



PCC

PARSIPPANY CUBE CLUB

Complete Cubing Curriculum

Beginner Foundations • Speed Development • Competition • Youth Leadership

A ready-to-use program for camps, tutoring, school clubs, workshops, online lessons, and community competitions.

Designed to develop problem-solving, algorithmic thinking, perseverance, confidence, collaboration, and service.

Founded in 2020 • Youth-led • Community-centered • All skill levels welcome

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About This Curriculum

Purpose, audience, delivery formats, and table of contents

The Parsippany Cube Club approach

Parsippany Cube Club (PCC) began as a youth-led effort to teach cubing remotely and has grown into a community program offering instruction, tutoring, camps, workshops, and competitions. This curriculum preserves that spirit: every learner should experience the satisfaction of solving a difficult puzzle, every instructor should teach with patience, and every event should strengthen community.

Who this is for

- Learners ages 7 and older; no prior cubing experience required.
- Beginner, intermediate, and advanced students learning at different speeds.
- Volunteer instructors, teen mentors, camp counselors, and private tutors.
- Families, schools, libraries, recreation departments, and community partners.

How it can be delivered

- Weekly classes: 60-90 minutes for 8-12 weeks.
- Intensive camps: 2-3 hours per day for 3-5 days.
- Private coaching: individualized 30-60 minute sessions.
- Online instruction: camera positioned above the hands and cube.
- Competition preparation and event-day workshops.

Core program promise

Every student leaves with progress: A successful session is not defined only by a completed solve. Progress may be recognizing pieces, performing a trigger correctly, recovering from an error, improving a time, teaching a peer, or showing perseverance after frustration.

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Learning Outcomes & Level System

A developmental pathway from first turns to leadership

What students learn

Domain	End-of-program evidence
Puzzle fluency	Identify centers, edges, corners, layers, faces, and legal turns; use standard notation accurately.
Problem-solving	Break a complex solve into smaller goals, recognize patterns, select a strategy, and check results.
Algorithmic thinking	Follow, memorize, explain, and eventually adapt repeatable move sequences.
Executive function	Sustain attention, sequence steps, manage working memory, and recover after mistakes.
Character	Practice patience, perseverance, sportsmanship, confidence, and respect for different learning speeds.
Community leadership	Teach peers, judge practice solves, volunteer at events, and connect cubing with service.

Five PCC levels

Level	Readiness standard
1. Cube Explorer	Can identify pieces, perform basic notation, create a daisy, and complete a matched white cross with guidance.
2. Independent Solver	Can solve a 3x3 using the PCC beginner method with a reference sheet and explain each major stage.
3. Confident Solver	Can solve without a reference, recover from common errors, and complete consistent timed solves.
4. Speedbuilder	Uses efficient turning, basic finger tricks, inspection planning, and introductory F2L/advanced last layer skills.
5. Competitor / Mentor	Competes calmly, records averages, sets training goals, teaches beginners, and supports fair event operations.

Placement and progression

- Place students by demonstrated skill, not age. A young learner with strong spatial reasoning may advance quickly; an older learner may benefit from a slower pace and more repetition.
- Advance when the student can demonstrate the skill on a scrambled cube, explain the purpose of the step, and repeat it successfully more than once.
- Avoid “time-only” promotion. Speed matters after accuracy, confidence, and safe turning habits are established.

Recommended checkpoints: Entry placement, end of Unit 3, first full solve, three independent solves, first timed average, and mentor readiness.

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Teaching Model & Class Design

How PCC instructors make difficult skills understandable

The PCC instructional cycle

Phase	Instructor behavior
1. Show	Demonstrate slowly with the same cube orientation as the learner. Name the goal before naming the moves.
2. Chunk	Teach no more than 2-4 moves at a time. Pause at visible landmarks so students can self-check.
3. Guide	Have the student perform the step while explaining what they see. Prompt with questions before touching the cube.
4. Fade	Reduce reminders: full script → first move only → visual cue → independent execution.
5. Reflect	Ask what worked, where the cube changed, and what the student will look for next time.

Recommended session structures

Length	Suggested flow
60 minutes	5 welcome/check-in; 8 warm-up; 15 teach; 15 guided practice; 10 independent practice; 5 challenge; 2 exit check.
75 minutes	5 welcome; 10 warm-up; 18 teach; 18 stations; 12 timed/partner practice; 8 challenge; 4 reflection.
90 minutes	10 community builder; 15 review; 20 instruction; 25 rotations; 10 competition simulation; 5 teaching-back; 5 close.

Instructor standards

- Use calm language: "Reset and try again" rather than "That is wrong."
- Keep your own hands off the learner's cube unless permission is given.
- Orient your demonstration cube to match the learner's viewpoint.
- Praise strategy, attention, and persistence - not only natural speed.
- Check understanding through performance, not "Do you get it?"

Inclusive adaptations

- Use high-contrast sticker shades or tactile markers when helpful.
- Offer larger cubes or smoother-turning cubes for fine-motor needs.
- Give printed move cards, color diagrams, and verbal rhythm cues.
- Allow standing, short movement breaks, or reduced scramble depth.
- Pair students by complementary strengths, not simply speed.

Room and online setup

- Aim for one instructor or trained mentor per 4-6 true beginners. Use tables with enough space for one cube, one guide, and a scorecard per learner.
- For online lessons, require an overhead or angled hand view, strong lighting, muted notifications, and a second solved cube for the instructor.

Safety and care: No throwing, forcing, or rapidly corner-cutting unfamiliar cubes. Small caps and internal pieces can be choking hazards; young children should be supervised. Parents/guardians remain responsible for medical and behavioral needs.

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Ready-to-Run 10-Week Beginner Course

One 75-minute class per week; adaptable for camps or private tutoring

Week	Focus	Instructional targets	Mastery check
1	Cube literacy & notation	Centers/edges/corners; color relationships; R L U D F B; accurate quarter turns.	Notation relay and cube anatomy check.
2	Daisy & white cross	Build daisy; match side colors; lower petals to white center.	Complete cross twice with prompts.
3	White corners	Locate target corner; align side colors; use corner insertion trigger.	Solve first layer with reference.
4	Middle layer - right	Find non-yellow edge; line up front color; perform right insertion.	Insert three right-going edges.
5	Middle layer - left & recovery	Left insertion; remove a trapped or flipped middle edge.	Complete first two layers.
6	Yellow cross	Recognize dot, L, line, cross; apply cross algorithm with correct holding.	Create yellow cross from three scrambles.
7	Align yellow edges	Identify matched edges; cycle remaining top edges.	All four top edges match centers.
8	Position yellow corners	Determine correct corner location regardless of orientation; corner cycle.	All corners in correct slots.
9	Orient corners & full solve	Twist each corner using repeated trigger; preserve cube orientation.	First complete solve and celebration.
10	Independence & mini competition	Review weak stages; timed practice; judging, sportsmanship, and goal setting.	Three solves plus progress certificate.

Camp conversion

For a five-day camp, teach two weeks of content per day. Begin each morning with a 15-minute retrieval review, offer a slower “foundation station” and a faster “challenge station,” and end each day with a low-pressure showcase. Do not rush the final layer if the group has not stabilized the first two layers.

Private-lesson conversion

- Use a diagnostic scramble at the start. Spend 70% of the lesson on the single step causing the greatest breakdown and 30% on full-solve integration.
- Assign a specific practice dose: for example, “five white crosses” or “ten right insertions,” not simply “practice more.”

Graduation standard: The core course is complete when a student can solve from a legal scramble with no physical assistance. A reference card is permitted for the Independent Solver level.

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Unit 1 - Cube Literacy & Notation

Learning to see the cube as a system rather than six separate colors

Objectives

- Identify 6 fixed center pieces, 12 edge pieces, and 8 corner pieces.
- Explain that centers define each face color and determine where other pieces belong.
- Perform R, L, U, D, F, and B turns; distinguish clockwise, counterclockwise, and double turns.
- Maintain a consistent holding position while reading an algorithm.

Core notation

Symbol	Meaning	Teaching cue
R	Right face clockwise	Turn the right layer upward when viewed directly from the right.
R'	Right face counterclockwise	Undo R; apostrophe means counterclockwise.
R2	Right face twice	A 180-degree turn; direction does not matter.
U / U' / U2	Top face turns	Commonly used to line pieces up before an insertion.
L, D, F, B	Left, Down, Front, Back	Always judge clockwise while looking directly at that face.

Teaching sequence

1. Start with a solved cube. Ask students to point to a center, edge, and corner without turning.
2. Turn only U. Ask what moved and what stayed in the same relative structure.
3. Teach R, then R'. Practice "move and undo" so students connect inverse moves.
4. Add U and U'. Combine into the four-move pattern R U R' U'. Do not yet call it an algorithm; focus on accurate turns.
5. Introduce F, L, D, and B only after students can preserve orientation through R/U drills.

Drills

Accuracy drills

- Call-and-response: instructor calls 8 moves; students execute slowly.
- Inverse hunt: students state the move that undoes each symbol.
- Turn quality: each move stops exactly at 90 or 180 degrees.
- Orientation freeze: after every third move, identify front and top.

Thinking drills

- Piece detective: find the red-blue edge and name its home.
- Center prediction: identify the opposite face without rotating the cube.
- Algorithm rhythm: say "R U R-prime U-prime" while moving.
- Error spotting: instructor intentionally performs one wrong direction.

Mastery check: Student reads and performs a 10-move sequence with at least 8 correct moves and can independently identify a requested edge and corner.

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Unit 2 - Daisy & White Cross

Building the first structure through observation and planning

Target state

A correct white cross has four white edge stickers touching the white center, and the side color of every cross edge matches the center directly beneath it. A “white plus sign” without matching side centers is not complete.

Beginner-friendly daisy method

1. Hold the yellow center on top. Find a white edge anywhere on the cube.
2. Move that edge next to the yellow center, creating one daisy petal. Avoid disturbing petals already placed.
3. Repeat until all four white edges surround the yellow center.
4. Turn U until one petal's side color matches the center on the same side.
5. Turn that matching face 180 degrees. The white petal moves to the white center on the bottom.
6. Repeat match-and-drop for all four petals; rotate the whole cube so white is now on top for the first layer.

Instructor questions that build reasoning

- “Which center tells you where this edge belongs?”
- “Can you bring the white sticker up without breaking a petal?”
- “Before turning twice, what side color must match?”
- “How will you know the cross is correct without looking at the white face?”

Common errors and corrections

Error	Coaching response
White corner used as a petal	Review the difference: an edge has two colors; a corner has three.
Petal reaches top but breaks another	Use U to create an open top position before lifting the new edge.
Cross looks white but sides mismatch	Return mismatched edge to the daisy, match its side center, then turn 180 degrees.
Student rotates cube constantly	Keep yellow top during daisy; use whole-cube rotations only when intentionally changing stage.

Practice prescription

- Beginner: build five daisies only. Intermediate: build five complete crosses. Challenge: inspect for 20 seconds and predict the first two white edges before turning.

Mastery check: Complete two correctly matched white crosses from different scrambles with no instructor touching the cube.

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Unit 3 - White Corners

Completing the first layer with a reliable corner trigger

Recognition

A white corner belongs between the three centers that match its three colors. Students should first name the corner's home, then move the corner to the bottom layer directly below that home. The working slot is the front-right corner.

Corner insertion

R' D' R D

Repeat until the white sticker faces up and the corner is solved. Usually 2-4 repetitions.

Setup: White face on top; target slot at front-right; target corner directly underneath in the bottom-front-right position.

Teaching sequence

1. Find a white corner in the bottom layer. Read its two non-white colors and locate the matching center pair.
2. Rotate D until the corner is directly under its correct slot.
3. Hold that slot at front-right. Repeat R' D' R D slowly, returning each face fully after every move.
4. If a white corner is in the top layer but wrong or twisted, place it at front-right and perform the trigger until it drops to the bottom; then reinsert correctly.
5. After each corner, inspect the entire first-layer side band. Every sticker in the top row should match its center.

Coaching language

Helpful cues

- "Name its home before you move it."
- "Under the slot, then use the trigger."
- "Right down, bottom away, right up, bottom back."
- "Finish all four moves even if the piece looks solved early."

Avoid

- Letting students repeat moves rapidly without checking orientation.
- Solving the corner for the student to save time.
- Calling every white piece a corner.
- Teaching multiple insertion algorithms before the first one is stable.

Differentiation

- For memory support, place four arrows on a move card. For advanced students, introduce shorter intuitive insertions when white faces the side, but retain the universal trigger as the recovery method.

Mastery check: Solve all four white corners from a completed cross and explain why each corner belongs in its chosen slot.

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Unit 4 - Middle Layer Edges

Choosing, aligning, and inserting an edge without disturbing the first layer

Setup and recognition

Turn the cube so the solved white face is on the bottom and yellow is on top. Search the top layer for an edge with no yellow sticker. Match the front-facing sticker to its center, creating a vertical "T." Then inspect the edge's top color: it must move either left or right.

Right insertion

U R U' R' U' F' U F

Moves the aligned top edge into the middle-right slot.

Setup: White face down; matched "T" on the front; destination color center is on the right.

Left insertion

U' L' U L U F U' F'

Moves the aligned top edge into the middle-left slot.

Setup: White face down; matched "T" on the front; destination color center is on the left.

Decision routine

1. Find a top edge with no yellow. If none exists, a middle edge is trapped or flipped and must be removed using either insertion algorithm.
2. Turn U until the front sticker matches the front center.
3. Look at the edge's top color. Find that center on the left or right.
4. Move the edge away from its destination first: U for a right insertion, U' for a left insertion.
5. Execute the algorithm, then verify both stickers of the inserted edge.

Common breakdowns

Problem	Fix
White face accidentally on top	Pause and reorient: white bottom, yellow top for all middle-layer work.
Wrong left/right algorithm	After matching the front, point physically to the destination center before turning.
First layer breaks	The likely cause is a missing prime or incomplete 90-degree turn. Undo only when the error is known; otherwise reset.
No usable top edge	Use an insertion algorithm on an incorrect middle edge to bring it out, then insert the correct edge.

Mastery check: Complete the first two layers from a solved first layer on two different scrambles, using both right and left insertion at least once.

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Unit 5 - Yellow Cross & Edge Alignment

Recognizing last-layer patterns and cycling edges into place

Part A: create the yellow cross

Yellow cross

F R U R' U' F'

Changes the top-edge orientation while preserving the first two layers.

Setup: Yellow face up. Hold the L like an upper-left corner; hold the line horizontally. For a dot, apply the algorithm and reassess.

Case	Correct response
Dot	No yellow edge stickers face up. Perform the algorithm once; identify the new case.
L shape	Two adjacent yellow edges face up. Hold the L in the upper-left of the top face.
Line	Two opposite yellow edges face up. Hold the line horizontally, not vertically.
Cross	All four yellow edges face up. Move to edge alignment.

Part B: match yellow cross edges to side centers

Turn only U and count how many yellow cross side stickers match their centers. If all four match, continue to corners. If two adjacent edges match, hold those solved edges at the back and right when possible. If two opposite edges match, perform the cycle once to create an adjacent case, then repeat.

Top-edge cycle

F2 U L R' F2 L' R U F2

Cycles three yellow cross edges while preserving their upward orientation.

Setup: Yellow face up. Use U turns to establish the best matching case before applying the algorithm.

Teaching emphasis

- Separate orientation from permutation: first make yellow stickers face up; then move those correctly oriented edges to the correct locations.
- Students should count matches after every algorithm rather than applying the sequence repeatedly without diagnosis.
- Use center language: "Does the side sticker match the center?" Never judge only from the top face.

Practice drill

- Instructor prepares dot, L, line, and cross cases. Student names the case, chooses the holding position, and predicts whether one or more applications will be needed before turning.

Mastery check: Create and align a yellow cross from three prepared last-layer cases with correct holding positions and no physical assistance.

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Unit 6 - Yellow Corners & the First Full Solve

Place corners first, then twist them without losing the solved structure

Part A: position the yellow corners

A corner is in the correct position when its three colors match the three surrounding center colors, even if yellow is not facing up. Check all four corners. If one is correctly positioned, hold it at front-right. If none is correct, perform the corner cycle once, then check again.

Corner position cycle

U R U' L' U R' U' L

Moves three top corners while keeping their orientation unchanged.

Setup: Yellow face up. Place a correctly positioned corner at front-right when available.

Part B: orient the yellow corners

Corner twist finish

R' D' R D

Repeat on one corner until yellow faces up; then turn only U to bring the next unsolved corner to front-right.

Setup: Keep yellow on top and the unsolved corner at top-front-right. Never rotate the entire cube during this finishing stage.

Critical instructor warning

The cube will look scrambled: During corner twisting, the lower layers temporarily appear damaged. This is expected. The student must finish complete four-move repetitions and must rotate only U between corners. The cube restores when all corners are oriented.

Full procedure

1. Check whether any yellow corner is already in the correct location.
2. Use the corner position cycle until all four corners occupy their correct slots.
3. Place an unoriented yellow corner at top-front-right.
4. Repeat R' D' R D until that corner has yellow on top. Count complete repetitions, not individual moves.
5. Turn only U to bring another unoriented corner to top-front-right. Repeat until solved.
6. Turn U, U', or U2 at the very end if the side colors need a final alignment.

Celebration and reflection

- Record the date of the first solve, the amount of help used, the hardest stage, and one strategy that helped. Take a photo only with parent/guardian permission.

Mastery check: Complete a full 3x3 solve from a legal scramble. Instructor may provide verbal stage reminders but does not perform moves.

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Beginner Consolidation & Troubleshooting

Turning one successful solve into a repeatable skill

The seven-stage solve script

Stage	Goal	Self-check question
1	Daisy and matched white cross	Are all four side colors aligned with centers?
2	White corners	Is the entire first-layer side band solid?
3	Middle edges	Are the bottom two rows solved on all four sides?
4	Yellow cross	Is the top edge orientation dot, L, line, or cross?
5	Align yellow edges	Do all four top-row edge stickers match their centers?
6	Position yellow corners	Are the three colors of every corner in the correct location?
7	Orient yellow corners	Is yellow on top, and did I rotate only U between corners?

Diagnostic method for instructors

1. Ask the student to stop immediately when unsure. Do not allow random turns.
2. Identify the last confirmed solved structure: cross, first layer, first two layers, yellow cross, etc.
3. Check orientation and holding position before checking algorithm memory.
4. Have the student verbalize the next goal, not just recite moves.
5. If recovery would take longer than a fresh attempt, reset with a new scramble and isolate the weak step afterward.

Deliberate practice menu

Accuracy practice

- Five crosses with no timing.
- Ten corner insertions from prepared cases.
- Five right and five left middle insertions.
- Recognition-only last-layer cards.
- Three slow solves with a pause after every stage.

Fluency practice

- One solve while explaining every decision aloud.
- One solve with no reference, then one reference-assisted correction.
- Three timed solves with at least two minutes of reflection between them.
- Teach one stage to a family member or peer.
- Video review: identify pauses, regrips, and unnecessary rotations.

Home practice expectations

- New solver: 10-15 minutes, 4 days per week. Confident solver: 20 minutes, 4-5 days per week. Stop before frustration causes careless turning.
- Log one process goal and one result goal. Example: "Use the correct left insertion every time" and "Complete three solves under five minutes."

Three-solve independence standard: A learner becomes a Confident Solver after completing three full solves on different scrambles without a reference and explaining how to recover from at least one common error.

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Speed Development Fundamentals

Improving time without sacrificing accuracy or enjoyment

The order of improvement

Priority	What it means
1. Accuracy	Legal turns, correct algorithms, and reliable completion.
2. Recognition	Find the next piece or case quickly.
3. Planning	Know the next action before finishing the current action.
4. Turning efficiency	Reduce regrips, rotations, lockups, and unnecessary moves.
5. Speed	Increase turning rate only after the first four are stable.

Foundational technique

- Use relaxed hands. Excess grip pressure increases lockups and fatigue.
- Practice U and U' with index-finger flicks; practice U2 as two controlled flicks. Keep thumbs on the front face as a neutral home position when possible.
- Turn precisely to 90 degrees. Speedcubes allow corner cutting, but corner cutting should rescue small misalignments - not replace accurate turning.
- Reduce whole-cube rotations by inspecting pieces from multiple angles and preserving a stable front/top orientation through algorithms.

Timing protocol

1. Use a consistent scramble source or an instructor-created set. Never compare times from easy hand scrambles with times from full scrambles.
2. Inspect before starting. For club practice, use up to 15 seconds to find the first cross pieces and decide the first moves.
3. Record single time, penalties or restarts, and one observation. Use an average of five for progress decisions rather than one lucky solve.
4. Separate "learning solves" from "test solves." Learning solves may pause, repeat, and analyze; test solves measure current performance.

Sample four-week speed block

Week	Focus	Training task
Week 1	Cross efficiency	Plan 2-3 cross edges before starting; target fewer cube rotations.
Week 2	Turning quality	Finger-trick drills and slow metronome solves.
Week 3	Pause reduction	Look for the next piece while finishing the current step.
Week 4	Competition set	Three averages of five with full reset and reflection.

Healthy performance culture: Celebrate personal bests, consistency, courage, and sportsmanship. Never rank young learners publicly unless the activity is an announced competition with clear rules.

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Intermediate Track - Intuitive F2L

Pairing a corner and edge before inserting them together

Why transition from beginner layers?

The beginner method solves white corners and middle edges separately. First Two Layers (F2L) combines one first-layer corner with its matching middle edge, then inserts the pair into a slot. This reduces moves, teaches deeper piece tracking, and creates the foundation for CFOP speedsolving.

Prerequisites

- Consistent independent 3x3 solves; reliable notation; controlled R/U/L/F turns; ability to identify a corner and matching edge by color.
- Students should be able to solve the cross on the bottom. This keeps solved pieces visible and prepares efficient pair insertion.

The F2L thinking cycle

Step	Question to ask
Locate	Find one unsolved bottom-layer corner and its matching edge.
Separate	If the pieces are joined incorrectly, move one to the top layer without breaking solved pairs.
Pair	Use U turns and a short trigger so the corner and edge connect in the top layer.
Align	Place the pair above its destination slot.
Insert	Use a right or left trigger to place the pair while preserving solved work.
Look ahead	As the pair enters, begin searching for the next corner or edge.

Core triggers

Right trigger	R U R' Opens the right slot, brings a piece across the top, and closes the slot.
Setup: Use slowly; identify which pieces move and which solved areas remain protected.	
Left trigger	L' U' L Mirror of the right trigger for the left slot.
Setup: Teach as a mirrored idea, not as an unrelated algorithm.	

Teaching progression

1. Prepared pairs: give the student a correctly paired corner-edge unit and practice insertion only.
2. Simple cases: both pieces on top with white facing up or to the side; guide the pair using one trigger.
3. Mixed cases: one piece trapped in a slot; remove safely, pair, and reinsert.
4. Four-pair solves: solve the cross, then pause before each F2L pair to state the plan.
5. Slow lookahead: turn at 50% speed and try to eliminate complete stops between pairs.

Intermediate mastery: Complete all four F2L pairs without reverting to separate beginner corner-and-edge steps on at least two solves.

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Advanced Track - CFOP, Lookahead & Algorithm Learning

A structured bridge into competitive 3x3 solving

CFOP overview

Stage	Advanced objective
C - Cross	Plan an efficient cross, ideally on the bottom, with minimal rotations.
F - F2L	Solve four corner-edge pairs while tracking the next pair.
O - OLL	Orient every last-layer sticker so the top becomes one color.
P - PLL	Permute the oriented last-layer pieces into their correct locations.

Recommended progression

1. Stabilize intuitive F2L before adding many algorithms. Faster last layer cannot compensate for long F2L pauses.
2. Learn two-look OLL: first orient top edges, then orient corners using a small set of recognized cases.
3. Learn two-look PLL: first position corners, then position edges. Add one new algorithm only after the previous one is accurate from multiple angles.
4. Graduate gradually toward full OLL/PLL if the learner enjoys algorithm study and can maintain old cases.

Algorithm-learning protocol

Phase	Student action
Understand	Know what pieces the algorithm changes and what remains solved.
Chunk	Divide the sequence into triggers or rhythmic groups.
Execute slowly	Complete 10 accurate repetitions without timing.
Recall	Wait 30 seconds, then perform from memory.
Recognize	Practice the visual case from several AUF positions (top-face alignments).
Integrate	Use the case during full solves; log recognition delay and execution errors.
Maintain	Review after 1 day, 3 days, 1 week, and 1 month.

Lookahead training

- Use slow solves where turning never stops. The goal is continuous visual tracking, not a fast final time.
- During the final moves of a pair, shift the eyes to a different unsolved corner. Do not stare at the pair already being inserted.
- Practice “cross plus one”: inspect the cross and identify the first F2L pair before starting the timer.

Responsible coaching

- Do not overload students with algorithm counts. A motivated learner may request more cases; another may improve more from turning, cross planning, or confidence work.

Advanced evidence: Student can describe CFOP, use F2L consistently, maintain an algorithm notebook, and show improvement across several averages rather than a single personal best.

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Additional Events - 2x2, Pyraminx & 4x4

Expanding pattern recognition while keeping 3x3 fundamentals strong

2x2 curriculum

Area	Instruction
Entry point	After a student understands 3x3 corners or has completed a full 3x3 solve.
Core concepts	All pieces are corners; solve one face with matching side layer, orient last face, then permute last-layer corners.
Training focus	Fast recognition, efficient first layer, short algorithms, and inspection planning.
Competition readiness	Reliable legal solves, consistent timer starts/stops, and awareness of corner twists or incomplete turns.

Pyraminx curriculum

Area	Instruction
Entry point	Suitable for beginners who want a second event; turning is intuitive and early success is common.
Core concepts	Tips, centers, edges, color matching, first layer, and last-layer edge cycle.
Training focus	Plan tips during inspection, solve centers efficiently, and avoid over-rotating the entire puzzle.
Competition readiness	Correct tip alignment, clean layer turns, and accurate final-state inspection.

4x4 curriculum

Area	Instruction
Entry point	Confident 3x3 solver with strong notation and patience.
Core concepts	Build centers, pair edge pieces, then solve like a 3x3.
New challenge	Centers are not fixed; students must preserve color relationships. Parity cases require dedicated algorithms.
Training focus	Efficient center blocks, edge-pair tracking, slice-turn accuracy, and calm parity recognition.

90-minute multi-event workshop

Time	Activity
0-10 min	Welcome, cube check, event goals, and demonstration.
10-30 min	2x2 first layer and final-layer case.
30-50 min	Pyraminx tips, centers, and edges.
50-60 min	Break and puzzle exploration station.
60-75 min	Choice coaching: 2x2, Pyraminx, or 3x3 weak step.
75-87 min	Friendly event rounds with scorecards.
87-90 min	Reflection and next-step recommendation.

Equipment note: Use competition-legal, fully functional puzzles for timed events. Stickerless puzzles are often easier to maintain, but learners may use any safe puzzle that turns reliably and has clearly distinguishable colors.

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Competition Curriculum & PCC Event Operations

Preparing students to compete fairly, calmly, and confidently

Student competition skills

- Arrive with a legal, functioning puzzle and a backup when possible. Warm up enough to feel comfortable but avoid exhausting hands.
- Listen to the judge, inspect the puzzle without turning layers, start and stop the timer correctly, and wait for the result to be recorded.
- Treat every solve as information. After a poor solve, use one reset breath and begin the next attempt without replaying the mistake.
- Congratulate other competitors, respect volunteers, and never disrupt a solver who is inspecting or timing.

PCC practice-round format

Role	Responsibility
Scrambler	Applies the written scramble privately and verifies puzzle orientation.
Runner	Moves covered puzzles between scramble and solving areas.
Judge	Uncovers the puzzle, manages inspection, observes the solve, and confirms the result.
Competitor	Follows instructions, solves independently, and signs or confirms the score.
Scorekeeper	Enters results, checks missing data, and calculates standings under the announced format.

Recommended PCC event flow

Stage	Operational focus
Welcome	Mission, fundraising cause, schedule, safety, and sportsmanship.
Orientation	Live demonstration of inspection, timing, judging, and score confirmation.
Rounds	Pyraminx, 2x2, and 3x3; allow beginner-friendly pacing and clearly announced attempt counts.
Learning break	Guest speaker, technique demonstration, or mentor station.
Awards	Recognize placement plus optional perseverance, improvement, and sportsmanship.
Community close	Thank volunteers, families, partners, and participants; connect event proceeds to the selected cause.

Competition coaching block

1. Week 1: rules simulation and timer mechanics.
2. Week 2: five-solve sets with no time goal - only clean procedure.
3. Week 3: pressure management, reset routine, and consistent inspection plan.
4. Week 4: full mock competition with rotating volunteer roles.

Fairness rule: All competitors receive the same published format, similar solving conditions, clear instructions, and respectful treatment. Accommodations should preserve the skill being measured while enabling access.

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Assessment, Badges & Progress Reporting

Measuring growth in skill, independence, thinking, and character

Four-domain rubric

Domain	Developing	Proficient	Advanced
Puzzle knowledge	Needs prompts to identify pieces or notation.	Uses notation and piece language accurately in familiar tasks.	Explains piece behavior, predicts outcomes, and applies knowledge to new cases.
Solve execution	Completes isolated steps with guidance.	Completes a full solve independently or with an approved reference.	Solves consistently, diagnoses errors, and uses more efficient methods.
Learning habits	Frustration interrupts practice; relies on instructor rescue.	Persists through errors, asks useful questions, and uses feedback.	Plans practice, reflects on data, and supports others calmly.
Community behavior	Needs reminders about turns, equipment, or respect.	Demonstrates care, sportsmanship, and partner cooperation.	Leads stations, judges fairly, and models inclusive encouragement.

PCC badge system

Badge	Evidence required
Cube Explorer	Anatomy, notation, and matched white cross.
First Layer Builder	White cross and corners completed correctly.
Two-Layer Builder	First two layers solved independently.
Independent Solver	Full 3x3 solve with reference permitted.
Confident Solver	Three no-reference solves and basic error recovery.
Speedbuilder	Timed averages, finger tricks, and efficiency goals.
Multi-Event Cuber	Demonstrated progress in 2x2 or Pyraminx in addition to 3x3.
Competition Ready	Mock-round procedure, sportsmanship, and reliable event solves.
Junior Mentor	Successfully teaches one beginner stage under supervision.

Progress report template

Report these

- Current PCC level and badges earned.
- Steps completed independently.
- Current reference or prompting needs.
- Recent timed average, only when meaningful.
- Learning strengths and observed character strengths.

Recommend these

- One specific technique goal.
- One practice assignment with quantity and frequency.
- One enrichment option or next event.
- One way a family member can support without solving for the learner.
- A target date for reassessment.

Assessment principle: Never use speed as the only measure. A slower student who explains decisions, solves reliably, and helps peers may show deeper mastery than a faster student who depends on memorized reactions.

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Youth Leadership & Volunteer Instructor Pathway

Turning experienced students into patient teachers and event leaders

Roles and readiness

Role	Primary duties	Readiness
Event Volunteer	Assists check-in, runners, room setup, scorecards, refreshments, and cleanup.	Reliable attendance; follows directions; understands event privacy and safety.
Junior Coach	Supports one or two beginners during drills and reviews.	Confident 3x3 solve; positive communication; supervised teaching practice.
Coach	Leads a station or private lesson using the PCC curriculum.	Can diagnose beginner errors, demonstrate accurately, and document progress.
Lead Instructor	Plans sessions, assigns mentors, communicates with families, and manages learning quality.	Strong teaching record, curriculum knowledge, and calm problem resolution.
Event Lead	Coordinates schedule, volunteers, competition procedure, awards, and charitable mission.	Operational readiness, fairness, communication, and contingency planning.

Required instructor training modules

1. PCC mission, inclusion, professional communication, and youth-centered conduct.
2. Beginner method accuracy: every instructor demonstrates all stages from a scramble.
3. Teaching practice: show, chunk, guide, fade, reflect.
4. Error diagnosis and recovery without taking over the learner's cube.
5. Classroom management, equipment care, online lesson setup, and escalation to the lead adult.
6. Competition roles, score integrity, confidentiality, and sportsmanship.

Observation checklist

- States the objective and demonstrates from the learner's orientation.
- Uses short explanations and frequent student practice.
- Asks questions that direct attention to centers, piece colors, and solved structures.
- Corrects respectfully and gives the student time to think.
- Adapts pacing without lowering expectations for effort or conduct.
- Closes with a measurable practice assignment and written note.

Volunteer reflection

After every session or event, volunteers record: what they were responsible for, one challenge, one action they took, one result, and one improvement for next time. Community-service hours should reflect actual participation and be verified according to PCC policy.

Leadership goal: PCC mentors should be known not only for solving quickly, but for making another person believe, "I can learn this too."

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Appendix - Algorithms, Glossary & Materials

A compact reference for learners, families, and instructors

PCC beginner algorithm reference

Purpose	Algorithm	Key setup
White corner insertion / corner twisting	R' D' R D	Repeat complete four-move cycles.
Middle edge to the right	U R U' R' U' F' U F	White down; matched front "T."
Middle edge to the left	U' L' U L U F U' F'	White down; matched front "T."
Yellow cross	F R U R' U' F'	L upper-left; line horizontal.
Align yellow cross edges	F2 U L R' F2 L' R U F2	Yellow up; reassess center matches.
Position yellow corners	U R U' L' U R' U' L	Correct corner at front-right when available.

Glossary

Term	Meaning
Algorithm	A repeatable move sequence used to produce a predictable change.
AUF	Adjust U Face: a U, U', or U2 turn used before or after a last-layer algorithm.
Center	One-color piece that defines a face; centers keep fixed relationships on a 3x3.
Corner	Three-color piece.
Edge	Two-color piece.
F2L	First Two Layers; pairing a corner and edge before inserting them together.
Inspection	Time used to study a scrambled puzzle before starting a timed solve.
Lookahead	Finding the next piece or case while completing the current one.
Orientation	Which direction a piece's stickers face.
Permutation	Where pieces are located relative to their correct positions.
Regrip	Changing hand position on the puzzle.
Trigger	A short, reusable move pattern such as R U R'.

Recommended materials

For each learner

- One reliable 3x3 speedcube and optional cube stand.
- PCC beginner reference card and pencil.
- Practice log or digital tracker.
- Name label and storage bag or case.
- Optional 2x2 or Pyraminx after core progress.

For each class or event

- Demonstration cubes, spare puzzles, and small repair kit.
- Printed scrambles, scorecards, clipboards, and timers.
- Projector/document camera or overhead phone mount.
- Achievement stickers/certificates and progress folders.
- First-aid access, attendance list, and emergency contacts managed by the responsible adult.

Final message to students: A solved cube is proof that a hard problem becomes manageable when you observe carefully, learn one step at a time, practice through mistakes, and keep going.