



# ***Process Evaluation of STEM Learning Modules*** **March 2008 Training Workshop**

**Conducted at Harford County, Maryland**

***February 29 – March 1, 7, 8, 2008***

***PARTICIPANTS: Aberdeen Proving Ground Army Research Lab***  
***Harford County Public Schools***  
***Harford Community College***

***TRAINER: CASE for Learning***

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**Action Research & Associates, Inc.**

drkjuffer@actionresearchinc.com  
410-465-1299



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## EXECUTIVE SUMMARY

Briefly, the March 2008 Workshop conducted by CASE for Learning at Harford County (MD) was rated “Highly Successful,” was praised on every level by the trainees, and Workshop objectives were met very well. All the trainees – both teachers and S&Es -- agreed or strongly agreed that the training was valuable, that the lead instructors were knowledgeable and very motivational, and they would highly recommend the training to others. By design, the Workshop provided the trainees with an experience as a “student,” receiving hands-on, student-centered inquiry-based training. However, the Workshop did not include an opportunity for teachers and S&Es to practice teaching or assisting teachers with MWM or conduct follow up discussions and analyses of the lessons on how to best implement MWM with students. Subsequent classroom observations and interviews with teachers and S&Es in May 2008 indicated this would have strengthened the Workshop and positively impacted classroom performance.

*As any highly professional program develops, it learns what aspects are succeeding well, what objectives are being accomplished, and what elements might benefit from additional strategizing. It is with this benefit in mind, that a Process Evaluation was conducted. Many of the Findings and Recommendations apply to any STEM Program.*

Action Research conducted a process evaluation at Harford County during Spring 2008. We actively participated in all four days of the March 2008 Workshop, made suggestions and provided materials to strengthen the training experience, and facilitating communication between the trainers and teacher and S&E participants. Action Research prepared PowerPoint presentation to provide the trainees an overview of the strong 2006 Summer Institute Program Evaluation findings, and introduced them to the Spring 2008 Process Evaluation and 2008-09 Summative Evaluation plans and their roles in the efforts.

While observing the March 2008 Workshop, Action Research assessed that the **trainees 1) were stopping the inquiry process at simply measuring and gathering data, 2) were not operating at higher levels of inquiry (interpreting data/findings; connecting patterns in data to support or not support hypotheses; or apply scientific theory to interpret data), and 3) that many did not have a deep knowledge of the physics concepts presented in MWM Sports Materials.**

In response, Action Research produced a “*Sports Materials Learning Objectives and Terms*” Worksheet and “*The Scientific Process vs. the Technological Design Process*,” (see Attachment A) to strengthen the training experience. On the third day of the four-day training session, CASE trainers distributed the Worksheets and discussed the scientific terms/concepts with the trainees to raise their comfort level. The S&Es contributed their scientific knowledge to deepen the discussion. The level of trainees’ discussion and acquisition of skills improved, as a result, but **more attention is recommended to strengthen teachers’ knowledge of the science concepts taught in MWM and STEM.**

The following Executive Summary highlights the Recommendations that resulted from the March 2008 Teachers Training Process Evaluation. A fuller description of the analysis behind these recommendations follows in the full report.

## **RECOMMENDATIONS**

- Continue *introducing* the teachers and trainees to teach MWM primarily through an effective experiential inquiry-based approach -- as CASE for Learning has been doing with its Workshops.
- Provide a highly critical opportunity at the end of the training for teachers and S&Es to work together to teach a MWM lesson/lab to the others. This component is expected to provide an opportunity to proactively address many implementation issues that teachers and S&Es encounter when they implement MWM in the classroom with students.
- Continue to use the effective “freeze-frame” time-outs to discuss and highlight the underlying pedagogical, scientific and learning management issues to successfully implement MWM. “Freeze frames” are important to assist teachers to more deeply understand and better 1) apply their learning of the MWM Inquiry & Design technique, 2) apply the science concepts involved in the unit, 3) manage the teaching and learning process, and 4) organize their labs and manage the classroom.
- Train the Teachers and S&Es together without exception. Based on the observed interactions and partnerships built, it is highly important to the effectiveness and dynamics of MWM Training to have the Teachers and S&Es (and, where applicable, Community College Science Professors) receive MWM Training together. Effective collaborative Teacher-S&E partnerships were established in this manner. The College Science Professors also formed effective partnerships with Teachers and S&Es.
- Integrate learning as a “student” and analyzing the learning process from a teacher’s point of view throughout the training. This will more fully prepare the teachers to implement MWM in the classroom. Continue to use the experiential, discovery approach to train the Trainees in MWM, but also add a Practice Teaching and discussion Component at the end of the Workshop.
- Instead of waiting until the end of the Workshop, provide the Trainees with an orientation of the Teacher’s Manual, MWM philosophy, and key science concepts midway through the Workshop, so they can use them the last half of the Workshop to better observe, analyze, and learn from the Trainers’ modeling the MWM teaching approach. Most Teachers need to deepen their science knowledge to feel comfortable with applying inquiry-based learning in the classroom.
- Distribute and discuss the Worksheets developed for Sports Materials in Mid-Workshop so Trainees can efficiently know *at a glance* the basic methodological structure, learning objectives and scientific content. This approach will reinforce the fact that there is considerable science content in MWM to be taught and reinforced through labs and design experience.

- Economize and streamline the time used for each training activity as well as reduce trial and error time learning technology. Teachers need active experience and help to practice, plan and discuss how they could realistically implement MWM activities within their limited class periods.
- Model student assessment practices, and provide more discussion of the types of assessment, and examples of assessment practices for each major activity.
- Develop more steps to better prepare the teachers to use the new technology introduced. It is important to reduce and better control the amount of trial-and-error time during the compact 24-hour Workshop. Currently, the introduction at times results in teachers' experiencing technical failure during presentations, which defeats the purpose of introducing the technology during the Workshop.
- Apply the additional time saved from tighter technology training to increase the time spent learning science concepts and MWM inquiry and design processes, and providing an practice MWM Teaching Experience.
- Incorporate the DVD on MWM Teacher Training for Sports Materials (and each of the other 3 modules) into the training process and used at every MWM Training Workshop.

Whenever MWM is updated and reprinted:

- include a DVD / CD with the materials digitized for teachers and students to use in today's digital classrooms.
- provide the Ken Burns' video on *Baseball* in the MWM Materials.
- rewrite the student content to include more robust science and math content.
- more clearly highlight and focus the science content provided in Teachers' Manual and include specific science objectives for each lesson.
- rewrite the Teachers' Manual to provide content-specific assessment exercises, items, strategies and options to measure student science and math knowledge for each component.