

***netTrekker classic and netTrekker d.i.:***  
**Research basis for the product design,  
content, and instructional utilization**

**Prepared for Thinkronize, Inc.**

**by**

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# ***netTrekker classic and netTrekker d.i.:*** **Research basis for the product design, content, and instructional utilization**

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The following report outlines the research basis for the product design, content and instructional utilization for the *netTrekker classic* product. The *netTrekker classic* product and its database of over 180,000 educator-selected online resources that align with each state's academic standards, is the foundation of the new netTrekker d.i. product, a major upgrade to netTrekker classic with numerous features that assist differentiated instruction. This report may be used as supporting documentation for both the netTrekker classic and netTrekker d.i. products.

**Overview:** The past decade has seen a significant increase in student access to and use of the Internet. Between 1994 and 2002, the percent of classrooms with Internet access increased from about 3% to 87% (Technology Counts, 2003). In the last five years, the ratio of students per Internet-connected computer decreased from almost 20 students per computer in 1998 to 5.6 students per Internet-connected computer in 2002. Furthermore, from 2000 to 2002 children's use of the Internet at home increased 68 percent and children already online reported using the Internet on average 5.9 hours per week in 2002, up from 3.1 hours per week in 2000 (Grunwald & Associates, 2003). A recent California survey showed that with this rapid increase in Internet access, teachers and students need to be able to quickly identify engaging educational content that supports state curriculum standards (Cradler, 2002). This need is specifically being addressed by a new Internet instructional resource known as *netTrekker classic* – the subject of this report.

*netTrekker classic* is a web-based educational resource with an interface that enables teachers and students to quickly identify educationally relevant public domain web-accessible resources from a large database maintained by *netTrekker classic*. These resources have undergone an extensive review process and are determined to have significant educational value for students in K-12 education. The content covers all curriculum areas from basic reading to higher-order problem solving and provides a variety of interdisciplinary learning opportunities uniquely available on the Internet. The *netTrekker classic* relational database links the identified resources to state curriculum standards for each of the core content areas and provides suggested lesson and unit plans to facilitate integration of these resources into instruction.

**Purpose of Report:** The purpose of this report is to provide the research basis for *netTrekker classic's* user-interface and selection of the content for *netTrekker classic*. It also suggests some research-based strategies for using *netTrekker classic* in schools in ways that will maximize the probability of producing measurable improvement in student learning for the content areas emphasized. Furthermore, educators will be able to use this report to reference the research when preparing NCLB proposals and plans that incorporate the use of *netTrekker classic* as an instructional resource. The *No Child Left Behind Act* (NCLB) mandates that all electronic learning resources (ELRs) purchased by school districts be designed with a scientific basis. The rationale is that NCLB assumes that research-based and evaluated programs will have a higher probability of increasing student academic achievement. This means that educators must have access to research-based ELRs in order to justify the use of NCLB funding for their purchase or use within NCLB supported programs and projects.

**Information and Data Sources for this Report:** It must be noted that much of the available research and evaluation on the use of the Internet and specific Internet-delivered content is descriptive rather than empirical. Educational Support Systems, Inc. (ESS) has made every effort to identify the most credible research using resources in its review such as the Center for Applied Research in Educational Technology (CARET), ERIC, the Regional Education Laboratories, and various university research databases. Additionally, ESS reviewed all of the available research conducted by Thinkronize, the parent company for *netTrekker classic*. This included: discussions with *netTrekker classic* developers, the Beta Test Summary, focus groups with teachers, librarians and students, survey results of student reactions to *netTrekker classic*, the web-content review criteria and process, and open-ended comments from users of *netTrekker classic*. ESS also commissioned the Center for Distributed Learning at Sonoma State University to conduct a heuristic review of the interface design.

**netTrekker classic Design and Beta Testing:** *netTrekker classic* developers conducted surveys and focus groups before the product was developed in order to help guide and determine the features most desired and needed by teachers and students. For example, *netTrekker classic* reports that “Fifteen content area specialists with a cumulative 242 years of educational and editorial experience reviewed national and state curriculum standards in order to create the taxonomy of disciplines, subjects and lessons that are the backbone of the *netTrekker classic* search tool.” In addition, hundreds of teachers were recruited to “compile, approve, and rank websites and to place them appropriately in the taxonomy” (*netTrekker classic* Product Summary Description, Thinkronize, Inc.). The developers also conducted surveys and focus groups to determine user reactions to earlier versions of the program and used the information to design refinements.

**Research Basis for netTrekker classic:** This report identifies independent research that supports the design decisions for the features and content provided by *netTrekker classic*. The report is organized around eight claims related to *netTrekker classic* benefits that can be supported by available research and evaluation studies.

1. *Increases learning opportunities and academic achievement*
2. *Provides online access to educationally relevant primary resource material*
3. *Helps teachers and learners save time*
4. *Provides for interdisciplinary content resources*
5. *Enables the selection and use of educationally relevant web content*
6. *Employs research-based web-navigation features*
7. *Uses widely accepted selection criteria for netTrekker classic content links*
8. *Identifies the research basis or other evidence for content links, when available*

**1. Increases learning opportunities and academic achievement:** *netTrekker classic* facilitates the use of the Internet as a learning resource that has the potential to increase academic achievement. A large number of studies have documented the positive learning impact of the Internet as an instructional resource, especially if it is integrated into the existing curriculum. *netTrekker classic* is designed to maximize effective use of the Internet through the use of tested search features combined with content that is reviewed according to a tested process.

- A 16-month study of 140 school-age children showed that those who spend more than 30 minutes a day on the Internet demonstrated grade point average increases from 2.0 to 2.2 or higher and their scores in standardized reading tests improved significantly as well. The conclusion of the study was that “spending

time online means spending time reading and when you're on the Web, you have to read a lot of text" (Jackson, 2003).

- Projects created by students in 14 experimental classes who had access to the Internet were rated higher than those projects created by students who did not have Internet access by an independent evaluator on nine factors (e.g., effectiveness of the presentation, completeness, organization) (Follansbee, 1997).
- Alignment between content-area learning standards and carefully selected technology use increased SAT1 test scores by 94 points among students who participated in technology integrated school reforms (Bain & Ross, 1999).
- A National Study by the *Center for Applied Special Technology* (CAST) reported that students with online access achieved significantly higher scores on measures of information management, communication and presentation skills than did students who had no online access. Also students with access to the Internet produced "better" projects than did students without access (CAST, 1996).
- A review of studies conducted by the *Software Information Industry Association* (SIIA) concluded that the Internet is having a dramatic impact on educational opportunities and learning outcomes (SIIA, 2000).
- A recent national survey by Grunwald & Associates (2003) showed that, 1) sixty-four percent of teenagers report that web-based learning resources are a valued part of their weekly online experience, and 2) eighty-one percent of parents believe the Internet is valuable to their children's learning.
- Positive attitudes from children and parents in under-served populations underscore the potentially vital role that the Internet can play in children's education (Grunwald & Associates, 2003).

The ease of finding resources to support student learning is a frequent educator response to the product as seen from a sample of comments from *netTrekker classic* users:

*"Our students enthusiastically endorsed netTrekker classic based on the ease of searching and the ability to use it from home,"* (Library Media Specialist).

*"The various methods and levels of searching allow students of varying academic and linguistic abilities to successfully use netTrekker classic,"* (Media Specialist).

*"Our teachers have reported to their departments or grade levels some very exciting activities cross-referenced to standards to help us build some resources to help achievement,"* (Assistant Superintendent).

**2. Provides online access to educationally relevant primary resource material:** The need of practicing teachers and administrators for primary and public domain educational content that corresponds to state standards has been documented. There are several online services that provide educators access to commercial resources, but none are known to offer a user-driven search process for accessing a database of the wide array of instructional resources in the public domain such as the Library of Congress, NASA, the Bancroft Library and others.

- An independent survey of teachers and school administrators in California showed that existing online databases such as the *California Learning Resource Network* (CLRN) focus on resources that are static and developed to teach specific skills. Existing online databases tend not to focus on the many primary, dynamic, and constantly changing resources found on the Internet. The survey respondents clearly indicated a need for web-links to such primary sources and media collections such as those that comprise the *netTrekker classic* content (Cradler, 2003).
- Interviews and surveys of students showed students prefer attending classes with multimedia and other forms of technology because they are more interesting, they hold their attention longer, and they make it easier to learn and retain complex material (Blake, Holcombe, and Foster, 1998, and Wise and Groom, 1996).
- Atkins (1998) found that use of multimedia and technology helped teachers conceptualize and increase the credibility of their teaching strategies.

*netTrekker classic* users report reliable and quick access to relevant content resources as a positive feature of the resource:

*"Students from grades 3 to 8 find netTrekker classic to be their first choice for Internet research because they can quickly find information they need and they know the teachers will be impressed because of it being reviewed by teachers in those fields,"* (Educational Technologist/Computer Teacher).

*"I have a different class every thirty minutes ranging in ages from 5-18 years old. They are all researching something different and have all used netTrekker classic to help gather information to incorporate into their projects. I love netTrekker classic and will continue to use it and to teach other teachers about the benefits of the product,"* (Computer Lab Instructor).

**3. Helps teachers and learners save time:** Most educators and students do not have the time to search the Internet for vetted sites tied to academic content or state standards. This was a premise of *netTrekker classic* that was clearly supported by several studies.

- A recent survey found that the majority of Internet-using educators (80%) ranked saving time to locate electronic learning resources that match to state standards as "very high" on a study of the online searchable database of commercial electronic learning resources (Cradler, 2003).
- The *netTrekker classic* beta test conducted with 250 middle and high school students in 10 classes showed that saving time searching for online educational resources was one of the most important features of the program (*netTrekker classic*, 2000).
- Students experienced with the Internet approach online information with caution (Hird, 2000). One study shows that these "cyber savvy" students are very aware of the opportunities for bias and erroneous information on the Internet,

underscoring the value of search features of *netTrekker classic* for making the best use of student time on the Internet when they are conducting research. *netTrekker classic* saves the user the time it takes to sort out inaccurate and biased information because this is already done by *netTrekker classic* staff.

- Research by NetDay (2001, 2003) shows that well designed sites will save search time resulting in less time taken away from instruction ([http://www.netday.org/article\\_tech\\_time.htm](http://www.netday.org/article_tech_time.htm)).
- Three-quarters of youth who go online everyday use the Internet as their main source for school reports and cite the ease and speed of online research as their main reasons for not using the print materials in traditional libraries (Pew Internet Project, 2001).

*netTrekker classic* users report that they save time by quickly locating resources they need:

*"My students like netTrekker classic because they don't have to dig through low quality and unrelated entries when they type a keyword into their search engines,"* (High School Teacher).

*"More of the students had successful searches and found more information than in other years,"* (High School Library Media Specialist).

*"Time is saved because netTrekker classic's search results are credible and more closely related to the academic needs of students. Dead links are also weeded out,"* (High School Media Specialist).

*"Using netTrekker classic, students can go directly to good, reliable sites. netTrekker classic is the only search engine we use in the library,"* (Middle School Library Media Specialist).

*"netTrekker classic is a great tool for both my students and teachers. Students can find reliable information quickly and teachers can easily incorporate state standards into their lesson plans. The variety of information and the ease of use make netTrekker classic a real time saver,"* (Media Specialist).

*"netTrekker classic is a gold mine of high quality Internet resources and a real time saver for my teachers and students. It's affordably priced and a wise use of my technology dollars,"* (Instructional Technology Specialist).

*"This is a big time saver. We will also be using netTrekker classic for professional development – a nice side-benefit of purchasing the program,"* (Librarian).

**4. Provides for interdisciplinary content resources:** *netTrekker classic* promotes the use of cross-curricular or interdisciplinary learning opportunities in several ways. First, theme searching enables users to conduct keyword searches for specific themes as well as to view the entire list of themes from which to search. Second, in the keyword search field

at the top of the Elementary and Secondary pages a search on "cross curricular" creates access to cross-curricular sites for the different grade levels. Third, most of the sites in the *netTrekker classic* database provide an array of instructional and learning activities involving a combination of disciplines that range from conducting independent online research to writing about and then presenting findings. Most of the reading-focused opportunities are embedded across content areas. Furthermore, *netTrekker classic* ensures that the reading levels for each site are pre-determined to be appropriate to the grade level indicated by the search category and details about language and reading level appropriateness are provided on the Website Evaluation screens. Research on the characteristics of effective educational websites found:

- Access to interdisciplinary (cross-curricular) curriculum media content was determined to be one of the top nine out of seventy-four characteristics of an effective educational web-site. This was the conclusion of an in-depth study conducted to validate an optimal set of quality indicators that could be used by K-12 educators, reviewers, and developers of educational web-sites. Access to interdisciplinary media is essential for creating and assessing quality learning experiences (Vaille, 1999).

Related comments from *netTrekker classic* users:

*"We have made available, because of netTrekker classic, some very exciting cross-referenced activities to the standards we are trying to teach. Our teachers have reported these to their departments or grade levels to help us build some great resources to help achievement. We will cross-reference our performance to these activities for the final evaluation,"* (Assistant Superintendent).

**5. Enables the selection and use of educationally relevant web content:** *netTrekker classic* uses a database program dedicated to maintaining current information on academic content standards across the states. In addition, experienced educators and content specialists carefully review the selected online content resources. The *netTrekker classic* lesson plans help to target the standards-aligned content to individual learner needs.

- Fifty-five percent of teachers in 2001 turned to the Internet as a research or information gathering tool for lessons and 58% of teachers said that the Internet helped them meet their research and resource goals (NetDay, 2001, [http://www.netday.org/anniversary\\_survey.htm](http://www.netday.org/anniversary_survey.htm)).
- A study, using surveys and focus groups of Internet-using educators, showed that the alignment of web-based instructional content to state and local content and performance standards for the targeted learner group was one of the nine keys to effective web-sites (Vaille, 1999).
- The *Smart Desktops for Teachers* study conducted in 2001 by the *Education Commission of the States* (ECS) found that web-based instructional software that is aligned to state curriculum standards along with corresponding lesson plans is a critical feature that should be included with web-based instructional resources (<http://www.ecs.org/clearinghouse/18/47/1847.htm>).
- The CLRN survey (Cradler, 2003) also indicated a need for information about web-based educational resources that included lesson or unit plans. A significant

number of the web-resources provide for lesson and unit plans that align to both the content of the web-site and state and/or national curriculum standards.

Comments from *netTrekker classic* users reinforce the importance of educationally relevant resources:

*"From the first time I logged onto netTrekker classic I was hooked! netTrekker classic delivers outstanding websites that are linked to specific Texas standards and curricular areas, making it extremely easy to find exactly what is needed. ....the variety, depth, and relevance of authoritative sources make this a resource that will be used enthusiastically," (Assistant Director for Learning Media Resources).*

*"netTrekker classic resources align with our state standards, which was a key issue for us and its ease of use was a big plus for our very diverse district," (Manager of Library Services).*

**6. Employs research-based web-navigation features:** The major design features for the *netTrekker classic* web-interface include the following: a) Subject searching, b) Keyword searching, c) Refined searching, d) Famous People searching, e) Save your search, f) Sharing saved searches, g) Theme searching, h) Cross-curricular searching, i) Current events, and j) Reference tools. Research conducted in the development phase of *netTrekker classic* incorporated 1) design criteria for usability of the search engine and the website and 2) feedback from surveys and focus groups. One survey of students found that the ability to "save searches" was rated "extremely important" by a majority of the students (*netTrekker classic* Survey Results). Additional data on student preferences for search engines and website functionality was collected from focus group sessions conducted in Spring, 2000. Students were asked 32 questions in one session and given a hands-on *netTrekker classic* assignment to complete for the second session in which they addressed an additional 42 questions specific to *netTrekker classic's* searching functions, visual design, and organization and display of content.

- The *netTrekker classic* navigation features were selected and refined according to research conducted during the beta testing of the site. Furthermore, most of these features used in other online databases were also rated as critical to users. The *netTrekker classic* beta test involved students and teachers in twelve public and private schools from a wide variety of socioeconomic backgrounds to test every feature of the *netTrekker classic* interface (*netTrekker classic*, 2000). These features were found to be of critical importance and value to the students and teachers participating in the beta test.
- Zhao, et al (2001) reports that innovative uses of technology are more likely to be successful when teachers are familiar with the content of lessons that are being integrated with the technology. This supports the "refined search" feature of *netTrekker classic* that allows the user to access resources that directly relate to the school level instructional strategies and priorities.
- A survey of teachers using the California Learning Resource Network (CLRN) online database of electronic learning resources showed that 80 to 90% of the 70 users surveyed consistently rated subject searching, keyword searching, customized results, and reference tools as very important (Cradler, 2003).

Related comments from *netTrekker classic* users:

*"netTrekker classic searches are easy to use and geared toward my age group. I was especially pleased with the Language Arts and Science sites. Both allowed me to enrich the weekly stories used in my classroom," (1<sup>st</sup> Grade Teacher).*

*"Next year we hope to see more use by professionals in the school as they develop curriculum units and lesson plans," (Library Media Specialist).*

*"Our school media center has bookmarked netTrekker classic as THE place to go when researching a topic on the Internet," (Media Specialist).*

The *Center for Design in Usability and Assessment* has conducted research in human factors design for web-sites. This review finds that *netTrekker classic* has incorporated design features identified in the Center's human factors research such as:

- **Visibility of System Status:** Users should always know where they are and where they are going. In *netTrekker classic*, search results are presented within the context of the knowledge tree of subjects and disciplines. The use of color schemes to help users to identify sections helps users know where they are.
- **Flexibility and Efficiency of Use:** Users should be able to customize the execution of frequent actions. In *netTrekker classic*, users can customize their search results pages to display the data most relevant to their needs. They can also save and archive their search results in order to easily access and share them with others.
- **Consistent "Look and Feel" of the Interface:** Every screen should be recognizable as a particular product, such as a common layout, background, and/or color scheme for all screens (Nielsen, 1993). *netTrekker classic* has a common layout for all search results and screens, and Elementary, Secondary and State Standards content is easily distinguishable.
- **Content of interest to the user is clearly displayed on the page** (Nielsen, 2000). The *netTrekker classic* site clearly displays Elementary, Secondary, and State Standards at the top of the user page. In addition, *netTrekker classic* is responsive to the classroom setting where learning activities are organized according to a specific set of subjects arranged hierarchically by discipline and the purpose of the website is clearly visible above the fold. Larger font sizes and specialized graphics attractive to elementary students were incorporated into *netTrekker classic*.

The *Center for Distributed Learning* located at Sonoma State University in California has conducted research on design for education web-sites. This research has resulted in an assessment tool known as the *Interface Design Evaluation and Assessment (IDEA)*. Professional staff specializing in web Interface research used the IDEA as the basis for their review of *netTrekker classic*. The conclusion of this review was that *netTrekker classic* generally incorporated design features identified in the IDEA research-based rubric for assessment of websites. (Contact *netTrekker classic* for additional details regarding this report.) The concluding statements from the report were as follows:

- *netTrekker classic* pages load quickly, including search results. This complies with both early research (Miller, 1968) and more recent research (Shneiderman, 1984) recommending that the computer should respond to simple user entries within two seconds. In addition, Martin & Corl (1986) found that best user results were experienced with pages that loaded in two seconds or less. These works concur with the meta-analysis by Bouch, Bhatti, & Kuchinsky (2000), indicating that response time is one of the most important components of user satisfaction.
- The *netTrekker classic* design is appropriately sized for the commonly used screen resolution of 800 x 600 pixels. Though many current monitors are capable of displaying 1024 x 768 resolutions, they are often preconfigured at a lower resolution (usually 800 x 600). Even though the monitor and computer would be more usable and may be designed for use at higher resolutions, many users keep the monitor at the default setting. One survey of monitor resolutions found user percentages to be the following: 640 x 480, 12.72%; 800 x 600, 54.2%; 1024 x 768, 25.78%; other sizes, 7.3% (Software Engineering Information Repository, 2003). As such, web designers should now be developing for 800 x 600 and above.

Related comments from *netTrekker classic* users:

*"The only new service we added was netTrekker classic because of the superior interface and ease of use," (Educational Technology Specialist).*

**7. Uses widely accepted selection criteria for netTrekker classic content links:** *netTrekker classic* has developed its criteria for the review of sites based on all known available research to guide these criteria. The criteria include: a) authority/credibility rating, comprehensiveness or subject depth, b) style or understandability, c) navigation, d) relative value compared to other resources, and e) existence of controversial information. The basis for the *netTrekker classic* criteria is supported by a variety of studies as well as experiences of known authorities on instructional web-design. A review of 10 studies and expert recommendations on educational web-site design clearly indicate that the web-design criteria used by *netTrekker classic* were justified especially in terms of obtaining optimal levels of use and engagement by teachers and students.

**8. Identifies the research basis or other evidence for content links, when available:** The existence of prior empirical research to validate the content of the resource links varies to a great extent. For example, the Sesame Street links were extensively researched by the Children's Television Workshop. Others, such as selected NASA links, were evaluated but may not always cite a specific study. However, many of the links provide documentation in terms of bibliographic references to support the content.

When reviewing each site under the category of "*Authority/credibility*", *netTrekker classic* reviewers look for a bibliography or other documentation of the validity and effectiveness of the material in the site. They also look for objectivity and accuracy of the information presented. In the future, *netTrekker classic* will be adding new review criteria, which is "*Is there credible research to document the impact of the use of the site on learning?*" Reviewers will be trained on how to evaluate the credibility of the research when it is found.

**Conclusion:** In general, *netTrekker classic* represents an instructional web-based resource that has been developed according to information and data about the needs of students and teachers for relevant content in the public domain. The developers made a significant effort

to conduct surveys and focus groups of students to determine instructional needs and web-site features most desired and needed. A wide variety of existing web-resources were reviewed to develop the most time-effective search engine. This review finds that most of the features as well as the content selection process are based on state-of-the-art information and are consistent with other well known and highly rated instructional web-resources familiar to ESS staff. The existing research tends to support the web-design features, the design-development process, and the content-review approach and process.

**Recommendations:** It is suggested that users of *netTrekker classic* be informed about the most effective strategies for integrating technology and Internet-use into instruction. This will not only enable most effective use of the product, but will also make it possible to more easily document its use.

There is a great deal of research on the most effective strategies for the infusion of web-based electronic learning resources into teaching and learning. In order to increase the probability that the use of *netTrekker classic* will result in sustained use, expanded learning opportunities, and academic improvements, certain conditions need to be in place. These include, but are not limited to, the following:

- a. *netTrekker classic* should be integral to the teacher's overall instructional planning for the semester, year, or specific course. Technology is most influential when integrated with curriculum and assessment. In a review of studies, the CEO Forum (2001) concluded, "technology can have the greatest impact when integrated into the curriculum to achieve clear, measurable educational objectives."
- b. Teachers should plan for and guide student use of *netTrekker classic* that corresponds with the lesson or activity for that day. Numerous studies of technology integration with mathematics and reading demonstrate greater learning effectiveness when technology applications are used with regularity and frequency and when they are consistent with and reinforced by other components of the curriculum (Mann et al., 1999, Becker, H. J., & Ravitz, J. L., 2001).
- c. Teachers should monitor the use of *netTrekker classic* sites by their students. Teacher guidance in the use of technology is important to students to ensure that students are understanding concepts, not just manipulating the software. For example, in the area of mathematics, students can manipulate the software to achieve a visual solution without conceptual understanding of how the problem is solved (Hillel, J., Kieran, C., & Gurtner, J., 1989).
- d. Teacher monitoring is also important as a reinforcement of the school's Acceptable Use Policies for ethical and legal use of the Internet.
- e. Teachers should preview resources and then build the use of *netTrekker classic* into their lesson or unit plans. Teachers need time to design, experiment with, and receive feedback regarding the strengths and weaknesses of challenging, complex lessons involving technology (Means & Olson, 1997). The most successful technology projects in a study of 118 recipients of technology innovation grants were those where teachers were least dependent on resources beyond their reach (Zhao et al., 2001).
- f. Professional development should include the *netTrekker classic* review criteria so that teachers can validate for themselves what the *netTrekker classic* reviewers

indicated about particular sites. Effective technology applications involve a process for continuously incorporating research findings into instructional strategies and curriculum planning (Cradler & Cradler, 2000).

- g. Students should be able to use *netTrekker classic* actively for their class projects and then share both in writing and in class presentations what they learned from the sites located as a result of *netTrekker classic*. Technology provides realistic, complex environments by furnishing investigative tools and data resources and by linking classrooms for joint investigations (Means & Olson, 1997). When students used the Internet to research topics, share information, and complete a final project within the context of a semi-structured lesson, they became independent, critical thinkers (Coley et. al, 1997).
- h. Teachers and students must demonstrate the prerequisite skills to conduct basic Internet searches to make optimal use of the *netTrekker classic* tool.
- i. Sufficient bandwidth should be available to the classroom in order to make optimal use of the *netTrekker classic*-identified educational resources. Consistent with research that shows technology use has a positive effect on student learning when it is part of the typical instructional day, research shows that students also want access to the Internet beyond what is available in computer labs and only at specified times of day (Levin, D, & Arafah, S., 2002).
- j. Teachers and school administrators should be committed to the use of technology as a supplemental instructional resource. Several studies conclude that school decision makers include a broad range of school community stakeholders in planning processes to prepare students for digital literacy, inventive thinking, and effective communication (CEO Forum, 2001; Levin & Arafah, 2002; Becker & Riel, 2000).
- k. Teachers should document the extent to which the use of electronic learning resources such as *netTrekker classic* contribute to and enhance the existing instructional resources they are using.

## References

- Atkins, S., (1998). Windows of opportunity: preservice teachers' perceptions of technology-based alternatives to field experiences. *The Journal of computers in Mathematics and Science Teaching*, 17, 95-105.
- Bain, A., & Ross, K. (2000). School reengineering and SAT-1 performance: A case study. *International Journal of Education Reform*, 9(2), pp. 148-153.
- Becker, H. J., & Riel, M. M. (2000). *Teacher professional engagement and constructive-compatible computer usage* (Report no. 7). Irvine, CA: Teaching, Learning, and Computing. Retrieved February 28, 2002, from [http://www.crito.uci.edu/tlc/findings/report\\_7/](http://www.crito.uci.edu/tlc/findings/report_7/).
- Becker, H. J., & Ravitz, J. L. (2001). *Computer use by teachers: Are Cuban's predictions correct?* Paper presented at the 2001 Annual Meeting of the American Educational Research Association, Seattle, Washington. Retrieved February 28, 2002, from [http://www.crito.uci.edu/tlc/findings/conferences-pdf/aera\\_2001.p](http://www.crito.uci.edu/tlc/findings/conferences-pdf/aera_2001.p).
- Blake, S., Holcombe, L, foster, D. (1998). Technology and teachers: An investigation of attitudes and beliefs of introductory use by preservice teachers. *Journal of Technology and Teacher Education*, 6, 39-49.
- Center for Applied Special Technology (CAST) (1996). *The role of online communications in schools: A national study*. Peabody, MA. Retrieved October 23, 2001, from <http://www.tcet.unt.edu/research/rlonline.htm>.
- Center for Design in Usability and Assessment. Retrieved July 7, 2003 from <http://www.csulb.edu/centers/cuda/>.
- CEO Forum on Education and Technology. (2001, June). *The CEO Forum school technology and readiness report: Key building blocks for student achievement in the 21st century*. Retrieved February 21, 2002, from <http://www.ceoforum.org/downloads/report4.pdf>.
- Coley, R., Cradler, J. & Engel, P. (1997). *Computers and classrooms: The status of technology in U.S. schools*. Princeton, NJ: Educational Testing Service, Policy Information Center, 37.
- Cradler, J., & Cradler, R. (2000). *The curriculum technology integration plan (CTIP): Impact of the CTIP on technology integration in the DoE DoD presidential technology initiative*. San Mateo, CA: Educational Support Systems.
- Education Week: Technology Counts 2003, Vol XXII, No. 35 May 8, 2003.
- Fisher, C., Dwyer, D. C., & Yocam, K. (Eds.). (1996). *Education and technology: Reflections on computing in classrooms*. San Francisco, CA: Jossey-Bass.
- Follansbee, S., Hughes, B., Pisha, B., Stahl, S., (1997). Can Online Communications Improve Student Performance? Result as of a Controlled Study. *ERS Spectrum* 15(1): 15-26.
- Grunwald & Associates, C&R Research (2003). Connected to the future: A report on children's Internet use from the Corporation for Public Broadcasting. Retrieved on July 7, 2003 from <http://cpb.org/ed/resources/connected>.
- (Hillel, J., Kieran, C., & Gurtner, J. (1989). Solving structured geometry tasks on the computer: The role of feedback in generating strategies. *Educational Studies in Mathematics*, 20, 1-39.
- Hird, A., (2000) Learning from Cyber-Savvy Students: How Internet-Age Kids Impact Classroom Teaching. Stylus Publishing.

Jackson, L. A., von Eye, A., Boca, F., Barbets, G., Fitzgerald, H. E., & Zhao, Y. (in press). Internet attitudes and Internet use: Some surprising findings from the HomeNetToo project. *International Journal of Human Computer Studies*. <http://www.msu.edu/user/jackso67/homenettoo/main.html>.

Kember, D. (2002) Long-term Outcomes of Educational Action Research Projects Educational Action Research ISSN 0965-0792 Volume 10 Number 1 2002 Retrieved July 8, 2003 from <http://www.triangle.co.uk/ear/>.

Levin, D., & Arafah, S. (2002) *The digital disconnect: The widening gap between internet-savvy students and their schools* American Institutes for Research for Pew Internet & American Life Project. Washington, DC. Retrieved January 3, 2003, from: [http://www.pewinternet.org/reports/pdfs/PIP\\_Schools\\_Internet\\_Report.pdf](http://www.pewinternet.org/reports/pdfs/PIP_Schools_Internet_Report.pdf).

Mann, D., Shakeshaft, C., Becker, J., & Kottkamp, R. (1998). West Virginia story: Achievement gains from a statewide comprehensive instructional technology program. Santa Monica, CA: Milken Exchange on Educational Technology.

Means, B., & Olson, K. (1994). Realizing the promise of technology: The link between technology and authentic learning. *Educational Leadership*, 51(7), 15-18. Retrieved February 17, 2003, from <http://www.ascd.org/readingroom/edlead/9404/means.html>.

NetDay (February 2, 2003). Technology Can Save Time and Expand Roles for Teachers. Retrieved on July 7, 2003 from <http://www.netday.org/articletechtime.htm>.

*netTrekker classic* (2000). Beta Test Summary of *netTrekker classic* and digitalbackpack, Unpublished report. *netTrekker classic*, 2000.

NetDay (2001). NetDay Survey 2001. The Internet, Technology and Teachers, Executive Summary, May, 2001. Retrieved July 7, 2003 from [http://www.netday.org/anniversary\\_survey.htm](http://www.netday.org/anniversary_survey.htm).

Nielsen, J. (1993). *Usability Engineering*. Academic Press, Boston.

Nielsen, J. (2000). *Designing Web Usability: The Practice of Simplicity*. New Riders Publishing, Indianapolis Retrieved on July 7, 2003 from <http://www.useit.com/jakob/webusability/>.

Palaich, R., Griffin, D., Good, C., Stout, E., Vickery, E. (2000). Smart Desktops for Teachers, Education Commission of the States. Retrieved on July 7, 2003 from <http://www.ecs.org/clearinghouse/18/47/1847.htm>.

Software and Information Industry Association SIAA, (2000). 2000 Report on the Effectiveness of Technology in Schools. <http://www.trendsreport.net>.

Thinkronzie, Inc. *netTrekker classic* Product Summary Description (2000).

Vaille, J. (1999). *Nine Keys to Unlock Great K-12 Educational Web Sites*, Unpublished dissertation. Pepperdine University.

Wise, M., Groom, R., (1996). The effects of enriching classroom learning with the systematic employment of multimedia. *Education*. 117. 61-69.

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. (2002). Conditions for classroom technology innovations: Executive summary. *Teachers College Record*, 104 (3) 482-515. Retrieved July 4, 2002, from <http://www.tcrecord.org/Collection.asp?CollectionID=77>.

## **Educational Support Systems, Inc. (ESS)**

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ESS is a business devoted to supporting education planning, applied educational research, program evaluation, project development, and policy advising. The major emphasis in this work is in the application of all types of technologies that can support teaching and learning. The capacity of ESS to perform these functions is based on extensive experience over the past 20 years working with a wide variety of entities including business and industry, State Education Agencies, school districts, county offices of education, the US Department of Education, National Science Foundation, NASA, Regional Education Laboratories, Department of Defense Education Activities, professional education associations, and foundations.

### **John Cradler, President, Educational Support Systems, Inc.**

John has extensive experience in the evaluation of educational technology programs at the national, state and local levels. He designed and serves as Co-Director of the Center for Applied Research in Educational Technology (CARET). He has worked as a senior researcher for Far West Regional Educational Laboratory (now WestEd), has developed a research-based reading program and conducted a scientific research study on the program that was accepted by the U.S. Department of Education. He is lead evaluator for the California Learning Resource Network and other state funded educational technology programs. He has written numerous articles and policy briefs on educational technology research.

### **Ruthmary Cradler, Vice-President, Educational Support Systems, Inc.**

Ruthmary works in program evaluation of educational technology programs at the national, state and local levels. She works on the staff of the Center for Applied Research in Educational Technology. She is a member of the PT3 national evaluators' panel. She is lead evaluator for numerous Technology Innovation Challenge Grants, Preparing Tomorrow's Teachers to use Technology (PT3) grants, Enhancing Education Through Technology (EETT) competitive grants as well as National Science Foundation, and Funds for Improving Post-Secondary Education grants. She has facilitated state level planning for *No Child Left Behind* (NCLB). She has co-authored numerous articles on research findings related to educational technology.

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### **Brett Christie, Consultant, Educational Support Systems, Inc.**

Brett is the co-director of the *Light Bridge* PT3 grant and assistant professor of education at Sonoma State University (California) where he was recently appointed Coordinator of the Educational Technology area of emphasis. He has been involved in integrating technology into education for approximately 10 years and has worked extensively in teacher education, as well as with all K-12 levels of education. He has a particular interest in innovative uses of technology for teaching and learning -- both classroom and web-based.

### **Rachel Smith, Consultant, Educational Support Systems, Inc.**

Rachel is on the staff of the *Center for Distributed Learning* located at Sonoma State University in California. She has worked with the CDL on research on web-site design for education. This research has resulted in an assessment tool known as the *Interface Design Evaluation and Assessment* (IDEA). Rachel is one of the professional staff specializing in web interface research and applied the IDEA as the basis for the review of *netTrekker classic*.