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ABSTRACT

A research group was interested in how an understanding of multiple intelligences might translate into a variety of teaching techniques and strategies directed toward specific intelligences they found in their eighth-grade science classroom. Because of the tremendous effect of mass media and other visual/spatial influences on students, the study of multiple intelligences was narrowed to visual/spatial. It featured a collaborative group conducting action research to explore how visual/spatial teaching techniques and strategies might affect the integration of the curriculum. The research process involved four chronological phases and a planning phase for future cycles. The four chronological phases were based on the recursive collaborative group action research cycle (illustrated in Figure 1). Phases 1-4 comprise the first research cycle of Cycle 1, and all other phases may repeat the cycle to gain more information. A complete cycle, consisting of the phases outlined, were conducted during the study. Unit lesson plans were developed and evaluated for the multiple intelligences included. The group discussed the results of the integration of the curriculum with visual/spatial techniques or strategies. This effort highlighted the value of collaboration and the ongoing assessment of techniques teachers use in the classroom to improve student learning and on-task time. By exploring regular, deliberate use of the visual/spatial multiple intelligence in lesson planning and evaluating the success, the group was able to address student needs and integrate the curriculum in ways that otherwise would not have occurred. (Contains 19 references.) (BT)

Utilizing Visual/Spatial Techniques and Strategies to Develop an Integrated Curriculum: A Collaborative Group Action Research Approach

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Running Head: VISUAL/SPACIAL TECHNIQUES

Utilizing Visual/Spatial Techniques and Strategies to Develop an Integrated Curriculum: A Collaborative Group Action Research Approach

As children do not learn in the same way, they cannot be addressed in a uniform fashion (Brualdi, 1996). The need to find better approaches that allow teachers to interact with their students in more productive ways and reduce off-task behavior is of paramount importance in an effective classroom. We were interested in how an understanding of multiple intelligences might translate into a variety of teaching techniques and strategies directed toward specific intelligences (Gardner, 1993, 1991; Campbell & Associates, 1999; Lazear, 1998, 1991) we found in our eighth grade science classroom. Because of the tremendous effect of television, movies, video games and other visual/spatial influences on students of our present era, we narrowed our study of the multiple intelligences to visual/spatial. In our study, we made use of a collaborative group conducting action research to explore how visual/spatial teaching techniques and strategies might affect the integration of our curriculum.

Our concept of "multiple intelligences" comes from Howard Gardner (1993, 1991, 1983) and for the purpose of our study we utilize his later definition of intelligence as "the capacity to solve problems or to fashion products that are valued in one or more cultural settings" (Gardner & Hatch, 1989). We were also influenced by Fogarty and Stoehr (1995), and others (Hyerle, 1996; Bransford, 2000), who provided a comprehensive look at integrating curricula with multiple intelligences for education and systemic change.

Arguing that "reason, intelligence, logic, and knowledge are not synonymous" Gardner (1993, 1991, 1983) proposed a new view of intelligence, his Theory of Multiple Intelligences, which expands the concept of intelligence into several specific areas. We concentrated on

Gardner's original seven intelligences summarized by Brualdi (1996) as:

- Logical-Mathematical - the ability to detect patterns, reason deductively and think logically.
- Linguistic Intelligence - the ability to effectively manipulate language to express oneself rhetorically or poetically.
- Visual/Spatial Intelligence - the ability to manipulate and create mental images in order to solve problems.
- Musical Intelligence - the capability to recognize and compose musical pitches, tones and rhythms.
- Bodily-Kinesthetic - the use of one's mental abilities to coordinate one's own bodily movements.
- Interpersonal Feelings - how one relates to other people and reacts to the intentions of others.
- Intra-personal Feelings - the ability to understand one's own feelings and motivations.

Of the seven multiple intelligences, we have noted a marked increase over the last few decades in the number of students who respond positively to teaching techniques and strategies based on the visual/spatial intelligence. Therefore we wanted to look more deeply at this one intelligence to see if our observations had merit.

An emerging research tool used in recent years to better understand and improve teacher thinking has been the use of collaboration and collaborative action research (Saurino, 1998; Pate, 1997; Elliott, 1990; Noffke & Zeichner, 1987; Carr & Kemmis, 1983). In our study, we needed a criterion by which to measure the effect of increasing visual/spatial teaching techniques and strategies and decided that we were interested in whether middle school teachers could increase student "on-task" time by tailoring our teaching techniques and strategies toward Gardner's Theory of Multiple Intelligences in the area of the visual/spatial intelligence as a means to better integrate our curriculum. We define "on-task" time as the period of time during which a student is actively engaged in a learning activity. We believe that time on-task is the one variable that leads students to achievement in learning and skill development. Gardner suggests that multiple intelligences could be extremely helpful in teaching children by not teaching them all in the same way. He notes that teachers may better understand a child if they have increased knowledge about the way that child thinks (Gardner, 1991). Knowing students' multiple intelligences can also help students understand how they learn best and can help teachers see that each person has a unique set of strengths and abilities that may require differentiated teaching strategies and techniques (Lazear, 1992). We believe that we are experiencing an increase in the percentage of our students who exhibit the visual/spatial intelligence even if they also exhibit other multiple intelligences.

The process of our form of action research is described as cyclical, involving a recursive, nonlinear pattern of planning, acting, observing, and reflecting on changes in educational situations observed by the researchers. For the purposes of our study, we are using Lewin's (1947) definition of action research, as the basis of our definition of collaborative group action research, from his study of "group dynamics." In Lewin's work, an attempt to solve a problem existing in the group was introduced by the group facilitator, and the impact of the change was noted. Lewin's work began a trend that has been influencing others ever since who emphasize issues of greater productivity and efficiency in many areas, including education.

The addition of the word "collaborative" to action research implies that two or more researchers are working together, exchanging ideas and expertise, interacting as they conduct action research in an effort to be more productive than if they worked alone. The collaborators meet together regularly to plan, conduct, reflect, and write about the research they are conducting. The collaborative action research in our study involved a group of educators conducting classroom-based research to answer a question of interest.

The word "group" emphasizes an important area of developing research in public schools. The group concept has been one of several attempts to conduct research that meets the needs of students by utilizing the benefits of working in a group to brainstorm answers to questions and solve problems of interest to the researchers. The ultimate beneficiaries of the research process are the students, yet the teachers and university researchers benefit from new knowledge gained through the collaborative process.

In addition, we see collaborative group action research as a methodology, a process of conducting research using a particular sequence of research strategies and theoretical perspectives (Saurino, Saurino, & Politzer, 2001, 1996; Saurino, 1998). Collaborative action research is a recursive sequence; each completed series of research steps often referred to as a "cycle" of research. The term cycle is misleading, however, since the research never begins again at the same starting point (Saurino, 1998).

Our Cycle of Collaborative Group Action Research

The research group in our study consisted of two in-service teachers, two graduate pre-service student teachers, and two university collaborators. Meetings with various members of the group were scheduled regularly throughout the study, and an informal atmosphere was maintained. The group meetings provided a place where plans were made, questions were asked and answered, problems were discussed, and reflections were expressed. The group setting also provided an avenue to brainstorm for new ideas, strategies, and techniques used to initiate actions, direct the research, solve problems, and ultimately answer the research question.

The research process completed by our study involved four chronological phases and a planning phase for future cycles. The four chronological phases were based on the recursive collaborative group action research cycle outlined below and illustrated in Figure 1:

Phase 1: August 2001	Planning phase of the project and Cycle 1
Phase 2: September 2001	Baseline data collection for Cycle 1
Phase 3: October-November 2001	Intervention strategies/Modification of interventions
Phase 4: December 2001	Repeat baseline data/Reflection for Cycle 1
Phase 5: January 2002	Return to Planning phase for future cycles

Phase 1 through 4 comprise the first research sequence of "Cycle 1" and Phase 5, and any following phases, might repeat the cycle to gain more information. After the first cycle, research questions could be modified or replaced, based on what was learned to date. A complete cycle, as was conducted during our study, consists of the phases outlined in Figure 1.

<u>Phase 1 (Planning Phase in Figure 1)</u>

The project began in August 1998 with an initial meeting of the graduate pre-service student teachers and the university researcher. The students had volunteered to do the research after being contacted by the university researcher, but did not know any particulars about the process of conducting this type of research. The general plan of creating research questions, taking

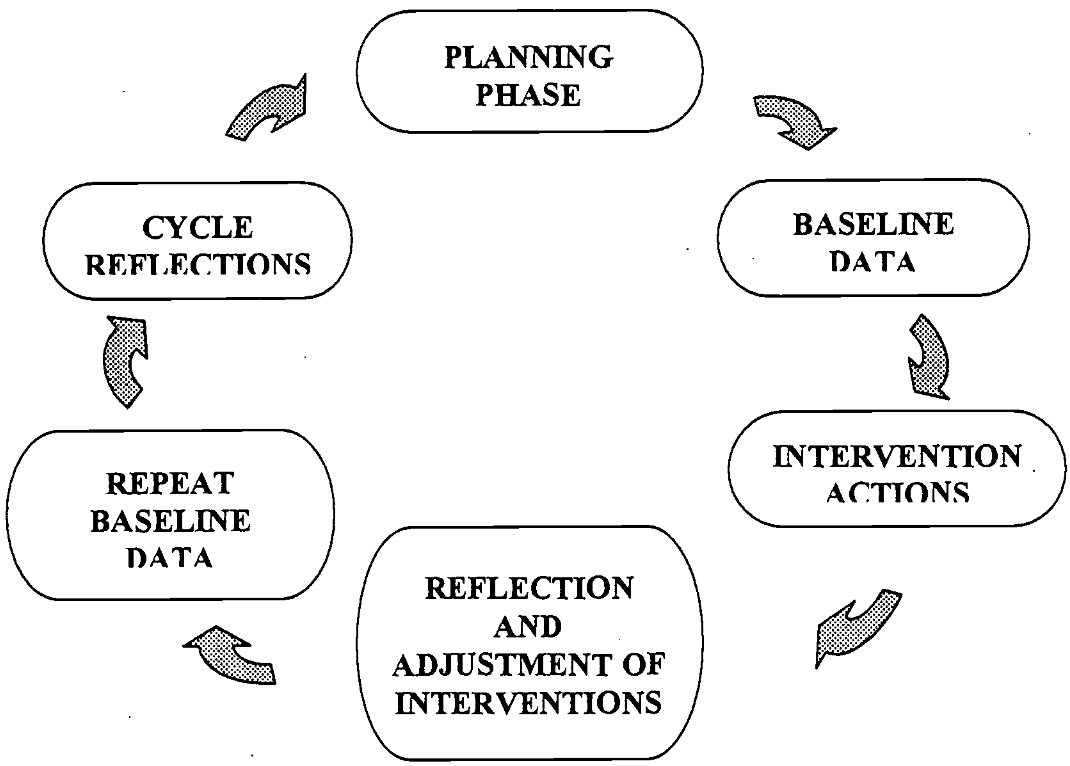

Figure 1: Illustration of one "cycle" of collaborative group action research.

actions, collecting data, and reflecting was discussed and a basic time-line for the cycle of research was established. The teachers had a variety of questions and concerns that were expressed and discussed. Their most arduous concern dealt with the amount of time required to complete the project. The university researchers emphasized the fact that the process was flexible and the time-line could be adjusted. During the project, meetings were audio taped and field notes created from observations and interviews with administrators, parents, students, and other teachers. In addition, everyone in the group kept a personal journal. These data were the source for this written report. The in-service teachers were included in the planning phase at the beginning of pre-planning in early September and we finalized the research question for the cycle. The finalized research question was as follows:

What teaching techniques and strategies that incorporate the concept of the visual/Spatial Multiple Intelligence might be used to help integrate our curriculum?

Phase 2 (Baseline Data Collection in Figure 1)

The second phase of the project began after the new school year started in September of 2001. After the research question had been finalized, the next step was to start collecting data that would be summarized and used to establish a baseline. The objective of this phase was to answer the question, "What is the current situation with respect to our research question?" This data established a baseline against which we could measure change later in the research cycle.

To accurately determine a baseline, the group collected data from several sources including other eighth-grade science teachers, eighth-grade science students, and administrators. Interviews with the other teachers and administrators revealed that they did not consider multiple intelligences in their lesson planning, even though the Faculty Handbook identified multiple intelligences as an area the teachers should explore. As one science teacher put it, "I hadn't considered trying to include specific activities in my science lessons that would address the multiple intelligences." Despite the lack of understanding or attention to all the intelligences, observations of the teachers revealed that the following four intelligences were coincidentally addressed on a regular basis: Verbal/Linguistic, Visual/Spatial, Logical/Mathematical, and

Body/Kinesthetic. One such assignment, which coincidentally addressed multiple intelligences, involved a student-designed portfolio project. In the project, a science teacher gave his students a plain manila folder with general instructions. The teacher instructed the students that on the front of the folder they were to define physical science in words and then include drawings or pictures to illustrate the key parts of the definition. On the back, the students were to write a paragraph about what interested them most in science and then draw or use pictures to illustrate their thoughts. Although this project addressed Verbal/Linguistic and Visual/Spatial, the science teacher admitted that he did not design this assignment with multiple intelligences in mind.

Four students were selected as our "visual/spatial multiple intelligence" sample. The sample consisted of two boys and two girls. Each student completed a multiple intelligences survey followed by individual interviews. The student interviews attempted to determine each student's stronger intelligences, and was followed by classroom observations. The baseline data from the students revealed that none of the students were aware that multiple intelligences existed, but were able to write about aspects of them. The students provided vastly different levels of understanding in completing the survey where answers ranged from one or two sentences to a paragraph or two for each intelligence.

Phase 3 (Intervention Actions and Reflection and Adjustment of Interactions in Figure 1)

The third phase included the interventive actions we took to answer our question, reflections about our actions, and the adjustments we made to our interventions. It began in October 2001 as the student teachers began their extended period of full-time student teaching. First, the sample students were given a basic understanding of each of the seven intelligences that were planned to be incorporated during the student teaching month. Student interviews provided excellent insight into each of the four students' strengths and weaknesses, and enabled better assessment of the relative success of the multiple intelligence techniques and strategies used to keep the students on-task. Examples of student responses for each of the eight intelligences are summarized below. All names, other than the authors, have been changed.

Verbal Linguistic: Bob stated, "I love reading and writing. I also love arguing with people". Lisa explained, "I'm verbal. I don't like writing as much as I do expressing things verbally". But Karen stated, "Usually I just read because I have to for school".

Visual Spatial: Steve explained, "I'm great with visualizing or creating images in my own mind". Lisa stated, "I'm not good at detailed drawing, but I like designing posters". Karen responded, "Seeing things in a pictures is much easier than reading or hearing it".

Logical Math: Steve stated, "I can't stand math or science when it's related to math". Bob explained, "I hate math! I never think with numbers, I'd rather use words". Karen responded, "I hate math. I'm not very good at recognizing patterns. Solving problems is difficult for me. It's really boring". But Lisa stated, "Math is my best subject. I can easily recognize patterns or relationships when I am given random numbers. It's also my favorite subject".

Body Kinesthetic: Lisa explained, "I like hands-on activities (it's easier for me to learn that way)". Karen also stated, "Hands-on activities make things much easier to understand".

Musical Rhythmic: Steve explained, "I love music. It's possibly my all-time favorite thing when it comes to such a vast subject". Karen also stated, "I love to listen to music all the time, even when I'm studying or doing homework".

Interpersonal: Bob responded, "I think that learning with other people is the best way to learn". However, Steve explained, "I find it hard to work with other people. In some projects, I feel like I would do better on my own. Sometimes I just don't like my partners' ideas". Karen, on the other hand, stated, "I love to work in groups. It's easier for me because you can get everyone's point of view. I don't like to work alone".

Intra-personal: Bob said, "Learning on your own? That's a joke. You can't learn anything without experience or influence"

The research group then formulated a plan to incorporate multiple intelligences teaching strategies and techniques that might help integrate our curriculum if we increase the number of visual/spatial techniques utilized. The plan included four parts. First, the group decided the intervention action phase of the cycle would encompass a unit on chemical and physical change, the atom, and the periodic table. Second, the student teachers developed lesson plans for the entire unit as the framework on which the multiple intelligence strategies could be added. Third, the group suggested strategies and techniques that the student teachers would initiate during student teaching, evaluated the progress, and modified subsequent lessons as appropriate. Finally, the four students in the sample were interviewed again to get their impressions on the impact the various strategies and techniques had on their classroom on-task time, and how they might be modified to be more effective.

After developing the unit lesson plans, which outlined the lessons and objectives to be covered, the each day's lessons were evaluated for the multiple intelligences included. Once completed, visual/spatial intelligence techniques were added to those lessons that did not addressed them more than once. On first review, we found that most lessons were easily modified to include visual/spatial techniques in the lessons being taught. Because the eighth grade science curriculum in this school district is over 50% “hands-on” activities, the student teachers found that visual/spatial was naturally included along with a variety of individual (intra-personal) and group (interpersonal) activities. Verbal linguistic, logical mathematical, and body kinesthetic were also readily included in the particular units taught by the student teachers. Musical rhythmic techniques were not as easily incorporated. The next task was to integrate the curriculum utilizing a number of visual/spatial strategies and techniques needed to address the intelligence not well represented in the unit.

The first lessons in the four-week unit covered chemical and physical change. As part of one lesson, the student teacher decided to include a Bill Nye video (visual/spatial technique) on "Chemical Reactions." The technique met with only marginal success as students did stay on-task, but retained little that related to the curriculum taught, and it seemed difficult to add other curricula (math, writing, social studies). However about a week later, a number of students asked the student teachers if they were going to see the "Chemical Reactions" video again. As a result, the student teachers added the "Chemical Reactions" video into the end of the periodic table lesson with the condition that students write about what they learned in the video and come up with a mathematical problem based on the information in the video.

Another technique utilized was an exercise called "The Merry Men of Matterdom" that was developed as a way to introduce students to patterns that could then be tied to the periodic table. Before introducing or discussing the periodic table, the student teacher used the "merry men" as a grouping activity incorporating the creation of patterns similar to those used in the periodic table. The exercise proved to be extremely successful and incorporated several visual/spatial techniques as well as integrating other curriculum. While some students had trouble identifying patterns initially, by working among the different groups they were able to share information and develop the patterns needed to successfully arrange the "merry men" according to all the patterns that existed. As part of the lesson on the periodic table, the merry men became a way to show the students how they had identified many of the same patterns used to set up the periodic table. Other techniques that incorporated hands-on labs as part of the unit assessment involved having the students go to stations was set up in another part of the classroom, complete the labs, then discuss and write down the procedures, formulas, and calculations they had used to find the answer.

Our second student teacher was adding an elementary endorsement to her certification and added several visual/spatial techniques to her integrated curriculum in her third-grade classroom. Her summary follows:

An activity I used at the beginning of a unit on division was <u>decorating cookies.</u> I have students work with a partner. I provide them with paper "sugar cookies" and heart "candy" decorations. Each group receives a different number of cookies/candy. The goal is to "divide" the candies equally among the cookies (6 candies → 3 cookies = 2 candies per cookie) and write about how the problem was solved. This activity is always a popular activity and provides the students with hands-on manipulation of tangible objects to see how to distribute/divide the candies among the cookies, utilizing visual/spatial techniques. Student involvement is enthusiastic and interest is high. Students are generally on-task and all groups are usually able to solve the problem. After solving the initial problem, they are allowed to collaborate with other groups to redistribute supplies and create new problems/solutions. Most groups go beyond the required assignment because of personal interest.

Another visual/spatial technique I use is called <u>Native American Studies.</u> The unit in Social Studies involves many hands-on activities, utilizing visual/spatial techniques to integrate the curriculum. As we explore each of three tribes, we try the different dances, foods, and art making projects. The culminating project is a presentation of a new tribe (chosen individually). Students assemble costumes, provide real, or "created" food dishes, create a work of art, build a habitat model indicative of their tribe, and write about the social characteristics of their new tribe. The presentations are videotaped for the class media library. In my experience students have been enthusiastic about the activity. They are given time to research and work on projects in class, and even students who are not normally comfortable in front of the group tend to do well as they become enthusiastic about sharing what they have created to represent their researched tribe.

<u>Life Cycles</u> is an activity I found to be popular during the study of biology is observing seed growth. Each student is provided soil, 2-3 seeds, and a clear plastic cup. They push the seeds

into the soil at the sides of the cup where they are easily seen. Over the following 2-3 weeks, students keep a journal indicating how they are caring for their plants, and what changes they observe in the development of the plant from seed (sketched and written information). Other seeds are grown and then dissected at various stages to enable students to observe what is happening inside the seed and older plants are examined in an attempt to see where the seeds came from (cycle of life). This information is also documented in their journals. Students are generally excited about the exploration and keep fairly detailed records as they observe and measure their seed's growth into a plant.

Moving molecules/Mixing colors is an activity in which students each have a clear plastic cup filled with water and two (different) bottles of food coloring (primary colors). We discuss what we are going to do and students make predictions about what they will observe. Students let their cups sit to be sure the water is "still" and then they put a drop of food coloring into the water at one side of the cup and a drop of the other color into the water at the other side of the cup. They draw and write (integrating curriculum) about their observations at the onset of the experiment, after 1 minute, after 5 minutes and after 10 minutes. During this time the students are also discussing their observations, making speculations about what is occurring, and estimating how long it will take for the colors to "touch." I find students to be actively engaged in the activity and usually surprised at the results as their colors "mix" together in the still water. I am always careful to try to avoid the potential mess (temptation) of 40 open bottles of foods coloring and 20 cups of water as well as the frustration of students whose experiment might be disturbed by another student.

Moon Craters involves the study of the moon during a space unit. I enjoy having my students make moon craters. We drop rocks into a shallow pan filled with flour and a top layer of a colored substance (light, colored sand/cinnamon/paprika, etc.) to enable students to observe the indentations and starburst patterns caused by the falling rocks (meteorites). Next we pour wet plaster into plastic cups or small shallow pans (one per student) and drop rocks into the plaster to simulate the meteorites hitting the moon. Students explore and compare their findings and discuss how size, speed, and shape of the rocks affect the craters. We also view photos of the moon's surface to look for comparisons. I find students enjoy the activity and are able to discuss and make distinctions, observations, and speculations about their findings, and apply that knowledge to the understanding of the formation of moon craters. Many students have told me that making craters is interesting because they can see/feel the results and that makes the craters more real. Again I need to be careful about the mess and the necessity for extra adult hands, the danger of the enjoyment of throwing rocks, as well as the fun of splashing plaster onto the person next to you.

Throughout this phase of the cycle, the group reflected upon what we felt worked in improving the integration of our curriculum with our visual/spatial techniques or strategies, and what did not. Some actions were modified and tried again, and some discarded. The group setting was also a place for analysis, and for brainstorming new ideas. As with the "Chemical Reactions" video, if it was not successful the first time, it was modified, tried again, and then we would move on to a new strategy or technique.

Phase 4 (Repeat Baseline Data and Reflection Phase in Figure 1)

The last phase of cycle 1 began with a repetition of the baseline data collection, using the same data gathering techniques utilized at the beginning of the cycle. We again wanted to define and summarize what the current situation was in regard to our research question so that we could reflect on the differences between the beginning and the end of the cycle. We analyzed the data and made direct comparisons between the initial and final baseline data. Then we reflected on the other data collected, what we had learned as a result of experiencing the process of conducting the research, and the research as an ongoing cycle. We reflected that we had highlighted a few effective techniques that might increase integration of our curriculum through the use of the visual/spatial multiple intelligence, if implemented consistently over a period of time. We also believe that other techniques and strategies might be found to be effective if we continued the research question through more cycles. We agreed that experiencing the research process made us more aware of multiple intelligences and integrating curriculum, and that by becoming proficient with the research process itself, we could continue to grow professionally through other projects.

Conclusions

In summary, the research effort highlighted the value of collaboration and the ongoing assessment of techniques teachers use in the classroom to improve student learning and on-task time. By exploring the regular and deliberate use of the visual/spatial multiple intelligence in lesson planning and then evaluating the success of that implementation, we believe we were able to address student needs and integrate our curriculum in ways that otherwise would not have occurred.

Specific things we learned through the process include the impact that actively pursuing ways to modify teaching techniques and strategies can have on a teacher's ability to measure success and adapt when efforts do not meet expectations. It was also clear that the group meetings we held during the project were critical to our ability to evaluate what we had tried and where we needed to go next. Finally, getting initial and final baseline data, and reflecting periodically during the research was of tremendous value since it provided benchmarks for determining whether or not we had really been successful in meeting our objectives.

We think more research is needed in using multiple intelligences to increase curriculum integration in the elementary and middle school classroom. Our effort encompassed a relatively short period of time, and allowed us limited opportunities to modify lessons to incorporate the visual/spatial intelligence in an effort to integrate our curriculum in different ways. It was also difficult in this period of time to evaluate which techniques were really more successful by repeating them or trying a different method of presentation. Additional research would also provide an opportunity to get more teachers involved. If we were to pursue future cycles, we would expand the research group to include other disciplines and widen the parameters of our integration of curriculum. We believe this would provide greater opportunity to try a wider variety of techniques, and even a greater number of intelligences.

Finally, we are convinced that collaborative group action research can help educators take a fresh look at their teaching techniques and strategies in a way that is non-threatening, yet provides an excellent avenue for professional development in a variety of areas. Teachers meeting in group collaboration, discussing what has worked in their classroom, and what hasn't, on a regular basis is an excellent arena in which to improve education, and the learning environment for our students. We think improving the professional level of teachers to the benefit of their students is what educational research is really all about.

References

Bransford, J. (Ed.). (2000). Expanded edition how people learn: Brain, mind, experience, and school. Washington, DC: National Academy Press.

Brualdi, A. C. (1996, September). Multiple intelligences: Gardner's theory. ERIC Digest (ED410226). ERIC Clearinghouse on Assessment and Evaluation, Washington, DC.

Campbell, L., Campbell, B., & Dickinson, D. (1999). Teaching and learning through multiple intelligences. Needham Heights, Massachusetts: Allyn Bacon.

Carr, W., & Kemmis, S. (1983). Becoming critical: Knowing through action research. Geelong, Australia: Deakin University Press.

Elliott, J. (1990). Teachers as researchers: Implications for supervision and for teacher education. Teaching & Teacher Education, 6(1), 1-26.

Fogarty, R., & Stoehr, J. (1995). Integrating curricula with multiple intelligences. Teams, themes, and threads. Palatine, IL: IRI Skylight Publishing.

Gardner, H. (1993). Multiple intelligence: The theory in practice. New York: Basic Books.

Gardner, H. (1991). The unschooled mind: How children think and how schools should teach. New York: Basic Books.

Gardner, H., & Hatch, T. (1989). Multiple intelligences go to school: Educational implications of the theory of multiple intelligences. Educational Researcher, 18(8), 4-9.

Gardner, H. (1983). Frames of mind. New York: Basic Books.

Hyerle, D. (1996). Visual tools for constructing knowledge. Association for Supervision and Curriculum Development.

Lazear, D. (1992). Teaching for multiple intelligences. Bloomington, IN: Phi Delta Kappan Educational Foundation. (ERIC - ED356227)

Lazear, D. (1991). Seven ways of knowing: Teaching for multiple intelligences. Palatine, Illinois: Skylight Publishing.

Lewin, K. (1947). Frontiers in group dynamics. Human Relations, 1, 5-41; 143-153.

Noffke, S. E., & Zeichner, K. W. (1987, April). Action research and teacher thinking. Paper presented at the annual meeting of the American Educational Research Association, Washington, DC.

Pate, P. E. (1997). Teaming and decision making. In T. S. Dickinson, & T. O. Erb (Eds.), Teaming in middle schools (pp. 425-442). Columbus, Ohio: National Middle School Association.

Saurino, D. R., Saurino, P. L., & Politzer, J. (2001, April). Strategies and Techniques Utilizing Technology To Increase Student On-Task Time: A Collaborative Group Action Research Approach. Paper presented at the Annual Conference of the American Educational Research Association, Seattle.

Saurino, D. R. (1998). A qualitative study of middle school collaborative team action research (Doctoral dissertation, University of Georgia, 1998). Dissertation Abstracts International, 1998.

Saurino, D. R., & Saurino, P. L. (1996). Collaborative teacher research: An investigation of alternative assessment. Current Issues in Middle Level Education, 5(2), 50-72.

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