SAN DIEGO STATE UNIVERSITY

DEPARTMENT OF EDUCATIONAL TECHNOLOGY

PROJECT FOR DIGITAL LITERACY PROGRAM EVALUATION

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PROJECT FOR DIGITAL LITERACY PROGRAM EVALUATION

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EVALUATION OF PROJECT FOR DIGITAL LITERACY AFTER-SCHOOL PROGRAM

EXECUTIVE SUMMARY

The Project for Digital Literacy (PDL) commissioned this study to determine how effective their Roamer Robot program has been in developing critical thinking skills. The mission of the Project for Digital Literacy is to develop "habits of mind" and "habits of work" within students during their early education. Because of the increasing pace of technological change and globalization, it is more important than ever that students are able to think critically and be comfortable and confident in their use of technology.

PDL has developed a six week course focused on giving children hands on experience working with the Roamer Robot. The Roamer robot built by Valiant Technologies has been created to allow children to develop Higher Order Thinking Skills (HOTS) by learning to program Roamer to move in a variety of ways. The classes are target to children in elementary school, generally in the first through third grades.

Object of the Evaluation

Evaluation of the PDL's HOTS program has focused on trying to determine to what degree the Roamer classes being conducted are helping participant children develop habits of work and habits of mind. This assessment took place after the six week training program had concluded in the fall of 2003. Informal visits of the classes were conducted to gather information on class instruction, and a survey was given to parents to gather information. This survey attempted gather parental attitudes and feedback about changes in their children's behavior in during and after the Roamer classes were taking place.

PURPOSE OF THE EVALUATION

Evaluation of the HOTS program focused on determining how the Roamer classes help participating children develop habits of work and habits of mind. This assessment took place after the close of the six week training program in the fall of 2003. Informal visits of the classes were conducted to gather information on class instruction, and a survey was given to parents to gather information. This survey attempted gather parental attitudes and feedback about changes in their children's behavior in during and after the Roamer classes were taking place.

Evaluation of the PDL's HOTS program, clearly formative and improvement-oriented, focused on determining how and in what ways the Roamer classes help participating children develop the previously described habits of mind and habits of work.

Informal visits to the fall '03 classes helped the evaluator understand class structure/organization and facilitation. At the end of the six-week course, he surveyed parents with an eye to learning

- their perceptions of the program's impact on their children (selected attitudes and skills) and
- to what degree they value the competencies that HOTS specifically targets.

CONCLUSIONS AND RECOMMENDATIONS

PDL initiated this study in order to determine parental values and how successful HOTS has been in inculcating habits of work and habits of mind. This study does show that *a majority of parents surveyed agreed or strongly agreed* that:

- **my child has taken greater responsibility for completing tasks and chores on their own**
- **my child has shown more curiosity, asked me more questions**
- **my child has an improved attitude toward school and school work**

Conclusion: This study provides evidence for improvement in a number of student behaviors related to habits of work and habits of mind.

Recommendation: Further studies should be carried out to validate these findings. As the HOTS program expands to other areas, additional studies should be carried to endure that the results of this study are generalizable to other age groups (older students) and other locations outside San Diego.

This study also gives important information to PDL about the skills and attitudes parents want their students to learn.

Conclusion: The parents of the children participating in the HOTS believe that most of the skills and attitudes that PDL is targeting are important. Interestingly, parents are more concerned with students having hands on experience with technology, or in developing technology skills. Instead, parents appear to value more general skills such as creativity and problem solving.

Recommendation: PDL needs to ensure that it clearly communicates its vision and mission to parents. PDL does appear to have a clearly defined mission, and that mission is closely aligned with parental values. PDL should communicate this result to potential clients to show the value they can bring to bring to the community thorough their after-school program.

Conclusion: Parents highly value, and PDL is committed to the development of, problem solving skills. This study does not, however, show clear evidence of improvement in behaviors linked to problem solving skills. This is, in part, a deficiency of questions in the survey that tie directly to problem solving behaviors.

Recommendation: PDL should follow up on this study by working with teachers to determine whether improvements in problem solving skills are showing up in school work. Optimally, a future study can look at creating pre and post tests to more objectively measure these changes.

PROJECT FOR DIGITAL LITERACY PROGRAM EVALUATION

PROGRAM DESCRIPTION

Setting

The Project for Digital Literacy (PDL) was launched in 2000 for the purpose of helping students develop critical skills through early exposure to technology. The Project for Digital Literacy has developed a Higher Order Thinking Skills program (HOTS) to help children develop critical skills. PDL has developed an after-school program that is currently being implemented at five schools in the San Diego area.

Project Organization

The Project for Digital Literacy is a non-profit organization governed by a board of directors and managed by one full-time employee, Nick Tan. Nick Tan and Ravi Sahay, of the board of directors, acted as primary points of contact in providing information and assistance during the evaluation. PDL also works with the Harmonium program, which manages after-school programs in the San Diego area. PDL works within the Harmonium program to provide Roamer classes. Harmonium advisors also assist in working with children in the Roamer classes.

Mission

The mission of the Project for Digital Literacy is to develop "habits of mind" and "habits of work" within students during their early education. The increasing pace of technological change and globalization has made the ability to think critically and be comfortable with and confident in the use of technology more important than ever. PDL is working to foster several attitudes and skills:

Habits of Work	Habits of Mind
Thinking cooperatively	Being persistent
Sharing tasks and taking responsibility for tasks	Being less impulsive
Sharing resources	Being aware of their own thinking

Helping others	Striving for accuracy and precision
Habits of Work	**Habits of Mind**
Listening to others with understanding and empathy	Learning to plan and following the plan
Working with a sense of humor	Developing habits of questioning
Drawing on past knowledge and applying it	Developing habits of posing new problems
Taking risks	
Using all the senses	
Being creative	
Enjoying the task of solving problems	
Thinking flexibly	

Program Implementation

The Project for Digital Literacy developed a six week course that gives children hands on experience working with the Roamer Robot. Children develop critical thinking skills by programming the Roamer robot, built by Valiant Technologies, in a variety of ways. The course targets children in elementary school, generally in the first through third grades.

PDL works with the Harmonium after-school program to conduct weekly Roamer classes. Average classes of consist of 15 students each and are taught by a PDL instructor. Harmonium employees help to facilitate the class and work with children in conducting exercises with the robots.

Roamer classes generally last 45 to 60 minutes and generally consist of instruction, where teachers discuss the robot, how it can be used, and introduce the problems to be solved. Students are then given opportunities to create programs to make the robot move, change directions, make sounds, etc. Once completed, students

enter those instructions into the robot itself, by pressing the correct buttons in sequence on the top of the Roamer. Instructors discuss how to make adjustments when there are errors, and students are given another opportunity to revise their procedures and steps.

PURPOSE OF THE EVALUATION

Evaluation of the HOTS program focused on determining how the Roamer classes help participating children develop habits of work and habits of mind. This assessment took place after the close of the six week training program in the fall of 2003. Informal visits of the classes were conducted to gather information on class instruction, and a survey was given to parents to gather information. This survey attempted gather parental attitudes and feedback about changes in their children's behavior in during and after the Roamer classes were taking place.

Evaluation of the PDL's HOTS program, clearly formative and improvement-oriented, focused on determining how and in what ways the Roamer classes help participating children develop the previously described habits of mind and habits of work.

Informal visits to the fall '03 classes helped the evaluator understand class structure/organization and facilitation. At the end of the six-week course, he surveyed parents with an eye to learning

- their perceptions of the program's impact on their children (selected attitudes and skills) and
- to what degree they value the competencies that HOTS specifically targets.

This study was not able to rely on any extant data, as this was the first evaluation into overall program effectiveness.

EVALUATION QUESTIONS

The study's questions were formulated after initial client meetings and an analysis of research literature. Further discussions with the client and the evaluator's faculty supervisor helped to refine the final evaluation questions.

The following table describes the questions that this study seeks to answer, as well as the sources of the information and the reason the question is being asked.

Table 1 – Evaluation Questions

Evaluation Question	Subquestions	Source of Information	Importance of Question
1) In what ways has the HOTS program developed student *habits of mind* (In the eyes of parents)?	1.1 In what ways have students' persistence (impulse control) improved? 1.2 In what ways are students more aware of their own process of solving problems? 1.3 Have students' abilities to create and follow plans increased? 1.4 How have students problem-solving skills increased? 1.5 In what ways, if any, has students' academic performance been affected by the program? 1.6 In what ways, if any, has the program affected students' social skills?	Parents	To determine whether the program is meeting its' original objectives relative to habits of mind
2) In what was has the HOTS program improved student *habits of work* (In the eyes of parents)?	2.1 Have students' abilities to think and work cooperatively increased? 2.2 Are students more likely to share tasks to accomplish goals? 2.3 Are students' learning to take responsibility to complete individual tasks? 2.4 To what degree are students sharing resources and helping others? 2.5 In what ways has student creativity increased? 2.6 Have students' abilities to listen and communicate with others increased?	Parents	As above

Evaluation Question	Subquestions	Source of Information	Importance of Question
3) To what degree do parents feel that habits of work and habits of mind are important?	3.1 Have students' attitudes toward science and technology changed? 3.2 How has student engagement and motivation improved? 3.4 How comfortable are students in using new technology? 3.5 How have students' self-image/self-confidence improved. 3.6 In what ways, if any, has the program affected students' confidence (academically, socially)?	Parents	Help PDL understand parents' values, enabling refining program focus and improving communication with parents

IMPACT OF THE LITERATURE REVIEW

The goal of the Project for Digital Literacy is to increase students' information literacy and critical thinking skills – roughly classified as habits of work and habits of mind. The evaluator reviewed the relevant literature to determine the impact of after-school programs and LOGO and robot based education on students' critical thinking skills.

Critical Thinking Skills

Critical thinking is increasingly becoming a central focus of K-12 education. As information continues to expand exponentially, the acquisition of static knowledge is less important that the ability to acquire relevant knowledge and make critical judgments with imperfect information. The key jobs of the 21st century require more sophisticated problem solving and creativity. It is not clear that schools are currently meeting this challenge.

Psychologist Deanna Kuhn (1991) studied hundreds of people from all walks of life and found that over half the population of the United States "Cannot reliably exhibit even the most basic skills of general reasoning and argument." (p.96) Neilson

(2000) also found that critical thinking skills are in high demand by employers, but are difficult to find.

What is Critical Thinking?

Thinking about ideas critically requires at least some understanding of logical relationships between items. Ennis (1987) defines critical thinking as the correct assessing of statements. He argues that a number of proficiencies (observing, inferring, generalizing, conceiving and stating, offering a line of reasoning, evaluating, detecting standard problems and realizing appropriate action) are required in critical thinking. Ennis is focused on critical theory as a method of arriving at correct answers to questions, rather than just analyzing existing theories. Hemming (2000) argues that this "narrow focus on correctness is dangerous, for the need to reevaluate may not be realized." (p.5)

Others argue that critical thinking is more than using facility with logic to arrive at the "correct" answer. Passmore (1967) argues that critical thinking is more of a character trait evidenced by the desire to call things into question. Thus a willingness to challenge conventional ideas and social conventions may be indicative of a critical spirit. According to this view, students must be encouraged to challenge their own closely held beliefs as well as what is taught to them. It is this willingness to ask questions that must precede any technical skills in logical deconstruction.

The research suggests that critical thinking can be improved with practice (Voss, Wiley, & Carretero, 1995). Van Gelder (2001) argues that this practice should be:

- Motivated – the student should be deliberately practicing in order to improve skills
- Guided – the student should have some ways of knowing what to do next
- Scaffolded – particularly in the early stages, there should be structures for preventing inappropriate activity
- Graduated – tasks should gradually increase in complexity

- Feedback – the student should have some way of telling whether a particular activity was successful or appropriate

Stages of Development

While teachers often try to make critical thinking an essential part of instruction, most do not approach it from a development perspective. Paul and Elder (1997) created a framework that features six stages through which critical thinkers pass.

Stage One: The Unreflective Thinker

Students at this level are not aware of how their thinking is structured or how they might make improvements to it. When students run into difficult problems they are often unable to resolve them. They lack the basic ability to approach problems in a systematic, positive way.

Stage Two: The Challenged Thinker

At this stage in development students realize that they are thinkers; more importantly they recognize that that their thinking is not perfect and that they make mistakes. At this stage students are starting to develop intellectual humility and become aware of their own ignorance.

Stage Three: The Beginning Thinker

Students begin the process of explicitly taking control of their thought processes. They become conscious of ways they can improve their thinking processes and apply intellectual standards to their thinking, such as questioning beliefs.

Stage four: The Practicing Thinker

Students begin to develop important habits; specifically focusing on purpose, question, information, inferences, assumptions, and concepts. Students begin to see connections between and among the subject areas they are studying.

Stage Five: The Advanced Thinker

Advanced thinkers are able to think well in all areas of their lives. They have an awareness of typical fallacies in thinking and are able to see issue from multiple

points of view. Advanced thinkers exhibit the intellectual discipline and perseverance necessary to take on challenging problems.

Stage Six: The Master Thinker

Master thinkers are deeply committed to fair-minded thinking, and have significant control of their egocentric thoughts. Master thinkers are fairly rare, and their ability to exercise a high level of analytical and problem solving skills in a variety of domains makes them valuable.

Paul and Elder argue that we need to be aware of these stages of development and find ways to help children move through these stages within the context of the school curriculum.

LOGO Research

With an increasing interest into higher order critical thinking skills, a number of studies have been carried out to analyze the impact of LOGO programming and robotics on children. LOGO is a computer language created specifically to help students develop problem solving skills by learning how to manipulate a graphical representation of a turtle on a computer screen. Students are given predefined problems, such as drawing a certain shape, and they receive feedback as they work. Singh (1992) reported quite a bit of variability in the ability of students to develop effective problem solving procedures and debug problems that arise.

There have been a number of studies conducted to determine the effect of LOGO programming on cognitive skills such as inductive reasoning, planning, metacognition and other information-processing skills. In research conducted on inductive reasoning, Degelman, Free, Scarlato, Blackman, and Golden (1986) found that kindergarten children who had exposure to LOGO performed better on rule-learning problems, such as using procedures to solve school problems. Other researchers also found evidence of LOGO use enhancing rule-learning skills.

Another important area of LOGO has been its impact on metacognition. Clements (1985) compared the development of creativity, achievement, and cognitive skills of children learning LOGO to those in a control group of children without any LOGO training. He found that the children learning LOGO scored significantly higher in:

a) Deciding on the nature of a problem

b) Deciding on performance components relevant for a solution to the problem

c) Deciding how to combine performance components

d) Selecting a mental representation

e) Monitoring solution processes

Clements and Gullo (1984) carried out an earlier study on metacognition and LOGO and also found that students were better able to identify steps requires to solve problems after LOGO training. These findings are important because the skills being developed are general and will benefit students in other academic areas. For example, children with greater ability to frame problems will be more successful in coming up with solutions when problems arise during homework.

Learning with Robots

While the literature is not as extensive, a number of articles have been found on the the way that robotics impacts learning. Some of these studies have focused on changes in children's attitude and behavior. Most have been small scale, and involving children in single classrooms. A study by Wang and Wang (2001) looked at the degree to which children could learn programming skills using robots. The study only looked at a small number of students, but preliminary results seemed to show that students were better able to read and predict programming instructions after practice using the robots.

Another study by Martin (1996) used programmable bricks to introduce engineering and science ideas to elementary and high school students. The study focused on getting students involved in all stages of creation from design and construction, to troubleshooting and debugging. The program continued throughout the school year, and Martin reported that students exhibited mastery of the technology as well as "feelings of ownership and pride with their accomplishments." (p.14)

Levy, Midouser, and Tallis (1996) created a study to look at children's perceptions and learning of technological systems. Six students were given access to robots

and a computer interface to program them. The authors found that students varied in their ability to create complex rules for the robots. They also found that adult support helped the children to successfully verbalize more complex interactions with the robot.

A study by the MIT Media Lab, conducted by Urrea (2001) explored how robots might help student learning, while contributing to social development in rural life. Twenty Five third grade students in Columbia and Costa Rica, and were able to choose projects with a community improvement emphasis. The authors concluded that the students demonstrated in increase in technological fluency, but this was not accompanied by any formal assessment. The study also emphasized the social nature of technology, and its ability to serve communal, as well as individual needs.

FIRST Evaluation

FIRST (For Inspiration and Recognition of Science and Technology) is an organization, which teaches children technology to build self-confidence, knowledge, and life skills. FIRST brings together teams of students in technology based project competitions that often include robotics. First has commissioned a number of evaluations of their program, and while these studies are not peer reviewed they find that there are a number of benefits from the program.

1) Student Engagement

2) Building knowledge and Skills

3) Developing Community Values

The studies commissioned by FIRST give some evidence of the social and academic benefits that can result from a well developed after school program in robotics.

ISSUES AND CONCERNS

A number of factors impacted the conduct of this study, including how data were collected, analyzed and reported.

Initial data gathering called for parents to fill out surveys at home. Unfortunately, very few of the surveys were initially returned. This lead to a revision of the data

gathering plan, in which parents were asked to fill out surveys at the time they came to pick up their children from their after-school activities.

Another issue concerned the timely gathering of the data. Harmonium evaluators were not sufficiently trained in data gathering, which delayed the process of sending back the surveys. Most of the employees did not return the surveys in a timely manner, and contacts were made to get all the surveys mailed back for analysis.

METHODOLOGY

Evaluation Design

The PDL study was behaviorally-focused—reflecting the evaluator's major investigative interests (habits of mind, habits of work). The behavioral framework allowed him to determine the extent to which program objectives have been attained (Russ-eft & Preskill, 2001); in this case, attainment was viewed through the eyes of parents. Results can help key stakeholders make next-steps decisions about program implementation (content, facilitation, activities, etc.).

Future studies can also take a behavioral stance—but explore the issues through student performance, attitudes, and values.

Selection of Subjects

Study participants included the parents of children who participated in the PDL HOTS program during the fall 2003 school semester. To help ensure a large and representative response, the evaluator surveyed parents at all five schools taking part in the program. One parent of each student was asked to complete a form; unfortunately delayed administration at one site forced the evaluator to exclude that school from his findings. The results of the survey which follow in the findings section of this report represent:

- Vista Grande – San Diego Unified School District
- Wegeforth – San Diego Unified School District

- Cubberly - San Diego Unified School District
- San Ysidro – San Ysidro School District

Instrumentation

The evaluator created a two-part survey to address his evaluation issues.

Parental Values

The first part of the survey focused on importance parents placed on habits of work and habits of mind targeted by the program. Parents were asked to rate whether or not they felt a specific skill or attitude was important for their child to learn. For example:

Learning about science and technology is:

1- Not important

2- Relatively unimportant

3- Relatively important

4- Important

5- Very Important

Parents were asked to rate the extent to which a specific skill or attribute was important to learn, using a five point ordinal scale. The section contained 20 total questions whose purpose was to find out what skills and attitudes parents thought were most important for their children to learn. Given this information, PDL can communication more clearly with parents the value of the HOTS program.

Student Behavior

The second part of the survey called for parents perceptions about specific behaviors their children exhibited. Behaviors reflected the habits of mind and work that the program targets. Parents responded via a five point scale anchored by (1) Strongly disagree and (2) Strongly agree. An example of one of these questions would be:

In the last 7 weeks (the duration of the class) my child has been more willing to help others at home when asked or needed.

1- Strongly disagree

2- Disagree

3- Undecided

4- Agree

5- Strongly Agree

There were a number of types of questions addressed, including working with others, academic achievement, general critical thinking skills, and creative thinking.

Pilot Testing

The survey was initially pilot tested with a small number (3) of the evaluator's co-workers, and formatting and wording suggestions were made as a result of that feedback.

Data Gathering

The Harmonium representative to the five participating schools agreed to administer the survey to parents. Initially, he allowed them to complete the forms at home; unfortunately, however, few actually turned them in. Ultimately, the representative produced another survey set, and had parents complete the forms when they picked their children up from class.

The evaluator received completed sets of forms by mail; the results that follow (*Findings*) represent data from four of the five schools involved in PDL this Fall (30 of 60 forms returned, for a 50% response rate).

Data Processing and Analysis

Descriptive analysis performed, including frequency distribution and measures of central tendency. After the data was gathered and mailed in from the Harmonium representatives, it was entered into a Microsoft excel spreadsheet. In Excel, the frequency distribution for each question was created, and the percentage of people giving each response was calculated.

LIMITATIONS OF THE STUDY

A number of constraints must be factored in when determining the veracity of the data. It is important to remember that this study is only the first step in beginning to determine the PDL's success in meeting its stated goals.

While the overall percentage of respondents to the survey was fairly high, this study only reflects the attitudes and observations at four schools in the San Diego area; it is clear that more studies need to be conducted. As previously mentioned, one of the schools participating in the survey did not return their data in time to be included in the analysis. Because of these factors, these data cannot be generalized without further study.

Also, the second part of the survey represents parental perceptions of student skills and attitudes, and actual performance cannot be inferred. Because this study relies on observations of parents, it is necessarily contains an element of subjectivity, which might be reduced in future studies by pre and post testing students on some behavioral measures of critical thinking.

Even with these caveats, however, the results of this study give important insight into parental values, and changes in student attitudes and behaviors.

FINDINGS

As discussed earlier in this report, there were really two major questions that this study sought to address: Parents attitudes and changes in student behavior following Roamer classes.

Parental Values

The first section of the survey focused on parents' perceptions of skills and attitudes targeted by the program. The study rates 20 statements on a scale that ranked from "not important" to "very important" depending on how much value was placed on each statement.

The purpose of this exercise was not to determine these values in an absolute sense, but to understand which values parents found to be the most important, and

which values they considered less important. The results below show the 5 attitudes and skills ranked most important by parents.

Table 2 – Top skills and attitudes (n=29) Complete results in Appendix B

Skill or attitude	Rank (out of 20)	Mean
• Develop problem solving skills	1	4.36
• Have a positive attitude toward school	2	4.31
• Draw on past knowledge and apply it to new situations	3	4.29
• Take responsibility for individual tasks	4	4.25
• Develop creativity	5	4.23

Interestingly, perhaps the central goal of the PDL is to develop critical thinking skills, which also turned out to be the most important goal parents had for their students. Secondly, parents feel it is important that children develop positive attitudes toward school. While HOTS does not take place during regular school hours, some research indicates that a well developed after-school program can increase student attitudes toward school. (Miller, 2001)

The attitudes and skills that the parents believed to be least important are included in the table that follows:

Table 3 – Bottom skills and attitudes (n=29) - Complete results in Appendix B

Skill or Attitude	Rank (out of 20)	Mean
• Have hands on experiences with technology	15	4.04
• Develop positive attitudes toward math and science	16	3.96
• Learn to create and follow plans	16	3.96
• Develop persistence, learn to be less impulsive	18	3.93
• Lean about science and technology	19	3.79
• Take risks	20	3.52

One of the most interesting things that can be seen from the proceeding table is that three of the six skills or attitudes that parents valued least dealt with science and technology. Also, while parents feel that taking responsibility is important (rank of 4) developing persistence and following plans was not considered important.

Student Behaviors

The second major purpose of this study was to start to answer the question of whether or not the HOTS program is having a positive impact on the habits of mind and habits of work of the students participating in the program. The table below shows those skills and attitudes that have shown the most change (reported by parents) after taking the PDL's Roamer classes. The study measured parents' perceptions of their children's behavioral and attitudinal growth on a five point Likert scale (shown above in *Student Behavior*).

Table 4 – Top skills and attitudes (n=29)

Rank (out of 15)	Question	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	my child has taken greater responsibility for completing tasks and chores on their own	7%	11%	30%	22%	30%
2	my child has shown more creativity, playing in unique, interesting, or imaginative ways	11%	7%	33%	15%	33%
3	my child has shown more curiosity, asked me more questions	4%	19%	22%	37%	19%
4	my child has an improved attitude toward school and school work	8%	12%	31%	27%	23%
5	my child is more aware of his/her own thinking.	0%	26%	26%	26%	22%

It is clear from these results that even the skills and attributes that were judged to have improved the most, the percentage of parents that agreed or strongly agreed with these statements was around 50%. Of the top five answers presented above, four related to habits of mind, and one to habits of work.

The table below shows that some of the attitudes and skills that parents value the most also showed the highest level of improvement as seen below:

Table 5 – Top skills and attitudes (n=30)

Importance Rank	Importance Question	Changes Rank	Changes Question
2	Have a positive attitude toward school	4	my child has an improved attitude toward school and school work
4	Take responsibility for individual tasks	1	my child has taken greater responsibility for completing tasks and chores on their own
5	Develop creativity	2	my child has shown more creativity, playing in unique, interesting, or imaginative ways

CONCLUSIONS, RECOMMENDATIONS, AND FURTHER RESEARCH

PDL initiated this study in order to determine parental values and how successful HOTS has been in inculcating habits of work and habits of mind. This study does show that *a majority of parents surveyed agreed or strongly agreed* that:

- **my child has taken greater responsibility for completing tasks and chores on their own**
- **my child has shown more curiosity, asked me more questions**
- **my child has an improved attitude toward school and school work**

Conclusion: This study provides evidence for improvement in a number of student behaviors related to habits of work and habits of mind.

Recommendation: Further studies should be carried out to validate these findings. As the HOTS program expands to other areas, additional studies should be carried to endure that the results of this study are generalizable to other age groups (older students) and other locations outside San Diego.

This study also gives important information to PDL about the skills and attitudes parents want their students to learn.

Table 6 – Top skills and attitudes (n=29)

Attitudes or Skills	**Percentage who believe statement is important or strongly important**
develop problem solving skills	76%
Have a positive attitude toward school	70%
Draw on past knowledge and apply it to new situations	79%
Take responsibility for individual tasks	71%

Conclusion: The parents of the children participating in the HOTS believe that most of the skills and attitudes that PDL is targeting are important. Interestingly, parents are not concerned with students having hands on experience with technology, or in developing technology skills. Instead, parents appear to value more general skills such as creativity and problem solving.

Recommendation: PDL needs to clearly communicates its vision and mission to parents. PDL does appear to have a clearly defined mission, and that mission is closely aligned with parental values. PDL should communicate this

result to potential clients to show the value they can bring to bring to the community thorough their after-school program.

Conclusion: Parents highly value, and PDL is committed to the development of, problem solving skills. This study does not, however, show clear evidence of improvement in behaviors linked to problem solving skills. As a result, the evaluator recommends further study and an emphasis on tying Roamer classes to critical skill building objectives.

Recommendation: PDL should follow up on this study by working with teachers to determine whether improvements in problem solving skills are showing up in school work. Optimally, a future study can look at creating pre and post tests to more objectively measure these changes.

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APPENDIX A – SURVEY

APPENDIX B – SURVEY RESULTS

APPENDIX C – DIGITAL LITERACY PROJECT MISSION