field notes, and organize the information. He or she would then go on to develop alternative views of the data. Scientific editors will recognize the steps of looking for contrary evidence, having peers check your methods and interpretation, and creating an "audit trail" so that someone else can follow in your footsteps; these also apply in qualitative research.

The final report should be comprehensive, should present sufficient compelling evidence for the researcher's interpretation, and should consider other perspectives. The context of the study should be conveyed through "thick description", so that the reader can judge how well the situation and its protagonists compare with those elsewhere.

Florance illustrated her discussion with some of her own research: an observational study of hands-on instruction in library information management and an attempt to design a clinical extract for patient-centered problem-solving (for a description of this study, see *CBE Views* 1996;19(2):20). Participants in the CBE sessions got a feel for the complexities of and possible variation in the data analysis when they were asked to code data from the observational study, categorizing the comments and questions of students in the hands-on course. Another core technique for qualitative analysis is constant comparison, whereby the researcher develops definitions of data categories from the features of similar events.

Important aspects of qualitative research that also apply to the quantitative form include the examination of internal and external validity (the study's credibility and transferability, respectively), reliability, dependability, and confirmability.

In addition to guiding the hands-on exercises in her sessions, Florance supplied a short bibliography on qualitative research and selected readings from the main sources. We editors might only rarely call on knowledge of qualitative research methods as we go about our daily work, but Valerie Florance's boot camp has opened a window on how we might discover more about our own profession.

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**Research Integrity and Scientific Misconduct: Responses and Critical Issues**

**Moderator:**
Annette Flanagan  
*Journal of the American Medical Association*  
Chicago, Illinois

**Speakers:**
Mary Scheetz  
US Office of Research Integrity  
Bethesda, Maryland

Mark Frankel  
*Professional Ethics Report*  
American Association for the Advancement of Science  
Washington, DC

**Reporter:**
Addene Caileigh  
*Academic Medicine*  
Washington, DC

The questions of how to define research misconduct and how to protect whistleblowers and accused researchers are important and controversial in science. Mary Scheetz described the definition and guidelines proposed by the US Department of Health and Human Services Commission on Scientific Integrity, and Mark Frankel described how various scientific communities—researchers, trainees, administrators, journal editors, the news media, and government agencies—have responded to the report and related efforts. The panelists also discussed the potential effects of electronic publishing on the opportunities for misconduct and the likelihood of detecting it.

Scheetz explained that the most recent proposed definition attempted to respond to criticisms and discussions throughout the scientific community. In general, the definition covers research misconduct (misappropriation, interference, and misrepresentation) and professional misconduct (obstruction of an investigation of research misconduct and noncompliance with research regulations). Scientists (investigators) have applauded the new definition because it addresses difficult issues that lie outside the traditional designations of fraud, fabrication, and plagiarism. They are also, however, worried that the proposed definition will stifle scientific inquiry.

Mark Frankel began his presentation by saying that in the middle to late 1980s the scientific research community did not appear to be taking misconduct issues seriously. Scientists seemed to feel that any problems were minor and should be left to the research community to handle. A series of scandals involving prestigious academic institutions, however, put the issue of misconduct on the front pages of national newspapers, and the community had to acknowledge the problem. He thinks that the scientists' objections and comments, although they might appear diffuse on the surface, all deal with an important core concern: who controls science and the conduct of science. Scientists are afraid that the government is gaining control, and they consider that dangerous for the future of science.

The panelists then discussed the guidelines proposed by the Office of Research Integrity (ORI) for the protection of whistleblowers. The government is concerned that institutions will retaliate against those who bring charges of misconduct. (ORI has resolved 19 retaliation cases since 1992 and...
has now created a separate staff to handle whistleblower cases.) Scientists are concerned that whistleblowers have too much power and protection and the accused too little, and many want more protection for accused researchers. Responding to questions about the whistleblower issues, Frankel commented that he works with member societies to set up standards for professional behavior, and he urges them to set a standard for the members' active obligation to report acts of misconduct. Both panelists discussed the question of who should investigate charges of misconduct, particularly in light of the inherent conflict of interest when an institution investigates one of its own members.

As the final section of the discussion, the panelists addressed the potential for misconduct and the detection of misconduct presented by electronic publication. They noted that the electronic medium makes manipulation of images and data easy, but it also allows (in theory) the creation of "digital signatures" or "digital authentication" for documents as a way to ensure that they are not tampered with after publication.

Multimedia Applications: Choosing an Information Delivery Medium That Meets Customer Needs

Speaker:
Mikael Engbergsternn
Crosby Multimedia Division
St Louis, Missouri

Reporter:
Addaene Cauley
Academic Medicine
Washington, DC

The range of electronic media available to publishers can seem daunting: diskette, CD-ROM, the Internet, and such emerging technologies as CD-ROM with Internet links, DVD-ROM (digital versatile disk-ROM), and broadband Internet. For convenience, this cluster can be called "multimedia". The major elements of multimedia are text, images, video, audio, and animation—and a graphical user interface (GUI, pronounced "gooey").

Each medium has special cost and production considerations, as do the components, and the capacities of these media are being improved and expanded. For example, compression technology has increased the capacity of diskettes, and the "wavelet compression" now under development might make diskettes better suited for complex images. Capacity is irrelevant with regard to the Internet, but file transfer time is constrained by bandwidth. The emerging technologies present even more opportunities. The use of "bridge technology" to link CD-ROM and the Internet will counter some of the limits that publishers see in CD-ROM publication. Using this new technology, a publisher would publish a document on the Internet and ship a related CD-ROM to the customer, who would look at the Web document and be able to call up special images (video, for example) from the CD-ROM through links embedded in the Web document. Likewise, the development of DVD-ROM will allow large-capacity collections of images (up to 17 gigabytes). The limitation is that the user must use special DVD players.

In developing multimedia products, a publisher must develop a budget, a schedule, product specifications, and a development team.

In considering new projects, publishers must know what they are trying to accomplish, be able to identify the target audience, know the proportion of the target audience that has the technology needed to use the new product, and understand how the content will be delivered to the user. There is a big difference between delivering static collections of text and images and delivering an interactive product. CD-ROM is a logical choice for the first, and the Internet is a better choice for the second. The publisher must be fully aware of the different implications of a target audience of single users, a large group of users at an institution (with technical support), and experienced computer users as opposed to novices.

In developing multimedia products, a publisher must develop a budget, a schedule, product specifications, and a development team (editor, producer, marketer, and outside professionals). Budgets present special problems because multimedia markets are new, and technology, target audiences, and users' experience are all changing rapidly. For any project, the publisher must be able to budget accurately for design, asset development and conversion, outside or in-house development, in-house project management, and manufacturing, packaging, and distribution. A unique feature of multimedia publication is the need to create and maintain a technical-support system for users (usually a telephone line, but possibly an Internet site).

Overall, Mikael Engbergstern suggested, the primary electronic media for publishers to consider now are diskettes, CD-ROM, the Internet, and CD-ROM with Internet.