

Final Report
Project SKILL2
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Harold H. Harris (PI)

Department of Chemistry and Biochemistry
College of Arts and Sciences
and Division of Teaching and Learning
College of Education
(314)516-5344

Charles Granger (co-PI)

Distinguished Teaching Professor
Department of Biology
College of Arts and Sciences
and Division of Teaching and Learning
College of Education

Wendy Saul (Co-PI)

Shopmaker Professor
Division of Teaching and Learning
College of Education

University of Missouri - St. Louis
1 University Boulevard
St. Louis, Missouri 63121

Partner Districts:

St. Louis Public Schools
Pattonville Schools

2 Abstract/Summary

Project SKILL (Science Knowledge through Inquiry Learning and Literacy) is a professional development project intended primarily for teachers of grades 3-5, in schools and districts designated as "high need" by the Missouri Department of Elementary and Secondary Education. This report focuses on the second year of the project (SKILL-2) because it was funded for one year at a time, and a "final report" was submitted at the completion of last year's project (occasionally referred to herein as SKILL-1).

The science content of workshops presented focused on topics in the elementary science Grade Level Expectations (GLE's) for the grades that our participants teach. We emphasized topics that are found in Strands 1 (Matter and Energy, 2 (Force and Motion), parts of 5 (Earth Systems), 6 (Universe), and 7 (Scientific Inquiry). Emphasized equally (or almost so) were the science process skills that are encompassed by our definition of "literacy". These include the recognition of independent and dependent variables, the planning of a scientific investigation, notebooking, the use of question boards, and the incorporation of teacher-selected science trade books.

There were three regular higher education faculty members that worked on the grant: Professor Hal Harris, Professor Charles Granger, and Professor Wendy Saul. We were very fortunate to have very distinguished additional senior staff: Dr. Becky Litherland (formerly Science Coordinator for Columbia Public Schools), Dr. C. J. Evans (former Missouri Science Coordinator). We also employed Mrs. Mary Harris (Presidential Award-Winning teacher), Dr. Paul Markovits (Science Coordinator for Pattonville Schools), and UMSL graduate student Jose Pareja. Several "veterans" of SKILL-1 also participated as peer leaders (and were compensated a higher rate than participants in their first year).

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4. School Districts and Participants

During the period July 1, 2006 to April, 2007, we conducted 14 Workshops, encouraged (and subsidized participation in the National NSTA Convention), and provided in-school guidance and support. One participant dropped out of the program after the summer workshops, and the participation of another was disrupted by the delivery a baby. [The hours spent at the NSTA convention were not formally accounted, and so are not included in the totals and average below. We would estimate that most of the participants spent at least six hours at the convention (they were required to write summaries and critiques of at least two sessions related to SKILL)]

Participant	School District	High Need	Workshop Contact Hours	In-school meetings	Total contact
Deborah Ballard	St. Louis City	Yes	70	4	74
Audrey Boaz-Chambers	St. Louis City	Yes	24	0	28
Elise Butler	St. Louis City	Yes	94	4	98
Donna Callahan	St. Louis City	Yes	58	4	62
Sharon Coulter	St. Louis City	Yes	45	3	48
Carolyn Cox	St. Louis City	Yes	42	0	42
Lisa Early	Pattonville	No	81	4	85
Delma Fransaw	St. Louis City	Yes	31	6	37
Sarah Funderburk	Pattonville	No	81	3	84
Melanie Gibson	Pattonville	No	73	3	75
Carol Glaza	St. Louis City	Yes	89	5	94
Danielle Hamer	St. Louis City	Yes	82	5	87
Anita Harris	St. Louis City	Yes	47	5	52
Danielle Harris	St. Louis City	Yes	42	4	46
Kathleen Hill	St. Louis City	Yes	96	5	101
Jane Kahmann	St. Louis City	Yes	85	5	90
Kristine Kimmle	St. Louis City	Yes	75	5	80
Mary Kurth	Pattonville	No	80	4	84
Debbie Lambing	St. Louis City	Yes	77	5	81
Debra Meadows	St. Louis City	Yes	89	5	94
Kelly Pearce	St. Louis City	Yes	82	4	86
Amy Perrot	St. Louis Charter	No	67	5	72

Janice Phelps	St. Louis City	Yes	89	5	94
Patsy Robinson	St. Louis City	Yes	76	6	82
Julie Sharkey	Wellston	Yes	81	4	85
Venus Smith	St. Louis City	Yes	81	4	85
Kim Stephens	St. Louis City	Yes	76	3	79
Billy Thompson	Pattonville	No	88	3	91
Patti Trares	St. Louis City	Yes	76	4	80
Julie Werton	St. Louis Charter	No	63	6	69
Kimberly White-Mengis	St. Louis City	Yes	54	3	57
Nancy Williams	St. Louis City	Yes	85	6	91
				Average	75.3

There were no significant problems of non-compliance with SKILL requirements by our participants. Nearly all of those who agreed in May, 2006 to complete the requirements of the program did so, even attending the "extra" workshop that we thought would be useful for summarizing the SKILL participation in the NSTA convention activities.

5. Project Activities completed by the participants

The SKILL year began with a session on May 13, 2006, at which the goals of the program were explained in detail, and participants agreed to complete the requirements of the program. An introductory, hands-on inquiry lesson was presented, in order to give the participants an example of what the subsequent workshops would be like. For two weeks in July, workshops were held all day, four days per week. The content of these lessons were force and motion, simple machines, electricity and circuits. Beginning in September, and continuing through October, November, January, and February, there were additional Saturday (all day) workshops on measurement, the earth-sun-moon system, the water cycle, the physics of sound, and preparation for the NSTA experience. In March, SKILL participants attended the National NSTA meeting in St. Louis. In April, we had a wrap-up session on that meeting.

An excellent guide to SKILL2 is the Web site (<http://www.umsl.edu/~harris/SKILL2>), with the agendas of the sessions. These are attached, as Appendix A. In the electronic version of this report, they are a separate, zipped file attached to the e-mail and named SKILL2WebIndexAndAgendas.zip.

6. Modifications to the original project

While we did not change the goals or the strategies of the project, we were forced to make a significant change in the personnel of SKILL during the summer and fall of 2006. The spouse of one of our key teachers, Dr. Becky Litherland, became seriously ill during that period, and Dr. Litherland was able to spend on a fraction of the time on the project that she (and we) had anticipated. Dr. Litherland's responsibilities included a significant amount of contact with the participants during the summer workshops, which was to be followed by visitations by her to the schools and classrooms of participants. Largely because of her unavailability, we used more of the time of graduate student Jose Pareja and master teacher Mary Harris than we had expected to need. While we missed especially Dr. Litherland's experience in professional development of elementary teachers and her skillful presentations, we were fortunate to have Mary and Jose to help fill the gaps. Mary was also able to work with us during several of the Saturday workshops during the school year.

Because of our experience in the first year of SKILL, we knew how important it is to have support and follow-up with teachers in their classrooms. When it became clear that the condition of Dr. Litherland's spouse was not going to allow her return to the project, we were very concerned about how that aspect of the project would be carried out. We could not have been more pleased to learn of the availability of master teacher and educational leader C. J. Evans, and we enlisted her as quickly as we could, beginning just before the first of the Saturday workshops in the Fall of 2006. We were extremely fortunate to have her continue with us through the rest of the project.

7. State and Project Objectives

State Objectives

The priorities stated by DHE for Cycle 5 of the Title II, Part A *Improving Teaching Quality Grant Program* as stated in the RFP is to use grant funds "to improve math and/or science achievement in Missouri's high-need school districts, targeting grade levels four to eight (4-8). Individual proposals may focus on one grade level or multiple grade levels within this grade span. PD projects that integrate math and/or science with other core academic subjects such as reading or communication arts are strongly encouraged."

Project Objectives

The overarching goal of project SKILL is to increase the science learning of underserved 4-6 grade students through teacher knowledge-base enrichment and enhanced teaching skills. SKILL will 1) Help teachers and school leaders analyze the school's existing science curriculum and textbooks, looking for opportunities to adopt science inquiry strategies, 2) Help teachers and students recognize and apply major science concepts so that they are better prepared to respond to Missouri GLEs, Curriculum Frameworks and MAP tests, 3) Model and assist teachers in using interdisciplinary techniques integrating language arts into science instruction and vice versa, 4) Help teachers modify, develop and use materials, activities and assessments that enhance and support the strategies for understanding science concepts, 5) Develop teacher-leaders to provide PD in their district.

8. Progress Toward Objectives

SKILL has made remarkable progress toward all of the objectives of *Improving Teacher Quality Grant* programs, and our own stated goals. Because the objects of the *Improving Teacher Quality Grant* program are quite general, the very design of our project meant that we were going to meet them. Our own objectives were to serve a "high-needs" population, and we did so; nearly all of our participants were from schools in that category – the only ones who were not, came from the Pattonville Schools (which had been categorized as "high need" in our first year) and the St. Louis Charter School (which operates within the St. Louis School District). We helped teachers to look critically at their own curricula and materials by explicitly examining their textbooks and materials, in consultation with the Science Coordinators. We helped them to see how they could use those materials to develop inquiry teaching strategies and literacy within the context of science content. GLE's, curriculum frameworks, and MAP tests were emphasized within every workshop. The definition of "science literacy" that was adopted within the philosophy of SKILL incorporates the process skills that encourage interdisciplinary approaches to the subject, including the use of trade books about science topics, student notebooking, development of scientific attitudes through the "four question strategy", question boards, and many other techniques. We purchased some science kits for the project, all of which were and are available for loan to teachers. Many of those purchased for the project are the same as those available in the districts in which our participants teach; we helped to show them how these can best be used to develop inquiry lessons. Toward the goal of developing science leadership in the schools and districts, we had five participants from SKILL-1 who wished to become peer leaders in SKILL-2, but nearly all of the participants in either of the years in which SKILL workshops were offered are willing and able to become science leaders in their schools and districts. Both of the science coordinators in our two large participating districts intend to use them in that way.

8a. Data on student achievement associated with or attributable to the project.
(Consider data provided from external evaluators, if available.)

While the demographic data and information about the previous education of our participants was of interest to us, the responses to items in which participants rated the usefulness of SKILL were telling:

The percentage of participants who rated SKILL-2 as Somewhat or Very Useful in the following Categories were:

PD Characteristics	Somewhat Useful	Very Useful
Content Knowledge	27.6%	62.1%
Content Standards	24.1%	69.0%
Instructional Materials	31.0%	58.6%
Instructional Methods	27.6%	51.7%
Learning Principles	31.0%	55.2%
Assessing Student Learning	37.9%	51.7%
Hands-on Activities	20.7%	69.0%
Collaboration with Other Teachers	41.4%	51.7%

One can easily see that the responses in the other categories: "No Response", "Not at All Useful", and "Minimally Useful", amounted to a very small fraction of our participants. This is consistent with the perceptive SKILL staff had from informal interactions in our workshops and other sessions. (It is not convenient to paste excerpts of the original report into this space, because it was supplied as a document in .pdf format. The complete external reviewer's report will be attached.)

Many of the other parts of the report will be useful to us in our own evaluation of the project, but need not be repeated here. However, Table II.8 in the report shows that participants thought the program was very valuable to them in improving their teaching practice.

Even more important to us than teacher perception of their abilities to teach well is the question "What changes in classroom practice resulted from SKILL"? This is addressed in Table III.1 of their report, which showed significant changes in the following practices:

Practices significantly increased:

Practice	t (p<.05)
Engage students in activities using manipulatives or equipment	2.52
Read and comment on the reflections students have written in their notebooks or journals	2.25
Allow students to pose questions or problems	2.92
Engage students in collecting and/or analyzing data	2.21
Students collect data	2.94
Students analyze data	2.94
Solve problems using simulations	2.31
Students engage in hands-on math/science activities	2.50
Students design or implement their own investigation	2.74
Students write reflections in a notebook or journal	3.09** (p<.01)
Students do long-term math/science projects	3.21** (p<.01)

There were other practices that increased with t values above 1.0, but not as much as those significant at the .05 level

Practice	t
Encourage students to explore alternative methods for solutions	1.48
Encourage students to use multiple representations	1.48
Allow students to work at their own pace	1.20
Help students to see connections to other disciplines	2.01
Use small-group problem solving	2.14
Teach using real-world contexts	1.76
Encourage students to communicate mathematically or scientifically	1.53

Allow students to design experiments or investigations	2.11
Include direction on what makes a good problem/solution	1.10
Expect students to use mathematics in science	1.30
Expect students to use science in mathematics	1.00
Students demonstrate a math/science principle	1.58
Students develop conceptual understanding	1.24
Students retrieve or exchange data	1.81
Students read from other math/science related materials in class	2.13
Students work on models or simulations	1.33
Students write a description of a plan, procedure, or problem-solving process	1.39
Conduct a pre-assessment to determine what students already know	1.48
Observe students and ask questions as they work individually	1.90
Use assessment of group interactions as part of the grade	1.77

Of course, increase in some practices means that there will be less of other ones. We were also pleased to see significant negative changes in the following practices, which are believe to be less effective than those we encourage:

Practice	t (p<.05)
Read from a math/science textbook in class	-3.32 (t<.01)
Answer textbook or worksheet questions	-2.89
Assessment using predominantly short-answer tests	-3.32 (t<.01)

There were other practices that decreased with t values above 1.0, but not as much as those significant at the .05 level

Practice	t
Use mathematical concepts to interpret and solve problems	-1.90
Ask students questions during large group discussions	-1.24
Allow students to work at their own pace	1.20
Review student homework	-2.13

One might question why participants reported more increases in practices than decreases. We believe that this is a manifestation of the fact that participation in SKILL significantly increased the emphasis on science in the classrooms of our participants. It is not only that they changed what they were doing before, but they began doing much more instruction in science.

8b. Discussion of the assessment procedures used to gauge the achievement of objectives.

In accord with recognized good educational practice, Project SKILL was assessed on a continuous basis during its progress. Pre- and post-tests were administered in association with each of the topics for which activities occurred. The pre- and post-test averages are compiled for each workshop or related set of workshops below (see Appendix for data summaries). In addition to the quantized test scores of participants, we also made a

general practice of collecting exit card comments for the workshops, both for our guidance in remediating problems and for the improvement of subsequent workshops. The comments on “what I learned today” were generally very positive and thoughtful. The scores of the pretest/posttest showed some improvement in content for each workshop tested. A summary of each session and the corresponding comments are collected in Appendix B.

9. Description of how the project was connected to specific Show-Me Standards, Grade Level Expectations, and/or curriculum framework.

Project SKILL emphasized the Show-Me Standards, especially as they are reflected in Grade Level Expectations, in each of the workshop sessions that occurred throughout the year. They were projected at the beginning of the session (and often later as well), and they were emphasized emphatically. The agendas for each session included excerpts from the pertinent GLE's, and there are hyperlinks provided from the SKILL Web pages (<http://www.umsl.edu/~harris/SKILL2>). Many of the workshops incorporated "MAP-like" assessment strategies, and teachers practiced writing materials for that purpose. We worked closely with the Science Coordinator for the St. Louis Schools (Olga Hunt) and especially Paul Markovits who is the Science Coordinator for Pattonville Schools, in order to assure that our materials were fully consistent with the curriculum frameworks of the districts.

10. Dissemination of project information

Several of our SKILL-1 "veterans" who were part of our peer leadership in SKILL-2 were enrolled in a graduate course in which they made written and public poster presentations about their SKILL work in December, 2006. They were Kathleen Hill (SLPS), Deborah Lambing (SLPS), Amy Perrot (SLCS), Patti Trares (SLPS), and Julie Werton (SLCS). We were very pleased that so many of our SKILL-1 participants felt that the SKILL experience was a basis for further study. Four of those "veterans" will be earning Masters degrees in the UMSL College of Education.

Professor Saul spoke at the NSTA meeting in St. Louis in March about topics that are directly related to SKILL:

On March 28, she (along with Mark Baldwin, Kristen Gasser, and Diane Miller) she presented an all-day development institute entitled "A Field Guide to Science and Literacy", a part of which showed the intimate relationship between literacy and inquiry science.

On March 29, she was the Featured Presentation on "Science and Literacy Essentials", in which she persuasively argued that the science literacy movement has its own set of "big ideas" (all of which are related to SKILL.)

On March 30, she presented a 2-hour professional development workshop entitled, "PDI CSE/EDC Pathway Session: Spinning a Web – Fully Integrating Science and Literacy" (which is the point of SKILL)

Dr. Litherland also presented at the NSTA meeting, but it was on a topic (density) that appears in the middle-level GLE's, and was not part of the SKILL curriculum.

One of our staff, Mary Harris, also presented at the NSTA meeting, on the teaching of polymer chemistry (not part of SKILL).

We are very pleased that two of our SKILL family will be leading science activities in two of the largest districts in Missouri beginning in Fall, 2007. One of our participants, Nancy Williams will become Science Coordinator in the St. Louis Public Schools. Our stalwart staff member, Dr. Becky Litherland, has accepted appointment as Science Coordinator for the Parkway School District. Nancy has already contacted us for advice about how best to continue incorporation of SKILL practices and ideals in SLPS, and our faculty anticipates ongoing cooperation with Dr. Litherland, who also will be furthering the SKILL philosophy.

11. Conclusion

Project SKILL has built a real community of elementary educators and university faculty and staff. We have had very positive personal interactions from the beginning to beyond the end of the project, and the content, pedagogical methods, and philosophy of the project seems to have made a permanent difference in the teaching of our participants. We had a larger-than-expected response to our invitation after the end of SKILL-1 for teachers who would like to continue into a second year and, had funding been available, we would have had many SKILL-2 participants who would have continued into a subsequent year.

Attachments

The Compliance Audit Checklist will be submitted with the final request for funds. It cannot be completed until our Office of Research Administration can be sure that all expenditures have been recorded.

Appendix A

On the following pages are presented the Index and the Agendas for SKILL-2 workshops that were presented by the project during the 2006-7 academic year. These pages are images of the Web site that was created and maintained for the project, and remains at <http://www.umsl.edu/~harris/SKILL2>. At that address will be found hyperlinks to the many additional pages of information that were made available to participants during the project.