

**Experiential Education and Empowerment Evaluation:**

**Mars Rover Educational Program Case Example**

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## **Experiential Education and Empowerment Evaluation: Mars Rover Educational Program Case Example**

Experiential education and empowerment evaluation are in alignment conceptually and in practice. They represent mutually reinforcing educational tools with similar values. The purpose of this discussion is to present the basics of this evaluation approach and demonstrate how useful and user-friendly it was in a recent evaluation of an experiential educational program.

### **Overview**

Empowerment evaluation is the use of evaluation concepts, techniques, and findings to foster improvement and self-determination. Empowerment evaluation has an unambiguous value orientation -- it is designed to help people help themselves and improve their programs using a form of self-evaluation and reflection.<sup>1</sup> Program participants -- including clients -- conduct their own evaluations; an outside evaluator often serves as a coach or additional facilitator, depending on internal program capabilities. The aim is to try to understand what is going on in a situation from the participants' own perspective as accurately and honestly as possible and then proceed to improve it with meaningful goals and strategies and credible documentation. As in traditional evaluation, empowerment evaluation findings are based on data, including honest criticism of program performance as well as information about program strengths. An important difference, however, is that the stakeholders establish their own goals, processes, outcomes, and impacts and then proceed to assess themselves accordingly.

Empowerment evaluation has been adopted in a wide array of settings and programs, including tribal reservations, inner city schools, higher education, nonprofit programs, and the Environmental Protection Agency. It has also been used in battered

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<sup>1</sup> Empowerment evaluation creates an environment conducive to three types of reflection: Content reflection, focusing on the content of an issue; process reflection, highlighting the methods used to resolve an issue; and premise reflection designed to examine the underlying assumptions or premise.

women's shelters, adolescent pregnancy prevention programs, substance abuse prevention programs, and national educational reform movements. (See Fetterman, Kaftarian, and Wandersman, 1996 for case examples.)

### **Three Steps**

Empowerment evaluation has three steps:

1. Establishing a mission or vision statement about the program.
2. Taking stock of the program's most significant activities.
3. Charting a course for the future by establishing goals, strategies, and criteria for evidence.

Unlike other organizational approaches, establishing a mission or vision statement about the program through empowerment evaluation involves bringing all participants into the process collectively instead of delegating or deferring it to one person. When the group has developed a statement with which they are all at least moderately comfortable, they move on to Step 2. This step, taking stock, begins with identifying the program's important activities and aspects. Then program staff members and participants work to identify and prioritize the most significant of these listed activities. Program staff members and participants rate how well the program is doing in each of those activities, typically on a 1 (low) to 10 (high) scale, and discuss the ratings. Finally, Step 3 involves charting a course for the future by establishing goals, specifying strategies, and agreeing on credible evidence to document progress towards these goals. This third step is really a blueprint for the future. It establishes a specific direction for the group and organizes and galvanizes their efforts. It also launches them into a research and evaluation mode, in which self-reflection is automatic and routine.

The empowerment evaluation community or group tests both their assumptions and specific strategies associated with their plans for the future, by collecting, analyzing, and interpreting relevant data. Mid-course corrections are made if the data suggest that the strategies are not working or that the assumptions are faulty. The process is cyclical. The group takes stock again to compare their current state with their earlier baseline or taking stock session. Then the group plans for the future again with updated information about where they stand. In essence, evaluation becomes a part of the normal planning

and management of the program, which is a means of institutionalizing and internalizing evaluation. (See Fetterman, 2001, for details concerning the steps and additional case examples.)

### **Purpose**

The purpose of this discussion is to present the three steps of empowerment evaluation in enough detail for others to begin using this approach, ideally with the assistance of an evaluator. A case example will be used to highlight the steps and illustrate the effectiveness of the approach in experiential education. The case example is the LAPIS program. The name LAPIS originated from the initials of the first sites to participate: Los Angeles, Phoenix, Ithaca, and St. Louis. The program is part of educational outreach efforts designed to involve students in testing one of the NASA/Jet Propulsion Laboratory's prototype Mars rovers. Coordinated by participants at Washington University in St. Louis and Cornell University, it is a NASA-supported project.

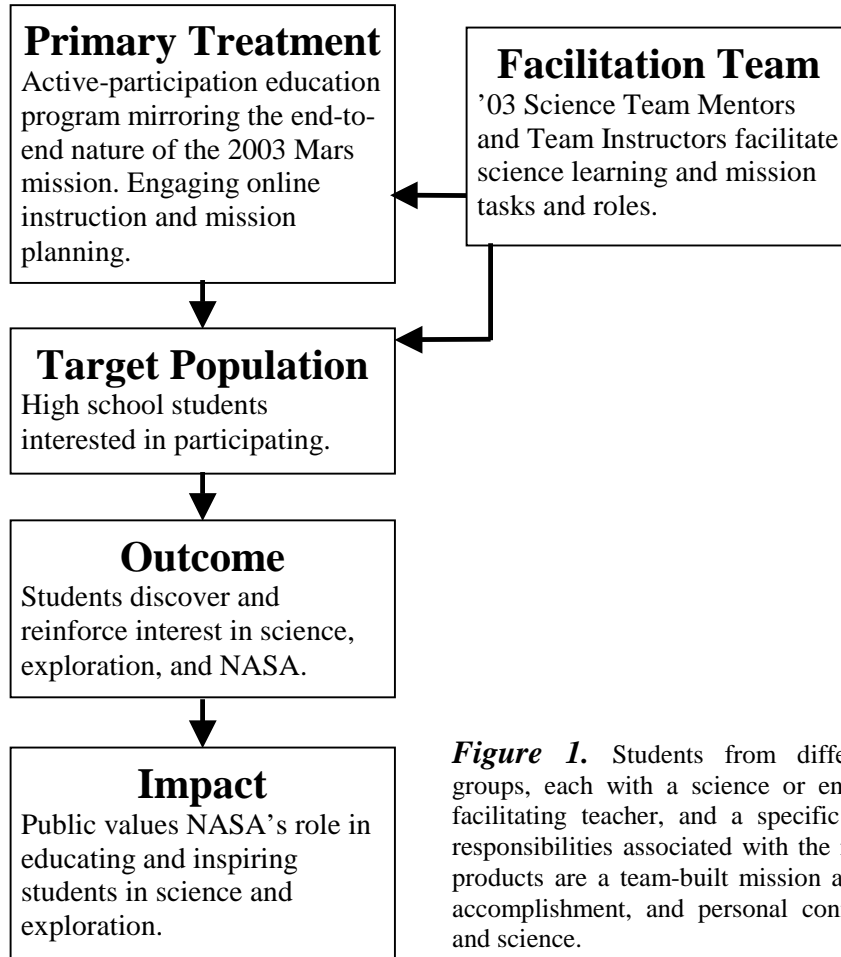
### **Program Description**

The LAPIS program, initiated in 1999, is an experiential education program designed to mirror an end-to-end mission on Mars. In LAPIS, small, distributed groups of high school students form an integrated mission team and work together with rover scientists and engineers to plan, implement, and archive a two-day test mission with the NASA/Jet Propulsion Laboratory's Field Integrated Design and Operations Rover (FIDO) (Arvidson, et al., 2000). During the semester-long program, they communicate with each other by email, the web, and teleconferences, and control FIDO remotely over the Internet, making decisions and sending commands as a team. In addition, when funding permits, they travel to the Jet Propulsion Laboratory to implement their mission from the Core Operations Team area. Their teachers help coordinate the team and support the students' interactions with their science or engineering mentor. To further broaden the impact of the program, the student team develops and maintains their own web site, communicating their activities and lessons-learned to other students and to the public. Limiting the number of students in each group insures that participants have continuous

one-on-one interactions with teachers, mentors, and other FIDO scientists and engineers. The program was implemented in the spring of 1999, 2000, and 2001, actively involving students from across the country in the FIDO rover test missions (Arvidson, et al., 2000b). Starting in 2002, LAPIS will broaden its base of participation and become the Athena Student Interns Program, which is part of a larger educational outreach plan from the NASA Mars Program Office and the Athena Science Payload team in preparation for the 2003 Mars Exploration Rover Mission.

### **Program Theory**

The theory behind the LAPIS program is simple and at the heart of most experiential education programs. Students learn by doing. They are immersed in preparing, implementing and archiving the mission. The primary educational treatment is active-participation in the test mission, which mirrors the 2003 Mars mission. Students are engaged in online instructions and mission planning and face-to-face interaction with their rover science or engineering mentor. The facilitation team consists of 2003 mission scientists and engineers and teachers who facilitate science learning and mission tasks and roles. The target population is high school students interested in participating in this science program. The desired outcome is to stimulate students' scientific imagination, foster principles of discovery and exploration, and reinforce an interest in and commitment to science. A secondary outcome is that students view NASA as a viable, if not enviable, employment option in the future. The program theory is graphically presented below in figure 1.



*Figure 1.* Students from different cities form groups, each with a science or engineering mentor, facilitating teacher, and a specific set of roles and responsibilities associated with the mission. The final products are a team-built mission archive, a sense of accomplishment, and personal connection to NASA and science.

## **Program Evaluation**

An empowerment evaluation approach (Fetterman, 2001) was used to evaluate LAPIS 3, in 2001. This approach actively engaged program participants in the evaluation process. The participatory nature of empowerment evaluation meant that the evaluation process also became part of the experiential learning process for the students, teachers, and mentors. The fact that almost all of LAPIS is engaged remotely (i.e. the various student groups communicate with each other and the coordinator via the Internet and telephone) required that the evaluation follow suit. Online surveys and teleconference discussions focused on the three steps of empowerment evaluation: “(a) developing a mission, vision, or unifying purpose; (b) taking stock or determining where the program stands, including strengths and weaknesses; and (c) planning for the future by establishing goals and helping participants determine their own strategies to accomplish program goals and objectives” (Fetterman, 2001).

The approach was invaluable in many respects. In addition to being true to the participatory spirit of this experiential educational program, it enabled program coordinators, teachers, and students in the program to make mid-course corrections along the way as necessary. The remainder of this discussion will focus on elaborating the three steps of empowerment evaluation and highlighting each one with specific case examples drawn from the evaluation of the LAPIS program.

### **Empowerment evaluation: Mission**

The first step in an empowerment evaluation is to ask program staff members and participants to define their mission. This step can be accomplished in a few hours. An empowerment evaluator or qualified staff member facilitates an open session with as many staff members and participants as possible. They are asked to generate key phrases that capture the mission of the program or project. This is done even when an existing mission statement exists, because there are typically many new participants and the initial document may or may not have been generated in a democratic open forum. This allows fresh new ideas to become a part of the mission and it also allows participants an opportunity to voice their vision of the program. It is common for groups to learn how divergent their participants' views are about the program, even when working together

for years. The evaluator records these phrases, typically on a poster sheet. Then a workshop participant is asked to volunteer to write these telescopic phrases into a paragraph or two. This document is shared with the group, revisions and corrections are made in the process, and then the group is asked to accept the document on a consensus basis – they don't have to be in favor of 100% of the document, they just have to be willing to live with it.

### **LAPIS: Determining the Mission**

The LAPIS program used an online survey to solicit participating students and teachers' thoughts about the purpose of the program. Empowerment evaluation, via online surveys, helped students and teachers craft a mission for the program that was not solely developed by the program organizers. Their comments were then discussed in a teleconference. Three themes emerged from their comments: active participation; learning about NASA, missions, space exploration and excitement about science; and encouraging teamwork. One student summarized, "I think [the goal] is to involve students in NASA exercises, and give them opportunities to use technology, work on solutions to scientific problems, and to network with others to solve those problems." It was reassuring to learn that the students' goals were closely aligned with the proposed program goals at this early stage. However, a radical restructuring, to the degree possible, would have been considered had the goals not been aligned. The participants understood and believed that the program was designed to involve them in a *real* process and to help them understand the way missions work—from technology to teamwork. This in essence helped them to develop a mission or unifying purpose about what they were doing.

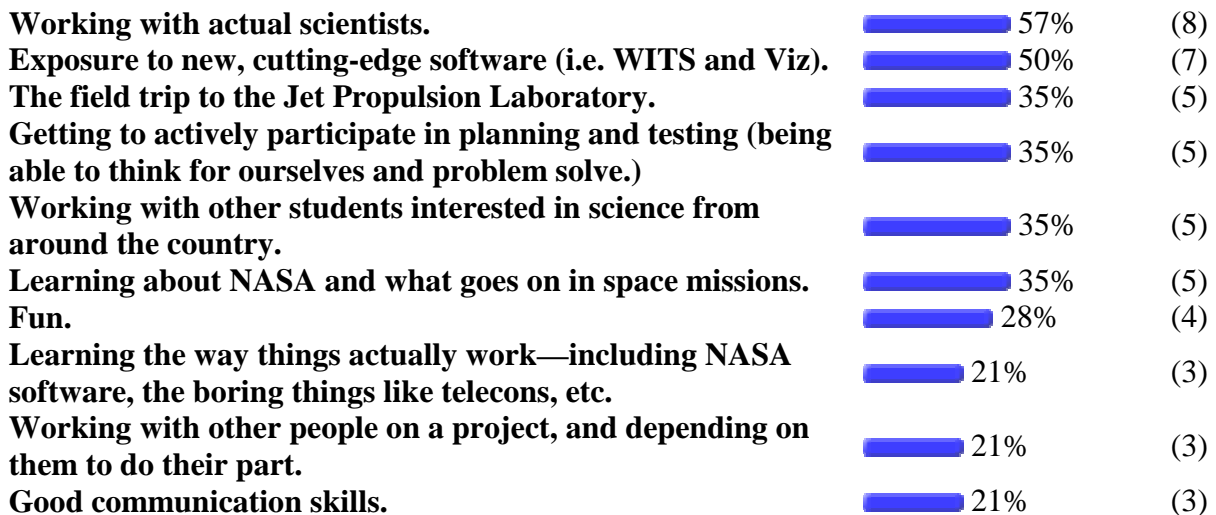
### **Empowerment Evaluation: Taking Stock**

The second step in an empowerment evaluation is taking stock. This step can also be conducted in a few hours. It has two sections. The first involves generating a list of current key activities that are crucial to the functioning of the program. Once again, the empowerment evaluator serves as a facilitator, asking program staff members and participants to list the most significant features and/or activities associated with the



program. A list of 10 to 20 activities is sufficient. After generating this list, it is time to prioritize and determine which are the most important activities meriting evaluation at this time.

One tool used to minimize the time associated with prioritizing activities involves voting with dots. The empowerment evaluator gives each participant in the evaluation five dot stickers and asks the participants to place them by the activity on which the participant wants to focus. The participant can distribute them across five different activities or place all five on one activity. Counting the dots easily identifies the top ten activities. The ten activities with the most dots become the prioritized list of activities meriting evaluation at that time. This process avoids long arguments about why one activity is valued more than another, when both activities are included in the list of the top10 program activities anyway. (See Chart 1 for a LAPIS illustration.)



*Chart 1.* This picture captures a typical Taking Stock prioritization exercise for demonstration purposes. In this case, bar charts are used instead of dots to highlight the most significant activities in the program. The total number of votes for each activity has been added on the right hand side of the poster. The activities with the most dots are selected for the second stage of the Taking Stock exercise – rating the activities.

The second phase of taking stock involves rating the activities. Program staff members and participants are asked to rate how well the program is functioning concerning each activity on a 1 to 10 scale, with 10 as the highest rating and 1 as the lowest. The staff members and participants need only have minimal definitions about the components or activities at this point--additional clarification can be pursued as needed.

However, detailed definition and clarification become a significant part of the dialogue process during the core of the taking stock phase of the evaluation.

Typically, the participants rate each of the activities while in their seats on their own piece of paper. Then they are asked to come up to the front of the room and record their ratings on a poster sheet of paper. This allows for some degree of independence in rating. In addition, it minimizes a long stream of second-guessing, and checking to see how others are rating the same activities while recording ratings in the front of the room on the poster sheet.

At the same time, there is nothing confidential about the process. Program staff members and participants place their initials at the top of the matrix and then record their ratings for each activity. Contrary to most research designs, this system is designed to ensure that everyone knows and is influenced by each other's ratings (after recording them on the poster sheet). This is part of the socialization process that takes place in an empowerment evaluation, opening up the discussion and stepping toward more open disclosure – speaking one's truth.

The taking stock phase of an empowerment evaluation is conducted in an open setting for three reasons: 1) it creates a democratic flow of information and exchange of information; 2) it makes it more difficult for managers to retaliate because it is in an open forum; and 3) it increases the probability that the disclosures will be diplomatic because program staff members and participants must remain in that environment. Open discussions in a vacuum, without regard for workplace norms, are not productive. They are often unrealistic and can be counterproductive.

It is important that program staff members and participants be asked to begin by assessing individual program activities because they are more likely to give their program a higher rating if they are only asked to give an overall or gestalt rating about the program. It will be easier for participants to give some activities low ratings if they are given an equal opportunity to speak positively about other activities, or rate them highly. The ratings can be totaled and averaged by person and by activity. This provides some insight into routinely optimistic and pessimistic participants. It allows participants to see where they stand in relation to their peers, which helps them calibrate their own assessments in the future. The more important rating, of course, is across the matrix or

spreadsheet by activity. Each activity receives a total and average. Combining the individual activity averages generates a total program rating, often lower than an external assessment rating. This represents the first baseline data concerning that specific program activity. This can be used to compare change over time.<sup>2</sup> (See Chart 2 for a LAPIS example.)

	SD	PG	RH	JT	DS	AS	SV	BK	CC	CS	DN	LF	NB	MS	NB2	SW	JC	MK	NP	DU	AVE.
Working with scientists	10	10	10	10	7	9	10	10	9	10	10	9	9	8	8	9	10	10	10	10	9.4
WITS/Viz	10	10	10	10	8	8	9	8	7	9	10	10	8	6	6	8	6	8	9	9	8.45
Trip to JPL	10	10	10	10	10	7	10	10	8	10	10	10	10	8	8	9	10	7	10	10	9.35
Actively participating	10	10	10	10	10	9	8	10	9	9	6	6	9	7	7	8	10	10	9	8	8.75
Working with other students	7	10	8	10	8	7	10	10	10	9	5	4	6	8	7	9	8	7	8	9	8
Learning about NASA	10	9	9	10	9	7	10	9	5	7	8	10	8	6	7	8	8	6	8	9	8.15
Fun	10	9	10	9	10	9	9	10	8	10	10	10	9	8	7	8	10	8	10	10	9.2
Learning how things work	10	9	10	10	9	7	10	10	6	10	9	9	7	8	8	8	6	9	9	10	8.7
Working with other people	10	10	10	7	9	6	9	10	8	10	10	9	9	8	9	8	10	9	8	10	8.95
Communication skills	10	10	10	8	10	8	10	10	7	9	10	9	9	8	8	8	10	9	9	9	9.05
<b>Personal Average</b>	9.7	9.7	9.7	9.4	9	7.7	9.5	9.7	7.7	9.3	8.8	8.6	8.4	7.5	7.5	8.3	8.8	8.3	9	9.4	8.8

**Chart 2.** This is a picture of the matrix used to facilitate this stage of the empowerment evaluation process. Activities are listed on the left column. Participant initials are on the top of the matrix. Individual ratings are listed for each activity in the column directly below the participant's initials. The averages are recorded on the bottom and on the right hand side of the spreadsheet. This worksheet provides a useful mechanism to enter into a dialogue about the status of the program.

All of this work sets the tone for one of the most important parts of the empowerment evaluation process – dialogue. The empowerment evaluator facilitates a discussion about the ratings. A survey would have accomplished the same task up to this point. However, now the facilitator probes and asks, for example, why one person rated "working with other students" a 10 while another rated it a 4 on the matrix. Participants are asked to explain their rating and provide evidence or documentation to support the rating. This plants the seeds for the next stage of empowerment evaluation – planning for the future -- where they will need to specify the evidence they plan to use to document

<sup>2</sup> Program staff members and participants should return to these activity ratings on a routine basis. In some cases, a monthly comparison is needed. However, most programs return to these ratings at a three, six, or 12-month interval.

that their activities are helping them accomplish their goals. The empowerment evaluator serves as a critical friend during this stage, facilitating discussion and making sure everyone is heard and at the same time being critical and asking, “What do you mean by that?” or asking for additional clarification and substantiation about a particular rating or viewpoint.

Participants are asked for both the positive and negative basis for their ratings. For example, if they give "working with other students" a 4 they are asked, “Why a 4?” The typical response is because there is some concern, and they proceed to list reasons for this problem. The empowerment evaluator listens and helps record the information and then asks the question again, focusing on why it was a 4 instead of a 1. In other words, there must be something positive to report as well. An important part of empowerment evaluation involves building on strengths; even in weak areas there is typically something positive that can be used to strengthen that activity or other activities. If the effort becomes exclusively problem focused, participants see only problems instead of strengths and opportunities to build and improve on practice.

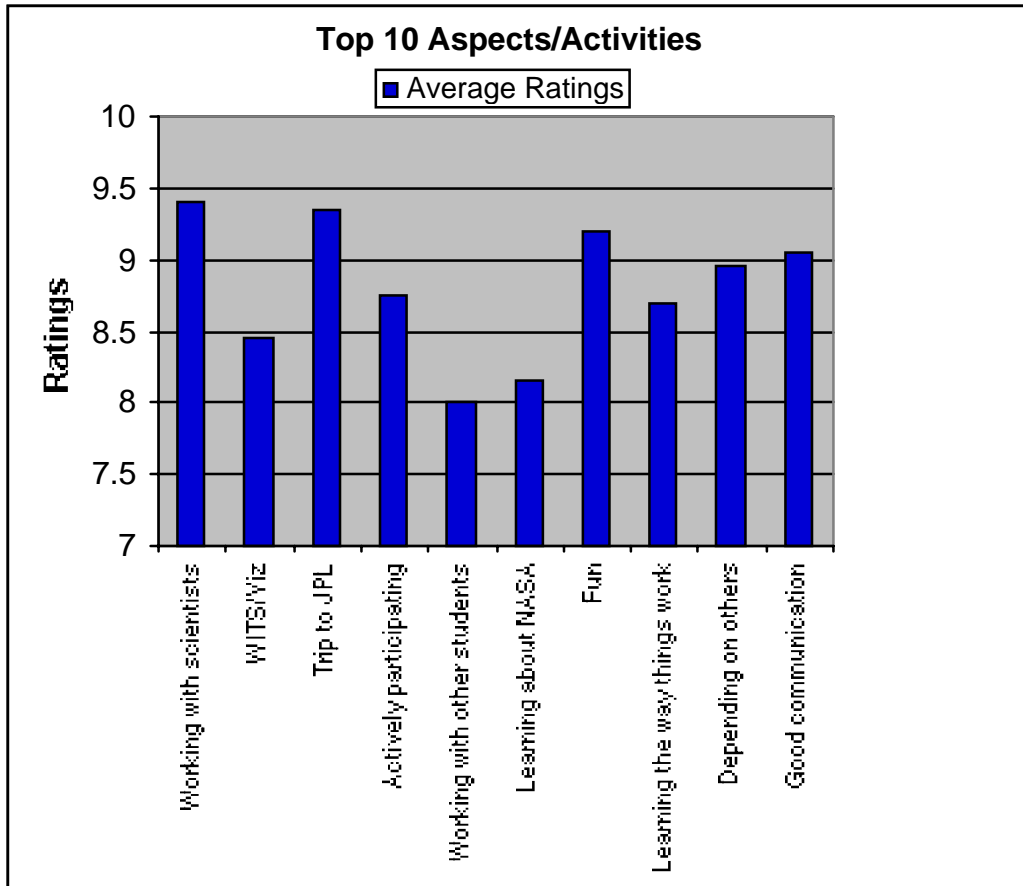
Some participants give their programs or specific activities unrealistically high ratings. The absence of appropriate documentation, peer ratings, and reminders about the realities of their environment help participants recalibrate their ratings. Participants are reminded that they can change their ratings throughout the dialogue stage of the workshop, based on what they hear and learn from their peers. The ratings are not carved in stone. However, in some cases, ratings stay higher than peers consider appropriate. The significance of this process, however, is not the actual rating so much as it is the creation of a baseline, as noted earlier, from which future progress can be measured. In addition, it sensitizes program participants to the necessity of collecting data to support assessments or appraisals.

After examining 4 or 5 examples, beginning with divergent ones and ending with similar ratings (to determine if there are totally different reasons for the same or similar ratings), this phase of the workshop is generally complete. The group or a designated subcommittee continues to discuss the ratings after the session is over, and the group is asked to return to the next (planning for the future) session with the final ratings and a brief description or explanation of what the ratings meant. (This is normally shared with

the group for review, a time in which ratings can still be changed, and a consensus is sought concerning the document.) This process is superior to surveys because it generally has a higher response rate – close to 100% depending on how many staff members and program participants are present -- and it allows the evaluation participants to discuss what they meant by their ratings, recalibrate and revise their ratings based on what they learn – minimizing “talking past each other” about certain issues or other miscommunications such as defining terms differently and using radically different rating systems. Participants learn what a 4 and an 10 mean to individuals in the group in the process of discussing and arguing about these ratings. This is a form of norming, helping create shared meanings and interpretations within a group.

### **LAPIS: Taking Stock**

The actual test mission is the LAPIS program's capstone experience. As the capstone experience approached, students were asked to list the top 5-10 most important aspects, features or activities of the program. Participants generated a list of 37 unique aspects/activities during the brainstorming phase of taking stock, done via online survey. These activities were listed on another online survey and the participants were asked to cast 5 “votes” for the activities they thought were most important to them. They were told that they could vote for five different aspects or cast all or some of their votes for one activity. The top ten program activities as selected by the students through this process were put into another list and the students were asked to rate each one on how well it was functioning, using a scale of 1 (low) – 10 (high) (see Graph 1).



**Graph 1.** The participants’ top ten program activities represent the group’s prioritization efforts and highlight the most important parts of the program to evaluate at the time. Their ratings of these selected program activities are presented graphically.

It is interesting to note that nine of the ten “important” activities or features of the program selected by the students were also aspects program organizers consider vital. Evaluations can be valuable even when they simply validate that everyone is operating on the same wavelength. The one aspect that students identified that program organizers did not, however, was “fun”. Although the program was designed to be engaging and interesting, there was no explicit focus on the social aspect of the program. It is clear, however, in light of this feedback, precisely how important fun is to students and, in fact, to teachers, scientists, and program organizers. Professionals do not go to conferences solely to attend presentations, but also to go to dinner with colleagues, discuss new ideas, and get to know one another. This was an unexpected “lesson learned” in the taking stock phase of the evaluation.

### **Empowerment evaluation: Planning for the future**

After rating their program's performance and providing documentation to support that rating, program participants are asked, "Where do you want to go from here?" They are asked how they would like to improve on what is going well and not so well. The empowerment evaluator asks the group to use the taking stock list of activities as the basis for their plans for the future – so that the group's mission guides their taking stock phase, and their taking stock phase shapes their planning for the future. This creates a thread of coherence and an "audit trail" for each step of their evaluation and action plans.

Program staff members and participants are asked to list their goals based on the results of their taking stock exercise. They set specific goals associated with each activity. Then the empowerment evaluator asks members of the group for strategies to accomplish each goal. They are also asked to generate forms of evidence to monitor progress toward specified goals. Program staff members and participants supply all of this information.

The empowerment evaluator is not superior or inferior in the process. Staff members, participants, and evaluators are equals. The empowerment evaluator adds ideas as deemed appropriate without dominating the discussion. His or her primary role is to serve as a coach, facilitator, and critical evaluative friend. The empowerment evaluator must be able to serve as a facilitator, helping program members and participants process information and be heard. The evaluator must also be analytical and critical, asking or prompting participants to clarify, document, and evaluate what they are doing, to ensure that specific goals are achieved. However, if the evaluator is only critical and analytical, the group will walk away from the endeavor. The empowerment evaluator must maintain a balance of these talents or team up with other coaches (from within or outside the group) who can help maintain this balance. The empowerment evaluation facilitator may be a member of the group, and, in fact, this is the ideal situation. However, the person acting in this capacity should have some group facilitation skills and seek the assistance of a trained evaluator when needed or if he or she lacks basic evaluative skills.

The selected goals should be established in conjunction with supervisors and clients to ensure relevance from both perspectives. In addition, goals should be realistic, taking into consideration such factors as initial conditions, motivation, resources, and

program dynamics. Goals should also take external standards into consideration, e.g. accreditation agency standards, superintendent's 5-year plan, board of trustee dictates, board standards, and so on.

Additionally, it is important that goals be related to the program's activities, talents, resources, and scope of capability. One problem with traditional external evaluation is that programs have been given grandiose or long-term goals to which participants could only contribute in some indirect manner. There is often no link between an individual's daily activities and ultimate long-term program outcomes (in terms of these goals). In empowerment evaluation, program participants are encouraged to select intermediate program goals that are directly linked to their daily activities. These activities can then be linked to larger, more diffuse goals, creating a clear chain of reasoning and outcomes.

Program participants are encouraged to be creative in establishing their program goals. A brainstorming approach is often used to generate a new set of goals. Individuals are asked to state what they think the program should be doing. The list generated from this activity is refined, reduced, and made realistic after the brainstorming phase, through a critical review and consensual agreement process.

There are a bewildering number of goals to strive for at any given time. As a group begins to establish goals based on this initial review of their program, they realize quickly that a consensus is required to determine the most significant issues on which to focus. These are chosen according to: significance to the operation of the program, such as teaching in an educational setting; timing or urgency, such as recruitment or budget issues; and vision, including community-building and leadership.

Goal setting can be a slow process when program participants have a heavy work schedule. Sensitivity to the pacing of this effort is essential. Additional tasks of any kind and for any purpose may be perceived as simply another burden when everyone is fighting to keep their heads above water.

**Developing Strategies.** Program participants are also responsible for selecting and developing strategies to accomplish program goals. The same process of brainstorming, critical review, and consensual agreement is used to establish a set of strategies. These strategies are routinely reviewed to determine their effectiveness and



appropriateness. Determining appropriate strategies, in consultation with sponsors and clients, is an essential part of the empowering process. Program participants are typically the most knowledgeable about their own jobs, and this approach acknowledges and uses that expertise—and, in the process, puts them back in the “driver's seat” of the program’s development and improvement.

**Documenting Progress.** Program staff members and participants are asked what type of documentation or evidence is required to monitor progress toward their selected goals. The number of goals is reduced to a manageable number during the prioritization process discussed earlier. Collecting data on every conceivable goal would not be feasible or desirable. Similarly, the amount of data collected concerning each goal needs to be manageable. This is a critical point. Each form of documentation is scrutinized for relevance to avoid devoting time to collecting information that will not be useful or pertinent. Program participants are asked to explain how a given form of documentation is related to specific program goals. This review process is difficult and time-consuming but prevents wasted time and disillusionment at the end of the process. In addition, documentation must be credible and rigorous if it is to withstand the criticism that the evaluation is self-serving. (See Fetterman, 1994, for additional discussion on this topic.)

### **LAPIS: Planning for the future**

A debriefing was conducted following the completion of the LAPIS test mission. A teleconference was held with the students, teachers, and mentors, to discuss the ratings previously collected during the taking stock phase. After engaging in a dialogue about the ratings, we moved to the third step in this process: Planning for the future. Together we determined specific goals for the improvement of each program activity and developed strategies for reaching these goals. We also pressed each other for credible evidence needed to document whether the strategies work. An example is show below:

**Activity or Feature of the Program:** Working with scientists.

**Comments from taking stock step:** This was the most important aspect to the participants and they liked the fact that they got to work closely with at least one

scientist or engineer (generally their mentor). However, they felt they would have liked for the whole group to get to work with all the scientists and engineers during the mission to get more exposure and experience.

**Goal:** The participants felt a good goal would be for all the students to get to work with all the scientists and engineers at some point.

**Strategy:** The students suggested setting aside extra time during the test mission for opportunities to talk as a group and one-on-one. They also suggested holding a teleconference or videoconference to get to know everyone better personally before the actual test mission at the Jet Propulsion Laboratory.

**Evidence:** Evidence would include providing organized opportunities for group and one-on-one talks with scientists during the test mission. Other evidence might be holding get-to-know-you teleconferences or videoconferences between students and scientists and engineers before the test mission.

The 2001 LAPIS students will continue to participate at some level as “student mentors” to future teams. They and future LAPIS-type program participants will benefit from the changes and improvements made to the program as a result of the empowerment evaluation.

## **Conclusion**

Empowerment evaluation is a natural match for experiential education programs. The participatory nature of the approach fit in perfectly with the aim of the LAPIS program since each step built on the next, providing students, teachers, and program developers with a coherent and meaningful experience. The empowerment evaluation approach reinforced the learning process by becoming a part of the educational experience. The information and evaluation provided by the students, teachers, and mentors was used to improve the program--in some cases program goals were reassessed,

in other cases strategies were revised and refined in order to accomplish specific program goals.

The LAPIS program will act as a model for outreach associated with future FIDO field trials and rover operations during the 2003 Mars mission. This LAPIS-based program will use data from the empowerment evaluation to plan implementation in 2002 and beyond and to glean information about the core aspects of the program and how to preserve them. Such information will be vital as we broaden the base of participation beyond the original four sites and seek to actively engage larger and larger numbers of students in Mars-related testing and missions. Ironically, the entire process of establishing a mission, taking stock, and planning for the future creates an implicit logic model or program theory, demonstrating that there is “nothing as practical as a good theory” of action (grounded in participants’ own experiences). (See figure 1.) In addition, staff members and participants become more sophisticated users of evaluation each time they apply empowerment evaluation to their program. They also better understand and own program goals in the process of conducting their own evaluations.<sup>3</sup> Empowerment evaluation paired with experiential education programs allows both program staff and program participants to learn by doing, to improve their understanding of the program, and to enhance the overall experience.

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<sup>3</sup> For additional discussion about the steps and timing of an empowerment evaluation see Fetterman (2001).

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Cassie Bowman has worked for three years developing and coordinating the LAPIS program. She is presently Deputy Coordinator of the NASA Robotics Education Project, working on robotics-related education and Mars 2003 Mission educational outreach. She received her master's degree in education policy and evaluation from Stanford University.