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Collaboration and Conflict: Multi-Disciplinary Teams Developing Multimedia for Preservice and Inservice Education

Linda P. Thurston

Interactive multimedia is becoming a fixed feature in the delivery of instruction at all educational levels. The process of multimedia places the learning potential of technology in the hands of the learner and such features as screen design, interactivity, audio and video elements, and learner control and navigation are educationally effective (Stemler, 1997). The very nature of multimedia, according to Bagui (1998), allows the learner to view things from many different perspectives and thus develops a robust understanding of relationships among concepts. He cites effective aspects of multimedia that include flexibility, rich content, motivational effects, immediate feedback, and interactivity.

Multimedia is increasingly being used to prepare professionals at the preservice and inservice levels. Research reports and program descriptions demonstrate the use of interactive multimedia with engineering students (Suni and Ross, 1997), social work students (Seabury and Maple, 1993; Patterson and Yaffe (1994); Thurston, Vershelden, and Denning, 1996), special education preservice teachers (Fitzgerald and Semrau, 1998) and general education teachers (Campbell and Yong, 1996; Reilly, Hull, and Greenleaf, 1993; Read and Cafolla, 1999; Kenny, Covert, Schilz, Vignola, and Andrews, 1995), human service education (Falk, 1990), and nutrition students (Beerman, Brown, and Evans, 1998). Fletcher (1990) describes using multimedia for training in not-for-profit organizations, and others have described its use in staff development in the private sector.

Multimedia can be defined as the use of several media to present information. Examples of types of media are text, video, graphics, pictures, and audio. Thus defined, multimedia has been used in education for decades. Technological environments are hypermediated, that is, the media are presented in an electronic, nonlinear way that facilitates interaction between the learner and the material. Interactive multimedia usually involves a computer based learning environment which involves many types of media that are linked nonlinearly with text and which provide learner control of the presentation of material. Interactive multimedia usually includes activities in which the learner interacts with the computer to develop portfolios, answer questions, study case examples, and make decisions about the learning path.

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Although the efficacy and advisability of using multimedia is not unanimously accepted, (e.g. see Owston, 1997; Beerman, Brown, and Evans, 1998; Pepi and Scheurman, 1996 for critical commentary on interactive multimedia in educational settings), there is ample evidence of the educational value of multimedia in preservice and inservice settings (Thurston and Cauble, in press; Bagui, 1998; Stemler, 1997). Time and resources are being spent to develop interactive multimedia for preparing professionals at preservice and inservice levels.

The Process of Developing Multimedia

Multimedia development involves the process of creating a software program or document containing media such as text, audio, video, animation, and graphics which are hyperlinked and presented in a non-linear and interactive mode for the purpose of exploring ideas. Mauldin (1996) compares multimedia development to sometimes being a rainforest (symbiotic and harmonious) and sometimes being a jungle (deep and dark with no easy way out). Strategies or procedures for developing multimedia for preservice and inservice education are not generally agreed upon. Liu, Jones, and Hemstreet (1998) reviewed the literature on instructional design and found no generally agreed upon procedures for multimedia development.

Mauldin (1996) delineates four steps in multimedia development: preparation (all technical aspects of development), instructional design, production, and evaluation. Yang, Moore, and Burton (1995) suggest three stages of development: analysis, development, and evaluation. Liu, Jones, and Hemstreet (1998) suggest these phases: funding, planning (content and budget), designing, producing, testing, and marketing. Thurston, et al. (1996) describe 12 steps used in developing Building Family Foundations and Liu et al. (1995) describe six phases of development.

Most researchers of the effects of multimedia do not describe the process by which their product to be tested is developed; and most developers do not describe the learning outcomes of their product. One exception to this generalization is Building Family Foundations, a multimedia project developed by an interdisciplinary team over the course of five years (Thurston, et al., 1996; Thurston and Cauble, in press; Cauble and Thurston, in press). This project was funded by a state department of human services and produced a series of 10 modules which used computer programs, video discs, and workbooks, to promote learning about child welfare issues in preservice and inservice social workers and educators.

The process of development for Building Family Foundations involved social work and special education professors, graphic artists, computer programmers, and instructional designers who had little or no experience with multimedia instructional design (Thurston, Vershelden, and Denning, 1996). The process was "sometimes a rainforest, sometimes a jungle", but the project directors agreed that it was mostly a jungle. Collaboration and conflict were seen in equal measure and the experiences from the project are the basis for the suggestions for multimedia development that make up this paper.

Collaboration as a Critical Development Component

Collaboration has been defined as "A style of direct interaction between at least two co-equal parties voluntarily engaged in shared decision-making as they work toward a common goal" (Friend and Cook, 1992). Dettmer, Thurston, and Dyck (1995) suggest communication, cooperation, and coordination as integral parts of collaboration and suggest that collaborators hold joint responsibility

for problem solving and program planning, implementation, and evaluation. Dettmer, Dyck, and Thurston (1999) suggest four key elements in collaboration: preparation, framework, evaluation, and role delineation. Collaboration may be defined as "an interactive process that enables people with diverse expertise to generate creative solutions to mutually defined problems" (Paolucci-Whitcomb, and Nevin (1986). In successful collaborative efforts, the outcome is enhanced, altered, and produces solutions that are different and better that the individual team members would produce independently. Although collaboration is assumed in the development of multimedia, the issue has not been addressed specifically in the literature. Publications on multimedia development rarely include the challenges of collaboration among members of the development team. When collaboration or cooperation is mentioned, the term usually concerns the outcomes expected from utilizing multimedia, such as teamwork skills of students and the use of cooperative groups (Ivers and Barron, 1998). Very few descriptions of the development process mention collaboration or conflict.

Thomas, Correa, and Morsink (1995) have identified several factors, parameters, or dimensions that are necessary for successful collaboration. These factors, suggested by a review of collaboration, total quality management, leadership, and teaming models, are listed in Table 1. Many of these were important issues to the development of Building Family Foundations and several are suggested as important issues by multimedia development research. For example, Liu et al. (1998) suggest that a "favorable working relationship" serve as the goal of the development team and that team discussion was an important part of the planning and designing phases of development in their six phase development sequence. Thurston, et al. (1996) suggest multimedia development teams consider and set aside time to develop a common language and to process issues that arise from differences in perspectives.

Table 1.
Some Dimensions of an Interactive Team

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1. Clarity of purpose.
2. Complementary dissimilarity between the team members.
3. Overlapping self-interests.
4. Sufficient time to build bridges of communication and trust.
5. Clarification and coordination of roles and responsibilities within the partnership.
6. Shared ownership.
7. Emphasis on action rather than structure building.
8. Adequate resources.
9. An understanding of each institution's culture.
Adapted from Thomas, Correa, & Morsink (1995)

Multimedia development teams consist of professionals with a variety of backgrounds, disciplines, and skills. This diversity is an asset in developing quality programs, yet it also inherently leads to conflict and diversity can present barriers to collaborative efforts. Teams members in multimedia development include technical specialists such as programmers, media specialists such as instructional designers, and content specialists (subject matter experts or SME's). Teams may also include experts in educational curriculum development and evaluation, administrators or managers from funders or institutions that are the development site, and learners for which the resultant multimedia program is being designed.

Members of the Building Family Foundations (BFF) team included one education professor, two social work professors, several multimedia instructional designers, a programmer, a graphic artist, and professional support staff (Thurston, et al. 1996). The project managers were the professors who also served as SME's for the ten modules of Building Family Foundations. Team members were committed to the collaborative efforts necessary for the team to be productive and effective, however, the three project directors (the three professors) underestimated the time necessary to build and maintain a collaborative working environment. Specific issues included role definition, to meet or not to meet, dealing with deadlines, diversity of skills and perspectives, and multi-lingualism. Each of these five issues of collaboration (see Table 2) will be addressed. For each issue conflicts and problems from the development of Building Family Foundations will be described, and suggestions for managing potential problems and promoting collaboration will be discussed.

Table 2.
Five Factors of Multimedia Development Collaboration

Five Factors of Multimedia Development Collaboration
1. Role Definition
2. To Meet or Not To Meet
3. Dealing With Deadlines
4. Diversity of Skills and Perspectives
5. Multi-lingualism

Five Factors for Collaborative Multimedia Development Teams

1. Role Definition.

Roles for team members should be carefully defined, yet flexibility should be allowed. Each member of a multimedia development team comes to the group with her or his own field of expertise. However, because of the nature of interactive multimedia, team members' ideas about aspects of development other than their own must be taken into account. For example, a multimedia designer may have a theme with suggested colors, graphics, and text. But the SME may think the text does not describe the content with appropriate depth, the artist may disagree with the look of the screen, and the programmer may suggest that the way linking was designed would be confusing to the learner. And all these perspectives could be accurate. Therefore, care must be taken to emphasize the teaming nature of a role and to

define professional roles within the team as overlapping in terms of input and decision-making.

In the development of BFF, developing the overlapping role perspective took important and valuable time away from the technical aspects of the development process and caused delays in the timetable for the entire project. Realizing this overlapping nature of roles would have helped the project directors provide better leadership for the project and would have produced less conflict as the team learned the value of this perspective of roles.

A crucial role in any team is the team leader. In the field of multimedia development, McDaniel and Liu (1996) suggest the project manager should keep the team on time and on budget, have the big picture of the project, keep people motivated, and facilitate communication. These are important goals within a team and for a development project, however the leadership role in BFF presented some problems for the project. There were three project directors and all were dedicated to the outcomes of the project and to the members of the team. Because all three directors had other responsibilities as faculty members, and because consensual management was the leadership style of the directors, management and leadership became a problem of role definition and clarification for the directors themselves and for the other members of the development team. It became very cumbersome to have all three directors make decisions cooperatively in terms of time to meet and have discussions. Getting three signatures on purchase orders and discussions about flexible hours for a designer tended to get the same attention as writing progress reports to funders and making decisions about thousands of dollars for equipment. In addition, staff would ask questions of whatever director they could locate, and miscommunication and confusion became problems for the staff as well as the project directors.

After more than a year of trying to lead-via-triumverate, the directors decided to split the responsiblilties and assign one director as the managing director. The managing director worked with the budget and day to day team issues while the other directors worked with the funding agency and wrote progress reports and took on more responsibilities as SME's. The directors met only periodically for major decisions and updates and were therefore allowed more time and energy to work on the development of the BFF modules. They learned that collaboration did not mean every team member should have a voice in every decision and that role partition and definition add rather than detracts from developing a collaborative working environment.

Flexibility and clarity of leadership or management roles is very important to the progress and process of multimedia development. Looking at management style and adapting it to the needs of the staff and the best interests of the final product reduces the potential for conflict and increases the cooperative environment that is essential for multimedia development.

2. To Meet or Not To Meet.

In their early efforts to produce a team that worked together and whose voices were equally heard, the project directors used frequent team meetings to enhance communication. McDaniel and Liu, (1996) suggests that all should engage in regular communication and practice good communication skills. Communication skills were less of an issue in the development of BFF than the question of meetings. Project managers tended to assume that team meetings would provide an opportunity for building collegiality, discussing issues, and

solving problems. Project staff tended to see meetings as time taken away from programming, designing, or other specific independent tasks. After struggling with the different perspectives of meetings, staff meetings were kept to a minimum and social gatherings such as having lunch together or celebrating birthdays took the place of meetings for developing relationships and informal talking about common personal or professional issues.

Team relationships within the BFF project were developed on an informal basis and long-lasting professional relationships and friendships were built over the course of the project. Meetings were kept to a minimum and specific time limits and agendas were developed and followed. Sub-team meetings and collaborations developed naturally when there were fewer expectations for whole group gatherings, and whole group gatherings tended to be informal and have a social basis, with announcements and brief reports given as needed.

3. Dealing with Deadlines.

During the first year of the BFF development project, the team was three to six months behind schedule and after one and one half years of funding, only one of ten modules had been produced (out of ten over a five year period). As the team became increasingly behind, conflict arose about responsiblilties, performance, scheduling. In addition, other normal teaming issues became problems and the whole team was very stressed.

Dealing with unmet deadlines and the resulting stress and conflict was difficult because it felt like "the hurrieder we were, the behinder we we got". Meetings to deal with timelines were seen as wasting precious time and light-hearted attempts to reduce stress were sometimes met with displeasure.

Two resolutions occurred. One was purposeful and the other was not. First, after struggling to work harder and faster, it became evident that the original timelines were unrealistic, considering the nature of teaming and the nature of the work being done. The project directors, in consultation with the funding agency, developed more realistic timelines and thus stress was reduced and progress occurred rapidly. The second resolution came as a natural result of the team working together, learning each others' perspectives and jargon, becoming more interrelated colleagues rather than single entities who sought to do their work individually rather than as a part of the whole. This natural development of group trust, respect, and collaboration so enhanced the work of the team that nine modules were produced in the next three and a half years.

In dealing with deadlines, multimedia teams should consider the time necessary for the development of the team and for trust and collaboration to develop within the context of the work of the team. Deadlines should be reasonable and if timelines are unmet, flexibility in changing them will prevent stress and stress-related problems in teaming.

4. Diversity of Skills and Perspectives.

Although some interactive multimedia development is a one or two person endeavor, most teams include a variety of experts in content, programming, graphics, adult education, video and audio production, instructional design, and evaluation. Each of these experts comes from the culture of their profession and comes with the jargon, assumptions, and work mode of their training and experience. The BFF team was no exception and although in hindsight, it was unrealistic not to consider this diversity of skills and perspectives as a

barrier as well as a strength, the directors did not account for this diversity as a barrier.

Another problem faced during the development of BFF was the need for learning more about each others' fields. For example, because the project was competency based, nearly all staff members had to learn to write, evaluate, and base their work on specific behavioral instructional objectives. Much of the "culture of helping" of social workers is based on soft skills such as empathy, and defining the competencies in specific behaviors and developing instruction to assure the mastery of those behaviors was a new experience for some SME's and instructional designers. SME's who were also professors had a difficult time, initially, thinking about content in a non-linear manner. As the instructional designers tried to facilitate this process, slow progress was made.

Besides jargon and professional skill differences, there were some major differences in perspective which needed to be considered in collaborative efforts. For example, in the module about family diversity, a few team members had to learn the social work perspective of the definition of the family and respecting all family compositions. The module include a section about gay and lesbian families. One unexpected difference of perspective was that between the social work perspective and the educator perspective. Although a major part of education is "helping" and a major activity in social work is "educating", the professional "culture of helping" and "culture of educating" are two distinct and different perspectives. Once they realized this difference, the project directors worked to learn about each other's professional perspectives and the result was a seamless integration of education and social work perspectives. For example, the parent training module included both the behavioral and the ecological perspective and families and case studies in all modules included adults and children with disabilities.

5. Multi-lingualism.

In the earlier metaphor of the jungle and the rainforest, one could think about the team members as different animal species, trying to communicate in their native roars and chatterings. This was a mostly unexpected barrier and learning more about each others' language benefited the project outcomes. The most effective collaborative efforts occurred when team members became multi-lingual. The technical language of the programmers and the video production team members was expected, and the group soon learned to correctly name the video process as "taping" rather than "filming", as one example. The group learned to talk in terms of "disc space", "interactivity", "templates", "scripts", "linkages", and other technical jargon that effected the work of everyone on the team.

Speaking a common language included understanding more about each other's fields. Technical experts learned about the characteristics of the program users, and, for example, learned that showing a picture of a child who had been abused should be proceeded by a warning or a small icon that could be linked to a picture would be better for helping social workers learn to identify abuse than would be a full screen picture come upon unexpectedly.

As team members came to understand the benefits of multi-lingualism, it became a part of everyday operations. Definitions and phrases were shared, both seriously and jokingly. Each team member learned new jargon, new skills, and new perspectives which added to the quality of their work in the project and professionally when the project was over.

Suggestions and Conclusions

Colon and Pain (1996) suggest a multimedia development methodology which gives a central role to collaboration among researchers, teachers, and technological. This collaboration, they claim, supports a productive relationship between theory and practice. Because interactive multimedia is multidimensional, a collaborative team approach will connect the practical and the technical and increase the likelihood of the use and usefulness of multimedia program in preservice and inservice educational settings. The SME expertise in content and application of content, the user-centered methods of instructional designers, and the technical expertise of programmers and video producers are all vital components of interactive multimedia. Collaboration is the one feature of methodology they have in common, and it is a very salient feature. Each partner in the team has distinctive knowledge and skills and contributes significantly to the whole, yet without collaboration, the pieces would never fit into a coherent whole which promotes new learning for participants in preservice and inservice education. This "culture of collaboration" is an essential part of the environment, the interactions, and the expectations for a multimedia development team. Facilitating collaboration assures the growth of shared understanding,

Any kind of collaboration is a complex, dynamic human process and there is always the potential for conflict, domination by individuals and subgroups, and the disintegration of collective goals (Colon and Pain, 1996). However, this paper has presented five suggestions with examples, which could prompt and promote collaboration and reduce conflict in the developmental process. After lengthy interviews with multimedia developers in the private sector, Liu, et al. (1998) conclude that the "degree to which different roles collaborate has much to do with the success of the finished product" (p. 263).

Although researchers in the field of educational technology may not be able to definitively answer the question, "Does technology help us do a better job of educating our students?" (Pepi and Scheurman, 1996), they do agree that having well-designed multimedia is critical for technology to have an impact on learning. Well-designed multimedia means a team that is sensitive to the demands of multidisciplinary work. Team members must take time to understand each others' roles, language, perspective, and professional skills; and they must be willing to share their own language, skills, perspectives with their collaborators. Team members must be flexible in their roles and understand that roles must overlap for true collaboration to occur. And finally, team members must be willing to take time to work with issues that arise from differences and they must not underestimate the time needed to develop trust, communication, and collaboration. The result will be better products and better outcomes for learners in preservice and inservice educational settings.

References

Bagui, S. (1998). Reasons for increased learning using multimedia. *Journal of Educational Multimedia and Hypermedia*, 7(1), 3-18.

Beerman, K., Brown, G., and Evans, M. (1998). Interactive CD study modules in food science and human nutrition: Assessing technology-enhanced study programs. *Journal of Educational Multimedia and Hypermedia*, 7(4), 365-374.

Campbell, K, and Yong, Z. (1996). Refining knowledge in a virtual community: A case- based collaborative project for preservice teachers. *Journal of Technology and Teachers Education*,13(3), 254-263.

Cauble, A.E., and Thurston, L.P. (1999). Effects of interactive multi-media training on knowledge, attitudes, and self-efficacy of social work students. *Research on Social Work Practice.* In press.

Conlon, T., and Pain, H. (1996). Persistent collaboration: A methodology for applied AIED. *Journal of Artificial Intelligence in Education,* 7(3/4), 219-254.

Dettmer, P., Dyck, N., and Thurston, L.P. (1999). *Consultation, Collaboration, and Teamwork for Students with Special Needs (2nd Ed.).* Boston: Allyn and Bacon.

Dettmer, P., Thurston, L.P., and Dyck, N. (1995). *Consultation, Collaboration, and Teamwork for Students with Special Needs.* Boston: Allyn & Bacon.

Falk, D. (1990). The effectiveness of alternate models of videodisc applications in human service and teacher education. *Journal of Interactive Instruction Development*, 3(2), 9-15.

Fitzgerald, G.E., and Semrau, L.P. (1998). The effects of learner outcomes with hypermedia case studies. *Journal of Educational Multimedia and Hypermedia*, 7(4), 309-331.

Fletcher, D. (1989). The effectiveness and cost of interactive videodisc instruction. *Machine-Mediated Learning*, 3, 361-385.

Friend, M., and Cook, L. (1992). *Interactions: Collaboration Skills for School Professionals.* New York: Longman Publishers.

Hatfield, M.M. (1996). Using multimedia in preservice education. *Journal of Teacher Education*, 47(3), 223-228.

Ivers, K.S., and Barron, A.E. (1998). *Multimedia Projects in Education.* Englewood, CO: Libraries Unlimited, Inc.

Kenny, R.F., Covert, J, Schilz, M.A., Vignola, M, and Andrews, B.W. (1995). Interactive multimedia to develop reflective decision-making among preservice teachers. *Journal of Technology and Teacher Education*, 3(2/3),169-188.

Liu, M., Jones, C., and Hemstreet, S. (1998). Interactive multimedia design and production processes. *Journal of Research on Computing in Education*, 30(3), 254-280.

Mauldin, M. (1996). The development of computer-based multi-media: Is a rainforest the same place as a jungle? *Techtrends*, April/May, 15-19.

McDaniel, K., and Liu, M. (1996). A study of project management techniques for developing interactive multimedia programs: A practitioner's perspective. *Journal of Research on Conputing in Education*, 29 (1), 29-48.

Owston, R.D. (1997). The World Wide Web: A technology to enhance teaching and learning. *Educational Researcher*, 26 (2), 27-33.

Patterson, D.A., and Yaffe, J. (1994). Hypermedia computer-based education in social work education. *Journal of Social Work Education*, 30(2), 267-277.

Pepi, D., and Scheurman, G. (1996). The Emperor's new computer: A critical look at our appetite for computer technology. *Journal of Teacher Education*, 47, 229-236.

Read, D., and Cafolla, R. (1999). Multimedia portfolios for preservice teachers: From theory to practice. *Journal of Technology and Teacher Education*, 7(2), 97-113.

Reilly, B., Hull, G., and Greenleaf, C. (1993). Collaborative readings of hypermedia cases: A report of the development and testing of electronic portfolios to encourage inquiry in teacher preservice. *Journal of Technology and Teacher Education*, 1 (1), 81-102.

Seabury, B.A., and Maple, F.F (Jr.). (1993). Using computers to teach practice skills. *Social Work*, 38(4), 430-439.

Stemler, L.K. (1997). Educational characteristics of multimedia: A literature review. *Journal of Educational Multimedia and Hypermedia*, 6(3/4), 339-359.

Suni, I., and Ross, S. (1997). Adaptive computer control in a hypermedia materials science document. *Journal of Educational Multimedia and Hypermedia*, 6(3/4), 383-393.

Thurston, L.P. and Cauble, A.E. (2000). Building child welfare competencies in social workers using interactive multimedia. *Journal of Computing in Education*. In press.

Thurston, L.P., Vershelden, C., and Denning, J. (1996). Using interactive multimedia to address rural social work education needs. In Torre, E.L., ed. *Modes of Social Work Education II: The Electronic Social Work Curiculum in the Twenty-first Century.* New Orleans: Tulane University Press.

Yang, C.S., Moore, D.M., and Burton, J.K, (1995). Managing courseward production: An instructional model with a software engineering approach. *Educational Technology Research and Development*, 43 (4), 60-70.