TECHNICAL REVIEWERS' COMMENTS

LRC-LXXV(75)-B:
"Energy Curriculum Project"
Submitted by: Bismarck State College;
Request for: $75,000; Total Project Costs: $155,000;
Principal Investigator: Emily McKay

1. OBJECTIVES

The objectives or goals of the proposed project with respect to clarity and consistency with Industrial Commission/Lignite Research Council goals are: 1 - very unclear; 2 - unclear; 3 - clear; 4 - very clear; or 5 - exceptionally clear.

Reviewer 13-4 (Rating: 2)

The proposal deals with the development and initial implementation of energy curriculum focused on North Dakota for 4th and 8th grade North Dakota Studies. There is no explicit eligibility criteria for this type of activity (i.e., curriculum development) listed by the Industrial Commission/Lignite Research Council. Further, the proposal does not contain an explicit statement connecting the proposed project topic to *any of the eligible topics* that are listed by the Industrial Commission/Lignite Research Council. Only topic 1-n of Chapter 43-03-02 (Eligibility) "in general any project which will utilize or enhance the development or use of lignite resources" might provide a possible fit but this is not discussed in the proposal.

Reviewer 13-5 (Rating: 4)

The objective of this proposal is to develop relevant energy curriculum for 4th and 8th grade North Dakota Studies courses. The objectives are very clear and consistent with NDIC/LRC goals to preserve and create a stable workforce and economic stability in the industry.

Reviewer 13-6 (Rating: 2)

How is this going to help the Math and Science curriculum? They need to be more specific.

2. ACHIEVABILITY

With the approach suggested and time and budget available, the objectives are: 1 - not achievable; 2 - possibly achievable; 3 - likely achievable; 4 - most likely achievable; or 5 - certainly achievable.

Reviewer 13-4 (Rating: 3)

The 12-month timeline and the overall level of funding ($250,000 for total project funding of which 30% is being requested here) would seem to be adequate to support the development, testing and initial implementation of the 20 days of curriculum material (e.g., teacher workshop, curriculum draft, pilot modules, testing, followed by revision, teacher training, marketing/outreach and delivery to select classrooms in fall of 2014).

Reviewer 13-5 (Rating: 4)

The objectives of the proposal are most likely achievable. Development of two-week energy units and support materials for 4th and 8th grades should be achievable. The goal of adoption of the energy units in a quarter of the schools within the first year may be more difficult to achievable.

Reviewer 13-6 (Rating: 3)

I do not really know what they are going to do in terms of coursework and hands-on components. How are they going to tie this into their math/science curriculum? Is this science fair material? The idea is good but it is too focused and objectives are unclear on how it enhances the science/math curriculums.

3. **METHODOLOGY**

The quality of the methodology displayed in the proposal is: 1 - well below average; 2 - below average; 3 - average; 4 - above average; or 5 - well above average.

Reviewer 13-4 (Rating: 3)

The project team appears to have good credentials for curriculum development overall (e.g., development of new 8th grade North Dakota Studies curriculum and involvement in a significant program in energy-related workforce training) and would be expected to be versed in methodology and the overall approach proposed is logical. On the other hand, detail is not provided for methodology in several areas. Team members have evidently done curriculum development on previous occasions for North Dakota Studies (a favorable action) but it is not clear if successful actions in that work are tied to the proposed actions here.

Under Project Description on page 3 the proposal states "teachers of 4th and 8th grade North Dakota Studies will gather in a workshop (the Budget indicates 8 teachers) to participate in energy curriculum development" and under Qualifications the proposal states that teachers will be chosen based on "knowledge and areas of expertise" (favorable) but we aren't given an indication of what knowledge and expertise is of interest. On the other hand, the teachers will "be representative of a cross section of school size and location" (favorable) but no method for accomplishing this action is suggested. No approach is outlined for the week long development workshop or for the follow up workshop. No methodology is given for recording and reporting experiences during the in-class module testing.

No plan is provided for outreach/marketing (Web and other outreach pathways are listed but not related). There is no methodology discussed to track use of these modules once released to the schools.

Reviewer 13-5 (Rating: 4)

The methodology displayed in the proposal is above average. The proposal is well presented and incorporates adequate management controls. The proposal incorporates expertise from a variety of knowledgeable sources and explains how the expertise will be utilized.

Reviewer 13-6 (Rating: 2)

Parts of this could be part of a general STEM statewide component. They should explain the HOW's in their proposal. I know it is STEM related, but specifically they need to answer the question of how does this support STEM and what are they going to do?

4. **CONTRIBUTION**

The scientific and/or technical contribution of the proposed work to specifically address Industrial Commission/LRC goals will likely be: 1 - extremely small; 2 - small; 3 - significant; 4 - very significant; or 5 - extremely significant.

Reviewer 13-4 (Rating: 3)

The proposal's scientific and/or technical contribution is not immediately clear in this context because the proposed activity does not result in an immediate concrete scientific or technical contribution but an educational one (as stated in Item 1, the only possible fit this reviewer can see is 1-n of Chapter 43-03-02 -- Eligibility). If the preferred criterion is accepted as education then the development of curriculum and its distribution which will occur by fall of 2014 could be considered an immediate contribution in education. However, the ultimate value (reducing outmigration and better informed citizens) is a longer range item and the question of assessing the impact of this project comes into question. According to the proposal, the value will be: 1/ future citizens who are more informed with respect to the State's energy resources, 2/ graduates who are more likely to remain in the state due to knowledge regarding employment opportunities in the energy industry, and 3/ graduates who have additional exposure to STEM (Science, Technology, Engineering, Mathematics) emphasis.

Reviewer 13-5 (Rating: 3)

The introduction of new scientific and technical information will not be large. However, collecting the information in the educational forum could be significant.

Reviewer 13-6 (Rating: 3)

It is my opinion that this is too focused on a specific area of STEM (science/technology/engineering/mathematics). The age group of students targeted (and the teachers) should get more of a general (STEM) enhancement. Components of this project may fit well in a more general STEM approach.

5. **AWARENESS**

The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 - very limited; 2 - limited; 3 - adequate; 4 - better than average; or 5 - exceptional.

Reviewer 13-4 (Rating: 3)

If "current research activity" is seen as education-related activities and initiatives in the region and "published literature" is seen as available energy-related education resources then the proposal lists resources and initiatives by stakeholders (energy companies and two state agencies) and the proposal states that a survey of programs and materials will be undertaken to flesh this out (a favorable action).

Investigators can't be expected to know everything at the time of the proposal -- fair enough.

On the other hand, literature and activities are informally referred to but not formally referenced in any portion of the proposal. In other words, the proposal contains no citations at all, not even in the case of curriculum products that are directly relevant to building the case for the proposed project (e.g., curriculum developed by team members in the past for North Dakota Studies) or with respect to relevant statements and directions from the EmPower group and its committees.

Reviewer 13-5 (Rating: 4)

The PI's awareness of current activities is evident in the reference to existing industry programs. The PIs did not provide footnote reference to published literature or current activities.

Reviewer 13-6 (Rating: 1)

Little evidence is provided.

6. **BACKGROUND**

The background of the investigator(s) as related to the proposed work is: 1 - very limited; 2 - limited; 3 - adequate; 4 - better than average; or 5 - exceptional.

Reviewer 13-4 (Rating: 4)

Project personnel listed in the "Qualifications" section (page 10-11) seem generally well qualified on the education side, energy side (experts from the energy industry), and IT area based on the limited information. Unfortunately, no resumes are included, only three of the project personnel have any detail on experience, the team leads for Curriculum and Industry Support are barely mentioned and several of the key personnel (e.g., team leads) are given a cursory treatment.

Reviewer 13-5 (Rating: 5)

The background of the investigators shown as the Energy Curriculum Team is exceptional as related to the proposed work

Reviewer 13-6 (Rating: 4)

The industrial contributors are both known to me and respected.

7. **PROJECT MANAGEMENT**

The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any is: 1 - very inadequate; 2 - inadequate; 3 - adequate; 4 very good; or 5 - exceptionally good.

Reviewer 13-4 (Rating: 2)

Individual items are adequate but as a whole I found them inadequate.

The project Management Plan (page 13) consists of a group of four tables with headings, personnel names and general statements of responsibilities. No supporting discussion is included for the year-long multi-party effort with respect to management issues such as lines of communication, schedule for team meetings, or internal reporting. The proposal does not discuss external reporting (e.g., reports to the Industrial Commission/Lignite Energy Council) including how such a reports would be compiled or their "at a minimum" contents.

The Milestone chart (Page 14 and Exhibit A) is very basic with the items correlating for the most part with the Project Description (page 4-6) section. The project has no end date milestone or item/milestone listed pertaining to an activity like "Final Project Report to Industrial Commission/Lignite Energy Council". No schedule is suggested for internal project meetings or stakeholder updates.

The Budget (Page 15) is rudimentary and generalized. The Budget does not address items such as investigator salaries or hours (lump sums are provided but there is no detail relating investigator, task, hours, and level of support). The tasks themselves are presented in such a general way that it is difficult to understand the breakdown of resources required among activities.

Matching Funds (page 16) contains a confusing column of figures with a total of $125,000 (there is what appears to be a statement of a target for funding from the "Lignite Industry" of $125,000 at the top that is not explained – am I to infer that the Lignite Industry is going to be paying for an entire module – if so this should have been clearly stated in an the body of the proposal). In-kind contributions are also listed. There is no statement indicating if in-kind or cash are backed by formal letters of support or commitment.

Reviewer 13-5 (Rating: 4)

The project management plan is very good. The project management plan includes budget, organization and Gantt Chart.

Reviewer 13-6 (Rating: 2)

No real schedule is provided. Goals are stated. How would an energy curriculum in the Education Department at VCSU work? A better choice would be a general incorporation of enhancing teacher awareness of what do scientists and engineers do in the energy field and what do they do in a general through STEM training. Mayville State has an excellent program for STEM training. The goal here is getting students interested in all STEM related fields, not just one area.

8. **EQUIPMENT PURCHASE**

The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 13-4 (Rating: 5)

Number 5 is circled because no equipment is explicitly requested in the proposal.

Although not directly related, “delivery platforms” are mentioned in Project Description (requiring a cost assessment) and are required for the delivery of the Web-based modules. A license fee cost of $25,000 per module (20% of total budget which includes 2 modules) is listed for Delivery Platform in the Budget. Clarification would be good.

Reviewer 13-5 (Rating: 5)

Equipment purchased is not identified.

Reviewer 13-6 (Rating: 5)

Note: Reviewer 13-6 provided no comments.

9. **FACILITIES**

The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.

Reviewer 13-4 (Rating: 5)

Again, the number 5 is underlined because no equipment is formally requested or listed in the proposal and facilities do not seem to be germane to the proposal. However, “delivery platforms” are mentioned in Project Description (requiring a cost assessment) but no criteria are given for choice among various platforms (the item accounts for 20% of the overall project budget).

Reviewer 13-5 (Rating: 5)

The facilities available for this project are exceptional.

Reviewer 13-6 (Rating: 5)

Note: Reviewer 13-6 provided no comments.

10. **BUDGET**

The proposed budget "value" [1] relative to the outlined work and the financial commitment from other sources [2] is of: 1 - very low value; 2 - low value; 3 - average value; 4 - high value; or 5 very high value.

Reviewer 13-4 (Rating: 3)

The total request for the overall project is $250,000 (page 2 and 15). This proposal is requesting $75,000 or 30% of the total (this is favorable and in keeping with the guideline that the request should be less that 50% of the total).

[1] “Value” – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar.

[2] Financial commitment from other sources – A minimum of 50% of the total project must come from other than Industrial Commission sources to meet the program guidelines. Support greater than 50% from Industrial Commission sources should be evaluated as favorable to the application.

The funding is not directed at producing a specific portion of the overall product. That is, there is *no specific product or activity* tied to the funds requested from the Industrial Commission/Lignite Research Council.

There is no discussion regarding the impact of receiving less funding than requested or how or if the project might be reconfigured to deal with this possibility. It is not clear how critical the requested share of the funding is beyond the fact that the scope of this multi-party/multi-funding source project may have to be reduced from two curriculum modules to one (my inference since none of this is addressed in the proposal).

Reviewer 13-5 (Rating: 5)

The proposal includes matching funds from a variety of industrial sources.

Reviewer 13-6 (Rating: 4)

See below.

OVERALL COMMENTS AND RECOMMENDATION:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 13-4 (Rating: FUNDING MAY BE CONSIDERED)

My role as a reviewer means I have to make a recommendation and I find that in this case it is not a straightforward decision. The curriculum concept has significant merit but in my opinion the presentation in this proposal is flawed in significant ways. As a result, I recommend considering funding but contingent upon appropriate resolution of the issues listed below.

Appropriate Detail in the Budget and Related Items -- The team appears to be a qualified core group and the overall Project Description is logical but the supporting materials in the Budget, Management, and Matching Funds sections contain such general (and in some cases seemingly preliminary or uneven language and presentation) that it is tough to get a handle on the level of effort required and allotted for each task and the dollars needed to match that.

A Clear Description of the Product -- The major product of the proposed project is energy curriculum sufficient for 20 days of class time but the basic components of the "curriculum" are never enumerated or described. In other words, we are never told what the educators will receive in the end (even if this is not known exactly at this time it could certainly be described in a general but concrete way for the group that is being asked to fund this project – for example, a sample from another group could be shown or models for the curriculum could be cited or described). This is especially important when requesting funds for a project that is not in the historical mainstream of the Industrial Commission/Lignite Research Council.

Cohesive Approach for Marketing and Use Tracking -- The Standards of Success (page 7) state "the project will be considered a success if a quarter of the schools adopt the energy curriculum [as a portion of their North Dakota Studies courses] within the first year [i.e., in the school year starting in fall 2014]…" We are not told if this is ambitious or conservative based on a standard or on past experience by a team member (after all, team members have created curriculum for North Dakota Studies before). The team needs to determine and justify the process for introducing the curriculum based on the team's experience or other examples (as a basis for Marketing/Outreach). The team needs to develop a tracking or feedback mechanism to provide for use data in some way. As it stands, the measure of success can't be assessed until months after the project is completed.

Practical Means of Value Assessment -- According to the Background section (page 8), the overall impetus for the project is based in identifying actions that will help to reduce outmigration and create a more informed citizenry. This is repeated in the Value to North Dakota section. If this is given as the value of the project and is its genesis – will anyone be checking to see if the project had the intended positive impact? What practical and informative means of ongoing value assessment are possible?

Basis for Future Curriculum -- Energy is a growing in importance with respect to where North Dakota is headed economically and socially. The group will be reviewing and assessing materials and activities as part of the project. Does this confluence create an opportunity for benefit through having this energy curriculum development serve as a model for an ongoing inclusive process that will ensure periodic review and updating of curriculum by a spectrum of stakeholders? How will additions and updates be accommodated in the future?

Plan for Communication and Reporting – The development of a plan that includes key times for communication and the level and type of reporting appropriate for teams, stakeholders and funding groups.

Reviewer 13-5 (Rating: FUND)

The strengths of this proposal include:

1. the members of the Energy Curriculum Team,
2. the matching funding from a variety of sources,
3. the reliance on existing programs, and
4. the project management plan.

The weaknesses of this proposal include:

1. the impact on the industry from 4th graders could be delayed a decade,
2. 4th and 8th graders in North Dakota are close to the energy industry and aware of many benefits
3. 4th and 8th graders are computer and Internet literate but the program is focused to a classical classroom approach, and
4. potential overlap with existing industry programs.

The focus on teachers of 4th and 8th graders, removes the information one level. To focus on 4th and 8th graders as a means to impact the image and benefits of the industry and employment in industry, means the positive impact of the program could be delayed ten years. An online element in the curriculum could be a means to impact image and benefits sooner. An online element could be used in conjunction with existing curriculum and existing industry programs.

Reviewer 13-6 (Rating: DO NOT FUND)

I think my comments above indicate my opinion. Components of the proposal have merit. However, I believe it is too focused on a specific area of STEM. We need to train our teachers to be aware of all areas of STEM related careers and to build their experience in delivering to young students.

How would VCSU incorporate this "energy curriculum"? New teachers barely know what an engineer does in the first place. We need to start there first.