GK12: Environmental Sciences and Molecular Biosciences in the Natural State

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KEY ACTIVITIES

Summer training workshop for graduate Fellows:

Module 1 (methods & materials):

1) Background for Teaching STEM
2) Teaching Strategies and Classroom Management
3) Planning for Instruction

Module 2 (team development and background)

1) present proposal
2) school administrators present school information (demographics / cultural issues)
3) teachers will outline curriculum, lesson plans, timelines, education standards, special needs and behavior issues

Module 3 (inquiry based lesson plan development)

1) engagement 2) exploration 3) explanation 4) elaboration 5) evaluation

Module 4 (inquiry based lesson plan dry run)

1) Fellows present lesson plan demonstrations

Fellows will also assist in training new Fellows in methods and materials and Teacher-Fellow Workshop

EVALUATIONS

1) Teachers' pre/post summer institute surveys
2) Fellows pre/post summer institute surveys (Table 3)
3) Mid-year reflection survey (Table 4,5)
4) Formative Evaluation by the ASU supervisor and cooperating teachers a minimum of two times each semester
5) Summative Evaluation by the ASU supervisor at the end of each semester
3) Student Evaluation in classes taught by the Fellow

PROJECT SUMMARY

Environmental Sciences and Molecular Biosciences in the Natural State

will place 8 doctoral students (Table 1) per year in 5 east Arkansas school districts (Table 2) to teach 6th – 12th grade students lessons based on their graduate research (see Figure 1 for university workplan).

Program goals:

1) to improve Fellows' skills in communicating their science to a broad audience while gaining a deeper understanding of their own research
2) to improve or enhance school district teachers' knowledge and experience
3) to peak students' interest in STEM and STEM careers while exposing students to an enriched STEM classroom environment
4) to strengthen partnerships between ASU and school districts and their communities.

Summer workshops train fellows and school teachers in inquiry based teaching, establish collaboration, and develop a series of 5E Learning Cycle lesson plans based on the Fellows' research following national and state frameworks.

Project sustainability will be ensured by 3 graduate assistantships being dedicated to GK12 activities after funding, a series of new graduate pedagogy courses, dissemination of information via web pages, presentations, and writings, and strengthening of partnerships of the university and the school districts.

Expected evaluated outcomes are:

1) greater communications skills for the GK12 fellows
2) deeper understanding of STEM by Fellows and students
3) STEM career choices by students
4) professional development and content exposure for school teachers
5) dissemination of programmatic activities
6) strengthening of partnerships.

Intellectual merit and broader impacts of this proposal are:

1) fellows maintain links with K-12 classroom
2) students will be curious about STEM and STEM careers
3) teachers will be better trained
4) linkages between higher education, school districts and communities will be strengthened and become more accessible, especially to underserved populations.

ANTICIPATED AND REALIZED BENEFITS

School districts receive a partnership with a university.

Teachers receive professional development, enhanced lesson plans, supplies, graduate credit.

Students receive enhanced STEM curriculum leading to interest in STEM careers, preparation for Science Benchmarks, Biology End-Of-Course Exam, Iowa Tests of Basic Skills Science Tests. Students recognize a positive role model in a STEM career.

Graduate Fellows increase communication skills at several levels, enhance pedagogical skills, share excitement of their research.

Realized benefits

A grant to construct blue-bird houses for *student* and *Fellow's* research.
Graduate credit to *teachers* as mentors and participants.
Increased teaching interaction skills with students by *Fellows.*
Increased self confidence of *Fellows* through weekly student interaction.

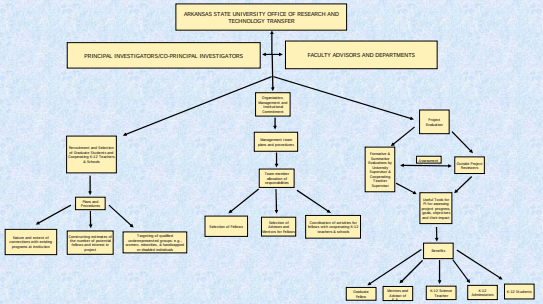

Figure 1. Workflow diagram for Arkansas State University GK-12 Program

Name	GraduateProgram	ResearchTopic	Race/Ethnicity	Gender
Bret Yount	2nd yr MS Chem	Environmental Detection	White	Male
Eric Freeburg	2nd yr PhD EVS	Geochemistry/aquatic	Hawaiian/Pac Islander	Male
Taylor Ingle	4th yr PhD MBS	Env Toxicology	American Indian	Female
David M Hayes	4th yr PhD EVS	Phylogenetics	White	Male
Allison M. Asher	3rd yr MS EVS	Ecology	White	Female
Annabelle McKie	3rd yr PhD EVS	Ecology	White	Female
Rodney S. Harris	3rd yr MS EVS	Phytoremediation	White	Male
Nicole Henderson	2nd yr PhD EVS	Anthropogenic compounds	African American	Female

Table 1. Current Fellows, year & graduate program, major, research topic, race/ethnicity and gender.

School District	2006 Enrollment	% Certified Teachers	% Not High Qualified	Graduation Rate	% Children Living In Poverty (U.S. Census)	% Free & Reduced Lunch	2006 ACTAAP Math % Proficient & Advanced 4th	6th	8th	2006 ACTAAP End Of Course % Proficient & Advanced Alg.	Geo.	Lit.	XPR Math Problem Solving & Data Analysis 5th	7th	9th
Armorel	421	95	14	76	5	25	80	69	19	79	50	43	66	59	67
Cross Co.	693	95	9	77	26	65	61	28	20	62	62	22	65	33	47
West Helena - Helena	3050	99	43	68	39	90	25	41	9	47	38	30	33	26	29
Nettleton	2919	100	1	89	21	46	73	72	55	80	83	45	65	60	65
S. Mississippi Co.	1304	98	10	69	27	74	52	40	30	49	32	36	55	46	50
State of Arkansas	**463922**	**99**	**10**	**71**		**54**	**62**	**59**	**45**	**65**	**60**	**47**	**63**	**56**	**53**

Table 2. Partner School District socioeconomic data and academic standing (ACTAAP & ITBS) Source (www.arkansased.org)

Develop students' conceptual understanding of science.	3.3 (1.6) / 4.6 (0.5)
Make connections between science and other disciplines.	3.4 (1.3) / 4.4 (0.5)
Have students work in cooperative learning groups.	3.1 (0.7) / 4.4 (0.5)
Have students participate in appropriate hands-on activities.	3.7 (1.0) / 4.7 (0.5)
Engage students in confirmation activities: Students confirm a principle through an activity, results are known in advance	3.6 (1.3) / 4.7 (0.5)
Engage students in structured-inquiry activities: Students investigate a teacher-presented question with a given procedure to follow.	3.3 (1.4) / 4.6 (0.5)
Engage students in guided inquiry activities: Students investigate a teacher-presented question; the students design and direct the investigation.	3.1 (1.5) / 4.1 (0.9)
Engage student in open-inquiry activities: Students generate their own research question and design their own investigation	3.0 (1.6) / 3.9 (0.9)
Manage a class of students engaged in hands-on work	3.6 (1.4) / 4.0 (0.8)
Teach groups that are heterogeneous in ability	2.6 (1.5) / 4.0 (0.8)
Use computers/technology to collect data	4.0 (0.8) / 4.7 (0.5)
Use computers/technology to analyze data	4.0 (0.8) / 4.7 (0.5)
Use the Internet in your science class for general reference	4.1 (0.7) / 4.7 (0.5)
Teach process ("how to") skills to students	3.6 (1.3) / 4.5 (0.6)

Table 3. Fellows' survey responses at pre/post summer institute of their preparation of pedagogical techniques. Ranked 1-5. Mean (SD) provided.

Figure 3. Classroom activities of GK12 fellows a) Annabelle McKie teaches in the classroom, b) students demonstrate Newton's Law, c) students xxxxxxxxxxxxxxxxx, 4) students are allowed close-up examination of a bat.

Any questions I had about procedures have been clearly answered	4.4 (0.8)
Any problems/issues that have arisen so far have been resolved to my satisfaction	4.5 (0.9)
I have a good relationship with the fellows I work with	4.9 (0.3)
Overall, the summer institute was a productive use of my time	3.4 (1.5)

Table 4. Teachers' survey responses at mid-year reflection. Ranked 1-5. Mean (SD) provided

Figure 2. Teacher – Fellow interaction during summer 2008 workshop.

The training provided to me about how to teach science was sufficient.	3.6 (0.5)
The training provided to me about classroom management was sufficient.	3.4 (0.5)
Any questions I had about procedures have been clearly answered.	4.4 (0.5)
Any problems/issues that have arisen so far have been resolved to my satisfaction.	4.3 (0.7)
I have a good relationship with the classroom teachers I work with.	4.9 (0.9)
Overall, the director-fellow meetings have been a productive use of my time.	4.4 (0.5)
I have learned new ways to teach science or gained ideas for my lessons from the director-fellow meetings.	4.1 (0.4)
I have consulted with other fellows when I had a question regarding teaching science content.	4.1 (0.8)
I have consulted with other fellows when I had other types of questions (example: classroom management)	4.1 (0.8)

Table 5. Fellows' survey responses at mid-year reflection. Ranked 1-5. Mean (SD) provided.

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