

## **Cultivating Diverse Talent in Science, Technology, Engineering, and Mathematics (STEM)**

### **Assessment Report**

Dr. C. June Maker, Principal Investigator, University of Arizona, Tucson, AZ

### **What is Discovering Intellectual Strengths and Capabilities while Observing Varied Ethnic Responses (DISCOVER)?**

The Discovering Intellectual Strengths and Capabilities while Observing Varied Ethnic Responses (DISCOVER) Projects is a 20-year program of research on identification and development of talent and giftedness in culturally and ethnically diverse populations. The Project is directed by Dr. C. June Maker at the University of Arizona. DISCOVER is an educational framework in which “at-risk” students are viewed as being “at-promise” for success due to their creative problem solving strengths in diverse cognitive domains.

When students’ strengths are identified and teaching approaches developed so that strengths are used as vehicles for developing academic and real-life skills, students from all groups, including those considered to be “at-risk” experience greater success in school. They and their teachers and caregivers develop more positive and realistic beliefs about their potential to succeed. When academic skills are taught within the context of real-world problem solving, these academic skills take on new meaning, and are perceived as relevant.

### **What is included in this report?**

This report was developed to help educators use the results of the DISCOVER Creative Problem Solving assessment as a vehicle for providing the best learning experiences for their students. This report provides teachers with learning profiles for students and classrooms to help teachers understand the strengths of each student. It contains five sections:

Section A: General information—includes information about the assessment and how it was conducted.

Section B: CDTIS/DISCOVER Curriculum and teaching strategies—includes how areas of strength and different types of abilities can be used in planning learning activities.

Section C: Classroom Profile—includes a summary of all the students’ strengths and weaknesses.

Section D: Students’ Profiles—includes each students’ areas of strength compared with other students assessed in the school.

Appendix A: A teaching unit developed and taught by a teacher involved in the DISCOVER V Project.

### **How do I read this report?**

1. The first section contains general information about the creative problem solving assessment and how student abilities were assessed. If you are interested in reviewing the assessment procedures and criteria being used, you could go directly to the first section.

2. The second section is about the teaching strategies that are appropriate for each type of ability measured. General characteristics of people possessing a particular type of ability, teaching strategies, teaching tips, and ways to foster each type of ability are included in this section. You need to refer to this section when you plan instructional strategies and activities.
3. The third section contains the creative problem solving assessment results for your classroom. In this section you will find information about the strengths of all students in your classroom, names of students who possess superior strengths in different areas, other students' areas of strength, and ways to group students in your classroom based on their strengths.
4. The fourth section includes each student's profile compared to the other students assessed in the classroom. You could refer to this section when you are planning for individual students and for group activities that will build on the strengths of the majority of students.

### **Section A: DISCOVER Creative Problem Solving Assessment**

The DISCOVER activities are part of a unique assessment of creative problem solving abilities based on new beliefs about intelligence and creativity. In the DISCOVER Project at The University of Arizona, we believe that people have several different abilities, not just one. We also believe that all of us can become successful if we understand our unique pattern of abilities, combine those abilities with interests, invest time and energy in developing what we like and are good at doing, and create opportunities to experiment and grow. The assessments consist of two types of activities: hands-on and paper/pencil. The hands-on activities are assessments of knowledge gained from experiences while the paper/pencil activities are assessments of knowledge and skills gained in school and other academic learning situations.

#### **Hands-On Activities**

The hands-on DISCOVER Creative Problem Solving Assessments are administered to an entire classroom of students who are clustered at tables in groups of four or five. A trained observer is assigned to each table, and observers work with different students for different activities. The trained observers at each table have sheets for recording behaviors observed during the problem solving tasks. Pictures are taken of students' creations, and their comments are recorded. Hands-On activities are Spatial Artistic, Spatial Analytical, Oral Linguistic, Naturalist, and Mechanical-Technical.

Translators or bilingual observers are provided for students whose first language is other than English. Teachers and observers are instructed/reminded that each student's response is accepted without judgment or show of favoritism; every contribution is valued equally.

Immediately following the assessment, the observers meet to complete the observation and debriefing tasks. The following steps are included: (a) Complete observer notes on each student observed; (b) As a team, discuss students' performance in each activity; and (c) Compile all information for each student.

Scores are determined in the context of the student's setting; that is, after the assessment, the team discusses the group's performance as a whole as well as those individuals who stand out as exceptionally competent in an activity. The ratings are as follow: *Wow! Definitely, Probably, Maybe, Unknown, and Redo*. These are assigned based on observed competency within an activity, *compared to their peer group, and in special instances compared to a group from the same grade level and school setting assessed at a different time*.

Students are rated based not only on their problem-solving skills within a variety of domains, using performance-based assessment, but, additionally, they are seen within the group with which they are most closely identified. Obviously, a "Wow!" is reserved for those who are outstanding in a particular area; less obviously, "Redo" means that the observer believed that the observation, for whatever reason, was not necessarily an accurate measurement of the student's competence in that activity.

**Spatial Artistic.** The spatial artistic activity is an assessment of general spatial abilities, those needed by artists, designers, photographers, and others who need to see the visual aspects of an idea and either create it for themselves or to communicate ideas to others. Students are given brightly colored hard cardboard shapes and are asked to design certain objects from the environment or from their imagination. At the later stage of the activity, they also are given plastic connectors so they can put the pieces together to make complex, three-dimensional constructions. They are led through a process in which they first explore the materials, then create what they see in photographs. Next, they create something from their imagination. In the last activity, they can create anything they want to create.

**Spatial Analytical.** The spatial analytical activity is an assessment of the abilities needed by engineers, astronomers, architects, mathematicians, builders, road and city planners, and others who need to be able to see the "big" picture and fit all the parts together to make it work. Students use Tangram pieces (regular geometric shapes such as triangles, squares, and parallelograms) to solve puzzles of increasing difficulty and make shapes in different ways. After some general instructions about making basic shapes and substituting pieces to make other shapes, students are asked to make a large shape with as many of their tangram pieces as possible. Next, they solve 6 puzzles of increasing difficulty. Puzzles have been constructed so that most students can solve the first 2 or 3 puzzles, but only a small percentage of students can solve all of the puzzles in the time allotted to the activity. Observers watch students and record how much time they take for each puzzle and the order (within the group) in which they completed them. Clues can be given if students have worked on a particular puzzle for 5 minutes and want to have a hint.

**Oral Linguistic.** This is an assessment of the abilities needed by anyone who needs to communicate ideas orally to others. Storytellers, public speakers, teachers, and others need skills in the use of oral language. During this assessment, students are given a bag of toys to use to stimulate their thinking and story-telling. Each student gets different toys, but the toys are similar types. For instance, they get people, but some get a man and a boy, others get a grandmother and a baby, and others may get a policeman and a woman. During the activity, they notice similarities and differences in the characteristics and finally tell a story about any or all of their toys.

**Naturalist.** The Naturalist assessment was developed to measure students' ability to make connections between living and non-living things in nature and to understand the relationships among components of ecological communities. Students who have more experience and knowledge about nature will easily understand the relationships among components in the environment and will be excellent observers of the characteristics of elements of the environment. The students who have naturalistic abilities can explain relationships between components of the environment, will sort different types of species, and will easily notice details of things around them.

Species sorting and creation of an ecosystem are the two main activities that students are asked to complete in this assessment. In the first activity, students are asked to sort 14 flower or insect cards. Students group the insects or flowers that are alike in some way and label each group. In the second activity, students are given different types of materials such as clay, markers, drawing paper, flower cards, insect cards, and rocks to create an ecosystem that will support the needs of all the elements they chose to include in the ecosystem. They must show how all the elements of their ecosystems are related.

**Mechanical-Technical.** The Mechanical-technical assessment was developed to measure students' skills related to understanding, creating, and repairing machines or other devices that perform or help perform human tasks. The students have 90 minutes to build their constructions. First, the observers give the students a picture of a simple gear construction and ask the students to build the same construction by using the materials they are given. Second, the students are given two choices of vehicles and are asked to select one to build. Finally, when they complete the vehicles, the observers ask the students to make a machine that moves by using the remote control device and the motors. This final construction should be students' own design. During all these steps the observers take pictures of all constructions (from different angles if needed). These pictures, all the notes taken about the students, and the results of their interviews about their constructions are then used by the team in the debriefing session to make decisions about the levels of abilities of the students.

### **Paper/Pencil Activities**

The paper/pencil activities are conducted in a large-group setting with one or two monitors to assist students in following the instructions. High school students may be assessed in several different classrooms or content areas or in one large group. Paper/Pencil activities are Written Linguistic, Life Science Concept Maps, Physics Concept Maps, and Math.

**Written Linguistic.** The written linguistic activity is an assessment of the abilities needed by writers and anyone who needs to communicate through written forms, such as journalists, scientists, teachers, researchers, and others who need to express ideas through writing. In this activity, students are asked to write about anything they want to write about, and are given as much time as needed to do the writing. They also are told that they will not be judged on the mechanics of their writing, but rather on the ideas they express.

**Concept Maps.** Concept maps are visual images of the concepts that students have in their minds. Concepts are represented in the form of a proposition that is a combination of two concepts labeled with a linking word that explains the relationship between two concepts. By using concept maps, we aim to measure students' conceptual understanding, students' ability to connect different concepts,

and their ability to sort the concepts in a hierarchical order. Students are given a list of concepts related to climate change (Life Sciences Concept Map) and to Newton's three laws of motion (Physics Concept Map), and are asked to make a map of the relationships. To score the Concept Maps, we analyze the number of relationships between concepts, the number of concepts used, and the number of relationships students recognize, including hierarchical ones.

**Math.** The Math assessment is a measure of the students' ability to analyze problems logically, understand the underlying principles of systems, do mathematical calculations, and manipulate numbers, quantities, and operations to solve mathematical problems. The students have 50 minutes to solve problems that range from closed to open ended on the sheet that they are given. On this sheet the first problems consist of mathematical equations. The next questions are math squares that students are asked to complete. The final questions are designed to measure the students' abilities to understand the mathematical concepts and apply them in creative ways. Scores on the math assessment include the accuracy of answers as well as the number and originality of their answers to the open-ended problems.

### **Section B: Curriculum & Teaching Strategies**

*We think, learn, and create in different ways.*

*Each individual is unique in each of his or her processing skills.*

#### **The DISCOVER Curriculum Model**

The DISCOVER Curriculum Model evolved over time into a comprehensive approach to empower students and make teaching more rewarding. Based on what was learned from the assessment, experience with students and problem solving, and the concept of multiple areas of human competence, it has emerged as a strong and effective way for students to learn. While it is appropriate for all students, it is essential for those who are highly talented; it is based on their learning needs, which are determined by their characteristics.

The DISCOVER Curriculum Model is based on the belief that students learn best by constructing their own learning from guided but open-ended experiences, making significant choices about their own learning, and having access to a wide variety of materials.

The teacher's role is that of guide to information and learning, rather than the source of all knowledge. Teachers must consider student interests and strengths as well as their knowledge and skill levels to develop curriculum to teach the prescribed skills and concepts. The key idea about curriculum and teaching is that students use their dominant abilities to stimulate learning in all subjects, especially subjects in which they are weaker.

Effective teachers of the DISCOVER Curriculum implement the following principles in their classrooms:

1. Provide opportunities for students to develop their multiple abilities;
2. Provide opportunities for students to solve problems;
3. Use active, hands-on learning with the "tools" of the multiple abilities;

4. Integrate the culture of the students and of the community into the curriculum; and
5. Plan curricula around state standards and abstract themes.

### **Problem Continuum**

The problem continuum is a key component in the development of the CDTIS/DISCOVER Curriculum. The curriculum for highly talented students should consist primarily of Types III, IV, V, and VI, with Type VI being the most appropriate and motivating. Solving real-life problems raises the emotional and motivational stakes for the learner. While solving real-life problems requires significant amounts of time and resources, it is through struggling with the issues contained therein that students learn both content and critical thinking. In the following section, problem types are explained and illustrated.

Appendix A contains a science teaching unit developed and taught by Judy Reinoso when she was a teacher in the Tuba City Unified School District.

Six types of problems are embedded in the DISCOVER curriculum. Problems are arranged from well-structured (Types I, II) to least structured and more open ended problems (Types V, VI). Following is a description of the problem types in the DISCOVER Model.

**Type I.** The problem and the method of solution are known to the problem presenter and the problem solver; the presenter knows the (one) correct solution. Solving math problems by a known algorithm or method; following a formula, in language, music, math or science; and performing prescribed body movements, as in dance or sports are Type I problems.

**Type II.** In Type II problems, the problem is known by the presenter and the solver, but the method of solution and solution are known only to the presenter. Type II is close to Type I in structure, except that the problem solver does not know the method by which to arrive at a solution. Problems such as mathematical “story problems” requiring the solver to figure out and apply the appropriate method to solve the problem; answering questions about factual material; scientific “experiments” with prescribed materials and variables; playing an instrument while sight reading the music; and creating a scale drawing are Type II problems.

**Type III.** The problem is known to the presenter and the solver, but more than one method may be used to arrive at the correct solution, which the presenter knows. Type III problems require a specific solution but many methods may be used to reach this solution. Finding the “key” to mathematical, word, or linguistic patterns; movement sequences created to meet specific requirements; and constructions using specified materials and meeting given criteria are Type III tasks.

**Type IV.** The problem is known to the presenter and the solver, but the problem may be solved in more than one way and the presenter knows the range of solutions. Problems that can be solved inductively but that have an accepted range of answers, such as geometry problems that may be solved using manipulatives; creating as many equations as possible using three (provided) numbers and the operations of addition and subtraction; writing Haiku; and creating music or movement sequences within defined parameters are examples of Type IV problems.

**Type V.** The problem is known to the presenter and the solver, but the method and solution are unknown to both. Type V problems are clearly defined, but methods and solutions are open. Questions such as, “In what ways might you share the results of your survey?” define Type V problems, as do constructions using specific materials and meeting pre-set goals, (such as building a mousetrap vehicle); creating prose or poetry; making a self-sustainable terrarium or aquarium; writing lyrics to an existing melody; writing a melody for existing lyrics; and finding new ways to apply existing formulas. Future Problem Solving (FPS) is a special case of Type V. The problem is known to the presenter and the solvers, and the solvers are taught the CPS process to use in developing their solution, but the solution is unknown to all.

**Type VI.** The problem is unknown or undefined and the method and solution are unknown to both presenter and solver. Type VI problems have the least structure; are the most complex; need to be defined and, possibly, redefined; and have numerous possible solutions. These are the problem situations we find in real-life that can be defined in more than one way and that may need redefining during the problem solving process. Type VI problem situations include those such as environmental pollution; student behavior; ethical behavior and standards; global warming; urban problems; social issues, such as violence or declining literacy; and international border issues. Type VI problems are not only appropriate for gifted students to grapple with, but are a critical aspect of their education.

### **Curriculum Differentiation**

Another way to develop activities for your students to address their intellectual needs is by *Curriculum differentiation*. In differentiated classrooms, teachers provide specific ways for each individual or small groups of students who share the same intellectual strengths to learn as deeply as possible and as quickly as possible.

Using the DISCOVER assessment results, teachers can plan learning activities according to students’ area(s) of strengths. For example, students who possess mechanical-technical strengths could work on a product that represents this intellectual strength, like model-building, and 3-D design. Students who possess spatial analytical and logical-mathematical strengths could work on a product like a diagram, table of classification, or crossword puzzle. Teachers need to determine what types of intellectual strengths are in the classroom, and then think about products that represent each type.

### **Developing Logical-Mathematical Ability**

Students who possess logical-mathematical ability are capable of analyzing problems logically, understanding the underlying principles of systems, doing mathematical calculations and manipulating numbers, quantities and operations, investigating issues, solving mathematical problems, using experiments to test things, and exploring patterns and relationships. The abilities assessed in this activity are used by engineers, accountants, mathematicians, real estate agents, financial planners, statisticians, and others who work with numbers and who attempt to predict or plan for the future.

### **Teaching Strategies**

- Use scientific demonstrations
- Use logical problem solving

- Teach critical thinking
- Calculate mathematically
- Provide logic puzzles and games
- Create codes
- Teach basic math from concrete to abstract
- Practice quantification
- Encourage classification and categorization
- Use Socratic questioning
- Use heuristics and scientific thinking
- Use manipulatives for hands-on experiences
- Design lessons to include direct instruction, guided practice, and hands-on problem solving
- Encourage pattern awareness
- Use computer games that encourage complex thought processes and computer programming
- Provide activities that make math, fun, relevant and challenging
- Relate math and science to real life situations
- Facilitate cooperative learning games
- Make charts, graphs, and lists
- Use sequencing patterns and relationships
- Practice predicting

### Teaching Tips

- Motivating special needs students to engage this intelligence may be the key
- Make tasks involving numbers fun
- Use games, objects, and activities
- Focus on reasoning
- Use manipulatives prior to calculations
- Encourage the use of calculators
- Use pictures, objects, movements, and musical beats to demonstrate and help understand concepts
- Demonstrate with authentic applications such as travel, shopping, cooking, and other every-day activities
- Create activities that develop over time such as mock companies and communities
- Use computers for math practice, problem solving, and logical thinking

### To Encourage Learning with this Ability

Allow	for individual and group interpretations of problem solving processes.
Create	challenging tasks.
Display	formulas, Venn diagrams and matrices—categorizing facts and information—mathematical operations, time lines, outlines.
Encourage	research projects.
Explore	patterns and their relationships.
Facilitate	hands-on experiments and working in labs.
Relate	to real-life situations.
Use	computers, calculators, puzzles and games, and mock communities.

### Developing Spatial Ability

Spatial analytical abilities are needed by engineers, astronomers, architects, mathematicians, builders, road and city planners, and others who need to be able to see the "big" picture and fit all the parts together to make it work. Spatial artistic abilities are needed by artists, designers, photographers, and others who need to see the visual aspects of an idea and either create it for themselves or to communicate ideas to others.

### Teaching Strategies

- Use graphic organizers
- Concept maps during instruction
- Allow for adequate WAIT TIME between verbal cues and verbal responses
- Use verbal presets: imagine picture visualize
- Encourage the use of sketches and graphic organizers during writing activities
- Incorporate charts, diagrams, imaginative storytelling, painting, collage, and visual thinking exercises
- Use mind-maps and other visual organizers,
- Use computer graphing software,
- Play with optical illustrations,
- Use color markers and coding to represent different ideas
- Use idea sketching and graphic symbols

### To Encourage Learning with this Ability

Allow	creative exploration of manipulatives for sketching of vocabulary words and concepts, use of a variety of art materials, and adequate wait time between verbal cues and responses.
Create	a graphic rich environment and color coding systems.
Display	brightly colored pictures, posters, graphics, charts, and graphic organizers.
Encourage	the use of illustrations, sketches, drawings, active visualizations, and imagination.
Facilitate	student centered learning, time for constructing, assembling, designing, sculpting, and "see/draw/share/embellish" time during instruction.
Relate	learning opportunities using cameras, videos, props, pretending, and creative play, dramatic productions with sets and costumes, art activities using "junk art supplies such as beads, buttons, Styrofoam peanuts, and packing materials, yarn, colored "glass", and fabric.
Use	overhead transparencies, blackboard, graphic organizers, and visual "markers" during math, music, and language arts.

### Linguistic Ability

Students who possess linguistic ability are sensitive to spoken and written language, capable of learning language and expressing their thoughts and they have the capacity to use language effectively, have good memory and highly developed auditory skills. People who possess linguistic skills are television and radio announcers, actors, politicians, storytellers, translators, administrators, lawyers, interpreters, teachers, and other occupations in which people talk to individuals or to small or large groups of people.

### Teaching Strategies

- Use idea sketching and graphic symbols
- Use lectures, writing, students' speech, storytelling, brainstorming debates, choral reading, and individualized reading
- Employ metacognitive strategies
- Teach skills in a meaningful context
- Facilitate large or small group discussion for improving communication skills
- Provide a variety of printed and multi-media materials such as books, word games, audio recordings, journal writing, publishing, and talking books
- Create a print-rich classroom environment displaying students' creative work
- Create a risk-taking environment fostering an acceptance of approximations
- Discover individual interests
- Model the joys of reading and writing
- Set up centers for listening, reading, writing, speaking, cooperative groups, peer coaching, problem solving, and computer use

### Teaching Tips

- Think strategically to plan and monitor their comprehension and revise their strategies
- Have strategies for what to do when they do not know what to do
- Persevere in the face of contradictory or inadequate information
- Use verbal presets: imagine picture visualize
- Know that their own success is a direct result of their effort, ability, and determination

### To Encourage Learning with this Ability

Allow	for a variety of methods.
Create	student made bulletin boards.
Display	samples of students' creative work, motivational posters; encourage student centered learning, meta-cognitive strategies, and mnemonics.
Facilitate	peer teaching and counseling, cooperative learning groups, student centered learning, problem solving centers, field trips, guest speakers, computer instruction, labs with hands on experiences and activities.
Offer	learning opportunities using comic books, films, games, magazines, radio, TV, & VCR.
Share	personal experiences, familiar items and ideas, and dramatic readings.
Use	manipulatives, prediction lessons, and computers for composition.

### Developing Naturalist Ability

Students who possess naturalist ability are interested in nurturing, exploring their environment, and learning about other species. They understand the fundamental principles in subjects such as botany, biology and zoology. They have ability to categorizing and cataloging information easily. Abilities assessed in this activity are used by biologists, medical professionals, conservationists, farmers, and others who show a sense for detail, and understand and can explain natural phenomena.

### Teaching Strategies

- Use scientific demonstrations
- Organize field trips to natural areas, and natural history museums
- Encourage classification and categorization
- Provide opportunities to collect, label and mount specimens from nature
- Use taxonomic keys and let students create their own keys
- Encourage pattern awareness
- Make charts, graphs and design lessons to include direct instruction, guided practice, and hands-on problem solving
- Examine and resolve a local environmental problem using a stakeholder approach
- Invite local biologist, medical professions and others to give talks about their professional work
- Make collections of the local flora and fauna
- Make models of ecosystems
- Do experiments in nature

### **To Encourage Learning with this Ability**

Allow	for individual and group interpretation of problem-solving processes
Create	challenging tasks
Display	various ecosystems and their components
Encourage	whole class discussions on problems related to biological classification
Facilitate	classification methods, problem-solving activities, and naturalist group activities
Use	Videos and books on nature and professional working in biological sciences

### **Mechanical-Technical Ability**

Students who possess mechanical technical ability have the skills related to understanding, creating, and repairing machines or other devices that perform or help perform human tasks. They have the ability to understand and manage technical mechanisms. They also understand what actions follow a specific mechanical practice. Abilities assessed in this activity are used by engineers, inventors, medical technologists, industrial artists, and others who use technical approaches in their interrelation with life, society, and the environment.

### **Teaching Strategies**

- Use mechanical demonstrations
- Organize field trips to technology companies and technology museums
- Provide opportunities to construct machines
- Teach basic mechanical methods
- Encourage imagination through open-ended problem-solving
- Encourage pattern awareness
- Make charts, graphs and design lessons to include direct instruction, guided practice, and hands-on problem solving
- Invite local technology experts, industrial biologists, and medical technologists to give talks about their professional work

- Provide and use computer technology
- Teach critical thinking skills
- Provide activities than make technology and mechanics fun, relevant and challenging
- Relate technology and mechanical ability to real-life situations

### **To Encourage Learning with this Ability**

Allow	for individual expression and interpretation of problem-solving processes
Create	challenging tasks
Display	various technology and mechanical systems in real-life situations
Encourage	whole class discussions on problems related to technology
Facilitate	mechanical construction, problem-solving activities, and group activities
Use	Videos and books on technology and mechanics

### **Grouping**

Grouping is an organizational structure that could be used effectively and purposefully in the classroom. Some students are premature and grow more than others. For example, when students struggle or advance as learners, the teacher has to use the students' profiles to help them in learning and try to develop their areas of weakness. Therefore, to meet individual needs, teachers need to draw upon the student's profile by using different types of grouping.

Three types of grouping are often used in regular classrooms: (1) homogenous grouping; (2) heterogeneous grouping; and (3) interest grouping. When teachers group students based on similar or different profiles of strengths and needs, they can provide a wide range of instructional strategies and activities that help students in each group setting to learn purposefully.

An important principle to use in all types of groups is that students are cooperating in accomplishing one goal, and not competing with each other.

### **Homogenous Grouping**

Often, students are grouped according to overall abilities such as when students with high IQs are in the same programs or classrooms. Instead, we suggest that students be grouped according to their specific intellectual strengths rather than overall level of ability. For example students who possess superior strengths in the logical mathematical area could be grouped and work on one activity accordingly. This type of grouping could be very effective for students to develop their area of strength and their area of weaknesses. They learn easily when they are taught by activities that use this intellectual strength or this area could be developed by involving the students in such activities.

### **Heterogeneous Grouping**

Groups in this setting consist of students with multiple types of abilities. Most regular classrooms are examples of heterogeneous grouping. Even though this type of grouping isn't recommended all the time, it could be used effectively to help students share their experiences with others and learn how to solve problems from different perspectives. Also, heterogeneous grouping is very helpful for students to work cooperatively and depend on each other in their learning experience. For example, if students are working together to develop a presentation, those with logical-mathematical strengths could develop a way to present data in a table or graph while those with mechanical-technical strengths could develop a device to demonstrate a concept or idea.

### **Interest Grouping**

Regardless of students' abilities and their areas of strengths, students could be grouped according to their areas of interest. Teachers could provide students with a variety of activities and let them choose from those that reflect their interests. At the high school level, in STEM areas, the most effective teaching practices include encouraging and providing opportunities for students to conduct their own original research in areas of personal interest.

## **Section C. Classroom Profile**

### **Classroom Strengths**

Students in your school were observed using the CDTIS/DISCOVER Assessment. In the school profile, all six assessments are shown. The first graph shows the strengths of students in each area. Therefore, teachers need to consider these strengths and weaknesses when they plan classroom activities.

**Insert Graph of Classroom Strengths Here**

## **Section D. Individual Students' Strength Profiles**

### **Individual Student Strengths**

Students in your school possess different levels of problem solving ability. Some of them are superior in one and/or more areas and others are not. However every student has at least one area of strength. Table 3 shows students' areas of strength in creative problem solving skills.

**Add here graphs of strengths for each student.**

**Appendix A**

**Teaching Unit Developed and Taught by a Teacher in the DISCOVER Projects**