

# Fireworks of Glass

THE ART OF  
DALE CHIHULY

A UNIT OF STUDY FOR GRADES 3-5



The Children's Museum  
of Indianapolis

## ACKNOWLEDGEMENTS

The Children's Museum of Indianapolis wishes to thank Dale Chihuly, Joanna Sikes and the staff of Chihuly Studio for their assistance in developing this unit of study.

## THE CHILDREN'S MUSEUM OF INDIANAPOLIS

The Children's Museum of Indianapolis is a nonprofit institution dedicated to providing extraordinary learning experiences for children and families. It is one of the largest children's museums in the world and serves people across Indiana as well as visitors from other states and nations. The museum provides special programs and guided experiences for students as well as teaching materials and professional development opportunities for teachers. Field trips to the museum can be arranged by calling (317) 334-4000 or (800) 820-6214. Visit The Children's Museum Web site: [www.ChildrensMuseum.org](http://www.ChildrensMuseum.org)



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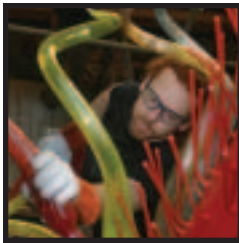
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# Fireworks of Glass

## THE ART OF DALE CHIHULY

A Unit of Study for Grades 3–5



Chihuly Studio

*Dale Chihuly poses with Tower and Chandelier pieces at The Boathouse studio.*

### ENDURING IDEA

DALE CHIHULY TURNS ORDINARY GLASS INTO EXTRAORDINARY WORKS OF ART THAT INSPIRE WONDER AND JOY.

In this unit of study students learn how Dale Chihuly transforms ordinary materials into extraordinary works of art. They learn about the scientific properties of glass and the ancient art of glassblowing. After creating their own sculpture, they engage in planning an installation in the school setting.

Students also learn why teamwork is important in glassblowing. They consider ways that Chihuly gives back to the community through his work with at-risk young people in the Hilltop Artists in Residence program.

This unit is intended for use by classroom and visual arts teachers working together to help students develop skills in observation, inquiry and communication as they learn key concepts in visual arts, science, language arts and social studies.

### WHAT WILL STUDENTS LEARN?

Lessons in this unit are interdisciplinary and help students achieve state and national standards in:

- VISUAL ARTS
- LANGUAGE ARTS
- SCIENCE
- SOCIAL STUDIES

### WHAT'S AHEAD

This unit of study introduces students to the art of Dale Chihuly through three lessons and a culminating experience that allow them to experience his artworks, examine his materials and processes, choose a medium and create their own works.

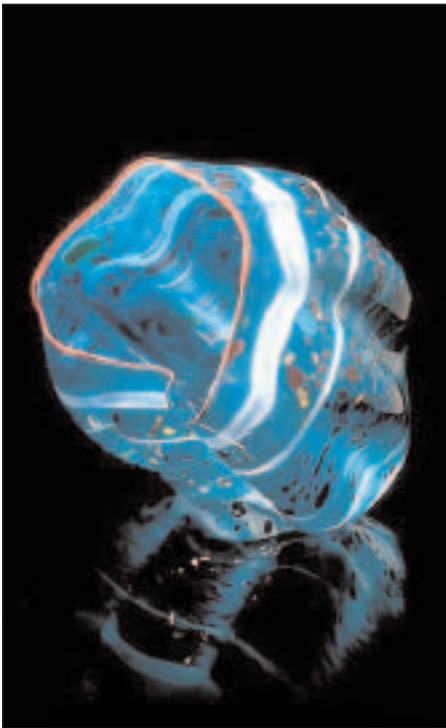


Chihuly Studio

*Dale Chihuly, 2000, Ikebana (Detail)*

**LESSON 1 —  
DALE CHIHULY: ARTIST**

Students examine works by Chihuly and learn how he became an artist. They explore the ways Chihuly interacts with his medium and experiments with color and form. They also learn why teamwork is important in glassblowing and how Chihuly helps at-risk young people.



Dale Chihuly, *Mazarine Blue Macchia With Spanish Red Lip Wraps*, 1981, 6" x 6" x 7".

Chihuly Studio

**LESSON 2 —  
INTENSE FRAGILITY**

Students consider the physical properties of glass that allow it to be used as a medium for works of art. They learn about glassblowing traditions and processes and create a virtual *Macchia*, one of Chihuly's most colorful forms.



**LESSON 3 —  
TOWER POWER**

Students learn how Chihuly and his team created and installed the **Fireworks of Glass Tower and Ceiling** at **The Children's Museum of Indianapolis**. They choose a medium and design and build their own sculpture.



**CULMINATING  
EXPERIENCE:  
INSTALL IT YOURSELF!**

Working in teams, students anticipate and resolve the problems involved in designing an installation for a school setting.

## WHAT WILL STUDENTS BE ABLE TO DO?

### UNIT GOALS

#### Students will

- Develop skills in observation and inquiry as they examine the work of Dale Chihuly
- Read a biography of Chihuly and learn how he works to help his community
- Learn how Chihuly continues to experiment with glass as a medium for his works
- Identify the properties that allow glass to be used in making both everyday objects and works of art
- Trace the history and science of glass-making
- Identify the steps in transforming glass into works of art
- Create sketches inspired by classroom collections
- Select a design element based on their sketches and create a drawing or a painting as the first step in planning a sculpture
- Examine the role of teamwork in glassblowing and creating large sculptures and installations of glass
- Discover the unique features of the **Fireworks of Glass Tower and Ceiling** at **The Children's Museum**
- Create a sculpture and engage in planning an installation that can be viewed in the school

## GETTING STARTED

### CLASSROOM ENVIRONMENT

Create a classroom environment that is rich in images of art glass, works by Dale Chihuly and sculptures made from a variety of materials. Include large and small works as well as installations. Establish a place in the classroom where students can handle evocative items, including natural forms such as shells, gourds or seedpods and cultural objects such as baskets. Bring together a number of similar items and create two or three classroom collections. One collection should include sculptures of different materials, such as metal, wood, paper and glass.



*A wooden folk art carving from Indiana; a wire motorcycle from Zambia, Africa; and a soapstone alligator from Kenya, Africa, are sculptures in the collections of The Children's Museum.*

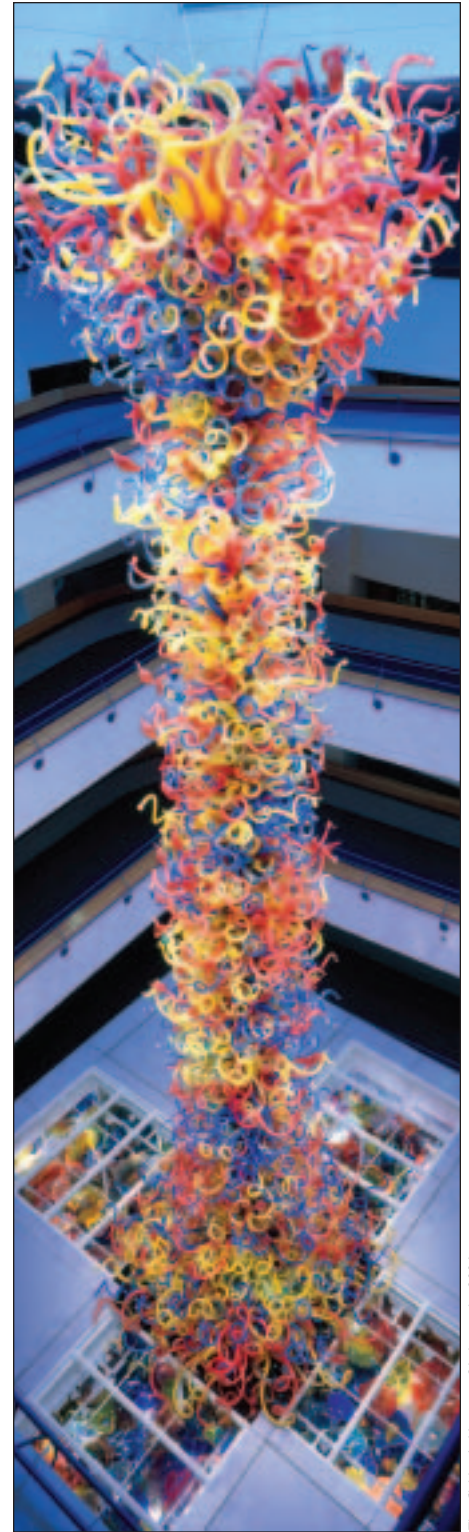


## FAMILY CONNECTIONS

Keep families informed about the unit of study and let them know that the class will be studying the work of Dale Chihuly. Inform them that students will be putting together collections of objects found in nature and objects made by human beings. Some adults might be willing to present a personal collection in the classroom. Families may want to use this as an opportunity to visit a museum. Encourage them to discuss artworks, such as sculptures, that they see outdoors and in other non-museum settings. Adults can help children to speculate about the materials used to make these artworks, how they were made and why they are important to the community. At home, parents and grandparents also can help students understand connections between art and science by encouraging them to examine common materials and discussing how heating and cooling causes changes in the characteristics of substances.

## MUSEUM LINKS

**The Fireworks of Glass Tower and Ceiling at The Children's Museum** is Dale Chihuly's largest permanent installation of blown glass. Only a visit in person can truly convey the unique interaction of form, color and light in this work. Rising from the Lower Level of the museum to the skylight in the roof, the *Tower* reaches a height of over 43 feet, creating an explosion of color throughout the museum core. At its base, the *Tower* rests on a steel and glass *Ceiling* filled with Chihuly glass forms that immerse viewers below in color and light. An interactive gallery on the Lower Level of the museum allows visitors to identify Chihuly forms, construct their own sculptures and view a Planetarium show of Chihuly's glass-blowing process. For online, interactive classroom and family experiences related to Dale Chihuly and **Fireworks of Glass**, visit **The Children's Museum** Web site at [www.childrensmuseum.org](http://www.childrensmuseum.org). For information about glass and glassmaking, see the Web site of the Corning Museum of Glass at [www.cmog.org](http://www.cmog.org). The Museum of Glass in Tacoma, Wash., features Chihuly's *Bridge of Glass* and includes an interactive *Virtual Hot Shop* at: [www.museumofglass.org](http://www.museumofglass.org)

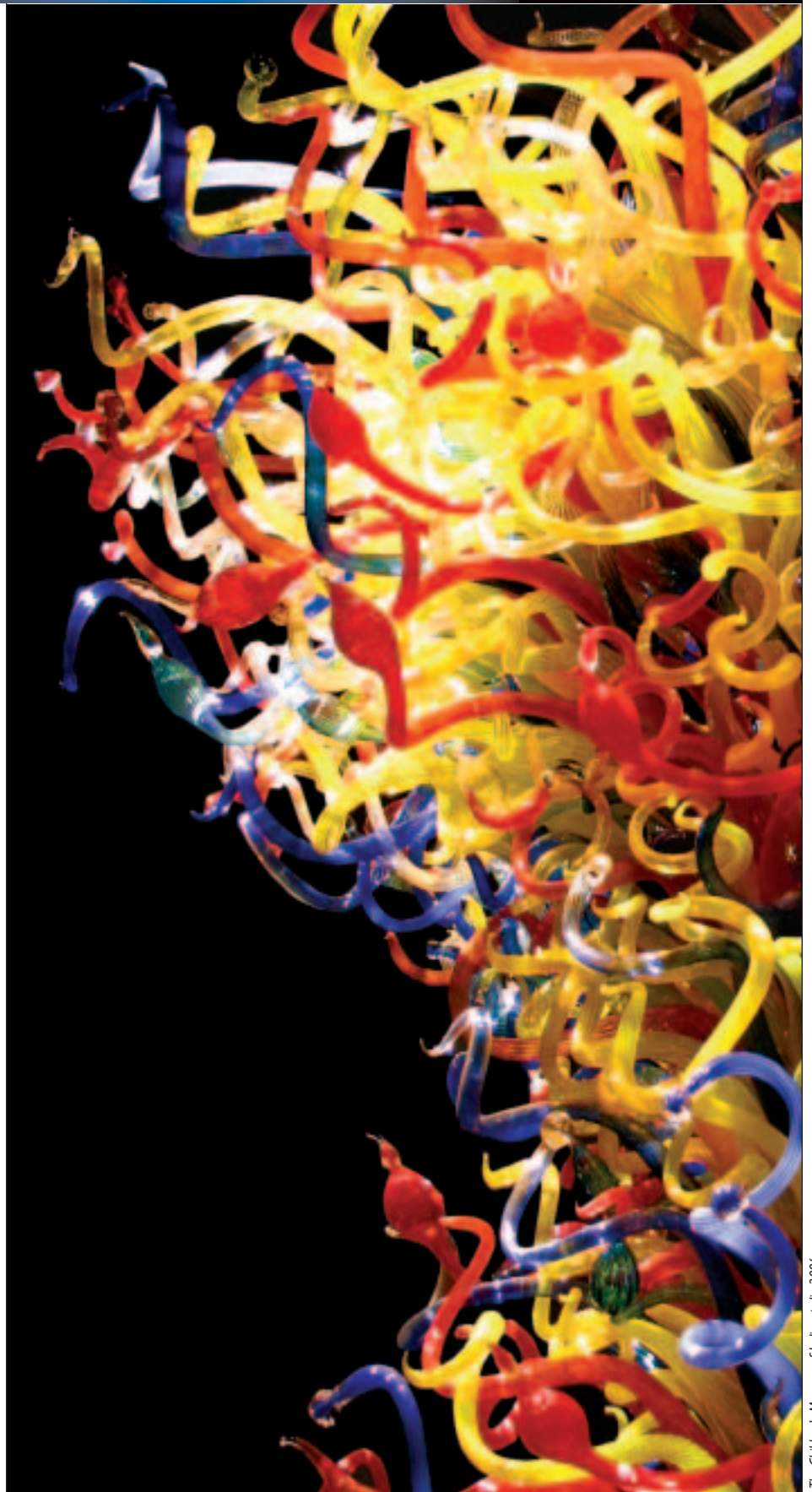


The **Fireworks of Glass Tower** rises through the museum's five-story central core and contains 3,200 pieces of glass. The Ceiling below is made up of 1,600 glass elements.

The Children's Museum of Indianapolis, 2006

## LESSON ONE — DALE CHIHULY: ARTIST

In this lesson, students view photographs of the **Fireworks of Glass Tower** at **The Children’s Museum**. They generate questions about the sculpture and the artist, Dale Chihuly, and discover how he has become the modern *maestro* of glass. They learn how Chihuly works with a team and how he uses his art to help children and youths build character and a sense of community. Students explore the ways that Chihuly uses his skills and creativity as he works. They use their own observational skills to create a sketch that they want to use in designing a sculpture.



Detail from the **Fireworks of Glass Tower**.

The Children’s Museum of Indianapolis, 2006



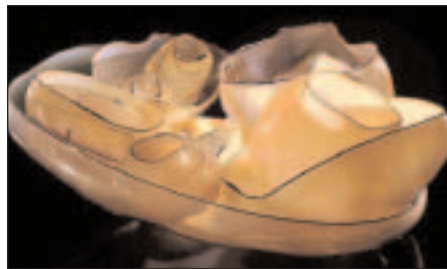
## OBJECTIVES

### Students will

- Use observation and inquiry skills to examine images of artworks by Dale Chihuly
- Generate questions about Chihuly and his work and use reading comprehension skills to discover answers
- View images of the **Fireworks of Glass Tower** and explore the personal meanings of the work
- Based on clues in this work, generate questions about where, when, how and by whom the work was made
- Record what they know and what they want to know about Dale Chihuly
- Read Chihuly's biography and list what they have learned about the artist as well as additional questions they want to answer
- Explain why teamwork is important in the glassblowing process
- Give examples of the way Chihuly works to help people in the community
- Examine the way that Chihuly's works evolve as he experiments with a form
- Start their own collections of natural or human-made objects
- Create a realistic sketch and an abstract sketch based on their collection

## FOCUS QUESTIONS

- Who is Dale Chihuly?
- What is he trying to accomplish?
- What is a **maestro**?
- How does Chihuly work with a team?
- How does he create his works of art in glass?
- Why is working with children and young people important to him?



Dale Chihuly, *Tabac Baskets, 1980*, 7" x 17" x 18".

Chihuly Studio

## MATERIALS

Lined and unlined paper for making **Chihuly Notebooks**

## TIME

Three to four class periods

## HOT WORDS

- |                       |                    |
|-----------------------|--------------------|
| ■ abstract            | ■ multiples        |
| ■ collection          | ■ natural          |
| ■ form                | ■ organic          |
| ■ geometric           | ■ pattern          |
| ■ glass               | ■ primary colors   |
| ■ glassblowing        | ■ sculpture        |
| ■ intermediate colors | ■ secondary colors |
| ■ maestro             | ■ shape            |
| ■ medium              | ■ sketch           |
| ■ mold                |                    |

## YOU WILL NEED VISUAL AIDS

- Detail of the **Fireworks of Glass Tower**
- Full-length view of the **Fireworks of Glass Tower**
- Images of objects from nature, such as seashells, plants and animals
- Images of objects made by humans, such as baskets
- Images of Chihuly blanket and basket collections
- Images of Chihuly *Seaforms* and *Baskets*
- Classroom collections of natural and constructed objects
- Color wheel
- Map of the United States
- Student Handout — Biography: **Dale Chihuly/Dale Chi-who?-ly**

## EXPERIENCE 1

### MEET THE MAESTRO



Chihuly Studio

*Chihuly uses a variety of drawing media.*

## INDIANA'S ACADEMIC STANDARDS

### Visual Arts

Standard 1: Responding to Art — History: 3.1.1, 4.1.1, 5.1.1

Standard 3: Responding to Art — Criticism: 3.3.1, 3.3.3, 4.3.1, 4.3.3, 5.3.1, 5.3.3

Standard 6: Responding to Art — Aesthetics: 3.6.2, 4.6.2, 5.6.2

Standard 12: Careers and Community: 3.12.1, 4.12.1, 5.12.1

### Language Arts

Standard 2: Reading Comprehension: 3.2.2, 3.2.3, 4.2.1, 4.2.2, 5.2.3, 5.2.4

### Social Studies

Standard 5: Individuals, Society and Culture: 3.5.3, 3.5.5

## PROCEDURES

- Show students the photograph of the **Fireworks of Glass Tower** without giving the title or explaining what it is. Ask students to take a few quiet moments to look at and think about the image.
- Ask students: “What do you think this is about?” Paraphrase or restate student’s comments without making judgments. Encourage students to participate in discussions and develop individual interpretations based on the work.
- After students have had opportunities to discuss the work and express their thoughts, ask individual students to provide evidence for their comments. Ask: “What clues in the work make you say that?” Use the photograph to point out things students mention.
- Ask students what material they think the work is made of and if they think the work was created recently or long ago. Discuss their responses.
- Ask students what questions they have that can’t be answered by observing the work. Unanswered questions may include the name of the artist, where and how it was made, why it was made, etc.
- Instead of answering all of the students’ questions, encourage them to do their own research. Record their questions on flip chart paper and refer to the list as the unit of study continues. Tell the class they will be conducting an inquiry into this artwork. Further observations and research will help answer their questions.



Photo courtesy of Brian Sullivan

*The glow of hot glass lights the face of a young glassblower at Hilltop Artists in Residence.*

- Have students read the biography silently and discuss what they have learned. Have each pair share at least one new item of information that addresses one of the questions the class has raised. Let students know that they can learn more by visiting The Children’s Museum Web site at [www.childrensmuseum.org](http://www.childrensmuseum.org) or by visiting Chihuly’s Web site at [www.chihuly.com](http://www.chihuly.com)
- Discuss with students what they learned in Chihuly’s biography about his work in the Tacoma community, particularly his work with students at Hilltop Artists in Residence.
- Show students the full-length photo of the *Tower* and explain that they are examining images of a **sculpture**.
- Introduce students to the collection of classroom sculptures and discuss the materials used. Discuss ways that sculpture is similar to and different from other types of artworks.
- Explain that the *Tower* was designed by Dale Chihuly, an artist who is famous for his works of art in glass.
- Write Chihuly’s name on the chalkboard and ask students what they know about Chihuly based on the discussion so far. After listing what the class knows, ask: “What do you want to know?” and list students’ responses.
- Tell students that they can find the answers to some of their questions by reading Chihuly’s biography. Divide the class into pairs. Provide each student with the handout **Dale Chihuly/ Dale Chi-Who?-ly** on page 26.



Photo courtesy of Brian Sullivan

Two students at Hilltop Artists in Residence work as a glassblowing team in the school hot shop.

## CHIHULY AND COMMUNITY

Chihuly's work as an artist is deeply influenced by his sense of community. As a young man he watched European glassblowers and realized that their synchronized teamwork was an expression of their membership in a close-knit community that in some ways was like a family. Later, Chihuly applied this understanding to the creation of his own glassblowing teams and in his civic work as well. Chihuly has contributed a great deal to the development of Seattle and nearby areas. His efforts have helped to spark an artistic, economic and social revival in his hometown of Tacoma, Wash.

In 1994 Chihuly and two long-time colleagues, Kathy Kaperick and Charlie Parriot, founded the Hilltop Artists in Residence program in Tacoma's Hilltop neighborhood. Here, Chihuly and fellow artists helped to convert a former industrial arts classroom in a local middle school into a glassblowing studio. The Hilltop program reaches out to young people at risk of dropping out of school or facing trouble with the law by providing glass arts and alternative academic programs. Chihuly believes that working on glassblowing teams can help these teenagers avoid gang membership and crime as they become part of a constructive and supportive community of artists. About 500 young people participate each year in Hilltop programs that help them learn the importance of individual responsibility and teamwork. Whether they decide to become artists

in adult life or not, these students develop skills and attitudes that change their lives for the better.

- Ask students: Why is teamwork important in glassblowing? Why do you think teamwork is important to Dale Chihuly? How does he help kids and other people in the community? Why do you think he does this?
- Discuss students' responses to questions about teamwork and Chihuly's projects to help young people. Explain how Chihuly has used his talents as an artist to help his community.
- Ask students what they would like to do to help other people at home and school. If your school has a service-learning program, discuss the different types of projects that have been planned and carried out by students.
- Introduce the **Chihuly Notebook** and explain that it will be used to record information and to plan their artworks. Ask them to write their names on the inside of the front cover and leave the cover blank for a future artwork of their own.
- Have students use the first page to write a paragraph about one thing they would like to do to help their community.

## EXPERIENCE 2 IN LIVING COLOR

In this experience, students learn why light is important in viewing a glass sculpture and explore the ways that Chihuly experiments with color in his work.



Photo by Teresa Rishel, Chihuly Studio

Light, forms and color interact in the **Fireworks of Glass** Ceiling.

### INDIANA'S ACADEMIC STANDARDS

#### Visual Arts

Standard 1: Responding to Art — History: 3.1.1, 4.1.1, 5.1.1

Standard 3: Responding to Art — Criticism: 3.3.1, 3.3.3, 4.3.1, 4.3.3, 5.3.1, 5.3.3

*“I cannot understand it when people say they don’t like a particular color. How on earth can you not like a color?”*

— Dale Chihuly, 1996

## PROCEDURES

- Tell students that now, after finding answers to some of their questions about Dale Chihuly, it is time to examine his works of art more closely. Return to the images of the *Tower*.
- Ask students where they think they could see this sculpture. After discussion, explain that it is at **The Children’s Museum**.
- Ask students what name they would give to this artwork. Encourage students to come up with as many different titles as possible. Ask them what evidence in the work suggests these titles.
- Explain that people at **The Children’s Museum** have named this sculpture the **Fireworks of Glass Tower**. Ask students why they think it was given this title. Do they think this is a good name? Why or why not? Do they like one of their own titles better? Why?
- Ask students why this artwork is called a “tower.” Discuss the ways that the effect of color and light in the *Tower* is similar to fireworks.
- Explain to students that the **Fireworks of Glass Tower** is located under a skylight in the roof of the museum so that it receives natural light. Spotlights also can be used on cloudy days or at night.
- Ask students how they think the *Tower* looks when the light shines on it. Ask: “Why is light important in viewing a glass sculpture?”

- Have students think about how the time of day, weather and season of the year would make a difference in the way natural light interacts with a glass sculpture. Ask students: “Do you think it is possible that a glass sculpture might look different each time you see it? Why or why not?”
- Have students observe one of the glass objects from the classroom collection as they experiment with different light sources, such as sunlight, a lamp and a flashlight.

- Discuss the different effects the light sources have on clear and colored glass. Have students record their observations in their **Chihuly Notebooks**.
- Explain to students that Chihuly is fascinated by the way glass, especially colored glass, interacts with light, and by the many different forms that glass can take. He is constantly experimenting with forms and colors.



At night, the **Fireworks of Glass Tower** is reflected in the skylight above.

The Children’s Museum of Indianapolis, 2006

## CHIHULY IN COLOR

Early in his career, Chihuly spent a six-day train trip mixing paints from watercolor tubes in as many combinations as possible. “Of course,” he says, “in six days I could only make a few thousand colors and that didn’t even approach all the situations possible” (William Warmus, *Dale Chihuly*, p. 18). Chihuly is fascinated by the way light transforms colored glass. The use of vibrant color is a key element in his works. Observing the **Fireworks of Glass** Tower and Ceiling provides an excellent opportunity to help students understand the nature of color as a quality of light. The wavelengths of light that can be seen by the human eye make up the color spectrum. Help students use a prism to show how white light, such as sunlight, can be broken into bands of color.



Dale Chihuly, Leaf Green Persian Set With Orange Lip Wraps, 1992, 21" x 23" x 22".

Chihuly Studio

## EXPERIENCE 3 FABULOUS FORMS

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In this experience, students learn that Chihuly explores the potential of different forms as he creates new works of art.



Photo by Terry Rishel, Chihuly Studio, 2006

Forms in the **Fireworks of Glass** Ceiling seem to float in space. Throughout his career, Chihuly has experimented with glass as a medium for creating diverse forms.

### INDIANA'S ACADEMIC STANDARDS

#### Visual Arts

Standard 2: Responding to Art — History: 3.2.2, 4.2.2, 5.2.2

Standard 7: Creating Art — Production: 3.7.1, 4.7.1, 5.7.1

#### Social Studies

Standard 3: Geography 3.3.1, 3.3.3, 5.3.2



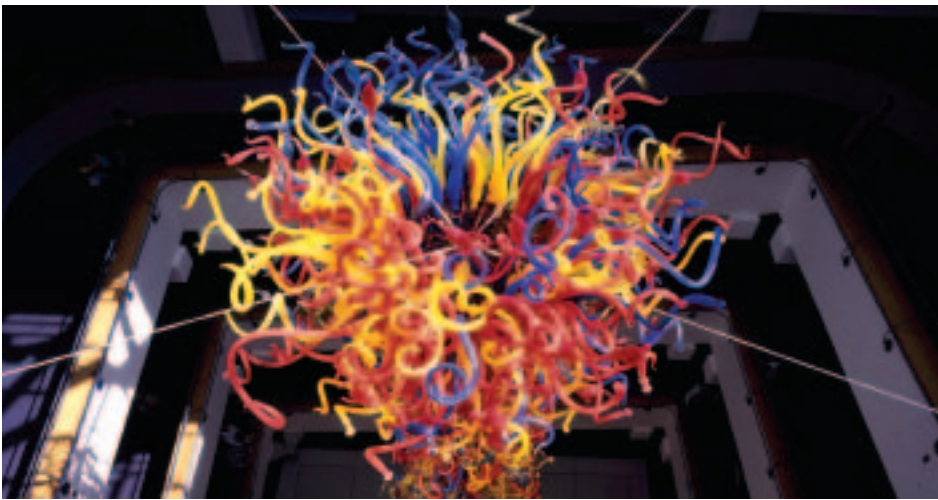
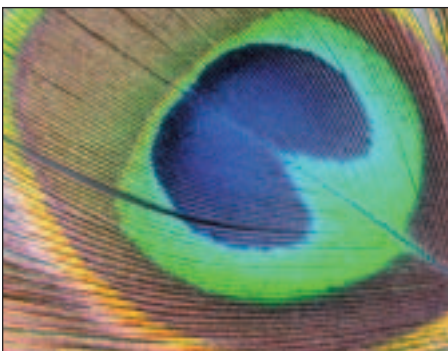


Photo by Terry Rishel, Chihuly Studio, 2006

Organic forms can be seen in this image of the **Fireworks of Glass Tower**.

## PROCEDURES

■ Have students examine the images of the **Fireworks of Glass Tower** again. Ask: “What **forms** do you see?” Explain that a **form** is three-dimensional and can be seen from various sides. A **shape** is flat and can be seen only from one side. (Use examples of sculptures and objects in the classroom to help students understand the difference between **shapes** seen in two-dimensional works, such as paintings, and **forms** found in three-dimensional works, such as sculpture.)



Organic shapes and intense colors show off in a peacock feather.

■ Ask students: “Do these forms remind you of anything you have seen in nature?” Students may suggest that the forms look like animals, plants, vines, gourds or other natural objects.

- Explain that **organic** forms and shapes remind us of objects found in nature. **Geometric** shapes (circles, squares, triangles) and forms (spheres, cubes, pyramids) are more regular and precise than most natural objects.
- Explain to students that Chihuly likes to experiment and see what kinds of different and unusual forms he can make in glass. He usually gives a name to forms after he creates them.
- Ask students to think of their own names for the forms they see in the Tower. Have them make quick sketches of the forms and write down the names they’ve invented in their **Chihuly Notebooks**.
- Ask students how they think Chihuly became so interested in the colors and forms he can create in glass.
- Have students think back to Chihuly’s biography and ask where he grew up. Ask them to locate Tacoma and Seattle in the state of Washington on the map and explain that this area is part of the Pacific Northwest region of the United States. Have students compare the geography and climate of that region to Indiana in the Midwest.

“Obviously, it wasn’t a conscious decision to work with glass. It started, I’m sure, back when I was a little kid, walking on the beach somewhere, I found a little bit of glass. It may have been a bottle ... broken on a rock into a hundred pieces, which was then dispersed on the beach for a hundred different kids to find.”

— Dale Chihuly,  
Chihuly Gardens and Glass



The Children’s Museum of Indianapolis, 2006

Goosenecks, Twisted Horns and Horneyes interact in the **Fireworks of Glass Tower**.



Chihuly's Seaforms seem at home with images of sea anemones and jellyfish. (Dale Chihuly, Pink Seaform Set With White Stripes, 1980, 6" x 10" x 10". Photo by Terry Rishel, Chihuly Studio.)

- Have students identify the Pacific Ocean and other bodies of water. Ask them what kinds of experiences Chihuly had growing up near the ocean and what kinds of objects he might have seen and collected. Ask: "How would Chihuly's early experiences have been different if he had grown up in Indiana?"
- Have students handle seashells from the classroom collection. Show images of sea animals, such as sea anemones and jellyfish, and sea plants. Then show students the images of Chihuly *Seaforms* and discuss the ways that these works remind them of living things from the ocean.
- Explain that the American Indian people of the Northwest Coast are known for their beautiful baskets. Show students the image of Chihuly's basket collection.
- Let students handle a basket from the classroom collection to see what it is made of and how it is made.
- Show students the photos of Chihuly basket drawings and related works in glass. Visit the Chihuly Web site for more examples: [www.chihuly.com](http://www.chihuly.com)

*"I had seen some beautiful Indian baskets at the Washington State Historical Society and I was struck by the grace of their slumped, sagging forms. I wanted to capture this in glass. The breakthrough for me was recognizing that heat and gravity were the tools to be used to make these forms."*

— Dale Chihuly, 1992



Northwest Coast American Indian Basket, Dale Chihuly Collection, Selitz Bowl with hourglass motif, 7.5" x 12" x 12".

Photo by Terry Rishel, Chihuly Studio

- Explain that Chihuly was fascinated by the forms of old baskets that had become slumped and irregular over time. He began to experiment with these forms in glass.
- Have students compare the images of the basket collection, drawings and glass artworks. What shapes and forms can they see in each one?
- Have students use their **Chihuly Notebooks** to make a sketch of a sea plant or animal or a basket. Discuss the ways that their sketches are similar to and different from the actual objects.
- Explain that artworks that attempt to represent things as our eyes see them are called **realistic**. Works that select only a few important characteristics to represent are called **abstract**. Sometimes the artist experiments with elements and materials so that works evolve in new directions.
- Show students images of realistic and abstract artworks in different media. Ask students if they think their sketches are realistic or abstract. Do they think the Chihuly works that they have seen so far are realistic or abstract? Why?

## EXPERIENCE 4

### COLLECTING LIKE CHIHULY

Students learn that Chihuly enjoys collecting many different kinds of objects. They help create a classroom collection or a collection of their own. They examine the characteristics of these collections and identify elements they would like to use in designing a sculpture.



Photo courtesy of Brian Sullivan

*Chihuly has carefully arranged the colorful patterns of Pendleton trade blankets from floor to ceiling along one wall of The Boathouse studio in Seattle, Washington.*

## INDIANA'S ACADEMIC STANDARDS

### Visual Arts

Standard 7: Creating Art — Production: 3.7.1, 4.7.1, 5.7.1

Standard 8: Creating Art — Production: 3.8.1, 3.8.2, 4.8.1, 4.8.2, 5.8.1, 5.8.2

Standard 9: Creating Art — Production: 3.9.2, 4.9.2, 5.9.2

Standard 10: Creating Art — Production: 3.10.1, 3.10.2, 4.10.1, 4.10.2, 5.10.1, 5.10.2

### Language Arts

Standard 4: Writing Process: 3.4.3

Standard 5: Writing Applications: 3.5.2, 4.5.5, 5.5.5

- Ask students where they think they would see works of art by Dale Chihuly. Explain that museums around the world collect and exhibit his works. Chihuly himself enjoys collecting interesting objects.
- Show students an image of a series of objects collected by Dale Chihuly. Explain that a **collection** is a selected group of similar objects. Reinforce this idea by having students examine and discuss one of the classroom collections.
- Explain that Chihuly collects many different types of objects. He is extremely interested in American Indian art and has extensive collections of baskets and trade blankets that are based on American Indian designs. In addition to artworks he also collects birdhouses, canoes, musical instruments, motorcycles and more.
- Ask students if they have any collections of their own. Discuss the reasons they are interested in the objects they collect. Tell students that they will have the opportunity to create an artwork based on a collection they will assemble.
- Have students bring multiples of one type of object to the classroom in a shoebox. These objects should be safe, clean and easy to find, transport and handle. Students should select either objects found in nature, such as shells, pebbles, leaves or seeds or common manufactured objects, such as bottle caps or small plastic containers. Some students may want to create collections of geometric forms.
- As an alternative to developing individual collections, ask students to contribute to two classroom collections, one a series of natural objects and the other a series of objects made by people.



- Have students examine their objects from different angles and discuss the most interesting characteristics of these collections. Discuss how the objects in a collection may be different from each other but will still have some important characteristics in common. For example, the leaves in a collection may be different from each other in a number of ways, yet they all have the same underlying structure of veins and stems.
- Help students discover the most outstanding visual characteristics of the objects when they are viewed as a collection. For example, help students find the most interesting thing about a collection of bottle caps. Ask students: What is the first thing you notice when you look at the bottle cap collection? What interests you the most about this collection? Is it the variety of colors? Is it the rounded form of the caps? Is it the repetition of wave-like lines around the edges?



*Frank and Teresa Caplan assembled this collection of carved and painted wooden animals from Oaxaca, Mexico.*

*The Caplan Collection, The Children's Museum of Indianapolis*

## ELEMENTS AND PRINCIPLES OF DESIGN

Analyzing collections of objects can introduce students to how artists manipulate elements to create a work of art. Artists use elements such as line, shape, form and color in different ways. They organize and combine these elements to create certain effects. For example, an artist may repeat a certain shape or color to create a pattern or repeat elements in a particular order to give a work a sense of movement and rhythm. Students in Grades 3–5 can be introduced to these ideas gradually and in context as they learn to observe classroom collections, examine works by Dale Chihuly and create their own works.

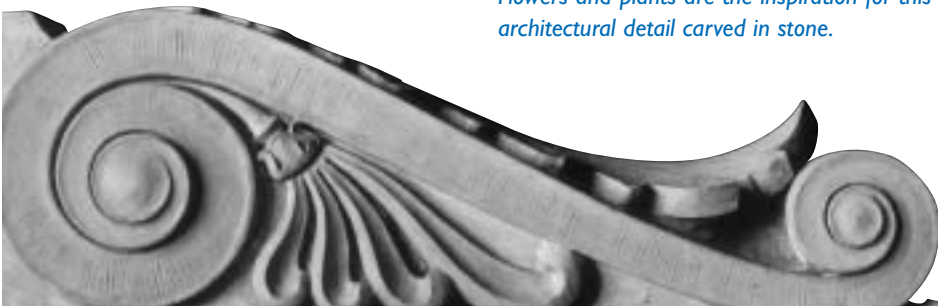
- Use the chalkboard or a flip chart to help students describe one or more collections. Write the title of the collection at the top. Make columns for different characteristics, such as Lines, Colors, Forms and Textures.



*The geometric forms of a modern building become more fluid as the glass façade interacts with the light.*

- Explain to students that an artist uses these characteristics purposefully to design a work of art.
- Help students think of as many descriptive words for these characteristics as possible and write them on the board or chart.
- Ask students if they see how individual objects are made. For example, can they see how the fibers used in making

*Flowers and plants are the inspiration for this architectural detail carved in stone.*



a basket are woven? Do they see any patterns? Do the wavy lines around the edges of the bottle caps repeat over and over? Why is this an important part of each bottle cap? Do the lines created by the veins in a collection of leaves look like a forest of little trees? Why are these veins important in the structure of a leaf?



*Light shining through a dry leaf reveals the intricate underlying structure of veins and cells.*

- Have students choose one object in the collection and use their **Chihuly Notebooks** to write at least one paragraph about their observations using as many descriptive words and phrases as they can.

## LESSON I ASSESSMENT

Students examine their collection to discover colors, shapes, forms, patterns and underlying structures. They create a rough sketch of their collection. After further examination, they select one or two visual characteristics and complete a second sketch that they plan to use in designing a sculpture.

### ASSIGNMENT: COLLECT AND SKETCH

**Present this scenario to students:**

- You are part of a team that is planning a large sculpture. You decide to examine a collection of objects to find ideas you can use.
- Use your powers of observation to examine your collection of objects.
- What do you see when you look at the collection?
  - Do you see lines? How are they similar or different?
  - Can you see forms? What are they like?
  - Are there a variety of colors or only a few?

- On a piece of drawing paper make a rough **sketch** of the collection. A sketch is a drawing that shows the main features or characteristics of something.
- After you finish the sketch, look closely at the collection once again. What are the most important or interesting characteristics of the collection that you see?
  - Do some elements seem to combine or work together? For example, does a line or form stand out because it is a certain color? Does a line, form or color repeat over and over so that it makes a pattern?
  - Select one or two characteristics of the collection that you think are most interesting.
  - Could you use these characteristics in designing a sculpture? How?

- On a second piece of paper make a sketch that you can use to design the sculpture.
- Use the most effective drawing tools for presenting your idea. For example, if you think that color is one of the most important elements, be sure to select a medium that conveys color.
- Compare your first sketch with your second sketch. How are they similar? How are they different? Write at least one paragraph in your **Chihuly Notebook** explaining how you would use ideas from your sketches to design your sculpture.

### SCORING CRITERIA

The assignment will be scored based on the student's ability to:

- Use observational skills in examining and rendering subject matter
- Select specific characteristics to emphasize in a sketch
- Control selected media
- Reflect upon and evaluate his or her work

### SCORING RUBRIC

This rubric provides a framework for assessing a student's ability to examine subject matter, select specific characteristics, use sketching as a technique to record observations and reflect upon his or her own work.

- **Partial:** The student lists only a few observations of the collected objects. The first sketch that is produced may lack attention to important visual characteristics and fail to show control of



sketching media. The student may have difficulty selecting visual characteristics to emphasize in the second sketch. Due to these problems, the student may not be able to state a strong rationale for using his or her sketches to design a sculpture.

■ **Essential:** The student examines objects in the collection carefully, records several observations and produces a sketch based on observations. The student executes the second sketch based on visual characteristics of the collection as a whole and can state a rationale for using these characteristics as elements in designing a sculpture.

■ **Exceptional:** The student examines objects in the collection with great care and records numerous observations. The first sketch produced as a result shows unusual care in execution and a high degree of control of the media. The student executes a second sketch that captures the key visual characteristics of the collection as a whole. The student can reflect upon the significance of these characteristics and state a convincing rationale for using them to design a sculpture.

## BONUS



- Have students develop a timeline of Chihuly's life, based on his biography in this unit. To help them make personal connections have them create and illustrate timelines of their own lives or write short biographies.
- Reinforce math concepts by having students construct **geometric forms**, such as spheres, cubes, pyramids and cylinders.
- Ask students what **colors** they see in the **Fireworks of Glass Tower**. Help them to identify the **primary colors**: red, yellow and blue. Remind students that primary colors can be mixed to create all the other colors. Can students find colors that are the result of mixing two primary

colors? These colors (green, violet and orange) are the **secondary colors**. Explain how mixing primary and secondary colors produces **intermediate colors**.

- Have students experiment with color by mixing primary colors to produce secondary colors and then primary and secondary colors to produce intermediate colors. Then have them create simple written equations. For example: yellow + blue = green; blue + green = blue green.
- Use the descriptive words that students have generated through observation of collected objects as the basis for writing activities such as poems and pieces of short fiction.

## TEACHER TIPS

Use the **Fireworks of Glass Tower** as an opportunity for students to examine a work of art in depth. Begin by helping students establish personal meaning and develop skills of observation, thinking and communication. Refrain from making judgments as students discuss their ideas. Help students look at the work as a whole and then ask them to provide evidence from the work that supports their ideas. Guide students to discover the way the artist has manipulated the medium and design elements to create the work and inspire a response in the viewer. Encourage students to develop their own interpretations and do their own research.

Continue the whole/part/whole approach as you help students create their own artworks. Some students may be very literal in their approach to drawing and want to try to represent every detail of a subject. It may be hard for them to select one or two visual characteristics and create a sketch. Encourage students to think about the ideas or meaning that they want to convey.

Help prepare students for the final assignment in this lesson by referring to the basket collection in the classroom. Ask them what personal experiences or memories are connected to baskets. Ask them what all the baskets have in common. For example, baskets

can usually hold or carry something. For this reason, baskets usually have a rounded or square form so that there is space inside. They have an opening at the top so items can be placed inside and removed. As baskets are used and grow older their forms slump and become irregular. Show students more Chihuly basket drawings on the artist's Web site at [www.chihuly.com](http://www.chihuly.com). Ask students: What characteristics of baskets seem to interest Chihuly the most? What characteristics has he selected for his drawings?



Chihuly Studio

*Dale Chihuly, Seaform Basket Drawing, 1982, 22" x 30", watercolor and graphite on paper.*

To help students understand both Chihuly's drawing and his work with young people it might be helpful to show the video "Chihuly in Action" (1999, 2003), available from Portland Press. The 27-minute film shows Chihuly working with at-risk students at Hilltop Artists in Residence. Another segment shows Chihuly working with children in a drawing workshop. All or part of the video may be suitable for your classroom. For a 5-minute preview, visit [www.portlandpress.net](http://www.portlandpress.net).



## MUSEUM LINKS

Visit **The Children's Museum** Web site at [www.childrensmuseum.org](http://www.childrensmuseum.org) for online experiences that allow students to experiment with color as part of the process of designing a sculpture. Students can select forms and color them with primary colors and also can mix colors to create secondary and intermediate colors. Students can learn how to use complementary colors and see how to create different illusions or effects. For similar experiences, visit the Virtual Hot shop at the Museum of Glass in Tacoma, Wash.: [www.museumofglass.org](http://www.museumofglass.org).



## TEACHER BACKGROUND INFORMATION

### DALE CHIHULY: EXTRAORDINARY VISION

#### THE YOUNG ARTIST

Dale Chihuly was born in 1941 in Tacoma, Wash. His father, a butcher and union organizer, died of a heart attack when Chihuly was a sophomore in high school. His mother took a job as a waitress to support herself and her son.



Photo by Ira Garber

*Dale Chihuly works in the hot shop of the Rhode Island School of Design in Providence, Rhode Island, 1979.*

Chihuly hadn't planned to continue his education after high school but his mother encouraged him. In 1959, he became the first member of his family to attend college. After discovering an interest in art, he transferred to the University of Washington, where he studied interior design and architecture. Distracted by college social life, Chihuly dropped out to travel in Italy, France and the Middle East. In 1963, he returned to the university with a new seriousness about his work and began to experiment with fibers, glass and color. During this time, he created one of his first installations, a large weaving of fiber and glass. He graduated in 1965 with a B.A. in interior design and went to work for an architectural firm in Seattle.

#### EXPERIMENTS WITH GLASS

In the meantime, experiments with glassblowing in his own basement studio convinced Chihuly that he wanted to become a glass artist. In the 1960s, most people thought of glass as material for making functional objects, not works of art. The University of Wisconsin had one of the few glass programs in the United States. In 1966, Chihuly obtained a scholarship to the University of Wisconsin-Madison where he studied with Harvey Littleton, founder of the studio glass movement. In 1967, he earned an M.S. degree in sculpture and entered the master's program at Rhode Island School of Design (RISD). He earned an M.F.A. degree from RISD in 1968. The same year, he was the first person to receive a Fulbright scholarship in glass studies. This allowed him to travel to Venice, Italy, where he worked as an apprentice in the Venini glass factory, famous for its



Photo by Claire Garoutte, Chihuly Studio

*Dale Chihuly, Indigo Blue Soft Cylinder With Pink Lip Wraps, 1996, 17" x 14" x 16".*



Photo by Claire Garoutte, Chihuly Studio

*Dale Chihuly, Light Blue Seaform With Yellow Lip Wraps, 1995, 6" x 11" x 7".*

modern designs. Here Chihuly observed Italian *maestros* as they carried out large glassblowing projects with teams of assistants. Chihuly adopted this working style and later perfected it in his own studios.

Back in the United States Chihuly established the Glass Department at RISD and spent the next several years teaching and collaborating with other artists. In 1971 he founded the Pilchuck Glass School near Seattle, a facility dedicated entirely to the study of glassmaking as an art and a training ground for future artists. Even in this early phase of his career Chihuly had begun to experiment with glass as sculptural material for large installations inside buildings and outdoors in different environments.

In the 1970s Chihuly returned to the idea of "weaving" with glass. Fascinated by the designs of American Indian trade blankets, he began to create cylinders in which threads of glass are woven into a design and pressed into a cylinder of molten

glass. Gravity and heat act on the woven glass and shape the designs in unpredictable ways, adding to their allure. The cylinders became one of Chihuly's first series. A fundamental part of his work is the discovery of a form and the continued exploration of that form and the multiple possibilities that it offers.

## OVERCOMING TRAGEDY

Chihuly experienced a tremendous misfortune in 1976. On a lecture tour in the United Kingdom, he sustained serious injuries in a car accident. As a result, he lost the sight in his left eye and his right foot and ankle were permanently damaged. The next year, three of his *Navajo Blanket Cylinders* were added to the permanent collection of the Metropolitan Museum of Art. In spite of everything, Chihuly's career was taking off.

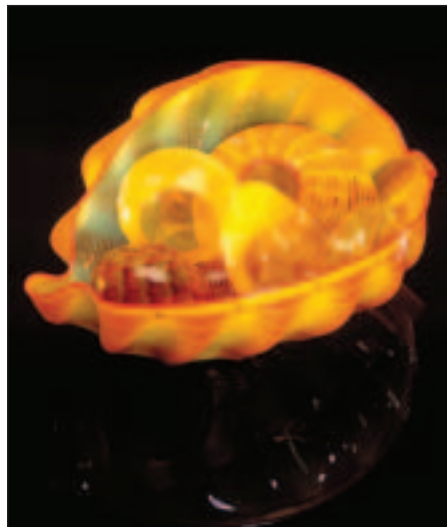


Dale Chihuly, *Blanket Cylinder*, 1976, 15" x 17".

Back in the United States, Chihuly refused to allow his injuries to interfere with his art. He continued to work, wearing custom shoes to help alleviate pain in his foot and leg. The loss of his left eye

affected his depth perception and made it difficult for him to blow glass.

Remembering the Italian maestros and their assistants, Chihuly began to put together a glassblowing team. He started to create drawings to express his vision for a piece to his team. The drawings would serve as a creative outlet and help Chihuly take his work to new levels.



Dale Chihuly, *Cadmium Yellow Seaform Set With Red Lip Wraps*, 1989, 13" x 33" x 16".

## DISCOVERING FORMS

Collaborating with a team, sometimes including Pilchuck students, Chihuly began to create and experiment with the forms he could create in glass. Interested in the graceful, slumping character of old Northwest Coast American Indian baskets, he began to experiment with a glass form shaped by heat and gravity. This led to the development of the *Baskets* series. Over the next few years, the *Baskets* evolved into the delicate *Seaforms*, which were the foundation for the expressively colored *Macchias*. Now Chihuly's works were being selected for national and international exhibits. Collectors, museums and art dealers were beginning to notice and buy his pieces.

Chihuly had been spending a great deal of time at Pilchuck and in the Seattle area. In 1983, he moved from the East Coast, where he had been teaching at the Rhode Island School of Design, to Seattle to work as an independent artist. Soon he was able to buy an old boat-building warehouse on Lake Union, an industrial area for fishing and boating businesses. The Boathouse became Chihuly's home, his artist's studio and hot shop.

## FORMS IN SPACE

By grouping multiple works in a series, Chihuly began to work on a large scale to create installations that filled and altered their spaces. He used a new series called *Persians* to create windows and walls where the graceful, flower-like pieces seemed to float. Chihuly went on to create new forms in the series called *Venetians* and *Ikebana*, which bring to mind Venetian glass and the Japanese art of flower arranging. His large spheres, called *Nijijima Floats* after the green glass floats that support Japanese fishing nets, are some of the most technically difficult pieces ever created by glassblowers.



Detail from the *Fireworks of Glass Ceiling*.

The idea of making glass forms float on the water or in the air may have led Chihuly to experiment with hanging sculptures. He became fascinated with the idea of creating chandeliers that would reflect and refract the light overhead without electrical wiring. Freeing the arms of the chandelier from their function as light bulb holders, he formed them into sinuous, interlocking sculptures that hang from a metal framework or armature. The *Chandeliers* series proved to be revolutionary and exportable. *Chandeliers* could transform overhead spaces in museums, public and commercial buildings and even outdoor settings. The demand led Chihuly to develop a process for managing all the parts, packing and shipping them, constructing metal armatures on site and hanging the pieces with stainless steel wires.

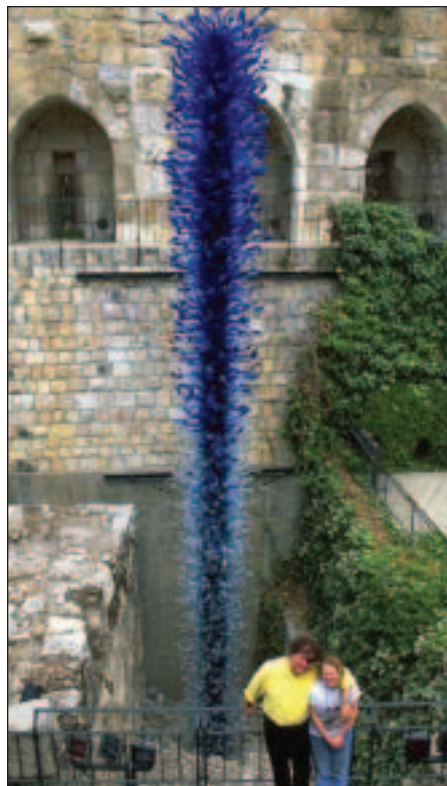
## FROM VENICE TO JERUSALEM

In the mid 1990s, the desire to pay homage to the glassblowing traditions of other cultures led Chihuly back to Venice, the city he had first visited in 1968 as a student. *Chihuly Over Venice* became his most ambitious and acclaimed temporary installation. It began in 1995 as Chihuly worked with glassblowing teams in Nuutajärvi, Finland, and at the Waterford Crystal factory in Ireland. Work continued in 1996 in Monterrey, Mexico. At all sites, Chihuly and his international teams collaborated, shared traditions and learned from each other. By August 1996, Chihuly had created 12,000 pieces of glass, which were then shipped to Venice. On-site teams assembled the pieces to create 14 chandeliers hung along canals, in palaces and in public spaces, where they were lit by sunlight during the day and

spotlights at night. The process was videotaped and appeared as a PBS documentary in the United States, introducing Chihuly to a broad American audience.



Dale Chihuly, *Mercato del Pesce di Rialto Chandelier*, 1996, 8' x 5', Chihuly Over Venice, Venice, Italy.



Dale Chihuly, *Chihuly In the Light of Jerusalem 2000, Blue Tower*, Jerusalem, Israel.

The idea that inverting a *Chandelier* would create a *Tower* played a major role in Chihuly's next international installation. *Chihuly in the Light of Jerusalem 2000* was a celebration of the end of the 20th century and the beginning of the 21st. It was installed near the Tower of David Museum in the old city of Jerusalem. From June 1999 through 2000, *Towers*, *Chandeliers* and other sculptures filled the ancient spaces around the museum with striking forms and colors.

## RENAISSANCE

Today Chihuly is recognized as the leader of a worldwide renaissance in glassblowing as a fine art. He is also considered the movement's greatest innovator, pushing the limitations of the medium and constantly pursuing new forms and techniques. His work as a teacher and team director has helped to inspire a new generation of artists.

Even though he has achieved international recognition, Chihuly remains close to Seattle and his hometown of Tacoma, Wash. Chihuly's work and collaboration with other artists has led to the development of Tacoma as a vibrant art community with new institutions such as the Museum of Glass and the Tacoma Art Museum. Chihuly is also noted for his work with children, teenagers at risk and people with disabilities. Chihuly is adept at inspiring others to use their talents in constructive ways. Perhaps this is because he has overcome difficulty and physical pain to achieve an extraordinary vision for himself and his art.

Photo by Russell Johnson, Chihuly Studio

Chihuly Studio, 2000

## DALE CHIHULY/DALE CHI-WHO?-LY



Chihuly Studio

Dale Chihuly as a little boy at his family home.

### DISCOVERING COLOR AND DESIGN

Dale Chihuly grew up in the city of Tacoma in the state of Washington, near the Pacific Ocean. When he was a boy, he liked to walk along the beach and find shells and other objects from the sea. He especially liked the colors and feel of beach glass that had been worn smooth by the waves and sand.

When he was young, Chihuly wasn't very interested in school. After high school, he didn't think he wanted to go to college. His mother encouraged him to give it a try. In college, Chihuly discovered

an interest in color and design. He graduated with a degree in interior design and found a job as a designer with a group of architects in Seattle.

In his spare time, Chihuly set up an art studio in the basement of his house and began to experiment with glass as a material for creating artworks. After melting stained glass, he used a metal pipe to blow his first glass bubble. Chihuly loved the beautiful colors and forms that could be made. He was fascinated by the way light passed through glass, reflecting colors in the space around it. He soon decided that he wanted to be a glassblower and make his own creations in glass.

### BECOMING A GLASS ARTIST

Glassblowing is an ancient art and requires a great deal of skill and practice. Chihuly knew he would have to study and work hard. He quit his job and went to work on a fishing boat in Alaska to earn money for graduate school. When he had saved some money, he entered the University of Wisconsin, where he studied with the glass artist Harvey Littleton. After graduating, a scholarship

enabled Chihuly to travel and study in other countries that were known for their beautiful artworks in glass. In Italy, he watched master glassblowers called **maestros**. He was especially impressed with how Italian glassblowers worked together in teams.



Chihuly Studio

Chihuly shapes a piece of hot glass with William Morris at the Pilchuck Glass School in Stanwood, Wash., circa 1978.

Chihuly returned to the United States and continued to study. Soon he was teaching other young artists. In 1971, he established the Pilchuck Glass School near Seattle, in his home state of Washington. As an artist, he was becoming known for his unusual glass sculptures that changed and were changed by the space around them.



Chihuly Studio

*Chihuly, working with Benjamin Moore, uses gravity and centrifugal force to shape a piece at the Pilchuck Glass School, circa 1977.*

## THE MAESTRO

In 1976, Chihuly was in a car accident in England that caused him to lose the sight in his left eye. This made it dangerous for him to blow glass and he began to depend more and more on his glass-blowing team. To direct the team and explain his ideas for his sculptures, he created drawings or paintings in brilliant colors. The drawings helped Chihuly's team understand the effect he wanted the sculptures to have. Chihuly was now a **maestro**. In Italian, the word *maestro* means "teacher" or "master," a person who has exceptional skills or abilities and leads others.

During the 1980s and 1990s Chihuly created many new, exciting works. He was now a successful artist and his black eye patch had

become his trademark. He didn't let the loss of an eye interfere with his vision for his artworks. He also knew that there is strength and a sense of community in working with a team. He wanted to share what he had learned with young people.



Photo courtesy of Brian Sullivan

*A student at Hilltop Artists in Residence does lampwork, using a small blowtorch to create jewelry from molten glass.*

## HELPING THE COMMUNITY

In 1994, Chihuly helped two friends establish the Hilltop Artists in Residence program in the Hilltop neighborhood of Tacoma, Wash., Chihuly's hometown. The program helps teenagers stay out of trouble by teaching them to blow glass and learn how to work together in a community. The program also encourages them to continue their education and to appreciate the beauty in artworks and in everyday things.

Today, Chihuly works with his team and with glass artists around the world to create sculptures that delight their viewers with beautiful forms and colors. His works become part of their environments and transform those places and the people in them. They rise up like towers or float and soar in indoor and outdoor spaces where everyone can enjoy them. He continues to work with people of all ages to improve their lives and their communities.



Chihuly Studio

*Chihuly drawing on the deck of The Boathouse on Lake Union in Seattle, Wash.*

## LESSON 2 INTENSE FRAGILITY

In this lesson, students conduct an investigation to see how changes in temperature can transform everyday materials and to identify important physical properties of glass that allow it to be used for functional objects and works of art. They visit an online hot shop to learn about the glassblowing process and create a virtual *Macchia*, one of Chihuly's most colorful forms. They examine the way that Chihuly uses his drawings in the process of designing glass sculptures and create an assemblage, a sculpture made up of smaller objects.

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*“Never underestimate the power of intense fragility.”*

—Vassar Miller  
*Wage War on Silence*



Dale Chihuly, Cadet Blue Basket Set With Black Lip Wraps, 2001, 8" x 11" x 10"

Photo by Scott M. Leen, Chihuly Studio

## OBJECTIVES

### Students will

- Identify important physical properties of glass
- Identify diverse uses of glass and explain why glass has so many different applications
- Discuss the ways that heating and cooling transform glass and other materials
- Explain why glass is an important medium for works of art
- Use print and online resources to identify major steps in the glassblowing process
- Use teamwork to create a Web-based Chihuly form, the *Macchia*
- Examine the way Chihuly uses his drawings in the process of creating large sculptures
- Create an assemblage, a sculpture made by combining smaller objects and ordinary materials.

## YOU WILL NEED VISUAL AIDS

- Images of **Fireworks of Glass** *Tower* and *Ceiling*
- Images of ancient glass objects
- Web access

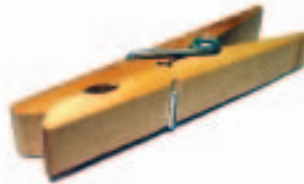
## MATERIALS

- Common glass objects of different types, including colored and opaque pieces
- Small container of play sand
- Bag of chocolate chips
- Heavy saucerpan

## FOCUS QUESTIONS

- What is glass made of?
- What physical properties does it have?
- How is glass used around us every day?
- When did people first begin to make and use glass?
- What properties make glass a medium for works of art?
- How is glass made?
- Why is teamwork important in the glassblowing process?
- How is glass transformed into works of art?
- How does Chihuly use his drawings to help him create works of art in glass?

- Hot plate or Bunsen burner
- Small plastic containers or molds of different sizes



## ART MEDIA

- Paper and sketching pencils
- Found objects and materials, such as pieces of cardboard, newspaper, fabric, plastic, foam, clothespins, and other “junk” items
- Painting media, such as tempera, watercolors, watercolor crayons, brushes and paint applicators
- Glue, paste, tape, wire and other bonding materials
- Scissors, wire cutters, etc.



## TIME

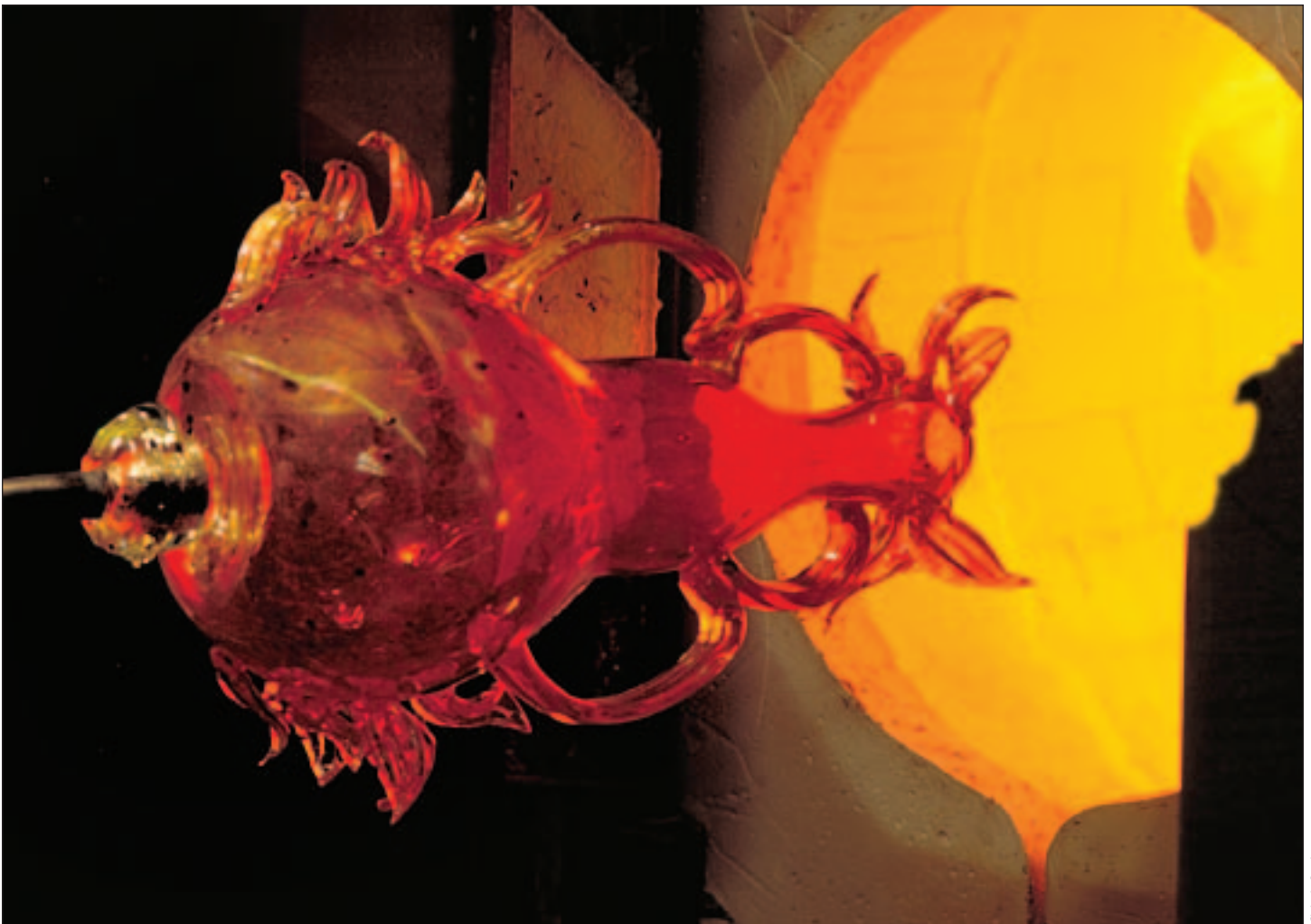
Three to four class periods

## HOT WORDS

- |                            |                  |
|----------------------------|------------------|
| ■ ancient                  | ■ ingredients    |
| ■ assemblage               | ■ liquid         |
| ■ fragile                  | ■ <i>Macchia</i> |
| ■ frits or jimmies         | ■ matter         |
| ■ furnace                  | ■ molten         |
| ■ gaffer or <i>maestro</i> | ■ opaque         |
| ■ gas                      | ■ properties     |
| ■ glass                    | ■ revive         |
| ■ glassblowing             | ■ solid          |
| ■ gravity                  | ■ transparent    |
| ■ hot shop                 | ■ translucent    |

## EXPERIENCE I AMAZING MATERIAL

Students examine the question of how the **Fireworks of Glass Tower** could be made of glass, a fragile material. Students consider the amazing properties of glass and find examples of the ways glass is used around them every day.



*A glassblower reheats a Venetian in a glory hole to keep it at the proper temperature.*

### INDIANA'S ACADEMIC STANDARDS

#### Science

Standard 1 — Scientific Thinking: 3.1.2, 3.1.3

Standard 2 — Scientific Thinking: 3.2.4, 4.2.1

Standard 3 — The Physical Setting: 4.3.5, 4.3.6, 5.3.8, 5.3.9



## PROCEDURES

- Help students focus once again on the photo of the complete **Fireworks of Glass Tower** and ask them what they know about glass, the material used to construct the sculpture.
- After discussing students' responses, explain that glass is very **fragile** or breakable, but it also has other **properties** or qualities that make it an amazing material for creating things, including works of art.
- Ask students what they think may be the most important and useful property of glass. To help them think about the question, call their attention to glass objects in the classroom, such as windows, glass beakers or test tubes. Help students distinguish between objects that are really glass and items made of plastic.



*Dale Chihuly, Smoke Brown Basket Set With Maroon Lip Wraps, 1995, 11" x 22" x 19".*

Photo by Teresa N. Reichel, Chihuly Studio, 1995

- Students may suggest that glass is useful because it is clear and you can see through it. Explain to students that we can see through **transparent** (clear) substances because light shines through them easily. Other materials are **translucent**. Light passes through them but not as easily as it does through transparent materials. For this reason, we can't see through them as well.
- Point out that glass is not always clear. Sometimes it is colored. Ask students: Is colored glass transparent or translucent?
- Explain that some kinds of glass contain substances that do not allow you to see through it at all. A material that does not allow light to pass through it is called **opaque**. Ask students: Why is the way glass transmits light important? Is this a property that also makes it beautiful? Why or why not?
- Have students write the title: "Uses for Glass" at the top of a page in their **Chihuly Notebooks**. Then have them write down all the ways glass is used in the classroom and school.
- Discuss the uses for glass they have found and help them realize that the glass in their examples has very diverse forms and applications. Reinforce the idea by allowing them to examine a variety of glass objects. Include items that are transparent, translucent and opaque.



Chihuly Studio

*Translucent and opaque glass was used in this Trumpet, a flower-like form that Chihuly created for the Mille Fiori installations.*

- Ask students to use their **Chihuly Notebooks** to record the properties of glass that they have learned about so far. What other amazing facts do they think they will discover about glass?

## EXPERIENCE 2

### HOT STUFF!

Students learn that sand is the major ingredient in glass. They carry out a guided investigation to see what happens when heat is applied to a material that appears solid at room temperature. They learn that glass has special physical properties that allow it to be formed into many different and beautiful objects.



*Chihuly and his team at The Boathouse hot shop prepare to move a completed Float to an annealing oven to cool slowly.*

## INDIANA'S ACADEMIC STANDARDS

### Science

Standard 1: The Nature of Science and Technology: 3.1.7, 4.1.5, 5.1.7

Standard 2: Scientific Thinking: 3.2.3, 3.2.4, 4.2.5, 5.2.4

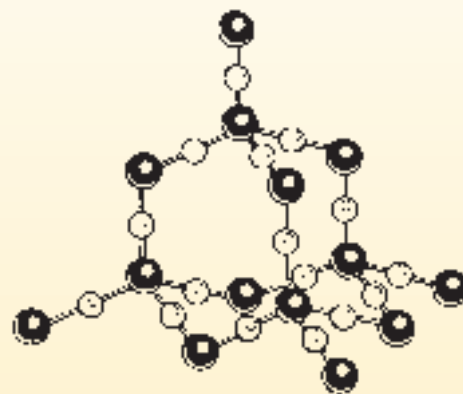
Standard 3: The Physical Setting: 5.3.4, 5.3.8

## PROCEDURES

- Explain that one of the reasons glass is useful and beautiful is that it can be made into many different forms. Ask students to speculate about how that can be done, since glass appears to be a hard, solid material.
- Ask students whether they think glass is found in nature or if it is a manufactured material. After discussion, ask students what they think glass is made of.
- Introduce the container of play sand. Let students examine the sand carefully. Explain the amazing fact that the main **ingredient** in glass is an ordinary substance that is often found in nature: sand.
- Ask students how they think it is possible to make glass from sand. Discuss their speculations and remind them that heating or cooling can change the characteristics of materials in amazing ways.
- Have students describe what happens when raindrops pass through very cold air. Most students will know that the rain will become snow or ice.
- Ask students what happens when a pan of water or a teakettle is heated on the stove. Explain to younger students that the steam that rises from the pan or kettle comes from water that has been changed into gas. You can't actually see the gas. The steam is made up of tiny drops of water that form (condense) as the gas cools. To help younger students get the idea, it may be helpful to demonstrate the process of freezing, melting and boiling water.

## WHAT IS GLASS?

The principal ingredient in all types of glass is **silicon dioxide** ( $\text{SiO}_2$ ). A common type of sand is made of this same substance. Silicon dioxide consists of a central silicon atom bonded with four oxygen atoms. Many solid materials are crystalline. This means that their molecules group together in a regular pattern. Glass is a non-crystalline substance. Its molecules do not group together in regular, repeating patterns. For this reason, scientists disagree about whether glass should be considered an “amorphous solid,” a “supercooled liquid,” or a third category of materials. For all practical purposes, glass behaves like a solid at normal temperatures but its irregular molecular organization is similar to that found in liquids. This irregular or “disorganized” structure gives glass special thermal properties.



This is a simplified model of a silicon dioxide ( $\text{SiO}_2$ ) molecule.

Crystalline substances melt at specific temperatures. Ice, for example, melts and becomes liquid at  $32^\circ\text{F}$ . It does not soften gradually. Glass, unlike a crystalline material, softens gradually as the temperature is increased. Eventually it can be poured much like a thick liquid. It can even be blown into bubble-like forms using a blowpipe. It is the ability to soften gradually that allows glass to be manipulated in diverse ways and formed into both commercial objects and works of art.

- Remind older students of their studies of matter in previous science lessons. Ask them to give examples of three states of matter: solid, liquid and gas.
- **Heat It Up!** Help students investigate what happens when chocolate chips that appear solid at room temperature are heated. Have them use thermometers to record temperatures of the chocolate as it melts and record observations in their **Chihuly Notebooks**. Pour the chocolate into molds and insert Popsicle sticks as it hardens. Students can eat the outcomes of this investigation!
- Pass around the chocolate chip bag and have students read the ingredients. Ask them what they know about the ingredients based on their investigation. Students will arrive at the conclusion that the ingredients in the chocolate chips appear to be solid at room temperature and gradually soften as the temperature increases. The chocolate can take on different shapes as it cools and hardens.

- Ask students if the observations they made in this investigation give them any ideas about how glass is made from sand and how glass can be formed into a great variety of objects. Discuss students' speculations.



Chihuly and his team use blow torches to heat up specific areas of a piece they are creating.

- Students may suggest that sand behaves somewhat like the chocolate chips when heated. Explain that there are similarities. Glass is made of sand and other substances that are solid at normal temperatures. When these materials are heated to high temperatures they form glass. When glass is heated it softens gradually and can be poured into molds or shaped into many different useful and beautiful things. For this to happen, glass must be heated to very high temperatures of 2100°F or more. Glass is truly hot stuff!

- Show students images of blown glass, cut glass, etching and engraving, and stained glass. Discuss the different processes involved.

- Have students write answers to the following questions in their **Chihuly Notebooks**:

- What properties of glass make it a wonderful medium for works of art?
- Why is it important for an artist to understand the properties or characteristics of glass?
- What do you think might be the difficulties and dangers involved in creating artworks from glass?



Molten glass flows from a gather collected on the end of a blowpipe.



Dale Chihuly working in Ireland at the Waterford Factory, 1995.

## EXPERIENCE 3

### MACCHIA MADNESS

In this experience, students learn that people have been making objects from glass for thousands of years and examine the glassblowing tradition as Dale Chihuly practices it. They visit an online hot shop to discover how glass is transformed into works of art and create a virtual *Macchia*. They explore the way that Chihuly uses drawings to design his sculptures and create their own sculptures by combining smaller parts to make a whole.

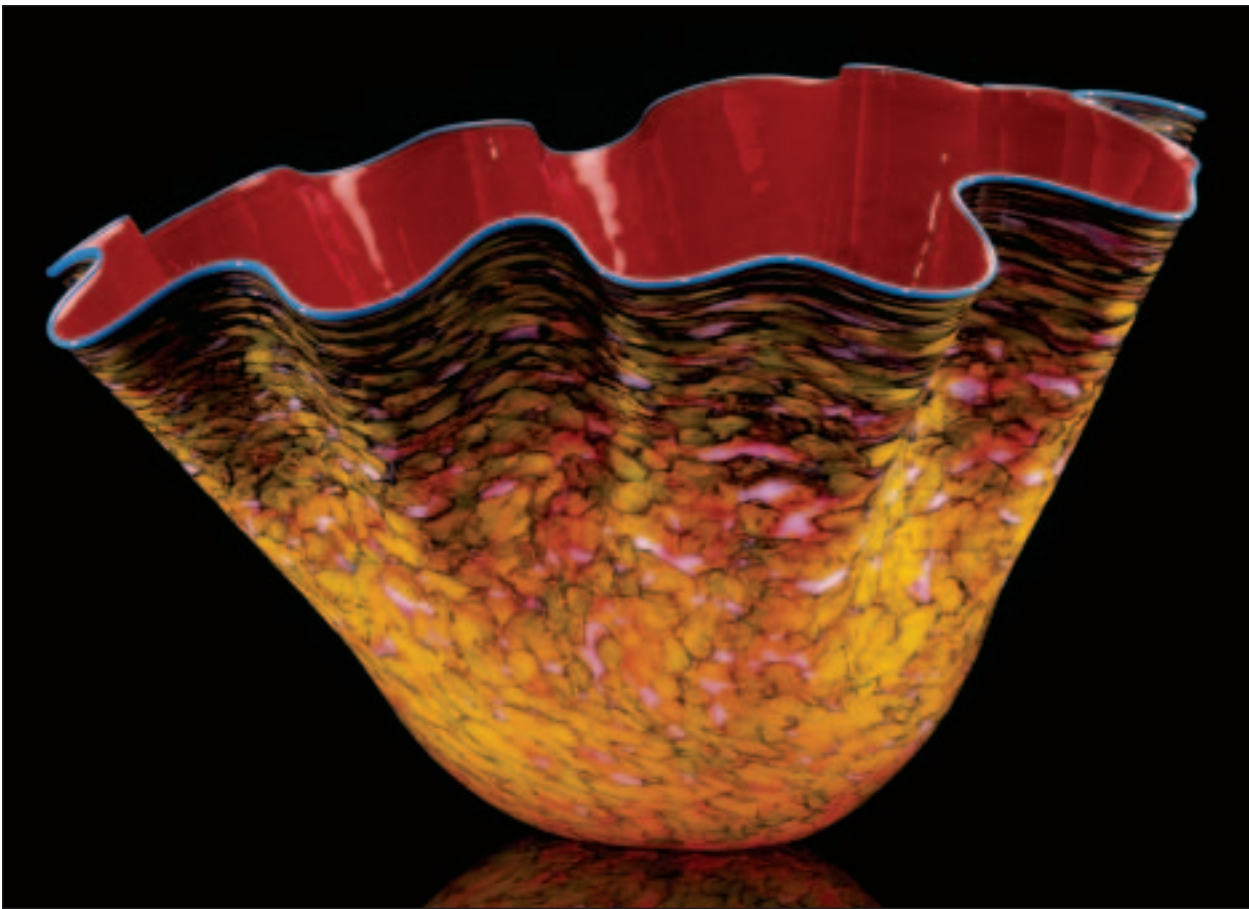


Photo by Scott M. Leen, Chihuly Studio, 1995

Dale Chihuly, Scarlet Macchia With Delphinium Lip Wraps, 1995, 29" x 28" x 20".

## INDIANA'S ACADEMIC STANDARDS

### Visual Arts

Standard 1: Responding to Art — History: 3.1.2

Standard 2: Responding to Art — History: 3.2.3, 4.2.2, 4.2.3

Standard 8: Creating Art — Production: 3.8.1, 3.8.2, 4.8.1, 4.8.2, 5.8.1, 5.8.2

Standard 9: Creating Art — Production: 3.9.1, 3.9.2, 4.9.1, 4.9.2, 5.9.1, 5.9.2

Standard 10: Creating Art — Production: 3.10.1, 4.10.1, 5.10.1

## PROCEDURES

- Discuss student notebook entries from **Experience 2** and focus on the properties that make it a medium for art: Glass transmits colors and light. It is hard but can appear to be fluid. It can be worked and sculpted so that it takes on abstract forms or suggest forms from nature. It can be used to create works that are very delicate and fragile or very strong.
- Show students images of artworks in glass from the past. Ask students if they think the objects were made long ago or in recent times. What do they observe about the objects that causes them think this?



Collection of the Corning Museum of Glass, Corning, NY (55.1.62).

*Jar with two handles, Eastern Mediterranean, possibly Cyprus, 2nd–1st century B.C. Core-formed, trail decorated and tooled.*

- Tell students that people have been making glass for thousands of years. People began blowing glass about 3,000 years ago in what is now the Middle East.

- Ask students to speculate about the kinds of objects people made from glass. Students will probably suggest that people made functional objects such as drinking glasses and containers as well as artworks.
- Explain that in ancient times glass was a prized material because it was very useful and beautiful but difficult to make. It could be produced only in places that had the right raw materials and only by people with skills in glass-making. In the 20th century, glass began to be produced almost entirely in factories. Because of this, glass objects became very common. Skilled craftsmen and artists were not needed and most people stopped thinking of glass as a medium for works of art.

## THE GLASS REVOLUTION — CHIHULY AND THE STUDIO GLASS MOVEMENT

Dale Chihuly has often been compared to Louis Comfort Tiffany. In the late 19th and early 20th centuries, Tiffany employed a large number of artists and craftsmen to create the stained glass windows and other glass artworks he designed. Styles changed in the period before and after World War II. Tiffany's factory closed and glass became an industrial material produced on a large scale. When Dale Chihuly decided to become a glassblower in the mid-1960s, there was one person he could turn to: Harvey Littleton.

Littleton was the founder of the **studio glass** movement. In the 1940s, new formulas for making glass were developed that allowed it to melt at lower temperatures. Littleton realized that this discovery meant that artists could melt glass in

ceramic kilns and did not have to use factory furnaces. He led the movement to return glassmaking to artists' studios and became an influential teacher. Chihuly became Littleton's student and the greatest innovator in the glassblowing tradition. Early in his career, Chihuly began to use glass as a sculptural material for large works rather than smaller ornamental objects. He has revolutionized people's thinking about glass as an art medium by creating monumental installations that inhabit architectural settings and outdoor environments where the public can view them.

- Remind students of the Chihuly biography and how he became interested in the art of glassblowing.

- Visit the Chihuly Web site at [www.chihuly.com](http://www.chihuly.com) and view images of Chihuly's works. Explain that the present is one of the most exciting times in the history of glass. New technology makes it possible for artists to melt glass in their own studios, where a small team can create artworks. Dale Chihuly is a leader in this **revival** of the ancient glassblowing art. He is also an **innovator** because he is doing things that no one has ever done before.
- Introduce students to the image of Chihuly *Macchias*. Explain that the **Macchia** is a form that Chihuly developed from his delicate *Seaforms*. In Italian the word *macchia* means "spotted." Ask students if this is a good name for one of Chihuly's most colorful creations. Why or why not?

## MAESTRO OF THE MACCHIA

Chihuly has created several original sculptural forms that reappear again and again in his work. *Seaforms* evolved from *Baskets* and *Macchias* from *Seaforms*. *Macchias* represent Chihuly's boldest combinations of color. He chooses one intense solid color for the interior and another for the exterior. The lip of the *Macchia* is a contrasting color. In between the layers of color, a layer of white glass forms "clouds." This layer of white glass keeps the interior and exterior colors separated. While it is still hot, the *Macchia* is rolled in bits of colored glass called **frits** or **jimmies**. These tiny pieces melt into the outer layers of glass and form bright speckles or spots. Chihuly has more than 300 colors in his hot shop. *Macchias* provide a way to use them all in infinite variations.

- Tell students that each of them can be a *Macchia* maestro. They can visit an online **hot shop** and create a virtual *Macchia*. First they need to learn more about glassblowing and the tools they will be using.
- Place students in teams of two or three and provide each member of the team with the **Student Handout: Hot Shop** on page 42.
- After teams have had a chance to discuss the glassblowing terms and processes, introduce them to the Web site of the **Tacoma Museum of Glass** at [www.museumofglass.org](http://www.museumofglass.org).



"People for centuries have been fascinated by glass. It's the most magical of materials."  
— Dale Chihuly (Dale Chihuly, Golden Yellow Macchia With Orange Lip Wraps, 1994, 23" x 32" x 30")

- Have team members decide who will be responsible for different aspects of the process. For example, one student might be the **maestro** or **gaffer**, another student might make sure the temperature remains constant and another might be the color expert.
- Allow teams to work until all students have had an opportunity to engage in all aspects of the teamwork and have successfully created a *Macchia*.
- Debrief teams about their experiences. How many *Macchias* shattered in the glassblowing process? Why did this happen? How did they feel when their work was destroyed? Was it frustrating or exciting? How did they feel when they successfully completed a piece? Why was teamwork important?

Photo by Claire Garoutte, Chihuly Studio

## CHIHULY ON DRAWING

In a Web-based interview, Chihuly outlines the central role of drawing in his creative process. Early in his career, Chihuly used graphite and charcoal to put his thoughts about a work on paper. Later he began to use more color. His drawings and sculptures became freer and more abstract and began to develop into works of art in their own right. After a car crash caused him to lose sight in one eye, the drawings took on a central role in Chihuly's design process with his glassblowing and construction teams. Today, Chihuly says, his drawings could be called paintings. He works with large sheets of heavy paper, laying down a base color with a large brush or mop. While the base is still wet, he applies layers of acrylic paint directly from tubes. Drawing in this way, Chihuly believes, has helped his work to progress. To see and hear Chihuly discuss his drawings, visit his Web site at <http://www.chihuly.com/Video/SRdrawvid.html>.

- Ask students what they think it would be like to design an entire sculpture made of Chihuly forms.
- Go to Chihuly's Web site at <http://www.chihuly.com/jerusalem/jerusalem.html> and introduce students to his installation *Chihuly in the Light of Jerusalem 2000*. Click on the *Overview* of the exhibition to view the drawings Chihuly created for each sculpture.



Dale Chihuly uses a mop to lay down base colors for a drawing during a workshop for neighborhood children at the museum in 2005.

- Help students compare the drawings with the sculptures in their outdoor settings in Jerusalem. Good examples for comparison include: *Crystal Tower*, *White Tower*, *Blue Tower*, *Red Spears*, *Yellow Chandelier* and *Star*. (Help students observe the way sculptures look in natural daylight and artificial light at night.)
- Ask students what elements (colors, lines, shapes/ forms, etc.) they see in a specific drawing. Do they see this same element in the sculpture? What organizing ideas or principles (patterns, movement and rhythm, etc.) do they see?
- Ask students what kinds of decisions they think Chihuly has to make when he is planning a sculpture. How do his drawings help him to make these decisions?
- Explain to students that their next assignment will be to create an **assemblage**, a sculpture made from smaller forms.
- Gather a variety of materials and suggest that students bring interesting “junk” materials from home. Any small found objects or materials that can be glued, tied, wired, taped, or joined together by other means will be useful.

The Children's Museum of Indianapolis, 2006



## LESSON 2 ASSESSMENT

Using the sketches of their collected objects from Lesson 1 as a guide, students create an assemblage, a sculpture made by combining a number of smaller components made from ordinary materials or found objects. They reflect on the meaning they want to convey and consider how the nature of the materials they use may suggest a theme, idea or a new direction for the sculpture.

### ASSIGNMENT FROM PARTS TO ART

#### Present this scenario to students:

- You are member of a team that is planning a sculpture. It is now time to try out your ideas by creating an **assemblage**, a sculpture made up of smaller parts.
- Examine your earlier sketches and reflect on the ideas you think would be interesting for a sculpture.
- Consider the materials and objects that you have to work with. Which materials will convey your ideas best? Do the materials suggest new possibilities for your sculpture?
- Decide which ideas and materials will work best together. For example: If you've decided that color will be an important element in your sculpture, be sure to choose objects and materials that can be colored or painted. If you want your sculpture to repeat a specific form, such as a sphere, choose materials that can be shaped the way you want.
- Make a sketch of your sculpture before you begin. When the sketch is finished arrange the objects you've collected.



*An Indiana artist created this assemblage of a flute player by using many different pieces of recycled metal and old auto parts.*

American Collections, The Children's Museum of Indianapolis

- Have a classroom sculpture exhibition and display your assemblage along with those of your fellow artists. Discuss how each person has used objects and materials to convey different ideas.

### SCORING CRITERIA

This assignment will be scored based on the student's ability to

- Reflect on the ideas that he or she wants to convey in a sculpture and consider new possibilities presented by the materials
- Select the objects and materials that convey chosen ideas best
- Execute design ideas by completing an assemblage made up of smaller forms
- Write at least one paragraph stating his or her ideas for the sculpture and the reasons for specific choices of design elements and media

### SCORING RUBRIC

This rubric provides a framework for determining a student's ability to identify and select design elements and materials, complete an assemblage that conveys these ideas and reflect on choices in written form.

- **Move objects around and try them out to get the effect you want.** Check the sculpture from several angles before you attach the pieces to each other.
- **When your assemblage is finished,** write a statement of at least one paragraph in your **Chihuly Notebooks** explaining your ideas for the sculpture and the reasons for your choices of design elements and materials.
- **Partial:** The student completes an assemblage but may have difficulty selecting design elements and conveying ideas. The student may have difficulty selecting and controlling materials and using them to convey his or her ideas. In the written paragraph, the student may not be able to explain coherent ideas for a sculpture.

■ **Essential:** The student selects design elements and uses them in a completed assemblage. The student chooses appropriate materials but may demonstrate some difficulties controlling them in a way that expresses his or her ideas effectively. The student can explain his or her ideas for the sculpture in written form and can provide a rationale for design choices.

■ **Exceptional:** The student selects design elements and uses them effectively to convey ideas in a completed assemblage. The student shows understanding of the possibilities presented by different objects and materials and selects those that communicate his or her ideas best. The student demonstrates exceptional control of the selected medium, creating a three-dimensional form that achieves the desired effect. The student's paragraph is well-written, provides a strong rationale for the selection of the design elements and materials and presents a coherent explanation of the relationship among design ideas, elements and media.

## MUSEUM LINKS

At **The Children's Museum** students can experience the sights and sounds of glassblowing in a dramatic show, *Chihuly's World of Glass*, in the Planetarium and engage in hands-on activities and virtual glassblowing experiences in the **Fireworks of Glass** gallery. They can choose colors and use Chihuly forms to create online drawings on the museum's Web site, [www.childrensmuseum.org](http://www.childrensmuseum.org).

## BONUS

■ **Glass Matters:** Glass is hot stuff but is it also supercool? Some scientists disagree about whether glass should be considered a solid, a liquid or another type of matter. Advanced students may want to research the meaning of the terms "amorphous solid" and "super-cooled liquid." Have them try to discover why these terms are sometimes used to describe glass and other materials.

■ **Amazing Facts:** Have students research and create a list of amazing facts about glass or amazing ways to use glass.

■ **A Glass Harp:** Throughout history people have experimented with musical instruments made of glass. Benjamin Franklin invented one that he called the "armonica." Some students may want to research specific glass instruments and determine how they produce their unique sound.

■ **Rainbow Effect:** Have students do further research and experiments on color as an aspect of light. By using a set of prisms they can duplicate Sir Isaac Newton's experiment in which he separated white light into the color spectrum and then reversed the effect.

■ **Glass in the Past:** Research the different uses of glass in cultures of the past and the areas of the world where glass was produced. Have students explore the reasons that glass became an important product for trade.

## TEACHER TIPS

Videos about glassblowing and glass-making processes on the Tacoma Museum of Glass Web site give students the next best thing to firsthand experience. Encourage students to take time to view the video segments of the *Macchias* experience on the Web site and listen to the sounds that accompany glass blowing. This experience also provides an excellent opportunity to reinforce the importance of teamwork. Glassblowing requires everyone involved to pay close attention, carry out responsibilities, trust other members of the team and watch out for everyone's safety. Some students may need help and encouragement in using the Web site. **The Children's Museum** exhibit and Web site offers virtual glassblowing experiences suitable for both younger and older children.

## HOT SHOP — HOW TO MAKE BLOWN GLASS

Blown glass is made in a **hot shop**. The hot shop is an artist's studio or workshop and is large enough for a **furnace** to melt the glass. It also has space for the glassblowing team to work.

First the glassblowers mix sand and other ingredients in a melting pot or tank and heat it to 2150°F. The mixture gradually melts and become **molten** glass. Molten glass is like a very thick liquid.

The glassblowing team is led by the **gaffer** or **maestro**, who is in charge of the piece being created. (The word *maestro* is Italian for “teacher” or “master.”) The gaffer directs team members who blow the glass, help add color and use various tools.

When the molten glass is ready, one of the glassblowers dips a **blowpipe** into the hot liquid. The blowpipe is a thin hollow metal rod. The glassblower uses it to collect a **gather**, a blob of glass, on the end of the pipe. The gather of glass is rolled on a steel table called a **marver** to smooth it into a rounded form. Then the



*A glassblower uses heavy shears to cut a piece of molten glass.*

glassblower twists the pipe and blows air through it to create a bubble of glass. The circular movement of the pipe and **gravity** help to shape the piece.

The gaffer uses **blocks**, large wooden tools that are kept wet, and other tools, to shape the hot glass into the form he or she

wants. Other members of the team help to shield the gaffer's arms and hands from the heat. The gaffer has to constantly reheat the piece to keep it at the right temperature. If it cools too quickly, the glass become brittle and could break. If it gets too hot, the glass will melt too much.



Chihuly Studio

*Glassblowers use metal rods and scissors to shape a new work.*

**Color** is an important element of most glass pieces. Most glassblowers start with clear glass and then add color. Colored glass is usually made in long rods or bars. This allows the gaffer to break off the right amount to melt and spread over the clear hot glass on a blowpipe. When the glass is blown into a bubble and shaped the colored glass becomes part of the whole piece. Several layers of color or thin bands or threads of color can be added. Another way

to add color is to dip the clear or colored glass bubble into some **frits** or **jimmies**. These are small bits of colored glass like the sprinkles on an ice-cream cone. The molten glass can also be rolled in a layer of frits that has been spread out on the marver.

Sifting a fine powder containing small amounts of metal, such as copper or gold, over the hot glass on the blowpipe can create different colors. Most glassblowing

teams have a member who is a color expert. It takes a great deal of training and experience to know what materials to use and how to create different effects. The clear glass, colored glass and metals have to heat and cool in similar ways or the piece may shatter or break.

When a blown glass artwork is finally ready, it is placed in an **annealing oven**. This is a special oven that cools the piece very slowly. If the temperature in the oven is not adjusted properly the piece will be fragile and may even break before it is removed. If the oven is at exactly the right temperature the piece will be strong. Creating a blown glass artwork is an accomplishment! No wonder glassblowing teams are proud of their work.

## LESSON 3

### TOWER POWER

In this lesson, students consider the decisions Chihuly makes in creating an installation. They identify different Chihuly forms and examine the ways they are used in the **Fireworks of Glass Tower and Ceiling** at **The Children's Museum**. They select the media they will use and create their own sculpture.



Craig Weili, The Children's Museum of Indianapolis, 2005

Based on plans developed by Chihuly and The Children's Museum staff, an artist created a drawing of the future **Fireworks of Glass Tower and Ceiling**.



The Children's Museum of Indianapolis, 2004

A scale model developed by The Children's Museum senior designer shows how the **Fireworks of Glass Tower and Ceiling** will become part of the museum's core.

## FOCUS QUESTIONS

- What makes the **Fireworks of Glass Tower and Ceiling** unique?
- What is an installation?
- How is experiencing an installation different from viewing a painting or sculpture?
- What decisions did Chihuly have to make when he designed **The Children's Museum Tower and Ceiling**?
- How did Chihuly and his team carry out the construction of the sculpture?
- What did they have to know about the building, the location and the audience?
- How was teamwork important?
- What forms does Chihuly use in the *Tower and Ceiling*?
- What forms would you like to create and use to make a sculpture?
- What media will you use?
- What other decisions will you have to make?
- What steps will you need to make to construct the sculpture?
- What effect will your sculpture have on the people who view it?

## OBJECTIVES

### Students will

- Use the Internet to research facts about the **Fireworks of Glass Tower and Ceiling**
- Identify the steps in constructing the *Tower and Ceiling*
- Consider what kinds of jobs and skills were needed to design and build the exhibit
- Give examples of why teamwork was important in constructing the sculpture
- Use online resources to identify Chihuly forms in the **Fireworks of Glass Tower and Ceiling**
- Design and name forms that they would like to use in creating a sculpture
- Work in teams to select media and plan the steps needed to construct a sculpture

## YOU WILL NEED VISUAL AIDS

- Images of **Fireworks of Glass Tower and Ceiling**
- Images of Chihuly's drawings for the *Tower and Ceiling*
- Images of the glassblowing process for *Tower and Ceiling* forms
- Images of construction process for **The Children's Museum** installation
- Web access

## ART MEDIA

Sculpting materials, such as clay, cardboard, paper, papier-mâché, foil, fiber, foam, found objects, plastic, wood and wire

## TIME

Three to four class periods

## HOT WORDS

- |               |                |
|---------------|----------------|
| ■ armature    | ■ installation |
| ■ construct   | ■ setting      |
| ■ chandelier  | ■ site         |
| ■ engineer    | ■ space        |
| ■ environment | ■ structure    |

## EXPERIENCE I A TOWERING ACHIEVEMENT

In this experience, students use the Web to research physical details about the **Fireworks of Glass Tower** and *Ceiling* and consider the decisions Chihuly had to make as he was planning the sculpture. They consider the roles and responsibilities of team members and other workers and why teamwork is important in constructing a large sculpture.

### INDIANA'S ACADEMIC STANDARDS

#### Visual Arts

Standard 11: Careers and Community:  
3.11.1, 4.11.2, 5.11.2

#### Language Arts

Standard 4: Writing Process: 3.4.1, 3.4.2,  
3.4.4, 4.4.1, 4.4.2, 4.4.4, 4.4.7, 5.4.1, 5.5.5

#### Science

Standard 5: The Mathematical World: 3.5.1



The Chihuly team and museum staff members work together to construct the **Fireworks of Glass Tower**.

The Children's Museum of Indianapolis, 2006

## PROCEDURES

- Show students images of the **Fireworks of Glass Tower** and *Ceiling* and have them guess the height of the sculpture.
- After students have had time to do some guessing, explain that the *Tower* is over 43 feet tall.
- Have students use yardsticks or measuring tapes to measure the height of the classroom from floor to ceiling and estimate how much taller the *Tower* would be. Help students measure the exact height on the classroom floor or in the hallway and compare to student estimates. (For fun, mark the measurement with masking tape and have students lie down on the floor to measure the distance. How many students tall is the sculpture?)



The **Fireworks of Glass Tower and Ceiling** light up the core of the museum at night.

The Children's Museum of Indianapolis, 2006



## DID YOU KNOW? FIREWORK FACTS

Dale Chihuly's **Fireworks of Glass** installation at **The Children's Museum of Indianapolis** took five years to plan and create. It consists of a *Tower* that rises to a height of over 43 feet through the heart of the museum and a *Ceiling* that serves as the base of the *Tower*. Together the two structures are an engineering marvel. The steel, aluminum and glass *Ceiling* appears to be suspended over the Lower Level exhibit area in the museum core. In fact, it is firmly anchored to massive structural beams and easily supports the 18,000-pound weight of the *Tower* above.

Construction began in January 2006. After the *Ceiling* was completed, workers erected a steel armature studded with small rods to serve as the "skeleton" for the *Tower*. Three workers from Chihuly's team and six employees from the museum's collections department carefully unpacked the glass pieces that had been shipped from Chihuly's studio in 350 cardboard boxes. A small plastic tube was inserted into the hollow end of each glass piece. The tube was designed to hold the glass pieces securely on the metal rods. The team began to place the pieces on the rods beginning at the bottom of the armature. Using ladders



*Chihuly team members position individual pieces on the armature as they begin construction of the **Fireworks of Glass** sculpture.*

and scaffolding, they worked their way to the top. They followed plans and models that Chihuly had developed in his studio but also had the freedom to make design decisions on-site as they determined how colors and forms interacted with each other and the environment of the museum's core.

Chihuly's glassblowing teams in Seattle spent months creating the 4,800 glass pieces that make up the artist's largest permanent installation to date. The 3,200 sinuous glass forms in the *Tower* are called *Twisted Horns* and *Goosenecks*. Some pieces, called *Hornballs*, are also tipped with bulbs and small spheres.

The predominantly red, yellow and cobalt blue colors in the *Tower* are accented with flashes of aqua, orange and lime green. The multicolored glass radiates light and excitement, a display of “fireworks” in the center of the museum. Below the *Tower*, the suspended *Ceiling* holds 1,600 glass forms especially arranged by Chihuly’s team. They represent some of the artist’s best-loved series, including *Seaforms*, *Persians*, and *Putti*. In the exhibit space beneath the *Ceiling* visitors can sit back on a gently revolving platform and look up at the kaleidoscope of colors and forms above.

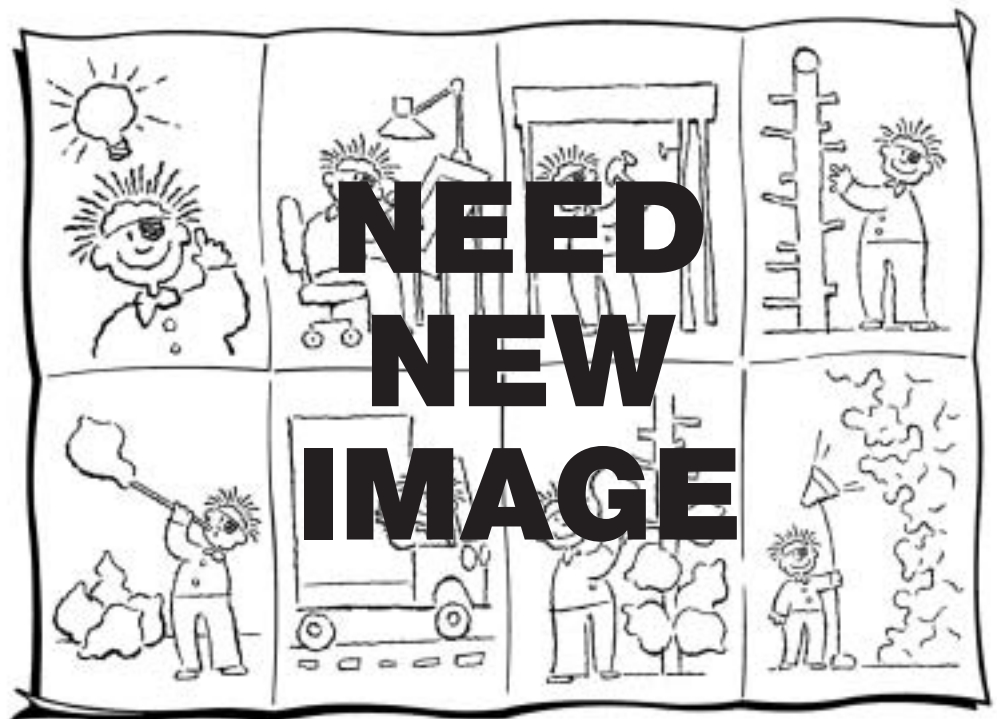
Ask students: “How do you think Chihuly creates a sculpture this large from something as fragile as glass?” Record student’s speculations on flip chart paper. After discussion, use **The Children’s Museum** Web site at [www.childrensmuseum.org](http://www.childrensmuseum.org) to introduce students to images of the *Tower* and *Ceiling* under construction by the Chihuly team. Give students time to access the Kids’ Page on the Web site, read the story of the *Tower* and *Ceiling* and take notes. Have them write “Amazing Facts About the **Fireworks of Glass Tower and Ceiling**” at the top of one page in their **Chihuly Notebooks** and record information such as the total weight and number of glass pieces used.

Place the class in groups of three and give each group one large piece of newsprint (at least 18" x 36") or other inexpensive paper. Have students fold the paper in half three times so that the paper is divided into eight frames of equal size.

Tell students that they are going to use **The Children’s Museum** Web site to research the steps in construction of the *Tower* and *Ceiling* and then develop a “comic strip” with eight frames that shows the different steps and key people in the construction process. Designate a student in each trio to be the “researcher,” who will check the facts, a “cartoonist,” who does the drawing, and a “recorder,” who adds the bubble of dialogue.

After using the Web site to view images and read about the various stages in constructing the sculpture, each team will have to discuss and agree upon eight major steps in constructing the **Fireworks of Glass Tower and Ceiling** and sequence them in order.

Debrief students by asking: What did Chihuly and his team need to know about the building before they began construction? What did they need to know about the audience? What kinds of decisions did they have to make? What kinds of experts helped them to make these decisions? What were the major steps in construction? How did they form the glass pieces and transport them to the museum? How did they construct the armature and mount the pieces? What kinds of jobs did local people do? What kinds of responsibilities did Chihuly team members have? Why was teamwork important?



*Sample Cartoon: After using The Children’s Museum Web site for research, have students create a cartoon that illustrates the process of creating the **Fireworks of Glass** installation.*

## EXPERIENCE 2

### FROM INSPIRATION TO INSTALLATION

Students examine Chihuly's drawings for the **Fireworks of Glass Tower** and *Ceiling* and consider how an installation of this kind relates to its setting or environment.



The Children's Museum of Indianapolis, 2006

A Chihuly team member arranges *Goosenecks*, *Twisted Horns* and *Horneyes* in the top of the **Fireworks of Glass Tower**.

## INDIANA'S ACADEMIC STANDARDS

### Visual Arts

Standard 3: Responding to Art — Criticism: 3.3.1, 3.3.3, 4.3.1, 4.3.3, 5.3.1, 5.3.3

Standard 6: Responding to Art — Aesthetics: 3.6.2, 4.6.2, 5.6.2

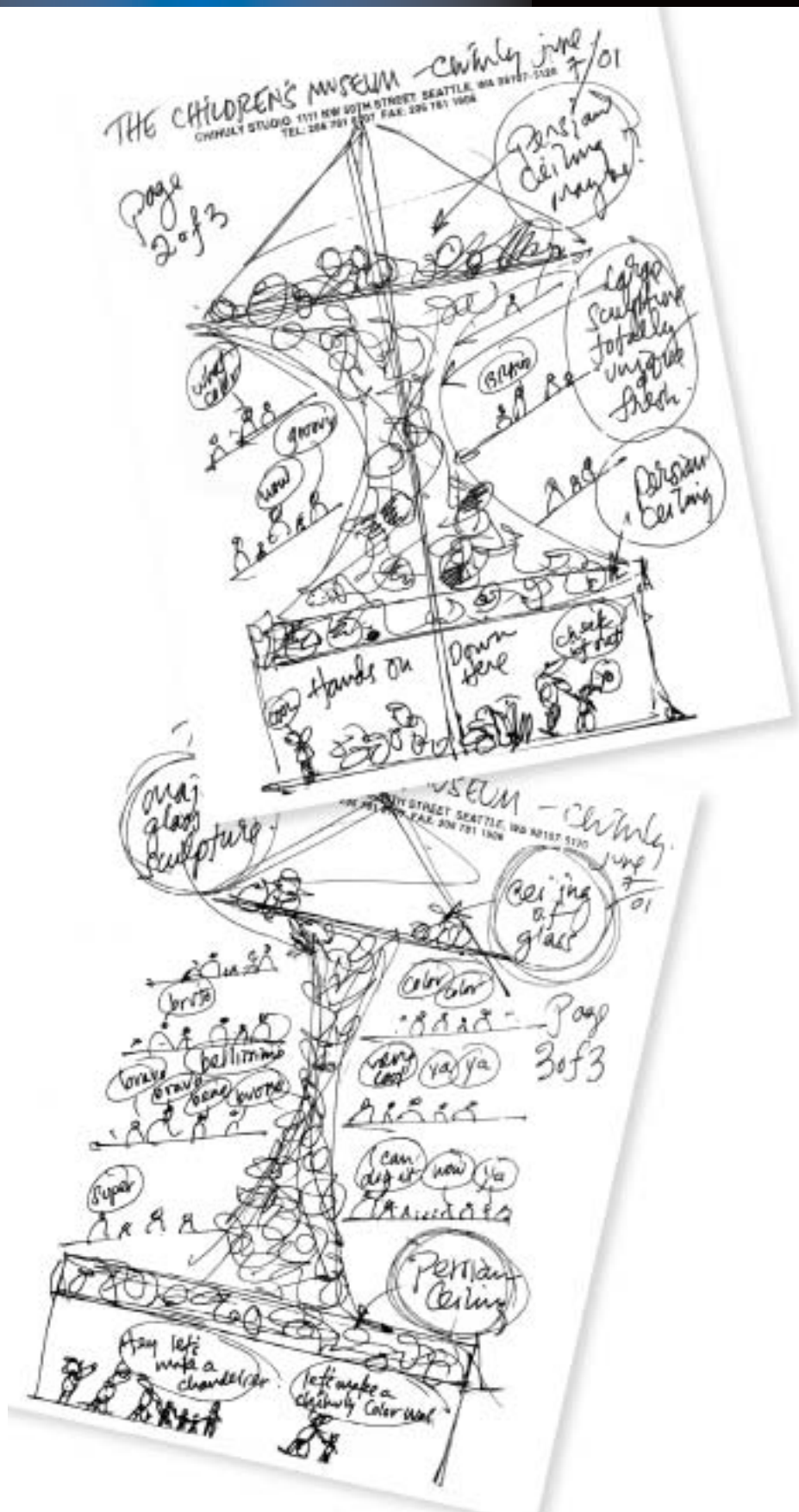
Standard 9: Creating Art — Production: 3.9.1, 4.9.1

### Language Arts

Standard 5: Writing Applications — 3.5.2, 3.5.4, 4.5.1, 4.5.5, 5.5.5

PROCEDURES

- Introduce students to three drawings created at the beginning of Chihuly's design process for the **Fireworks of Glass Tower and Ceiling**. Ask students: Can you tell from these drawings what forms and colors Chihuly had in mind for the *Tower and Ceiling*? How do you feel when you see the drawings? What kinds of effects do you think he wanted to create for viewers?
- Remind students that to achieve these effects Chihuly had to make choices. Ask students: What do you think was one of the first decisions he had to make?
- Help students consider the possibility that one of Chihuly's first decisions might have been the selection of glass as a medium. Ask students: "What other materials could Chihuly have chosen for this **setting**? Why so you think glass was chosen?" Students should remember that Chihuly is very interested in the way glass and other materials transmit light.



June 7/01 Page 1 of 3

Dear Jeffrey:

Greetings from the Seahorse. I listed all of your ideas & need a couple of sketches of an idea with glass on for ceiling, interior & down on the 2nd floor like you suggest. I think it would look pretty amazing. I'll have someone give you a call & walk figure out what to do next.

Tip from Chihuly.

After discussions with Dr. Jeffrey Patchen at **The Children's Museum** in June 2001, Chihuly created sketches that illustrate his vision for the **Fireworks of Glass Tower and Ceiling**. This vision was realized when the installation opened in March 2006.

Dale Chihuly, Sketches for The Children's Museum, pencil on paper, June 7, 2001.

## TOWERS AND CHANDELIERS

“The idea of a Tower just came from looking at one of my Chandeliers and imagining what it would look like upside down.”

— Dale Chihuly

Chihuly has been filling large spaces with his *Chandeliers* series since his first installation of this creation in Seattle in 1992. The *Chandeliers* are often immense and contain hundreds or even thousands of pieces of glass suspended by steel armatures or heavy chains. One of his most ambitious installations, *Chihuly Over Venice*, placed 14 *Chandeliers*, consisting of a total of more than 12,000 pieces of glass, along the canals of Venice. Chihuly also saw other possibilities in this type of sculpture. He realized that if he turned the form upside down it would become a *Tower*.

The open space of **The Children’s Museum** core is the perfect space for either a *Chandelier* or a *Tower*. Chihuly determined that a *Tower* would be the best choice. He realized that he could mount the *Tower* on a steel and glass *Ceiling* that would seem to float between the Lower Level and the First Floor of the museum. This would allow the *Tower* to soar toward the skylight, the highest point in the museum. Light would shower



Photo by Russell Johnson, Chihuly Studio

Dale Chihuly, Mercato del Pesce di Rialto Chandelier, 1996, 8' x 5', Chihuly Over Venice, Venice, Italy.

down through the skylight and play with the sculpture. The *Ceiling* supporting the *Tower* could be filled with glass pieces that would pour color and light on visitors below.

■ Show students images of **The Children’s Museum** core before the installation of the **Fireworks of Glass Tower**. Point out that it is a tall

vertical space that could hold a soaring sculpture. There is also a skylight in the roof above this space that fills the area with light.

■ Help students think of the space or environment as a key factor in selecting the medium and the type of sculpture Chihuly would create.

## CHIHULY ON ICE

Although he works primarily in glass, Chihuly sometimes uses a type of plastic called Polyvitro, a polyurethane material developed especially for outdoor sculptures or other settings where glass would be too fragile. Chihuly has even created sculptures from ice. In 1993, he designed *100,000 Pounds of Ice and Neon* for an installation at the Tacoma Dome. In 1999, he created a 64-ton installation entitled *Chihuly Jerusalem Wall of Ice*. Chihuly shipped large, very clear blocks of man-made ice from Alaska to a site just outside the gates of Jerusalem. In this desert environment, such a vast amount of ice created a sensation. Over the three days it took for the ice to melt, thousands of people visited the installation to experience the play of sunlight on ice during the day and the effects of colored spotlights on the ice at night. Chihuly's installations transform an environment so that light, color and materials interact to create extraordinary cultural and artistic experiences for viewers.



Dale Chihuly, *Chihuly Jerusalem Wall of Ice*, 1999.

Chihuly Studio



The Children's Museum of Indianapolis, 2006

A family is awed by the **Fireworks of Glass Ceiling**.

- Explain that works of art like the **Fireworks of Glass** are called **installations**. Often installations are large works or a series of works that create a special environment or relate to their environment in certain ways. The *Tower* and *Ceiling* at **The Children's Museum** is Chihuly's largest permanent installation.
- Ask students if they think visiting an installation is different from viewing a painting or sculpture. How?

## WHAT IS AN INSTALLATION?

Installations are usually temporary arrangements of art objects in museums or outdoors. While the environment is always important in viewing a work of art, installations are planned with a specific environment in mind and designed so that the work and the space interact with each other in dynamic ways. In many cases the artist intends to immerse the visitor in a unique experience or give the visitor a role in creating the experience. For example, a fabric artist might suspend long pieces of cloth from the ceiling of a room so that currents of air and the movement of people through the exhibit cause the fabric to flutter and swirl. In this case, visitors themselves would create some of the interactions that enliven an otherwise static space.

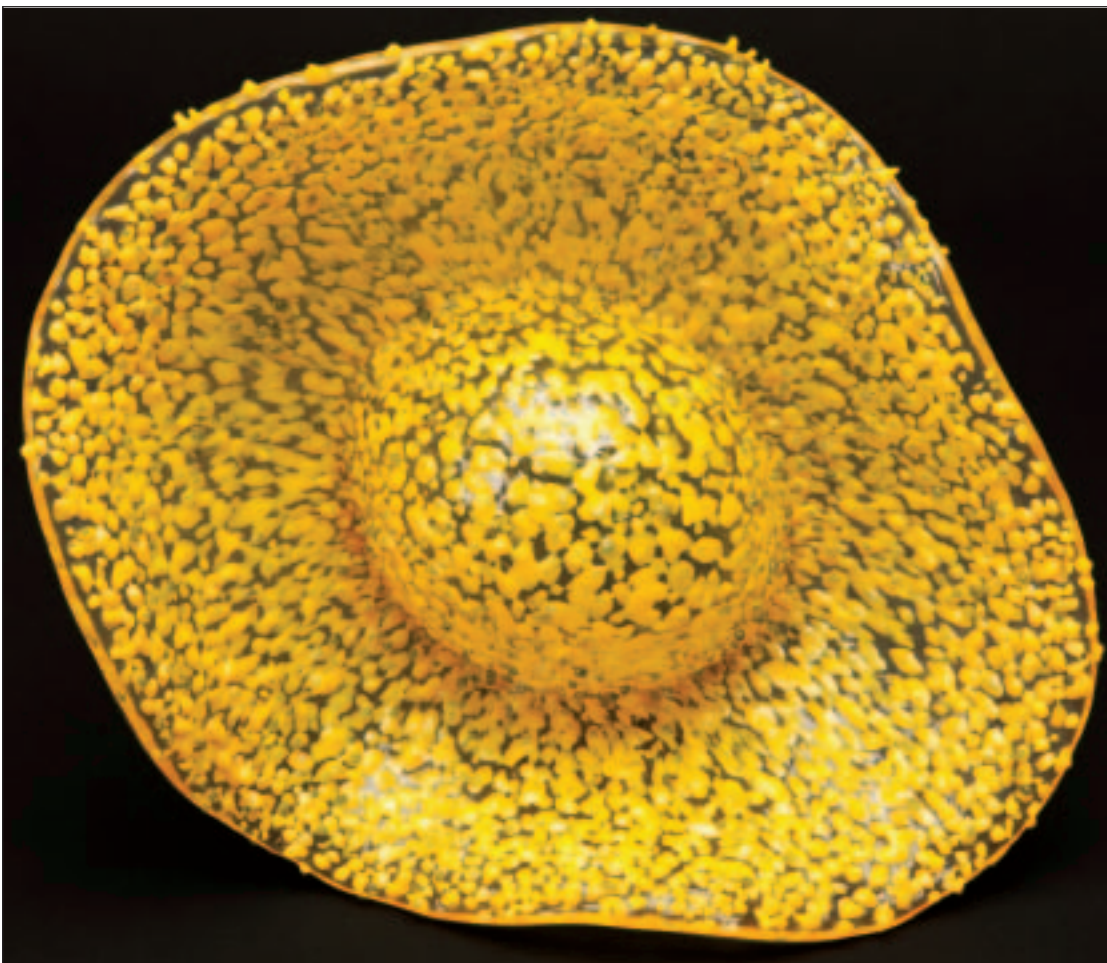
- Ask students: What do you think it would be like to stand near the **Fireworks of Glass Tower**? What would it be like to stand underneath the *Ceiling*? How would it make you feel? What would you be able to see and do?
- Have students take an imaginary journey to **The Children's Museum** and visit the space beneath the *Ceiling*. Have them write one or more paragraphs in their **Chihuly Notebooks** that describe the experience. They should use a variety of descriptive words to explain what they see and how it makes them feel. (After a real visit, students can record their impressions and compare them to their imaginary experience.)

## EXPERIENCE 3

### FORM AND FUNCTION

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Students view images of the **Fireworks of Glass Ceiling** and use **The Children’s Museum** Web site to link to identify Chihuly forms. They review their own artworks to select and name forms they would like to use in a sculpture. Working in teams, they resolve problems and develop plans for constructing a sculpture, including taking measurements and selecting location, forms, colors and media.



The Children's Museum of Indianapolis, 2006

*Chihuly's Mexican Hat is one of the many forms in the **Fireworks of Glass Ceiling**.*

## INDIANA'S ACADEMIC STANDARDS

### Visual Arts

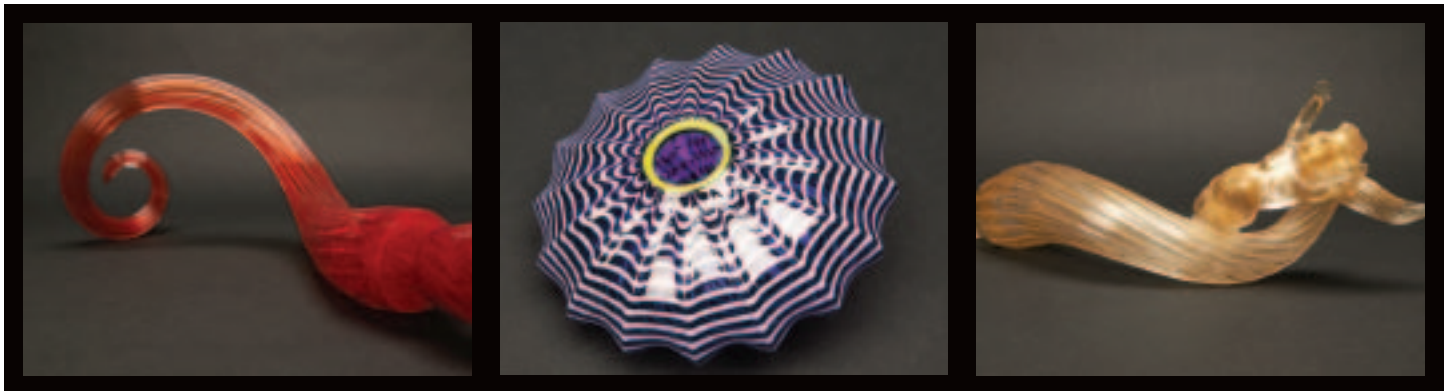
Standard 7: Creating Art — Production: 3.7.1, 4.7.1

Standard 8: Creating Art — Production: 3.8.2, 4.8.2, 5.8.2

Standard 9: Creating Art — Production: 3.9.1, 4.9.1, 5.9.1

## PROCEDURES

- Have several students read to the class their **Chihuly Notebook** paragraphs describing their imaginary visit. Discuss the things that they think they would see when they look at the glass *Ceiling*.
  - Show students images of the **Fireworks of Glass Ceiling**. Explain that Chihuly is famous for creating *Ceilings* that suspend many individual glass pieces over a room or walkway.
- At **The Children’s Museum**, light passes through the pieces in the *Ceiling*, reflecting colors on the floor and visitors below. Visitors can even sit back on a revolving platform and look up at the multicolored forms overhead.
- Ask students what kinds of forms they see in the images. Are forms organic or geometric? Are the same forms and colors repeated or is there an emphasis on variety?
  - Introduce students to **The Children’s Museum** Web site link to gallery activities. Here students can identify the Chihuly forms in the **Fireworks of Glass Ceiling**.
  - Have students use their **Chihuly Notebooks** to list the names of new forms they discover in the gallery.



Chihuly Studio

Dale Chihuly, *Twisted Horn*, Venetian, Putti, **Fireworks of Glass Ceiling**, 2006, *The Children’s Museum of Indianapolis*

## CHIHULY FORMS

In addition to *Baskets*, *Seaforms* and *Macchias*, Chihuly has created other forms in series that repeat and evolve. Chihuly often names these forms after he designs them in order to explain the effect that he wants to his team. *Persians* and *Venetians* were named after the glassblowing traditions in these areas of the world. *Persians* are flower-like spiral forms with fluted edges. Their intense colors are intersected with wavy ribs and veins. The *Venetian* series is reminiscent of Art Deco decorative vessels created in Venice in the 1920s and 30s and characterized by the brightly

colored and wildly entwined vines, leaves and flowers. *Putti*, from the Italian word *putto*, meaning “little boy,” also refers to an earlier artistic tradition. *Putti*, or cupids, were used in Renaissance and Baroque art and were also used in the Venetian Art Deco pieces. Chihuly uses them as playful figures that interact with other forms.

Ask students to return to their previous sketches and their assemblage. Remind students that Chihuly creates large sculptures from smaller parts by using a series of forms in many variations. Have they designed forms in their

artworks that they would like to use in a sculpture? Have students give names to their favorite forms. The names should help them explain the effect they want to achieve.

Introduce students to various types of materials and art media, such as clay, cardboard, paper, papier-mâché, foil, fiber, foam, found objects, plastic, wood and wire. Ask students: How will you create the forms you have selected? What would be the best media for the forms and the armature that supports them? If you are planning to add color, what media would work best?



## CHILDREN AND CHIHULY SCULPTURES

The work of Dale Chihuly has empowered students of various ages and abilities in schools across the country to develop sculptures using diverse materials.

Fourth Grade students at Clinton Young Elementary School in Indianapolis created a Chihuly *Tower* by covering long balloons in papier-mâché and painting the forms with tempera paints. They mounted their forms on dowel rods attached to a foam armature to create their installation. Visit **The Children’s Museum** Web site and click on the Teacher page to see their work.

In Cincinnati, Ohio, students in Grades 1–6 viewed the video “Chihuly Over Venice” and considered the question: “What is it about Dale Chihuly’s work that inspires us?” They tried Chihuly’s free drawing style and made multimedia collages that used texture and color to create patterns. They created outdoor sculptures from foil and painted papier-mâché forms. They made clay bowls and cylinders and constructed towers of painted plastic and glass bottles.

Even younger children love Chihuly. An exhibit at the Knoxville Museum of Art inspired preschool children at the Child Study Center at East Tennessee State University. They created Chihuly *Towers* and *Chandeliers* using “clown” balloons attached to large blocks of polystyrene



Fourth-grade students at Clinton Young Elementary School in Indianapolis decorate papier-mâché forms for their sculpture.

Photo courtesy of Deborah Boward, Clinton Young Elementary School, 2006

packing material. You can view their work at <http://child.etsu.edu/programs/childstudy/chihuly/chihuly.htm>

- Explain to students that it is time to develop a plan for a sculpture that they will create. Divide students into design teams of three to four students.
- Have teams review their **Chihuly Notebooks**, sketches, assemblage and the “comic strip” framework developed earlier. These items will help them select a site, type of sculpture, forms and media for their sculpture. They will consider the effects they want to create and problems they will have to resolve, including how to take measurements and create a larger work.
- Have each team use the **Student Handout: Plan a Sculpture** on page 59 to plan the steps needed in creating a sculpture.
- Debrief teams after they have developed their plans. Help them to modify their plans if necessary and collect the materials they will need.

## LESSON 3 ASSESSMENT

### SCULPT IT LIKE CHIHULY!

Using the plans developed in Experience 3, student design teams create their own sculptures. Each student will use his or her **Chihuly Notebook** to document the team's progress and evaluate the result. Each team will report on their self-evaluations and also carry out and discuss their evaluation of another team's work.

#### Present this scenario to students:

- Your design team is ready to begin work on your sculpture. Review your plan one more time and think about these questions:
  - What do you plan to name your sculpture? Why have you chosen this name?
  - How do you think light will interact with the materials you have chosen?
  - Will you be able to create the forms that you want to make from the materials you have chosen?
  - Do you think the kind of armature you are planning to build will support the sculpture?
  - If you are adding color to the forms, what kind of medium will you use? If you are using a wet medium, how long will it take to dry?
  - How will you attach forms to the armature?
  - How large will the parts of your sculpture be? How large will the sculpture be when it is put together?
  - Are there any changes you need to make in your plan?
  - Make sure you have the materials you need and that each team member knows his or her role.
- Work with your team to create your sculpture. Use your **Chihuly Notebooks** to document your progress. If difficulties develop, list them in your notebook and tell how you solved each problem.
- As a team, carry out a self-evaluation of your work by using your **Chihuly Notebooks** and answering the following questions:

#### SELF-EVALUATION

- What is your sculpture about?
- Did it turn out differently than you planned? Why?
- Did you make changes as you worked? Why?
- Did you make good decisions in selecting the location, media, forms, colors and other choices for your sculpture? (For example, does the location you selected have enough light? Did the media behave the way you expected? Were you able to make the forms and apply the colors the way you wanted to?)
- Did you take good measurements? Were you able to solve problems related to media and construction? What kinds of problems came up as

you worked? How did you solve them? (For example, was the armature strong enough? Were you able to attach the forms to the armature so that they didn't fall off? If not, what did you do about the problem?)

- Did your team follow your plan and work together? What were the advantages of working with a team? What were some of the problems?
- Does your sculpture have the effect you wanted? Have you been able to get your ideas across? If not, why?
- How do you think viewers will react to your sculpture? Why? What kind of impact does your sculpture have on the surrounding space?
- How were you influenced by Dale Chihuly's work as you planned and created this sculpture?
- What did you name your sculpture in the beginning? Would you give it a different name now? Why or why not?
- Report your findings on your own work to the entire class. Use your sculpture and any visual aids that you think would be helpful.
- Use the same questions to evaluate a "partner" team. Observe their sculpture and interview team members to answer the questions. The same team will evaluate your work. When both teams have finished the evaluations, have a "partners" discussion about the process of creating the sculptures and the result.

## SCORING CRITERIA

This assignment will be scored based on each team's ability to

- Decide on the meaning or ideas they want to communicate
- Select location, media, visual elements and other features that convey their ideas in a sculpture
- Take measurements and control media, techniques and processes to create a specific effect
- Work together to make choices, resolve problems and carry out tasks
- Pursue a plan for construction and complete the sculpture
- Evaluate their own work and that of another team, focusing on effectiveness of choices, use of skills, problem solving and communication of ideas

## SCORING RUBRIC

This rubric provides a framework for determining each team's ability to communicate ideas in a sculpture and to evaluate their own work and that of others.

- **Partial:** The team completes a sculpture but may have difficulty establishing the meaning of the work, communicating a specific idea or creating specific effects. The sculpture may indicate difficulty in controlling the medium and processes involved or difficulty in anticipating and resolving problems that developed during the execution of the sculpture. The work may indicate poor measurement skills and a lack of planning, teamwork and care in carrying out tasks. In their self-

evaluation, the team may not be able to explain the meaning they intended to convey or establish a connection between the effect they wanted and their choices of setting, media, techniques and visual elements and principles. They may also be unable to reflect upon and apply assessment criteria to the work of another team.

- **Essential:** The team establishes a meaning for their work and completes a sculpture showing good control of the selected media and processes. The work shows evidence of accuracy, planning, and teamwork in problem solving and care in execution. The team may not have been able to manipulate the medium and design elements and principles to convey their ideas effectively, but they recognize this as an important goal and can assess their own performance on this criterion. In their self-evaluation, the team is able to reflect upon the meaning they wished to convey and how well their choices obtained the results or effects they desired. They are also able to make fair comments about the effectiveness of the artistic choices made by another team.
- **Exceptional:** The team establishes a meaning for their work and completes the sculpture showing exceptional control of selected media, processes and techniques. The work shows evidence of accuracy, planning, teamwork and ongoing problem solving as well as great care in execution. Choices of setting, media and visual elements and principles are thoughtful and work together to communicate

ideas and/or create an original effect. In their self-evaluation the team reflects on the meaning they wished to communicate. They can identify Chihuly's influence in their choices and can explain how selection of location, materials, forms, techniques and other aspects of the sculpture were made consciously to convey ideas or achieve specific effects. The team can apply evaluation criteria to the work of another team with fairness and insight.

TEACHER TIPS

From the beginning to the end of this experience, help students focus on the question “What is this about?” Help them understand that the ideas they want to convey should guide their choices throughout the planning and construction of their sculpture. Collecting a variety of art media will be extremely important in this lesson. To the extent possible, let students choose from a selection of materials that they can manipulate and use safely in the school environment. Selections may need to be adapted according to students’ age and learning needs. Let families know about the sculpture project well in advance so that they can help collect materials. Allowing students to select a location in the classroom for their sculpture is also an important part of the learning process. In crowded classrooms, this will take planning in advance and some adjustments to create a variety of spaces and contexts where students can create their sculptures. Students will need assistance in the team planning process. Students should be allowed to do their own work, but younger students may need help and direction as they carry out the process of constructing the sculpture.



The Children's Museum of Indianapolis, 2005

A student in Chihuly’s 2005 workshop at The Children’s Museum uses the artist’s drip paint technique to create his own work.

BONUS

- After a visit to **The Children’s Museum**, have students use their notes, the “comic strip” they developed on page 48 and firsthand experience to write a newspaper article about the **Fireworks of Glass Tower and Ceiling**. The article should describe how the *Tower and Ceiling* were constructed and should include facts and details that would interest to readers. Students should be sure to mention how visitors react to the experience.

## PLAN A SCULPTURE

Refer to your sketches and paintings and discuss the questions on this sheet with your team.

Work together and make decisions about each question.

Write down the answers to develop a plan for your sculpture:

1. What will your sculpture be about?  
(This is the most important question. It will influence your answers to all the other questions.)
2. What kind of experiences and reactions do you want viewers to have when they interact with your sculpture?  
Think about the ideas you want to get across with your sculpture and the effects you want to create.  
(For example: Do you want viewers to experience a specific color? How do you want the color to make them feel?)
3. Where do you want to locate your sculpture? Why?  
(This is an important question too. It will also influence your other choices.)
4. What kind of sculpture do you want to create in this space? Why? (For example, do you want to create a sculpture that rises up like a tower, a sculpture that is suspended in air or one that is attached to a wall? What are some other possibilities?)
5. Will the sculpture you want to create fit the space? Be sure to use your math skills to take measurements as you plan and build the sculpture.
6. What forms do you want to use? Why? What would be the best medium for creating the forms?
7. What will you use to support the sculpture? Will you need an armature? How will you attach pieces to it?
9. What colors do you want to use? Why? What media would work best?
10. What steps will you need to take to construct the sculpture? Who will be responsible for each step? Will all team members work together on every step or will different team members do different jobs?

### Steps

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

### Team Members

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

## LESSON 4 — CULMINATING EXPERIENCE: INSTALL IT YOURSELF!

In this lesson students use what they have learned about Chihuly's process for creating large sculptures and installations to plan a temporary installation in their own school.



Photo courtesy of Deborah Bovard, Clinton Young Elementary School, 2006

*Fourth-grade students at Clinton Young Elementary School in Indianapolis worked as a team to create and install this sculpture in their school.*

## INDIANA'S ACADEMIC STANDARDS

### Visual Arts

Standard 8: Production: 3.8.1, 3.8.2, 4.8.1, 4.8.2, 5.8.1, 5.8.2

Standard 11: Careers and Community: 3.11.1, 4.11.2, 5.11.2

Standard 12: Careers and Community: 3.12.1, 4.12.1, 5.12.1, 5.12.3

### Language Arts

Standard 7: Listening and Speaking: 3.7.5, 3.7.7, 4.7.8, 4.7.5, 4.7.8, 4.7.9, 5.7.4, 5.7.5, 5.7.6

### Science

Standard 6: Common Themes — Models and Scale: 3.6.3, 4.6.3

## OBJECTIVES

### Lesson 4 will enable students to:

- examine examples of Chihuly installations of sculptures
- identify the roles that different Chihuly team members play in the process of planning and carrying out an installation
- consider why it is important for community members to become involved
- examine their own school setting in detail to determine where and how a sculpture or exhibition of sculptures could be installed
- determine which members of the school staff would need to be involved
- work in teams to plan a temporary installation in the school setting
- speculate about the impact of the installation on the selected space and the larger school environment

## FOCUS QUESTIONS

Use these questions to help students focus on key ideas in this experience:

- How does Dale Chihuly plan an installation?
- Why is teamwork important in this process?
- What are the roles of different members of the team?
- Why is it important for people in the local community to become involved?
- What impact does an installation have on the surrounding community?
- Could you create a temporary installation of a sculpture or sculptures in your school?
- Who would you need to talk to and work with to accomplish this?
- What impact would the installation have on everyday life in your school? What problems could develop?
- What benefits would the installation have for the school and people in the school community?
- How would the installation change the space around it? How would the characteristics of the space affect the installation?
- How would people react to the installation? What kind of experiences would it provide for viewers?

## YOU WILL NEED VISUAL AIDS

- Videos or Web-based images of Chihuly installations such as “Chihuly Over Venice” and *Chihuly in the Light of Jerusalem 2000*.
- Images of Chihuly team members carrying out different roles and working with community people

## TIME

Approximately two class periods

## HOT WORDS

- |                |             |
|----------------|-------------|
| ■ benefits     | ■ permanent |
| ■ environment  | ■ scale     |
| ■ installation | ■ setting   |
| ■ interact     | ■ space     |
| ■ officials    | ■ temporary |

PROCEDURES

- Show students videos or Web site pages documenting Chihuly installations in different settings. Explain that many of Chihuly’s installations are designed to be **temporary**. Ask students: How is experiencing a temporary exhibit different from visiting one that is **permanent**?
- Ask students to consider how the **environment** or **setting**, the place where the installation is located, is important. Explain that Chihuly designs and places his works so that they **interact** with a specific environment. The environment enhances the installation and, at the same time, helps us to experience the environment in a new way.
- Have students speculate about the various steps that must be taken to create and install works of art like this and the kinds of jobs involved. Use the chalkboard or a flip chart to record students’ thoughts.
- Help students think of steps that might not have occurred to them, such as getting permission from local **officials**, arranging for Chihuly team members to travel to the site and have places to stay, employing local people to help with some jobs, carrying out construction work, filming and documenting the process, contacting local newspapers and television stations, and working with local officials to manage traffic caused by large numbers of people visiting the exhibit.



Chihuly Studio

*Dale Chihuly poses with members of his glassblowing team. Each team member has an important role to play in the process of creating a glass sculpture and planning an installation.*

**CHIHULY TEAM**

Chihuly directs a diverse team of people with a wide range of talents. There is the **glassblowing team** that follows Chihuly’s specifications in creating a piece. This includes the head gaffer, color experts and technicians. There are also expert **packers** and **shippers** who pack glass pieces and ship them to a location safely. The **mock-up and installation**

**team** includes architects, lighting designers and builders who evaluate a space, construct the metal armatures that support a sculpture and put the glass pieces into place. Members of the **media team** are experts in photography, video, the Internet, book publishing and public relations. They use their special skills to communicate with the public about Chihuly and his work.

- Point out to students that it is not possible for one person to do this. It takes a team working in cooperation with local people. In addition to the glassblowing team, Chihuly works with a large group of people who carry out a number of different jobs.
- Ask students to speculate about the different jobs team members have. Use background information on the **Chihuly Team** to help them identify roles and responsibilities.



- Show students images of Chihuly team members working with local people. Ask students: Why is the involvement of local people important in planning and building an installation?
- Help students to understand that local people are needed to do certain jobs, such as direct traffic and keep the area clean. Officials such as the mayor, city council, police and other safety officers also have to give their approval.
- Ask students why local officials would have to be involved. Would a large installation have an impact on everyday life in the community? How? What problems might be involved? What **benefits** would the installation have for the community?
- Tell students that they will have the opportunity to plan a temporary installation in their own school. Divide the class into teams of four.
- Explain to students that they can select one of the sculptures previously created for the classroom as model. Before they make any decisions, however, they should become familiar with **spaces** in the school that might be settings for artworks.
- Show school maps to students and help them locate familiar places in the school on the map. Introduce them to areas that may be new to them, including outdoor spaces.
- Take students on a walking tour of the school to visit potential sites for a sculpture. Have students use their maps to find specific locations and take notes on what they discover.
- In their notes, students should try to answer the following questions about each space:
  - Is the space the right size for an installation?
  - What kind of installation would be interesting this space? Why? How could it be created and built?
  - What kind of light is available in this space? How will the light affect the installation during the day and at night?
  - Will people be able to visit the installation if you place it in this space?
  - Would there be any safety problems with having an installation at this site? How could you resolve these problems?
  - Who would be affected by an installation in this space? Whose permission would be needed to build an installation in this site?
  - Would this be a good setting for an installation? Why or why not?
  - How would this installation change the way you experience the surrounding environment?
  - What might you name your installation? Why?
- Have teams meet and use the maps and notes to begin planning their installation, including selection of site and type of sculpture, obtaining interviews to collect more information, carrying out calculations to increase the **scale** of the sculpture, developing plans for creating, constructing and maintaining the sculpture and plans for informing and involving people in the school community.
- When plans are complete, teams should prepare and deliver a presentation using visual aids to explain why an installation of this type would be important for the school community.

## LESSON 4 — ASSESSMENT

### ASSIGNMENT: INSTALL IT YOURSELF!

Now that you have created a Chihuly-style sculpture, it's time to think about making a big impression! Select one of the sculptures as a model for a larger temporary installation in your school building or on the school grounds. Work with a team to develop a practical plan for the installation and prepare a presentation for other people in your school. Your plan and presentation should answer the following questions:

#### Provide this scenario to students:

1. What kind of an installation would you like to create?
  - What might you name it?
  - What forms and colors will you use?
  - What materials will you select?
  - How large will it be? How does it compare in size to your model?
  - What math and science skills will you need to use to create a large sculpture?
  - How will it be constructed? How long will it be in place?
  - What will be the roles of each member of your team?
2. What space have you selected? Why is it a good place for the installation?
  - How will the installation look in the space? How will it make the space more interesting?
  - Who will be able to see the installation?
  - What kind of impact will it have on viewers? How will it make them feel?
3. Whose permission and cooperation do you need to create the installation?
  - Will people who work in the school be affected by the installation? (For example, will janitors need to clean the space? Will the installation make this difficult?)
  - Have you interviewed people in the school to get information?
  - Whose permission will be needed?
  - Will you need funding (money) for materials? Where will it come from?
4. What kinds of problems do you think you might have? How are you planning to resolve these problems?
5. How would this installation benefit your school community?

Each member of your team should take responsibility for explaining a part of the plan. All members of the team should be prepared to answer questions from your audience. Organize your ideas carefully and use the model sculpture and other visual aids, such as a sketch of the site and the installation, to help convey ideas. Look at your audience, speak clearly and include facts, details, examples and other information to make your ideas clear.

## SCORING CRITERIA

This assignment will be evaluated based on each team's ability to

- Understand and apply elements and principles of design in planning an installation
- Work as a team to develop a practical plan for creating an installation in the school setting
- Deliver an oral presentation that uses visual aids to effectively communicate ideas to listeners

## SCORING RUBRIC

This rubric will serve as a framework for evaluating each team's ability to design and plan construction of an installation and to communicate that plan to others in an oral presentation.

- **Partial:** The team chooses a sculpture as a model and develops a plan for an installation but does not demonstrate understanding of how the sculptural forms and other design elements of the installation will interact with the selected space. Evidence of teamwork may be lacking in plan development and in presentation and delivery of the plan to an audience. The team may have been unable to anticipate problems and identify possible solutions. The team may fail to take accurate measurements and there may be flaws in the construction phase of the plan that would make the installation impractical to carry out. The team members may fail to engage the audience or provide details, examples or clarifying information. Visual aids are present but may not be used effectively.

■ **Essential:** The team chooses a sculpture as a model and develops a plan for an installation. Selection of forms, colors and other design elements indicate that the team has anticipated at least some of the ways that these elements will interact with the light and other aspects of the selected space. The team can explain how they would scale the model up and the construction plan is practical. The plan shows evidence of teamwork although not all problems relating to construction and impact on the school community have been resolved. Team members deliver a well-organized presentation, speak clearly and use visual aids effectively. Questions from the audience may indicate that some problems and needs for information have not been anticipated.

■ **Exceptional:** The team chooses a sculpture as a model and develops a plan for an installation. They focus on the impact that the installation will have on viewers and show an exceptional understanding of the interaction of design elements and the selected space. The team can explain how the model would be built to a larger scale to suit the space and has anticipated construction problems. The team has analyzed the impact of the installation on the school community, correctly identifying benefits as well as the need for cooperation and permission from school officials. Team members deliver a well-organized presentation and use speaking skills that engage their audience to a high degree. Visual aids are used effectively to convey ideas. The team uses the presentation and

answers to audience questions persuasively to show that they have resolved potential problems and have developed a plan that could be carried out successfully in the school setting.

## TEACHER TIPS

Depending on circumstances in your school, it may or may not be possible to construct the installations students plan in the school building or on the grounds. Students can still learn from the planning process and gain an appreciation of the work involved. Share evaluation criteria with students and make sure they know that their plans should focus on ideas that they could actually carry out in the school setting. Keep school staff informed about the project and let them know that teams may want to interview them to learn about their jobs and how an installation would affect their work and the school environment. With approval from school officials, students can prepare a presentation and deliver their plan to an audience outside their own classroom, such as the principal, a faculty or staff committee, parents or students at a different grade level.

## MUSEUM LINKS

The best preparation for planning an installation would be to take students on a field trip to **The Children's Museum**, where they can actually experience the **Fireworks of Glass**. This will provide a real-life venue to consider questions related to the interaction of the artwork with the space. Here students can see the results of choices made by Chihuly and his team in designing and constructing the installation. They can also observe viewer reactions and reflect on their own interactions with the sculpture. They can analyze the use of materials and the roles involved in designing, planning and maintaining the installation. Students can see an overview of the installation process for the *Tower* and design their own installation on the museum Web site, [www.childrensmuseum.org](http://www.childrensmuseum.org). They can choose an indoor or outdoor space and determine the size and color for their sculpture. On completion of the installation, animation shows environmental effects and students can evaluate the results.

## FOR STUDENTS

### Books

There are few children's books on the history and science of glass or the art of glassblowing. The following fiction and nonfiction titles are available in local libraries and may be of interest to your students.

- Branse, J.L. *A Day in the Life of a Colonial Glassblower*. New York: PowerKids Press, 2002.

This story of a young boy learning his family trade of glassblowing is a useful link to the study of American history in Grade 5. It provides details on the glass manufacturing process in an era before mass production and gives insight into the life and work of colonial Americans.

- Geeslin, Campbell. *Elena's Serenade*. New York: Atheneum Books for Young Readers, 2004.

A little girl in Mexico is determined to study glassblowing, an art practiced exclusively by men, and grows closer to her father in the process. This fanciful and well-illustrated book may appeal to younger children. It focuses on the picturesque and traditional aspects of Mexican culture, and also reinforces the importance of pursuing your dreams.

- Houston, James. *Fire Into Ice: Adventures in Glass Making*. Toronto, Ont.: Tundra Books, 1998.

Canadian author and glass artist James Houston lived in the Arctic for many years. This book explains, in part, how his glass sculptures are made and how he draws inspiration from nature and from native peoples.

- Parker, Steve. *Glass*. Milwaukee, Wis.: Gareth Stevens Publishing, 2002.

Full of amazing facts about glass, this book in the *Science Files — Materials*, series uses simple text, color photos and illustrations to explain the properties, raw materials, manufacturing processes, diverse types and uses of glass and its potential for future inventions.

## FOR TEACHERS

### Books

- Bannard, Walter Darby, and Henry Geldzahler. *Chihuly: Form From Fire*. Seattle: Portland Press, 1993.

Chihuly's artworks are illustrated by full-color images of a wide selection of Chihuly sculptures, such as the *Baskets* and *Seaforms* at the core of his work from the 1970s through the 1990s. Photographs and commentary about his large-scale architectural installations also are featured.

- Chihuly, Dale. *Baskets*. Seattle: Portland Press, 1994.

"Baskets turned out to be one of the best ideas I ever had." (Dale Chihuly)

Quotes from the author; commentary by art critics, drawings and 75 color photographs tell the story of the series of forms that was inspired by American Indian baskets and evolved into some of Chihuly's most evocative works.

- *Chihuly Baskets*. Seattle: Portland Press, 1995.

Experimenting with the *Basket* form, Chihuly attempted to strengthen glass by forcing it into a ribbed mold. The result was both strong and delicate, a fluid form with radial lines and undulating edges that suggest water, motion and marine life. Oceanographer Sylvia Earle and art historian Joan Seeman Robinson add their insights to the full-page color photographs of Chihuly's sea-like creations.

- *Chihuly Gardens and Glass*. Seattle: Portland Press, 2002.

"I want my work to appear like it came from nature so that if someone found it ... they might think it belonged there" (Dale Chihuly). More than 100 full-page color images of the artist's glass sculptures in gardens and other outdoor settings illustrate Chihuly's intent to integrate his works with nature even as their presence alters our perception of the environment.

FOR TEACHERS *continued*

- Littleton, Harvey K. *Glassblowing: A Search for Form*. New York: Van Nostrand Reinhold, 1971.  
Harvey Littleton started the first course in glassblowing at an American university and was Dale Chihuly's teacher. Littleton's insistence on the importance of glass as a medium for artistic expression in the 1960s and '70s constitutes what the artist calls a "revivalist manifesto." Color and black-and-white photos help to trace the history, materials and processes of glassblowing and demonstrate the quest to discover the essential form and nature of glass that is the hallmark of both Littleton's and Chihuly's work.
- Warmus, William. *The Essential Dale Chihuly*. New York: Harry N. Abrams, 2000.  
The small format of this book does not allow for a full presentation of images but does provide a useful overview of Chihuly's life and work. Soon to be out of print, the book may still be available in libraries and from online booksellers.

## VIDEOS

"Chihuly in Action": This 27-minute video shows the artist working with at-risk students at Hilltop Artists in Residence, a glassblowing program Chihuly started to help young people understand the importance of teamwork and personal responsibility. The video also shows him working with younger children in a drawing workshop. It is available in many libraries, **The Children's Museum** Store and from Portland Press.

## WEB SITES

## ■ Dale Chihuly — Artist:

[www.chihuly.com](http://www.chihuly.com)

The artist's Web site provides a comprehensive overview of his work, including his biography, the development of his series of forms, the role of drawing in his art, the creation of his major installations and statements about his artistic vision.

This is the site to find beautiful images of Chihuly's diverse and fascinating works.

## ■ Corning Museum of Glass:

[www.cmog.org](http://www.cmog.org)

The collections of the Corning Museum represent 3,500 years of glassmaking and glassblowing from ancient Egypt to the 20th century and beyond. The [Research and Learn](#) page of the Web site provides an extensive and downloadable *Resource on Glass* with background information, a glossary and answers to questions frequently asked by teachers and students.

## ■ Museum of Glass:

[www.museumofglass.org](http://www.museumofglass.org)

Click on [The Building](#) page of this site, which features Chihuly's *Bridge of Glass* and information about the museum's *Hot Shop*, including a glossary of glassblowing terms. The [Education](#) page provides a *Virtual Hot Shop* with videos, information and an interactive glassblowing activity.

## ■ Portland Press:

[www.portlandpress.net](http://www.portlandpress.net)

Chihuly's Seattle-based publishing house provides a wealth of images as well as information on how to order books, DVDs, videos, stationery, calendars, posters and prints. Images in all publications meet Chihuly's high standards for quality.

## ■ The Children's Museum of Indianapolis:

[www.childrensmuseum.org](http://www.childrensmuseum.org)

Visit the museum's Web site and click on **Fireworks of Glass** for information on Dale Chihuly and his work, the **Fireworks of Glass Tower** and *Ceiling*, and interactive experiences for children, families and classrooms.

## EXHIBITS

For a schedule of current and future exhibits of Chihuly's work, visit the artist's Web site at [www.chihuly.com/schedule.html](http://www.chihuly.com/schedule.html)

### Chihuly in Indiana

Individual Chihuly works are part of both private and museum collections in Indiana. Significant exhibitions also have taken place at several museums in the past. In addition to the **Fireworks of Glass Tower** and **Ceiling** at **The Children's Museum**, Chihuly works may be seen at the following locations:

- Ball State Museum of Art, Muncie, *Basket set*
- Brauer Museum of Art, Valparaiso University
- Columbus Museum of Art and Design
- Columbus Visitors Center, *Yellow Neon Chandelier*
- Eiteljorg Museum of American Indian and Western Art, Indianapolis
- Fort Wayne Museum of Art, The George R. Stroemple Collection
- Indiana University School of Medicine, VanNuys Medical Sciences Building, Indianapolis, *DNA Tower*
- Indianapolis Museum of Art

### Chihuly Across America

Dale Chihuly's works are part of the collections of many museums and galleries across the country. The following institutions have substantial permanent Chihuly collections on display:

- Colorado Springs Fine Arts Center (Opening Fall 2006)
- Oklahoma City Museum of Art
- Franklin Park Conservatory, Columbus, Ohio
- Tacoma Art Museum, Tacoma, Washington
- Toledo Museum of Art, Toledo, Ohio

Many other locations have at least one major piece, such as a *Chandelier*, on permanent display, including the following museums:

- Birmingham Museum of Art, Birmingham, Alabama
- Clinton Library and Archives, Little Rock, Arkansas
- San Jose Museum of Art, San Jose, California
- Delaware Art Museum, Wilmington, Delaware
- Naples Museum of Art, Naples, Florida
- Wichita Art Museum, Wichita, Kansas
- Kalamazoo Institute of Arts, Kalamazoo, Michigan
- Minneapolis Institute of Arts, Minneapolis, Minnesota
- Kemper Museum of Contemporary Art, Kansas City, Missouri

- St. Louis Art Museum, St. Louis, Missouri
- Joslyn Art Museum, Omaha, Nebraska
- Corning Museum of Glass, Corning, New York
- Cincinnati Art Museum, Cincinnati, Ohio
- Columbus Museum of Art, Columbus, Ohio
- Oklahoma City Museum of Art, Oklahoma City, Oklahoma
- National Liberty Museum, Philadelphia, Pennsylvania
- Dallas Museum of Art, Dallas Texas
- San Antonio Museum of Art, San Antonio, Texas
- Milwaukee Art Museum, Milwaukee, Wisconsin

## GLOSSARY

**abstract** — a style in which the artist simplifies, leaves out or rearranges elements of a subject to the point that it may not be recognizable

**ancient** — from a long time ago; having lasted for a very long time

**armature** — a core or framework, similar to a skeleton, to support a sculpture

**assemblage** — a three-dimensional work of art made by joining many pieces together

**benefits** — the positive contributions resulting from some action

**chandelier** — a decorative light that hangs from the ceiling and has several branch-like parts for holding bulbs. Chihuly has developed the *Chandelier* as a sculptural form made up of many glass pieces that reflect light rather than using light bulbs.

**collection** — a group of objects of one type that have been collected by one person or in one place

**construct** — to build something or put together different parts to form something

**elements of design** — the visual “tools” artists use to create art, including line, shape, form, color, space and texture

**engineer** — a person who uses science and math to design and build structures

**environment** — the surroundings in an indoor or outdoor space; the complex interaction of physical and biological factors in nature

**fireworks** — devices filled with flammable chemicals that produce bright displays of colored patterns or loud noises when they explode

**form** — an element of design; any three-dimensional object that has height, width and depth, such as a cube, sphere or cylinder

**fragile** — easily damaged, broken or harmed

**frits or jimmies** — coarsely ground bits of colored glass. A glassblower will dip a gather of glass into a pile of frits or roll the hot glass over frits that have been spread on a steel table called a marver. This creates spots or speckles of color in the piece.

**furnace** — an enclosed structure heated to a very high temperature so that substances put inside, such as glass, will melt or burn

**gas** — a fluid substance such as air that when unconstrained does not have shape or volume and tends to expand indefinitely

**gaffer** — the leader of a glassblowing team and the person in charge of a glass piece that is being created

**geometric** — related to the branch of mathematics that deals with measurement, properties and relationships or points, lines, angles, surfaces and solids. Geometric shapes include circles, squares, triangles, etc. Geometric forms include spheres, cubes, pyramids, etc.

**glass** — a hard transparent material made from silica sand that is used to make different objects

**glassblowing** — blowing air into a tube to form heated glass into objects.

**gravity** — the force that attracts objects to each other, especially the force that makes things fall to the ground

**hot shop** — a facility with a furnace, gas-fed heating chambers, a temperature-controlled annealing oven and other equipment, where glassblowers create works made from glass

**ingredients** — materials or components that make up any mixture or combination

**innovative** — using new methods and ideas

**intermediate color** — a color made by mixing a secondary color with a primary color

**installation** — arrangements of art objects in galleries, museums or outdoors. Installations are often planned with a specific environment in mind and designed so that the work and the space interact with each other in dynamic ways.

**interact** — the way two or more objects or substances act or react to affect each other

**liquid** — a substance, such as water, that is not a solid or gas and that flows freely

**Macchia** — a Chihuly glass form characterized by its layers of opaque color and colored spots, based on the word

for “spot” or “spotted” in Italian

**maestro** — teacher or maste; a very skilled person; the leader of a glass-blowing team

**marver** — a smooth, flat steel plate on which glass is rolled.

**matter** — physical substances in the universe

**medium, media** — the material(s) for creating artworks

**mold** — a hollow container with a particular shape into which soft or liquid substances are poured, so that the substances harden and take the shape of the container

**molten** — metal, rock or glass in a liquid state because of great heat

**multiples** — many items of the same type or different types

**natural** — existing in or produced by nature; not artificial

**officials** — the members of an institution who manage facilities, budgets and information

**opaque** — preventing rays of light from passing through, and therefore not transparent

**organic** — being or coming from living plants and animals. Organic shapes and forms are irregular, such as things in nature.

**pattern** — a choice of lines, colors or shapes repeated in a planned way

**permanent** — lasting a long time

**primary colors** — the three colors (red, yellow and blue) that can be mixed together in different ways to make other colors.

**principles of design** — the way elements of design are combined or organized: balance, unity, variety, emphasis, pattern, movement and rhythm

**properties** — qualities of a substance or material that can be used in a particular way

**revive** — to bring back from an unused state

**scale** — a proportion of two sets of dimensions, such as the relationship between a model or drawing and the original object

**sculpture** — an artwork that has three dimensions: height, width and depth or thickness

**secondary colors** — colors made by mixing two of the primary colors

**setting** — the environment or surroundings for an artwork or literary work

**shape** — a flat or two-dimensional figure that may be geometric (square, circle, triangle) or organic (irregular in outline)

**site** — the piece of land or other area where something will be located

**sketch** — a preliminary drawing used in planning an artwork

**solid** — a substance that is not liquid or gas

**space** — an empty area that is available to be used

**structure** — the way in which the parts of a system or object are arranged or organized, or a system arranged in this way

**temporary** — not lasting or not needed for a long time

**texture** — the way a surface feels or appears to feel, sensed by touch or sight

**tower** — a tall narrow structure, often square or circular, which is either a part of a building or stands alone

**trade blankets** — blankets using American Indian designs manufactured by other Americans in the 19th and early 20th centuries for the purposes of trade with native peoples

**transform** — to change completely the appearance or character of something or someone

**translucent** — allowing some light through

**transparent** — allowing most light through so that a material can be seen through easily



## INDIANA ACADEMIC STANDARDS

### Grade 3 Language Arts Standards Comprehension and Analysis of Grade-Level-Appropriate Text

3.2.2 Ask questions and support answers by connecting prior knowledge with literal information from the text.

3.2.3 Show understanding by identifying answers in the text.

#### Organization and Focus

3.4.1 Find ideas for writing stories and descriptions in conversations with others; in books, magazines, or school textbooks; or on the Internet.

3.4.2 Discuss ideas for writing, use diagrams and charts to develop ideas, and make a list or notebook of ideas.

3.4.3 Create single paragraphs with topic sentences and simple supporting facts and details.

#### Research and Technology

3.4.4 Use various reference materials (such as a dictionary, thesaurus, atlas, encyclopedia, and online resources).

#### Different Types of Writing and Their Characteristics

3.5.2 Write descriptive pieces about people, places, things, or experiences that develop a unified main idea and use details to support the main idea.

3.5.4 Use varied word choices to make writing interesting.

#### Organization and Delivery of Oral Communication

3.7.5 Organize ideas chronologically (in the order that they happened) or around major points of information.

3.7.7 Use clear and specific vocabulary to communicate ideas and establish the tone.

### Grade 4 Language Arts Standards Structural Features of Informational and Technical Materials

4.2.1 Use the organization of informational text to strengthen comprehension.

4.2.2 Use appropriate strategies when reading for different purposes.

#### Organization and Focus

4.4.1 Discuss ideas for writing. Find ideas for writing in conversations with others and in books, magazines, newspapers, school textbooks, or on the Internet. Keep a list or notebook of ideas.

4.4.2 Select a focus, an organizational structure, and a point of view based upon purpose, audience, length, and format requirements for a piece of writing.

4.4.4 Use common organizational structures for providing information in writing, such as chronological order, cause and effect, or similarity and difference, and posing and answering a question.

#### Research and Technology

4.4.7 Use multiple reference materials and online information (the Internet) as aids to writing.

#### Different Types of Writing and Their Characteristics

4.5.1 Write narratives (stories) that include ideas, observations, or memories of an event or experience; provide a context to allow the reader to imagine the world of the event or experience; and use concrete sensory details.

4.5.5 Use varied word choices to make writing interesting.

#### Organization and Delivery of Oral Communication

4.7.5 Present effective introductions and conclusions that guide and inform the listener's understanding of important ideas and details.

4.7.8 Use details, examples, anecdotes

(stories of a specific event), or experiences to explain or clarify information.

4.7.9 Engage the audience with appropriate words, facial expressions, and gestures.

### Grade 5 Language Arts Standards Comprehension and Analysis of Grade-Level-Appropriate Text

5.2.3 Recognize main ideas presented in texts, identifying and assessing evidence that supports those ideas.

5.2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

#### Organization and Focus

5.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

#### Different Types of Writing and Their Characteristics

5.5.5 Use varied word choices to make writing interesting.

#### Organization and Delivery of Oral Communication

5.7.4 Select a focus, organizational structure, and point of view for an oral presentation.

5.7.5 Clarify and support spoken ideas with evidence and examples.

5.7.6 Use volume, phrasing, timing, and gestures appropriately to enhance meaning.

### Grade 3 Science Standards Scientific Inquiry

3.1.2 Participate in different types of guided scientific investigations such as observing objects and events and collecting specimens for analysis.

3.1.3 Keep and report records of investigations and observations using tools, such as journals, charts, graphs, and

computers.

### **Technology and Science**

3.1.7 Recognize that and explain how an invention can be used in different ways, such as a radio being used to get information and for entertainment.

### **Manipulation and Observation**

3.2.3 Keep a notebook that describes observations and is understandable weeks or months later.

3.2.4 Appropriately use simple tools, such as clamps, rulers, scissors, hand lenses, and other technology, such as calculators and computers, to help solve problems.

### **The Mathematical World — Numbers**

3.5.1 Select and use appropriate measuring units, such as centimeters (cm) and meters (m), grams (g) and kilograms (kg), and degrees Celsius (?C).

### **Common Themes — Models and Scale**

3.6.3 Explain how a model of something is different from the real thing but can be used to learn something about the real thing.

## **Grade 4 Science Standards**

### **Technology and Science**

4.1.5 Demonstrate how measuring instruments, such as microscopes, telescopes, and cameras, can be used to gather accurate information for making scientific comparisons of objects and events. Note that measuring instruments, such as rulers, can also be used for designing and constructing things that will work properly.

### **Computation and Estimation**

4.2.1 Judge whether measurements and computations of quantities, such as length, area, volume, weight, or time, are reasonable.

4.2.5 Write descriptions of investigations, using observations and other evidence as support for explanations.

### **Earth and the Processes That Shape It**

4.3.5 Describe how waves, wind, water, and glacial ice shape and reshape the Earth's land surface by the erosion of rock and soil in some areas and depositing them in other areas.

4.3.6 Recognize and describe that rock is composed of different combinations of minerals.

### **Common Themes — Models and Scale**

4.6.3 Recognize that and describe how changes made to a model can help predict how the real thing can be altered.

## **Grade 5 Science Standards**

### **Technology and Science**

5.1.7 Give examples of materials not present in nature, such as cloth, plastic, and concrete, that have become available because of science and technology.

### **Manipulation and Observation**

5.2.4 Keep a notebook to record observations and be able to distinguish inferences from actual observations.

### **Earth and the Processes That Shape It**

5.3.4 Investigate that when liquid water disappears it turns into a gas (vapor) mixed into the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.

### **Matter and Energy**

5.3.8 Investigate, observe, and describe that heating and cooling cause changes in the properties of materials, such as water turning into steam by boiling and water turning into ice by freezing. Notice that many kinds of changes occur faster at

higher temperatures.

5.3.9 Investigate, observe, and describe that when warmer things are put with cooler ones, the warm ones lose heat\* and the cool ones gain it until they are all at the same temperature. Demonstrate that a warmer object can warm a cooler one by contact or at a distance.

## **Grade 3 Social Studies Standards**

### **The World in Spatial Terms**

3.3.1 Distinguish between physical and political features on maps and globes and label a map of North America identifying countries, oceans, major rivers, the Great Lakes, and mountain ranges. Locate the United States, Indiana, and the local community.

### **Places and Regions**

3.3.3 Explain that regions are areas that have similar physical and cultural characteristics and locate the local community in a specific region.

3.5.3 Examine the contributions of individual artists (painters, sculptors, writers, musicians, and traditional artists) in enriching the culture of the community.

3.5.5 Use community resources — such as museums, libraries, historic buildings, and other landmarks — to gather cultural information about the community.

## **Grade 5 Social Studies Standards**

### **Places and Regions**

5.3.2 Use community resources — such as museums, libraries, historic buildings, and other landmarks — to gather cultural information about the community.

## Grade 3 Visual Arts Standards

### Responding to Art: History

3.1.1 Identify visual clues in works of art and artifacts that reflect characteristics of a given culture and speculate on where, when and by whom the work was made.

3.1.2 Speculate on the function or purpose of a work of art and make connections to the culture.

3.2.2 Identify and distinguish between realistic, abstract, and non-objective works of art.

3.2.3 Describe clues found in a work of art or artifact that determine if the work is old or new.

### Responding to Art: Criticism

3.3.1 Identify and describe sensory, formal, technical and expressive properties in the work.

3.3.3 Use appropriate art vocabulary.

3.4.1 Listen to multiple responses to a work of art by people from the art world (historians, critics, philosophers, curators) then identify criteria used by these people in making informed judgements.

### Responding to Art: Aesthetics

3.6.2 Reflect on personal response to a work of art and identify personal preference.

### Creating Art: Production

3.7.1 Demonstrate observational skills in the production of artwork.

3.8.1 Apply elements (line, shape, form, texture, color and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis) in their work that effectively communicates their ideas.

3.8.2 Identify and discriminate between types of shape (geometric and organic), colors (primary, secondary, complementary), lines (characteristics and qualities), textures (tactile and visual), and

space

(placement/overlapping/negative/positive/size), in their work and the works of others.

3.9.1 Identify differences between media and the visual characteristics of each medium.

3.9.2 Identify and control different media, techniques and processes to effectively communicate ideas, experiences, and stories.

3.10.1 Demonstrate evidence of reflection, refinement and care in completion of work.

3.10.2 Identify and apply assessment criteria for studio work (craftsmanship, control of media, communication of ideas) and reflect on the evidence of those qualities in their work.

### Careers and Community

3.11.1 Identify the roles of artists, docents, guards, and curators at museums and galleries.

3.12.1 Identify individual art experiences and how these affect daily life.

## Grade 4 Visual Arts Standards

### Responding to Art: History

4.1.1 Identify the relationship between a work of art and the geography and characteristics of the culture; and identify where, when and by whom the work was made (focus: Indiana history).

4.2.2 Identify styles of works of art as belonging to a specific culture and place.

4.2.3 Distinguish between contemporary and traditional works of art and identify characteristics of both.

### Responding to Art: Criticism

4.3.1 Analyze sensory, formal, technical and expressive properties in a work of art.

4.3.3 Use appropriate art vocabulary.

### Responding to Art: Aesthetics

4.6.2 Understand that personal preference is one of many criteria used in making informed judgments.

### Creating Art: Production

4.7.1 Demonstrate refined observational skills in their work.

4.8.1 Apply elements (line, shape, form, texture, color and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis) in work that effectively communicates their ideas.

4.8.2 Identify and discriminate between types of shape (geometric and organic), colors (primary, secondary, complementary, tints, and shades), lines (characteristics, quality), textures (tactile and visual), and space (placement, perspective, overlap, negative, positive, size), balance (symmetrical, asymmetrical, radial) and the use of proportion, rhythm, variety, repetition, and movement in their work and the works of others.

4.9.1 Identify differences between media and the visual characteristics of each medium.

4.9.2 Identify and control different media, techniques and processes to effectively communicate ideas, experiences and stories.

4.10.1 Demonstrate the ability to successfully generate an idea, select and refine an idea, and execute the idea.

4.10.2 Identify and apply criteria for assessment in their work, in peer critiques, and in self-assessment.

### Careers and Community

4.11.2 Identify various opportunities in art related careers (historian, critic, curator, gallery director, display artist, website designer, graphic artist etc).

**Grade 5 Visual Arts Standards**

**Responding to Art: History**

5.1.1 Identify the relationship between a work of art and the geography and characteristics of the culture, and identify where, when, why and by whom the work was made (focus: North America).

5.2.2 Identify distinguishing characteristics of style in individual artists work and art movements.

**Responding to Art: Criticism**

5.3.1 Analyze the artist's use of sensory, formal, technical and expressive properties in a work of art.

5.3.3 Use appropriate art vocabulary.

**Responding to Art: Aesthetics**

5.6.2 Understand that personal preference is one of many criteria used in making judgments about art.

**Creating Art: Production**

5.7.1 Demonstrate refined observational skills through accurate rendering of representational objects and subject matter from life.

5.8.1 Apply elements (line, shape, form, texture, color, value and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis and unity) in work that effectively communicates their ideas.

5.8.2 Identify and discriminate between types of shape (geometric and organic), colors (primary, secondary, complementary, intermediates, neutrals, tints, tones, shades, and values), lines (characteristics, quality), textures (tactile and visual), and space (background, middleground, foreground, placement, perspective, overlap, negative, converging lines positive, size, color), balance (symmetrical, asymmetrical, radial) and the use of proportion, rhythm, variety, repetition, and movement in their work and the works of others.

5.9.1 Discriminate between visual characteristics of a variety of media and selectively use these in their work.

5.9.2 Identify and control different media, techniques and processes to effectively communicate ideas, experiences, and stories.

5.10.1 Demonstrate evidence of reflection, thoughtfulness and care in selecting ideas and completing work.

5.10.2 Identify and apply criteria for assessment in their work, in peer critiques, and in self-assessment.

**Careers and Community**

5.11.2 Identify various responsibilities of selected careers in art (illustrator, costume and set designer, sculptor, display designer, painter, graphic designer, animator, visual editor).

**NATIONAL ACADEMIC STANDARDS**

**National English Language Arts Standards**

**Content Standard 1:** Students read a wide range of print and non-print texts to build an understanding of texts, themselves and the cultures of the United States and the world; to acquire new information; to respond to the needs of and demands of society and the workplace; and for personal fulfillment.

**Content Standard 3:** Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts.

**Content Standard 4:** Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

**Content Standard 5:** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

**Content Standard 7:** Students conduct research on issues and interests by generating ideas and questions and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

**Content Standard 8:** Students use a variety of technological and informational resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

**Content Standard 12:** Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

**National Arts Education Standards**

**Visual Arts K-4**

**Content Standard 1:** Understanding and applying media, techniques and processes

- a) know the difference in materials, techniques and processes
- c) use different media, techniques and processes to communicate ideas, experiences and stories
- d) use art materials and tools in a safe, responsible manner

**Content Standard 2:** Using knowledge of structures and functions

- a) know the differences among visual characteristics and purposes of art in

order to convey ideas

- b) describe how different expressive features and organizational principles cause different responses
- c) use visual structures and functions of art to communicate ideas

**Content Standard 3:** Choosing and evaluating a range of subject matter, symbols and ideas

- a) explore and understand prospective content for works of art
- b) select and use subject matter, symbols and ideas to communicate meaning

**Content Standard 5:** Reflecting upon and assessing the characteristics and merits of their work and the work of others

- a) understand there are various purposes for creating works of visual art
- c) understand there are different responses to specific artworks

### Visual Arts 5-8

**Content Standard 1:** Understanding and applying media, techniques and processes

- a) apply media, techniques and processes with sufficient skill, confidence and sensitivity so that their intentions are carried out in their artworks
- b) conceive and create works of visual art that demonstrate an understanding of how the communication of their ideas relates to the media, techniques and processes they use

**Content Standard 2:** Using knowledge of structures and functions

- b) evaluate the effectiveness of artworks in terms of organizational structures and functions
- c) create artworks that use organizational principles and functions to solve specific visual arts problems

**Content Standard 3:** Choosing and evaluating a ranges of subject matter, symbols and ideas

- b) apply subjects, symbols and ideas in their artworks and use the skills gained to solve problems in daily life

**Content Standard 5:** Reflecting upon and assessing the characteristics and merits of their work and the work of others

- b) describe meanings of artworks by analyzing how specific works are created and how they relate to historical and cultural contexts
- c) reflect analytically on various interpretations as a means for understanding and evaluating works of visual art

### National Science Education Standards

#### Content Standards K-4

**Content Standard A — Science as Inquiry:** As a result of activities in grades K-4, all students should develop Abilities necessary to do scientific inquiry Understanding about scientific inquiry

**Content Standard B —** As a result of the activities in grades K-4, all students should develop an understanding of

- Properties of objects and materials
- Position and motion of objects
- Light, heat, electricity, and magnetism

**Content Standard E — Science and Technology:** As a result of activities in grades K-4, all students should develop

Understanding about science and technology Abilities to distinguish between natural objects and objects made by humans

**Content Standards G — History and Nature of Science:** As a result of activities in grades K-4, all students

should develop understanding of Science as a human endeavor

#### Content Standards: 5-8

**Content Standard A — Science as Inquiry:** As a result of activities in grades 5-8, all students should develop Abilities necessary to do scientific inquiry Understanding about scientific inquiry

**Content Standard B —** As a result of their activities in grades 5-8, all students should develop an understanding of

- Properties and changes of properties in matter
- Motions and forces
- Transfer of energy

**Content Standard E — Science and Technology:** As a result of activities in grades 5-8, all students should develop

Understanding about science and technology

**Content Standards G — History and Nature of Science:** As a result of activities in grades 5-8, all students should develop understanding of

- Science as a human endeavor
- Nature of science
- History of science

### National Social Studies Standards

**Content Standard 1:** Students can explain and give examples of how language, literature, the arts, architecture, other artifacts, traditions, beliefs, values, and behaviors contribute to the development and transmission of culture.

**Content Standard 4:** Students can relate personal changes to social, cultural, and historical contexts; describe personal connections to place as associated with community, nation, and world. They work independently and cooperatively to accomplish goals.



Photo by Terry Rishel, Chihuly Studio, 2006

The **Fireworks of Glass Tower** (Detail), *The Children's Museum of Indianapolis*, 2006



Photo by Teresa N. Rishel, Chihuly Studio, 2006

The **Fireworks of Glass** Tower and Ceiling, *The Children's Museum of Indianapolis*, 2006



*Dale Chihuly, Pendleton Blanket Collection, The Boathouse, Seattle, Washington.*

Photo courtesy of Brian Sullivan





Photo by Kevin Carter, The Children's Museum of Indianapolis, 2006

*Dale Chihuly, Collection of American Indian Baskets, The Boathouse, Seattle, Washington.*



Photo by Chihuly Studio

Dale Chihuly, Cadmium Yellow Seaform Set With Red Lip Wraps, 1989, 13" x 33" x 16".



Photo by Claire Garouste, Chihuly Studio

*Dale Chihuly, Alabaster Basket Set With Oxblood Lip Wraps, 1991, 18" x 27" x 21".*



Collection of the Corning Museum of Glass, Corning, NY (66.1.2.13)

Vase, Egypt, 18th dynasty, about 1400–1300 B.C., Opaque turquoise, white, yellow and dark blue glass; core-formed, applied 11.10.7cm.

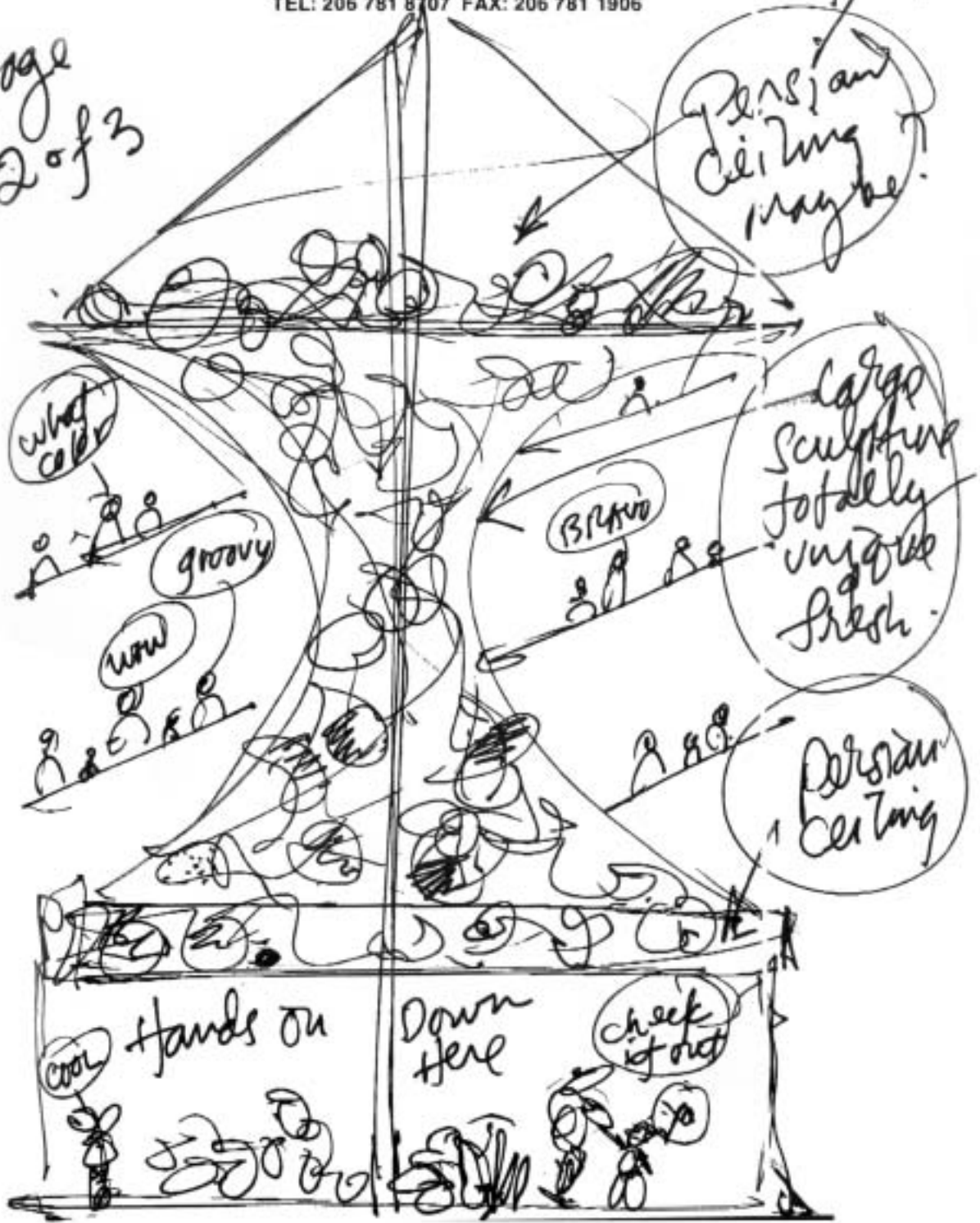


Photo by Claire Geroutte, Chihuly Studio

*Dale Chihuly, Pale Yellow Macchia With Red Lip Wraps, 1986, 20" x 22" x 21".*

THE CHILDREN'S MUSEUM - Chihuly June 7/01  
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Dale Chihuly, Drawing for the **Fireworks of Glass** Tower and Ceiling, graphite pencil on paper, June 2001.

Chihuly Studio



The Children's Museum of Indianapolis, 2006

*Before: The empty core of The Children's Museum waits for Chihuly's installation of the **Fireworks of Glass Tower and Ceiling.***