

LICW CONTRIBUTED ESSAYS & PERSPECTIVES

Personal Perspectives on CW Learning and Fluency

VERSION 1.2

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Originally published within earlier editions of the LICW Curriculum Guide. The essays are attributed to their respective contributors and are presented as a companion collection.

LICW is committed to ensuring digital accessibility for people with disabilities. This collection uses semantic Word headings, navigable structure, and readable typography.

REVISION HIGHLIGHTS:

Version 1.2 integrates Automatic Character Recognition (ACR) into the From Understanding to Ability essay, and adds “Flow Copy vs. Exact Copy: How Different?” by Tom Weaver W0FN.

Editorial context and references distinguish individual reflections and theoretical interpretations from formal LICW academic positions. The core publications remain the authoritative statements of LICW’s instructional framework, rationale, and curricular offerings.

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FOREWORD

The LICW Method did not emerge fully formed. It developed through observation, experimentation, discussion, and the contributions of individuals who brought their own experiences, insights, and questions to the challenge of teaching Morse code.

The essays collected here were originally included in earlier editions of the LICW Curriculum Guide. As our academic framework evolved, much of their underlying thinking became integrated into The LICW Method, LICW Academic Positions & Research, and the current Curriculum Guide.

We have preserved these contributions because they remain valuable in their own right. They offer insight into the questions, observations, and reasoning that helped shape our approach, while allowing their authors to speak in their own voices.

These essays represent the perspectives of their respective authors. Some explore theoretical interpretations and developing ideas rather than established scientific conclusions. LICW's formal academic positions, including their supporting evidence and limitations, are documented separately in LICW Academic Positions & Research.

We are grateful to these contributors for their intellectual curiosity, thoughtful engagement, and lasting contributions to the development of the LICW Method.

1. FROM UNDERSTANDING TO ABILITY

Mike N1CC and Tom W0FN

An easy mistake in learning Morse code is treating it mainly as an academic exercise.

Academic understanding is valuable. It explains why characters should be learned as distinct sound patterns, how conscious decoding creates a cognitive bottleneck, why maintaining flow and recovering from missed content are essential, and how practice should be structured. Yet a student may understand automaticity, Automatic Character Recognition (ACR), Instant Flow Recovery (IFR), and sound-first learning - and still freeze during a continuous stream of CW.

Understanding the principles of CW fluency does not produce the skill.

The missing ingredient is rarely another lecture or explanation. It is exposure - real-time practice through on-air QSOs, or ragchewing with a practice partner in a Zoom room.

- **Instructions** set the compass direction
- **Practice** builds familiarity
- **Repetition** rewires conscious effort into subconscious pattern recognition

Motor and perceptual skills are forged in neural pathways through volume and friction, not intellect. You cannot think your way into automatic reflexes; you train them into existence.

THEORY VS. REFLEX

- **Intellectual Insight:** Clarifies *why* flow-first recognition matters, helping students abandon bad habits like counting dits and dahs or relying on lookup tables.
- **Practical Experience:** Converts clunky, conscious, high-energy translation into effortless reflex through cumulative hours of live sound exposure.

- **Neuro-Perceptual Definition (Ideal for CW/Skill Acquisition):** The shift of an action from deliberate, conscious processing to reflex, where repetitive exposure enables the subconscious brain to map input to output instantaneously.

Practice is not an exam to test your recognition skills; it is the construction site where the skill is physically built.

KEY TAKEAWAY Understanding Morse is not the same as using it fluently. Instruction can explain sound-first learning, ACR, Continuous Flow, IFR, CFP, and appropriate listening posture. The underlying automaticity develops through meaningful, repeated listening, sending, guided practice, and on-air use.

2. LISTENING FORWARD, AND WHY HEAD COPY FEELS LIKE MAGIC

Quentin K7DRQ

If you've been head-copying for a while, you've had moments like this: you're a few characters into a word, and before the sender has finished sending it, the word arrives whole in your head. Maybe the sender's signal flickers out for half a second, hidden under QSB, and your brain quietly serves up the next few characters anyway, or you suddenly realize you've been "ahead" of the code for the past few seconds, hearing words form before the dits and dahs have all landed.

It feels mildly miraculous when it happens, but it isn't. We have a name for what your brain is doing, and over the past two decades, neuroscience has built up a fairly serious framework around it. It's called *predictive coding*, and once you see it in your own listening, you can't really unsee it.

THE BRAIN DOESN'T WAIT

The traditional picture of perception goes bottom-up: sound waves hit your ear, get decoded into characters, assembled into words, and then understood. It's a tidy and intuitive notion, but I think it's mostly wrong. The picture that's emerged from cognitive neuroscience instead (championed in particular by Karl Friston[1] and Andy Clark[2]) is closer to this: your brain is constantly running forward, generating predictions about what it's about to sense. What you experience as "hearing" is mostly your brain confirming or correcting its own forecasts. Sensory input isn't the content of perception; it's a correction signal on the prediction.

The brain doesn't wait for the world to deliver. It guesses ahead, and the world either confirms the guess (in which case you barely notice) or contradicts it (in which case you suddenly *do*).

HIERARCHY

The other key piece is that this prediction machinery is layered. Higher levels of cortex make slower, more abstract predictions ("we're discussing antennas") and pass those predictions down to faster, more concrete levels ("the next word is probably *dipole* or *vertical*"), which pass them down

again to the level forecasting the next character, which forecasts the next dit or dah. Predictions flow down. Mismatches climb back up.

When you're in a smooth QSO and everything is clicking, those predictions are mostly right. The corrections flowing back up are small, and effort is low. You float along; as we say at LICW, the code is just *coming to you*. When the topic suddenly turns, when the sender misspells a word, when QRM knocks out a character, predictions break down at one level, mismatches climb the layers, the higher levels scramble to revise - and it feels like grasping, confused, effortful.

This is, I think, the cleanest description of what we already know from sitting in front of a key for years. It's also why context matters so much. Context is what the upper layers know, and what they know constrains everything below. It's why "we just had a long discussion about the rig, so when I miss a few characters in the next sentence, I can probably fill them in." It's why a great fist – clean, rhythmic, predictable – is so much easier to copy than a stuttery one. Predictable input is forecastable input, and forecastable input is input that doesn't rock the boat.

EVIDENCE FOR BRAIN PREDICTION

I want to share one piece of evidence I find particularly validating, because so many CW ops have felt this. Researchers studying the auditory cortex use what they call *omission paradigms*. They play a regular pattern of sounds (beep beep beep beep) and then, occasionally, silently drop one. There's just nothing where a sound should have been.

Researchers see that the auditory cortex *responds* to the missing sound: not just to the surprising silence around it, but specifically to the sound that wasn't there. Heilbron and Chait[3], in a 2018 review of predictive coding evidence in audition, point to omission studies as some of the cleanest direct evidence for genuine forward prediction in the auditory system, rather than mere reactive processing.

Think about every QSB-laden QSO you've ever had. You're copying along fine, and then a wave of QSB hits. A moment later, you find yourself confidently writing or saying the character that was hidden behind the static. You weren't guessing; your auditory cortex was already running the forecast. It had a prediction in flight, the incoming signal failed to arrive,

and the prediction held. You've been doing experimental neuroscience to yourself for years, and you just didn't know!

NEUROSCIENCE AND LICW TEACHINGS

If your brain is genuinely predicting forward – if listening is mostly forecast-checking – then a lot of LICW philosophy starts to look less like folklore and more like applied neuroscience.

Here's the bridge that ties it all together. Your brain has a limited budget of attention to spend at any given moment. You can spend most of it on the incoming signal, scrutinizing every dit. You can spend most of it on the higher-level forecast, riding the topic and the rhythm. You can't max out both at once. Where you spend your attention budget changes everything about how copy feels.

Alert indifference is spending the attention budget wisely. Lean too hard on the incoming signal and every transient thump and hiss becomes a crisis your brain has to deal with – you're "grasping at the code." Lean too light and you stop noticing real surprises (we've all zoned out during a QSO…). The leaf-on-a-pond image I've used in a previous newsletter article is just the right balance: light enough to flow with the forecast, alert enough to register meaningful corrections.

Letting the code come to you is letting the prediction machinery work. The conscious mind is at its worst when it interferes. When it tries to manually decode each character, it's effectively dumping the entire attention budget on the incoming signal and starving the upper layers. "Don't think, let the subconscious handle it" is almost mechanical advice: get out of the way and let the layers settle. I say this knowing full well that it's easier said than done, but once you're able to get there, you'll notice how much easier copying gets.

The Recognition and Retention buffers we talk about in the Intermediate and Advanced curricula are basically those layers showing up in our working language. Recognition is happening at the level forecasting next characters; retention is happening at the level forecasting next words and gist. They reinforce each other. A strong retention buffer feeds top-down predictions into recognition; strong recognition feeds clean input into retention.

Sending with a great fist is a gift you give the receiver's predictive machinery. You're delivering a clean, easily-forecastable stream. Their layers lock in fast. Their attention can stay light, and they can copy you fluidly.

SO WHAT?

There are two takeaways for me, one practical and one gentler.

The practical one: sharper character recognition will always help, but the bigger gains in copy come from time spent in the flow. This is incidentally what Project OverLearn is all about. The forecasts your brain makes in a QSO get built from real CW running through your ears at conversational speed, with all its rhythms, common words, and operator quirks. Letting characters slip past while staying in the stream isn't tolerating failure - it's giving the predictive machinery the conditions it needs to learn. Subliminal recognition, the Word Discovery mindset, the whole shift from decoding to knowing – these are what predictive coding looks like from the inside.

The gentler one: if some of this lands, please be patient with yourself when copy feels hard. What we're asking the brain to do is genuinely impressive: running forward predictions over a noisy, slow, real-time signal, in a code most of us learned in adulthood, often while QSB and QRM are playing havoc with the input. That it works at all is wonderful. That it eventually feels effortless is, frankly, neuroscience at its most quietly miraculous.

It's not magic. It's just a brain doing what brains do, and a CW op leaning into it.

REFERENCES CITED IN THE ESSAY

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2. Clark, A. (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. Behavioral and Brain Sciences, 36(3), 181–204.

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3. A FLOW-BASED PATH TO FLUENCY

Tom W0FN

THE CHALLENGE WITH TRADITIONAL CW TRAINING

Morse code fluency may be understood as the ability to comprehend meaning while listening and to transmit accurately, rhythmically, and at useful speed.

Traditional training methods often emphasize achieving high character-recognition success before increasing speed. While understandable, that approach can create several limitations:

- **Recognition delay:** Prolonged concentration on isolated-character performance, or on reducing TTR as an end in itself, can postpone the continuous-stream practice needed for real-world fluency.
- **Failure mindset:** Students may interpret misses as failures, creating discouragement and making it harder to continue through imperfect copy.
- **Poor flow recovery:** Overemphasis on recognition accuracy can delay the development of **Instant Flow Recovery (IFR)**, the crucial ability to ignore misses and remain synchronized with the ongoing stream of code.

A FLOW-BASED PATH TO FLUENCY

The Flow-Based Path to Fluency accelerates progress by emphasizing exposure, continuity, and recovery rather than immediate perfection. It rests on three core elements:

1. **Overlearning character sound units**
   Characters are overlearned not as sequences of dits and dahs, but as distinct acoustic units experienced within conversational character flow. As familiarity grows, **Time To Recognize (TTR)** is reduced through repeated exposure.
2. **A shift from decoding to discovery**
   Students move gradually from slow, conscious character-by-character decoding toward a relaxed **Word Discovery** mindset. The cognitive

focus shifts from identifying each element to sensing what word or phrase is emerging.

3. **Instant Flow Recovery (IFR)**
   IFR is the ability to remain in the stream regardless of recognition success. Recognition is temporarily de-emphasized so that the learner can develop continuity, comfort, and increasing subconscious recognition.

LICW'S APPLICATION: PROJECT OVERLEARN

LICW's Project OverLearn applies these principles by temporarily setting aside the traditional mandate for high recognition success and instead prioritizing comfort with realistic conversational flow.

Its central instructional premise is simple: **flow before perfection**. Students are encouraged to remain in the stream, tolerate misses, and develop growing familiarity with character flow at natural operating speeds.

PRACTICAL IMPLICATIONS

Within this model, several instructional practices become especially important:

- **Exposure and flow:** Students engage in "sound surfing" practice in which the goal is to keep up with the sound stream even when recognition is incomplete.
- **Alert indifference:** Students adopt a "try, but don't care too much" mindset that supports IFR and reduces the emotional cost of misses.
- **Flow-based word recognition:** Practice may include non-CW verbal word recognition or phrase-level listening in order to strengthen word discovery independent of character-by-character decoding.
- **Natural chunking:** Repeated exposure to common patterns such as CQ, DE, TU, THE, RST, and common endings gradually allows those sequences to be heard as rhythmic units rather than assembled character by character.

CONCLUSION

Improvement in Morse fluency is not driven by ever lower isolated-character TTR scores. It comes from the joint development of ACR,

continuous Character Flow, recovery, Word Discovery, and increasingly direct comprehension under realistic receiving conditions.

Within the LICW academic model, this framework helps explain why fluency emerges through continuity, recovery, and growing subconscious familiarity. Project OverLearn applies these principles to accelerate the transition from character recognition to word discovery, retention of meaning, and conversational CW fluency.

4. FLOW COPY VS. EXACT COPY: HOW DIFFERENT?

Tom Weaver W0FN

Two Sides of the Same Cognitive Coin: Actually, Flow Copy and Exact Copy share the identical neural process. The true distinction is not between approximate copy versus exact copy, but between discrete accuracy (short-flow CW) with logging and dynamic accuracy (long-flow CW) without logging. Let's define long-flow CW as code with lots of word spaces that create meaning.

The notion that BootCamp's Flow Copy and Word Discovery pedagogy ignores accuracy and merely chases the approximate "gist," of what's being heard while treating Exact Copy as an entirely separate cognitive discipline, rests on an artificial divide.

Project OverLearn's month-long BootCamp doesn't lower standards of exactness, but it often downgrades recognition success temporarily to help students focus on the ability to sustain cognitive readiness during a lengthy and uninterrupted acoustic stream of Morse code. We call this important skill **Character Flow Proficiency (CFP).**

Exact Copy involves logging brief, discrete information—callsigns, signal reports, antenna details, POTA exchanges. Flow Copy aims to copy many words accurately during conversational CW without logging. Both encounter recognition misses and rely on Alert Indifference, Instant Flow Recovery **(IFR)**, and Character Flow Proficiency **(CFP)** skills to improve recognition.

Although they share foundational skills, BootCamp's Flow Copy training demands additional multitasking, more advanced Character Flow Proficiency skills, and the ability to comprehend multiple trains of thought during extended flows of CW.

THE FUNDAMENTAL SIMILARITIES

1. Automatic Character Recognition (ACR): "Knowing" Without "Thinking"

ACR is the ability to recognize characters by their unique acoustic "signature" without conscious thought. ***Automatic Character Recognition isn't learned; it is practiced into existence.***

In both Flow Copy and Exact Copy disciplines, if the brain tries to consciously “translate” elements it has stepped out of the acoustic stream. Project OverLearn’s BootCamp emphasizes overlearning sound patterns ***during flow*** to the point of **automaticity**.

2. Acoustic Pattern Recognition (APR)

APR develops through repeated exposure to individual characters as well as familiar letter sequences. Common words such as “the” become recognizable as a single sound pattern spanning several letters. Exact Copy with 100% fidelity relies on the same immediate acoustic pattern recognition as word-for-word conversational copy.

3. The Predictive Brain: How Accuracy is Achieved

The brain predicts what comes next and checks those predictions against incoming sounds. Both short-burst Exact Copy and conversational Flow Copy use this process:

- In Exact Copy, familiar prefixes and call district structure help narrow possible callsigns. Each incoming sound confirms the callsign’s exact characters, usually while the operator logs them.
- BootCamp’s Word Discovery mode uses the same process without logging; character sounds provide clues that can reveal a word before its final letters arrive. Rather than occasional guessing, this predictive closure process continually anticipates words and verifies them against each incoming character.

4. Loose Focus/Alert Indifference: The Attitude for Exactness

Exact Copy is often assumed to require intense focus on every sound and greater use of the Retention Buffer, while Alert Indifference is often mistaken for inattention or indifference to accuracy. Cognitive science points to the opposite:

- **The Perils of Hard Focus:** Hypervigilance can make correcting a missed letter, number, or word feel irresistible. Dwelling on that miss creates a mental “stutter”: trying harder to recover one character or word can cause the next three or four to be missed.

- **Alert Indifference Supports Accuracy:** Relaxed, flexible attention supports both Exact Copy and Flow Copy by allowing subconscious processing to continue without conscious interference. Letting misses pass keep the operator in the flow and ready for a repeated callsign or the next conversational sentence. This makes accurate copying sustainable across repeated contest exchanges and long CW conversations.

5. The Pedagogical Reality

Flow Copy trains students to pursue **complete, word-for-word comprehension** while staying in the flow. Inevitable missed characters or words should not disrupt their attention or readiness for what comes next.

- **Exact Copy** drills, typically at high speeds, develop accurate callsign copying and strengthen the retention buffer. They prepare students for a series of brief, high-speed exchanges that require logging.
- BootCamp trains students to copy many words accurately at “highway speeds” without logging. Flow Copy and Exact Copy share core skills, but Flow Copy also requires following multiple trains of thought and overall meaning. Their drills differ because their demands differ—not because they use entirely separate skill sets.

Practicing mostly short Morse code bursts may not prepare operators for a steady stream of words, sentences, and ideas. Even an accomplished CW contester who recognizes characters and callsigns instantly at high speed may struggle to copy a full sentence.

BootCamp teaches students to stay centered, alert, and relaxed within the acoustic stream—what athletes and musicians call “getting in the flow.” Advanced **Character Flow Proficiency** skills enable the cognitive resilience needed for real-world Exact Copy during conversational rag chews. Although BootCamp does not teach logging, its Flow Copy training also supports Exact Copy through acquired Automatic Character Recognition (ACR).

BootCamp’s Flow Copy training does not oppose Exact Copy; it extends those skills into a more sustainable form. Their similarities appear to outweigh their differences.

RELATED LICW ACADEMIC POSITIONS

The following papers provide the formal academic framework related to these essays. The essays are preserved as attributed contributions; these Academic Position papers remain the controlling references for LICW's current educational positions.

FROM UNDERSTANDING TO ABILITY

AP-03 Automatic Recognition and Continuous Flow; AP-16 Repetition, OverLearn, and Consolidation; AP-21 Measurement and Student Progress.

LISTENING FORWARD, AND WHY HEAD COPY FEELS LIKE MAGIC

AP-17 Receiving Objective and Listening Posture; AP-18 Conditioned Response After Recognition; AP-19 Annotative Copy and the Transition to Head Copy; AP-20 Functional and Cognitive Fluency.

A FLOW-BASED PATH TO FLUENCY

AP-03 Automatic Recognition and Continuous Flow; AP-14 Overlap, Comfort, and Stretch; AP-15 Errors, Misses, and Instant Flow Recovery; AP-16 Repetition, OverLearn, and Consolidation.

FLOW COPY VS. EXACT COPY: HOW DIFFERENT?

AP-03 Automatic Recognition and Continuous Flow; AP-15 Errors, Misses, and Instant Flow Recovery; AP-16 Repetition, OverLearn, and Consolidation; AP-17 Receiving Objective and Listening Posture; AP-18 Conditioned Response After Recognition.

Companion publications: The LICW Method, Version 5.0; LICW Academic Positions & Research, Version 5.0; and the LICW Curriculum Guide, Version 5.0.