time of 20 minutes, the students were gathered in a room and asked questions about their experience. One student, who was able to complete the entire "to-do list," considered it annoying that the shoe changing activity appeared every time she entered the house or school. The other students agreed, but understood that it was an authentic Japanese custom, and decided it was necessary for authenticity. They also determined that the school shoe changing activity was presented in a manner that was too difficult. All four students completed at least one task from the "to-do list" and were able to navigate the interface. One who was less familiar with computers and the Internet was somewhat more timid than the other students, but he was still able to traverse the panoramas and navigate using the map.

As a result of the student focus group evaluation session, the shoe changing activity for the school was modified from a step-based activity to a correct-choice activity. The tutorial was also modified to focus more on the specific areas where the four focus group students experienced difficulty.

National Endowment for the Humanities Review

Near the end of the development cycle, a NEH grants reviewer was provided a copy of the *i-irasshai* CD-ROM. Yuki Takatori, PhD, a visiting lecturer in Japanese at Georgia State University, provided a complete review of the project, an analysis of its authenticity, and proofing of the content.

In summary, Dr. Takatori's remarks were:

"All in all, *i-irasshai* is an innovative software application that ought to have a great appeal to anyone studying Japanese. Logging into this virtual world on a regular basis will lead students to many fruitful discoveries about what makes the Japanese people tick. [It was explained to me that no more than 20 minutes usage each day is sufficient, but *i-irasshai* riveted me to the monitor for two hours.] I strongly urge those involved in production to attend an academic conference, such as ACTFL or ATJ, at the earliest possible opportunity, to introduce *i-irasshai* to teachers of Japanese on the national arena.

Clicking the mouse in *i-irasshai* is like opening a series of locked doors to unknown worlds. I have always been a believer in the virtues of traditional classroom teaching, but *i-irasshai* has piqued my interest into educational software and distant learning. For anyone wanting to explore the realm of Japanese culture, *i-irasshai* is a must."

Comments from the full report elucidate further, "What struck me most is the authenticity and thoroughness of the

information provided." ...[*i-irasshai*] offers the kind of experience that would satisfy even the most inquisitive students. ...[It] makes a conscious effort to strike a balance between old and new. ...Tradition and innovation are in perfect balance."

Beta Testing

For beta testing, forty-five CD-ROMs were sent to teachers and students at schools enrolled in the GPB *Irasshai* program and who volunteered to evaluate the CD-ROM. A questionnaire was included which focused on general and specific use, installation, interface features, content, and general comments. Twenty-eight completed questionnaires were returned. Fourteen percent of respondents were unable to install the Internet browser plug-ins successfully and thus were unable to access the *i-irasshai* program. The remaining respondents who were able to successfully complete the installation indicated a very favorable experience. The evaluators spent an average of three to four sessions using the application for an average time of thirty minutes per session. During these sessions, four evaluators completed the "to-do list" every time, fifteen completed the "to-do list" at least once, and three were either unable to complete the "to-do list" or decided to explore without it. The most highly requested improvement was the addition of more activities. Overall, the comments were positive including compliments for the design of the site and the thoroughness of the information.

Improvements Suggested From Beta Testing

Based on feedback from the evaluations, the top priority for improvement, was to make the installation from CD-ROM easier by guiding the user through the installation process step-by-step. A small number of inconsistencies were reported after the initial mailing of the CD-ROMs and were corrected.

CONCLUSION

Based on the feedback received, the *i-irasshai* project has been a tremendous success. As high bandwidth Internet connections become more widespread, the site will provide a valuable experience not only for students of all ages, but for anyone interested in the culture of Japan. The rich interactions and ample insight into Japanese customs will attract new and repeat visitors. Future additions and improvements to the site will continue to add to visitors' knowledge and enhance their experience.

ACKNOWLEDGMENTS

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