Development of FASTeR: a Multimedia DVD-ROM for Science Education

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Abstract

The purpose of this paper is to describe the development of a technological innovation designed to assist teachers of the Foundational Approaches in Science Teaching program, or FAST. An electronic resource, or FASTeR, is a multimedia resource designed to provide support to teachers in implementing the FAST program by showing events of actual student investigations and teacher preparation. However, the effectiveness of multimedia in learner outcomes has been a continual debate since the days of Clark and Kozma. Proponents of the positive influences of multimedia maintain that learners process information in a myriad of different ways and that multimedia assists those learners. Opposition maintains that there is little empirical evidence as to how multimedia positively adds to learner outcomes. As the debate continues, the authors of this paper recognize that computer multimedia and its impact in education is a relatively new field of study and that additional empirical evidence will emerge as further research questions are advanced.

The FAST electronic resource, or FASTeR, was initially developed during a pilot study that reduced face-to-face interaction time of FAST professional development that had been offered for over thirty years as a two-week institute. With the reduction to one week, a solution was needed to provide teachers with the ability to understand and carry out investigations that would not be covered during the reduced time frame. A team of subject matter experts, advisors, a graphic designer, computer programmers, a professional videographer, student videographers, a narrator, and an instructional designer was assembled to develop the alternative intervention for the pilot study. The alternative intervention included an online course (not described in this paper) and the FASTeR, a resource that includes classroom footage of teachers introducing lessons and guiding students through investigations, and teacher institute footage of other FAST teachers in the role of students. Also included are slideshows of experiment set-ups and still images of laboratory materials and equipment. The fundamental, major design assumption of the FASTeR was that viewing video examples, whether considered models or non examples, of other teachers and real students would contribute to learning and understanding.

Feedback for the FASTeR was extremely positive. Though anecdotal in nature, the positive reception suggested that teachers had a mechanism by which the relationship between the procedure and the principles could be reiterated. This ability to re-review may have increased the meaningfulness of the specific investigations which may not have been apparent during the teacher institutes, thereby increasing retention. Though this paper does not describe a formal research study, since the development of the electronic resource stemmed from a project with different goals, the authors hope this description can contribute to the literature on implications of multimedia enhancements in professional development. Future designs and revisions will include usability studies, focus group interviews, and regular teacher feedback.
Introduction

This paper is a description of the development of a technological innovation designed to assist teachers of the *Foundational Approaches in Science Teaching* program, or *FAST*. The electronic resource, or *FASTeR*, is a multimedia resource provided on a digital video disc (DVD-ROM) with hours of catalogued real teacher institute and classroom video. *FASTeR* has been described previously in conjunction with the development and implementation of an alternative version of professional development for the *FAST* program (Gray, Nguyen, & Speitel, 2005). The purpose of this paper is to describe the *FASTeR* in more detail to contribute to the literature on implications of multimedia enhancements in professional development.

*FASTeR* was developed as part of a larger research project whose goal was to decrease effectively the face-to-face interaction time in teacher institutes (Gray et al., 2005). The goal of the pilot version of the *FASTeR* DVD ROM was to support teachers in implementing the *FAST* program by showing events of actual student investigations and teacher preparation. It complements and further depicts information found in the student book and teacher guide, reviews the teacher institute, and presents investigations the teachers may not have conducted during their professional development. It shows children operating in real classrooms, which is a feature not possible in *FAST* teacher institutes. This paper will begin with a short description of the *FAST* PD, continue with considerations in multimedia-support literature, follow with a description of *FASTeR* and the technical design process and assumptions, and share feedback from developers, teachers, and administrators as to the usefulness of the multimedia DVD-ROM. The paper will conclude with recommendations for future designs and research questions that have emerged from the design assumptions.
Background on FAST Professional Development

The Foundational Approaches in Science Teaching program, or FAST, is an award-winning, inquiry-based, middle school science curriculum developed by the Curriculum Research & Development Group (CRDG) of the University of Hawai‘i. FAST, which consists of three levels, emphasizes the foundational concepts and methods of the physical, biological, and earth sciences by directly involving teachers and students in inquiry (Young & Pottenger, 1992). The United States Department of Education (USDOE), selected FAST as one of two exemplary science programs by its Expert Panel on Mathematics and Science Education (United States Department of Education, 2004). The FAST program has also been evaluated and validated as an exemplary program by the National Science Teachers Association and has received numerous other awards and recognitions from independent outside agencies.

Entrenched firmly in the FAST program are professional development opportunities for teachers. CRDG holds firm to the ideal of providing support through professional development. All science teachers using the FAST program are required to participate in a FAST teacher institute, a professional development program that immerses participants into a full range of activities and investigations and exposes them to contemporary instructional inquiry strategies (Gray et al., 2005). Without successful certification, CRDG does not allow teachers to purchase their science curricula. The goals and objectives of FAST PD are designed to prepare teachers to successfully teach the inquiry science program in their classrooms by developing participants’ (a) knowledge of the program's philosophy and objectives, (b) ability to use the variety of instructional strategies that are inherent in FAST, (c) understanding of the content of physical, biological, and earth science, and technology in FAST, and (d) excitement and enthusiasm for teaching science at the middle/junior high school level (Young & Pottenger, 1992).
FAST curriculum developers began offering professional development teacher institutes in 1970. During the first two summers, teachers attended a six-week session. Due to increased demand from schools and teachers, the institute’s duration was decreased to four weeks over next two summers, then three weeks the next year. Expansion into the continental United States from Hawaii prompted a revamping of the institute to two weeks due primarily to travel and costs. Since 1975, the FAST PD has been offered as a two-week institute during the summer and is carried out in a local school science laboratory.

Though increased time span and contact hours in professional development have shown to have substantial positive effects (Garet, Porter, Desimone, Birman, & Yoon, 2001), contextual factors such as the No Child Left Behind Act of 2001 (United States Department of Education, 2001) and new certification and licensing requirements presented FAST developers with the challenge of decreasing the face-to-face time commitment while adhering to the integrity of the program. In summer 2004, the first one-week teacher institute was offered which prompted the development of the FASTeR being described in this paper. For a more thorough discussion of the pilot study’s modified FAST professional development, see Gray et al. (2005).

Considerations in multimedia-support literature

The decision to create an electronic resource for the FAST teacher institutes was based primarily on the notion of electronic performance support systems. Other possibilities for the electronic resource were as computer-based instruction, computer-assisted instruction, or an intelligent tutoring system. However, developers knew that time constraints on production would not allow for full development of feedback mechanisms which are all crucial components of the three previously mentioned alternative designs. Electronic performance support systems, or EPSS, are computer-based systems that provide a mechanism to generate learning as well as
performance (Gery, 1991). Though EPSS are more widely used in military applications and workforce skills-based contexts, they are also found in education frameworks due to their developmental grounding in the process of learning. There are three components to EPSS: (a) an advisory system, (b) an information base, and (c) learning experiences (Raybould, 1990). The FASTeR grounded itself in the latter two components that will be described later. As a stand-alone resource, it would not make sense to any user since feedback is not immediately offered.

As shared by (McKenney, 2005), any technological innovation should not be used independently, but introduced in a training setting, along with follow up support, is most practical and effective when used as a shared resource to supplement existing activities, and should be used on a sustained basis within a professional development program. Therefore, there was no attempt made to make the FASTeR an advisory system.

However, technological advancement has always been tempered by the continual media debate between Clark and Kozma, with Clark (1983; 1994) positing that media’s only influence on learning is on cost and distribution and Kozma (1991; 1994) rebutting that the capabilities of a particular medium influence the way learners process information. The debate is further exacerbated by resistance to technology in education, namely supported by Jones and Paolucci’s (1998) review over 800 journal articles in search of evidence that supported the claim that technology-mediated instruction increased learner achievement and outcomes. The researchers concluded that quantifiable learning outcomes were not significantly linked to technology adoption, a belief echoed by many other researchers (Matthews, 1998; Price, 1996; Ringle, 1997; Twigg, 1996; Van Dusen, 2000).

Yet, slim evidence of significant differences in learning outcomes between technologically-mediated and traditional instruction has not swayed all educators away from
technology in education. The lack of empirical evidence may frustrate educators who feel that computer technology positively influence learning (Honey, 2000; Honey & Moeller, 1990), but others (Fishman, Soloway, Krajcik, Marx, & Blumenfield, 2001; Hannafin, Hill, Oliver, Glazer, & Sharma, 2003; Hara & Kling, 1999; Harasim, Hiltz, Teles, & Turoff, 1995; Kabilan, 2004) emphasize that technological innovation can be successful and holds promise, so long as there is a focus on motivation, skills and knowledge, self-directed learning, interactive competence, and technology skills. Computer technology in education research is a relatively new field of study. It will take time for the empirical evidence to emerge as more systemic adoptions take place in small school settings as well as district- and state-wide efforts.

Some specific issues about teachers usage of technology revolve around electronic mail for communication with parents and peers followed by access to the World Wide Web for additional teaching resources (Lanahan & Boysen, 2005). In a survey of 1000 K-12 teachers across the United States teachers, 17.5% of teachers considered themselves advanced users with more than half being comfortable with technology (Rother, 2005). The high numbers were attributed to changes in perception and recognition of professional development opportunities since the professional development numbers remained the same.

**About the FASTeR**

The *Foundational Approaches in Science Teaching* electronic resource, or FASTeR, as seen in Figure 1, is a multimedia resource provided on a digital video disc (DVD-ROM) with hours of catalogued real teacher institute and classroom video. The DVD-ROM is meant to be used in a computer, not in a standard DVD player. As a starting point, the current version of FASTeR is aligned with level 1 of FAST, *The Local Environment*. 

Figure 1. Opening screen of the FAST Electronic Resource, or FASTeR.  

The multimedia include classroom footage of teachers introducing lessons, guiding students through investigations, and teacher institute footage of other FAST teachers in the role of students. Also included are slideshows of experiment set-ups and still images of laboratory materials and equipment. The resource media pieces, as seen in Figure 2, are keyed to segments of FAST I investigations, including review, introduction, problem, materials, procedure, data collection, analysis, summary, and challenge.

Interface and navigation

The interface was programmed and designed so that teachers navigating through the FASTeR would utilize the same skills as those used when browsing the World Wide Web. The FAST trainers and curriculum developers knew that an intuitive interface was needed because there was no time to train teachers on how to navigate through the system. They requested a product that could be slipped into a computer, clicked on, and work without the need for installation and restarting of the computer. Therefore, rather than develop an executable software
package, web programming was implemented with the assumption that all FAST teachers had experience with the Web browsing and searching skills.

*Figure 2. Keyed segments in FASTeR and multimedia examples.*
The current version of the FASTeR, which only covers FAST I, was designed to allow for expansion into FAST II and III in the future. Teachers started by selecting the FAST I icon and continued by selecting the investigation they desired. They could then review the rationale, overview, problem statements, and procedures in brief. Or, they could choose to watch multimedia resources such as videos and slideshows, or listen to audio.

**Videos**

The videos are Quicktime® movies that present classroom footage or other teacher institute footage. For each investigation, they are divided into four major categories that correspond with the student investigations, (a) Review/Introduction/Procedure, (b) Materials/Procedure, (c) Investigation/Data Collection, and (d) Analysis/Summary/Challenge. A total of 22 investigations have supporting videos linked to them. Eighteen of those investigations have videos from other teacher institutes. Nine of those investigations have videos of real students in classrooms. Videos range from 1.25 minutes to 14 minutes in duration. Teachers have the ability to pause and continue the videos at their convenience. Also, a control bar is available so that teachers can rewind or forward the video as needed. The number and types of videos as related to student investigations are listed in Table 1. The video footage is derived from two different sources—a teacher institute conducted in summer 2003 and a FAST I class taught in school year 2003-2004.

**Slideshows**

The slideshows are narrated Flash® animations of investigation set-ups and still images of laboratory materials and equipment. Teachers navigate through the slideshows using a forward and back navigation scheme. The slideshow does not advance until the teacher clicks on the next button. Otherwise, teachers also have the option to click on a replay button so that a
Table 1. Current FASTeR videos and slideshows as related to FAST I, The Local Environment, investigations. Videos are divided into four major categories that correspond with the student investigations: Review/Introduction/Procedure (Intro), Materials/Procedure (Proc), Investigation/Data Collection (Data), and Analysis/Summary/Challenge (Summary).

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<thead>
<tr>
<th>Investigation</th>
<th>From Other Teacher Institute</th>
<th>From Classroom</th>
<th>Slideshow</th>
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<td>Intro</td>
<td>Proc</td>
<td>Data</td>
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<td>Physical Science</td>
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<td>19 Heating Ice in a Balloon</td>
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<td>5 Written Scientific Reports</td>
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procedure can be repeated as many times as needed. A total of 12 investigations have slideshows linked to them. The number and types of slideshows as related to student investigations are listed in Table 1. The slideshow imagery is a mix between photographs of actual equipment and supplies mixed in with graphic illustrations.

Production

Production for the FASTeR started officially in summer 2003. During conceptualization of the FASTeR, a teacher institute was videotaped to practice the techniques that would be needed in the upcoming real student-filled classroom. Though the capturing of the teacher institute was only for practice, the footage was judged by the production team as good enough, if not better than planned, to use for the final electronic resource. It was also during this time that the team determined that a more “natural and realistic” view of the PD would be more informative and believable to future teachers than one that was “canned” or professionally conducted (Gray et al., 2005). Taping began in the student classroom at the start of the school year. During shoots, the lead videographer decided to utilize two and sometimes three cameras to better capture the classroom interactions. The inherent nature of a classroom’s fluid setting and myriad of interactions were difficult to capture with just one camera as was done in the teacher institute practice period. For more information on the production itself, see Gray et al (2005). Upon review of the video footage that was captured, the lead content expert realized that she could not discern the investigation preparation and set up from the classroom footage. She felt it imperative to capture the pre-class set up of equipment as well as remind teachers of key safety and inquiry points during student investigations. The investigations were staged so that a series of images could be taken of the equipment. In the slideshow, the series of images from each investigation was then narrated. Two proofs of concept were developed—one animated and the
other with live images with some animation. Because of time restrictions, the second version was chosen. With the help of the videographer, a mini-studio set up with a blue backdrop was built while two experienced FAST teachers were contacted to assist during spring break. A total of twelve investigations were identified as crucial to explain. The content expert determined that skills and knowledge from the set ups of the identified twelve were repeated processes in the remaining investigations. After the pictures were taken, the images were compiled and our content expert narrated each one in their respective orders.

Design assumptions

There were several basic teacher needs that guided the development of the FASTeR, informed primarily by the pedagogical needs of the professional development and secondarily by technology standards for teachers. FASTeR’s purpose, as mentioned previously, is to serve as an information base and as a learning experience as described in electronic performance support systems, or EPSS, design (Raybould, 1990). As an information base, FASTeR presents all unit rationale, overview, investigation problems, and procedures in brief without the immediate need to refer back to the robust, 658-page, 1.5” thick teacher guide. Multimedia was used to enhance concepts and procedures that were provided only as black and white, line-drawing illustrations in the guide. As a learning experience, FASTeR contains multimedia about investigations that were not covered during the time frame of the face-to-face teacher institute. As a whole, the FASTeR provides for a mechanism by which the relationship between the procedure and the principles can be reiterated. This ability to re-review may increase the meaningfulness of the specific investigations which may not have been apparent during the teacher institutes, thereby increasing retention (Smith & Ragan, 1999).
Though the FAST PD is designed to immerse teachers into the role of students, teachers still do not see or experience other teachers interacting with middle-school students nor see or experience equipment setup for half of the investigations. In general, the most immediate support for teachers once they reached their own classrooms was the teacher guide and the student book (FAST also has an informal 1-800 help telephone line, a teacher list-serve, a newsletter, and classroom visits to more formal methods, such as a university course over interactive TV, and renewal sessions). The teacher guide and student book do not immediately provide (aside for some black and white sketches) visualizations of real classrooms and workshops. Therefore, there was a need for better step-by-step instructions for teachers for the assembly of equipment in some investigations. Again, the goals and objectives of FAST PD are designed to prepare teachers to successfully teach the inquiry science program in their classrooms.

Design assumptions for FASTeR were based on the needs previously stated, the goals of FAST PD, information technology availability in student classrooms, and technological possibilities. The fundamental, major design assumption of the FASTeR was that viewing video examples, whether considered models or non examples, of other teachers and real students would contribute to learning and understanding. This assumption was based on successful endeavors by the Inquiry Learning Forum (Barab, MaKinster, Moore, & Cunningham, 2001), Integrating New Technologies into Methods of Education project (Callahan & Switzer, 1999), Arizona AzTEC project (The Arizona AzTEC project, Center for research on education in science, mathematics, engineering and technology, n.d.), School Web of Instructional Media (Speitel & Nguyen, 2001), and Teachers’ Domain (Teachers’ Domain, 2005). Both real-life model examples and non examples, a term used to describe errors or mistakes, are valuable learning events.
Technology standards for teachers also played a role in the design of the FASTeR. By providing an electronic resource specifically geared towards the curriculum, developers knew that they were meeting at least one of six recommendations for the general preparation of teachers to use technology—providing access to a highly relevant technology resource in the classroom (Kelly, 2002). In addition, the decision to make FASTeR non-Internet reliant met an additional recommendation, to provide “non-tethered technology” (p.50).

Technological design assumptions

The FASTeR is not meant to be used following a prescribed protocol; the technical design of the product needed to be fluid. Therefore, hypertext was chosen as the final product interaction medium due to its widespread use in modern society and multilinear nature for teacher exploration. *Hypertext*, coined by Ted Nelson in the 1960s, is verbal or graphic units that are joined together by links. A user chooses the path that they wish to take based on individual needs and curiosities (Boltner, 1998). Hypertext is most recognized as web pages on the World Wide Web. A hypertext markup language interface with a simple Flash® search engine was chosen for presentation of videos and equipment setup slide shows because of ease of assembly. A graphical interface was designed by a graphic artist to highlight themes, investigations, and essential teacher guide content.

Options for storing, cataloging, presenting, and delivering the video were limited by the large volume of video. For instance, a two-week teacher institute can have from 80 to 240 hours of raw video, depending on how many cameras are used. A single student investigation may last seven days, 50 minutes per day. The developers assumed that they would distill this video down. Experimentation with sample classroom video showed that 20 hours of compressed video would fit on a computer DVD-ROM. This was the format that was decided on for the production. VHS
tapes were not considered because segments of videos are not easily accessible and cataloguing is not intuitive. Web delivery was also a possibility. However, due to the volume of video, it was decided to pursue the path of a self-contained unit such as a CD-ROM or DVD-ROM rather than create small videos for download off of the World Wide Web. It was also unknown to the researchers whether teachers had Internet access once they returned to their respective schools.

Feedback

Teacher participants comments

The pilot version of the FASTeR was introduced during the second day of the 2004 summer FAST I teacher institute and homework assignment were given to review the resource. Throughout the institute, feedback was positive for the FASTeR. As discussed in Gray et al. (2005), the instructor reported that FASTeR helped teachers understand challenging concepts, alleviated the need for frantic note taking, was considered focused and meaningful, and addressed standards of PD and technology. Teachers found it exciting, state-of-the-art and empowering to have in addition to traditional curricula. Figure 3 contains statements from two FASTeR users.

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**TEACHER 1**
Being new to FAST it really helps to see the set up for the labs and the questioning techniques of the facilitators, but it doesn’t take away from being able to talk to someone (who is experienced with FAST) or going through training and workshops to do the labs and get a feel for them personally I could see myself using this as a tool to help prepare for labs, but it still doesn’t help if I have specific questions about a lab.

**TEACHER 2**
The DVD/FASTeR resource has been most helpful. It is just difficult to remember everything during the class. I guess because I was kind of on information overload and having that as a reference has been wonderful! I refer to it often. I do realize what a job it must have been to get that done though. Seeing is believing! I love using it! Thanks for going to the trouble & work to make it.

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Figure 3. Examples of comments from FASTeR survey.
However, minimal time was spent reviewing FASTeR since the trainers themselves were not yet overly familiar with the new product and needed the precious time during the institute to review investigations and inquiry methods. FASTeR was primarily a support piece that teachers looked at during their free time. Also, several comments were made as to the “presentation mode only” of FASTeR. In other words, teachers only viewed presented materials and no feedback mechanism was available immediately when using the FASTeR. If teachers had a question, they still had to call or email FAST support.

Production team comments

The production team was also asked to comment upon the process of producing the FASTeR so that a more streamlined or better informed product could be improved upon for the future. Several themes emerged from their comments ranging from pre-production needs to equipment to personnel.

First, it is always best to script and storyboard. Having a complete idea of what to say, what to shoot, and what to capture may seem like a luxury at the beginning of production, but it is very essential to a smooth workflow and professional quality product later in the end. Obviously, a classroom cannot be scripted, but knowledge of what the result should be helps videographers and other production crew who are not familiar with the subject area and classroom layout.

Second, a two-camera shoot for documentary video going into a professional development product is better than a one-camera shoot. In the classroom, the more experienced operator would usually operate the industrial camera and follow the main focus (usually the teacher). Student assistants would primarily follow classroom interaction. As time progressed, it became apparent that the more experienced shooter was also required to run the smaller camera during student investigation time. This allowed for shooters to routinely shift between cameras, depending on the main focus of the day and experience of the operator. During a one camera
shoot, the resulting footage was often erratic since the camera operator was whipping the camera around to capture as much interaction as possible.

Third, trained and skilled personnel are essential. As a university, the production team benefited from the availability of undergraduate student assistants. However, critical shots were completely missed by student assistants - through no fault of their own - due to lack of experience. Technical problems, such as no audio, auto iris/shot composition/image stability/RF interference, also emerged due to lack of experience. For this reason, much of the second camera footage was unusable, and many cut-away shots were simply not there during the edit.

Summary

Again, the development of the FASTeR was a by-product of a pilot study to reduce interaction time of FAST professional development that had been offered for over thirty years as a two-week institute. The FASTeR was developed as a partial solution to provide teachers with the ability to understand and carry out investigations that would not be covered during the reduced time frame. It contains videos of other teacher institutes for 18 investigations, videos of real student investigations for nine investigations, and explanatory slideshows of equipment set up and safety issues for 12 investigations. Though the timeframe and sense of production felt rushed to the production crew, they and the content experts were still able to develop features that mapped well to the goals of FAST PD as shown in Table 2.

The general ability to map FASTeR features to FAST PD goals was not arbitrary. It is evidence of the expertise of each of the production crew and staff and their personal aptitude in their respective fields. In addition, the production crew emphasized the need for multiple cameras to capture effectively the classroom interactions, the need for a script and storyboard even if a
classroom is difficult to storyboard, and the need for trained personnel in order to obtain usable audio and video footage.

| Table 2. Goals of FAST PD (Young & Pottenger, 1992) and how they are addressed in the FASTeR |
|---------------------------------------------------|-----------------------------------------------|
| Goals of FAST PD                                   | Addressed in FASTeR                          |
| To develop participants…                           | Teacher will be…                             |
| …knowledge of the program's philosophy and objectives | …reminded of unit philosophy and objectives for each investigation by selecting rationale and overview for particular investigations |
| …ability to use the variety of instructional strategies that are inherent in FAST | …able to view examples of instructional strategies by selecting video resources of teaching and questioning by practicing teachers and real students |
| …understanding of the content of physical, biological, and earth science, and technology in FAST | …able to refer to step-by-step slideshows of difficult experimental preparations |
| …excitement and enthusiasm for teaching science at the middle/junior high school level | …able to view teachers in other institutes and students in classroom situations successfully engaged in their inquiry and learning |

Four major assumptions guided the iterative process of production. First, the team worked under the assumption that repeating FAST Teacher Guide concepts in the FASTeR in textual and other multimedia forms is beneficial. Second, viewing video examples of other teachers and real students contributes to learning and understanding. Also, viewing video examples of other teachers and real students increases retention and recall of FAST science inquiry. And lastly, hypertext navigation is understood by all FAST teachers However, future designs of this product could better answer or dispel these assumptions.

Future design plans and considerations

There were numerous assumptions that guided the development of the FASTeR, all of which can be transformed into substantive research questions that can guide future versions:

1. How effective is the FASTeR as an electronic performance support systems information base and learning experience?

2. How effective is the FASTeR in promoting recall and retention of inquiry science?
3. Does viewing video examples, whether considered models or non examples, of other teachers and real students contribute to learning and understanding by teachers, thereby contributing to student achievement?

4. What is the familiarity level of FAST teachers with hypertext interfaces? Is hypertext the most effective user interface design for the FAST electronic resource?

5. What is the level of Internet connectivity at FAST teacher schools? Is a DVD-ROM the best delivery medium for the FAST electronic resource, or can the Web be employed?

Furthermore, of great need to determine the validity of the FASTeR are usability and impact studies. Does the FASTeR meet general usability guidelines? A pre-production plan would help to alleviate some of the usability issues as well as focus group reviews with pre-service and in-service teachers. Achievement impact studies of FASTeR will need more future consideration.

In Gray et al.(2005), the authors also suggested that FASTeR can also be further designed to include more advanced features such as frequently asked questions (FAQ’s), indexing capabilities including pedagogical topics, rich descriptions of video, images, and simulations, and video of explicit inquiry, perhaps making it available on the Web as well as the via the DVD-ROM. Also, the FASTeR developers need more research into the influences of culture, gender, experience and age of teacher users of the FASTeR and representation of such in the multimedia.

Overall, FASTeR was received positively by teachers and developers experienced a sense of satisfaction that it was received well. Professional development for teachers, though designed
with the best of intentions, is sometimes “information overload” as mentioned by one teacher participant. The FASTeR provides the ability to sit back and review, enabling personal reflection about events that happen at the quick and thorough pace of FAST PD.

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