UC San Diego

Evaluating and Optimizing Coaching Methodologies for Fleet Safety and Performance: An Evidence-Based Analysis of Differentiation and Optimization Opportunities

Nadir Weibel, Matin Yarmand, Cole Biehle, Elysia Mac, Huimeng Lu, Vivian Xiang
UC San Diego, Computer Science & Engineering & Design Lab

June 30, 2025

Executive Summary

This report critically evaluates coaching methodologies for enhancing fleet driver safety, engagement, and overall organizational performance. Drawing on empirical research across education, behavioral science, and fleet management, this analysis identifies key dimensions of effective commercial driver coaching, highlights significant limitations of current practices, and outlines strategic recommendations focused explicitly on differentiation and optimization. The findings emphasize the superior effectiveness of personalized, manager-led coaching methods, yet also show how manager-led coaching alone is challenging to implement at scale given the scarce availability of expert coaches. On the other hand, this report shows that in-cabin automated warning systems and self-coaching offer strengths in scalability and flexible learning. However, without integration with more personalized and interactive feedback, these approaches alone do not achieve the same long-term safety outcomes as when combined with human-led coaching elements. As such, this report recommends a mix of the three approaches for future optimization, especially focusing on (1) strategic integration of AI-driven platforms, and (2) complementing existing risk identification coaching programs with targeted positive reinforcement mechanisms and regular short-session, in-person coaching. Ultimately, the provided evidence-based recommendations offer a potential pathway for achieving measurable improvements in driver safety outcomes, operational efficiency, and competitive differentiation.

1. Introduction: The Critical Need for Effective Driver Coaching

Effective driver education and coaching have profound implications for fleet safety, operational efficiency, and organizational reputation. Fleet drivers operate under challenging conditions where even minor mistakes can lead to severe safety incidents, significant financial repercussions, and lasting reputational damage. Approximately 92.6% of all motor vehicle crashes are attributed to human factors—including speeding, distraction, fatigue, and judgment errors—underscoring the urgent necessity of robust driver education and behavior modification strategies [1]. Each year, the Federal Motor Carrier Safety Administration identifies thousands of

commercial motor vehicle fleets facing heightened risk, adding an average of 2,783 fleets annually to its high-risk designation list [2].

Training and coaching methodologies without the right workflows have frequently proven insufficient in addressing these safety concerns, partly those that rely on generalized, passive instructional techniques that fail to deliver sustained behavior change. Recent research highlights critical gaps in driver coaching approaches, such as inconsistent feedback, inadequate personalization, and poor integration with operational realities, which can undermine long-term effectiveness and driver engagement [20,21,22]. Consequently, fleet management organizations are increasingly exploring alternative evidence-based coaching methodologies designed to foster lasting behavioral improvement and measurable safety enhancements.

This report provides an extensive analysis of current coaching methodologies, systematically comparing the efficacy of in-person versus remote coaching environments, individualized versus mass instruction, and various coaching modalities (manager-led, automated in-cabin, and self-directed). By critically examining strengths and limitations in existing fleet coaching practices and integrating insights from educational and psychological literature, this report identifies clear differentiation opportunities and specific areas for optimization. Strategic recommendations emphasize personalized, manager-led coaching combined with scalable AI-enhanced approaches, frequent short-session interactions, integrating positive recognition to existing risk-management programs, and robust measurement frameworks. These integrated strategies offer fleet management organizations a comprehensive roadmap for enhancing driver safety outcomes, operational effectiveness, and achieving lasting competitive differentiation.

2. Dimensions of Effective Learning in Driver Education

Key Points:

- **In-Person vs. Remote Learning:** In-person environments enable richer interactions, immediate nuanced feedback, and greater engagement, critical elements for sustained behavioral change.
- **One-to-One vs. Mass Instruction:** Individualized coaching significantly outperforms mass instruction, achieving higher mastery levels and sustained behavioral improvements.
- **Blended Learning Approach:** Combining the immediacy and personalization of face-to-face methods with scalable remote or automated approaches optimizes effectiveness.

In-Person vs. Remote Learning

In-person learning environments offer crucial advantages beyond direct instruction, including informal interactions, immediate feedback, and spontaneous discussions. Olson and Olson

emphasize nine unique characteristics of face-to-face settings that are difficult or impossible to replicate remotely, highlighting intrinsic limitations of remote learning [3].

1. **Rapid feedback** – Immediate responses allow quick clarification and adjustments in communication.
2. **Multiple channels** – Communication simultaneously occurs through multiple modes (voice, gesture, expression, etc.).
3. **Personal information** – Informal exchanges convey additional context (status, mood, availability).
4. **Nuanced cues** – Subtle communication cues, such as body language or facial expressions, convey critical information.
5. **Shared local context** – Being physically together creates a shared environment and understanding of situational context.
6. **Implicit communication** – Information is communicated indirectly or implicitly through tone, timing, or action rather than explicit statements.
7. **Spatiality of reference** – Shared space allows easy references to physical objects, locations, or environmental features.
8. **Co-presence** – Physical proximity creates an inherent sense of connection and accountability.
9. **Individual control** – Participants in face-to-face settings naturally control their focus of attention and level of involvement more fluidly.

These nine characteristics underscore the inherent richness and depth of face-to-face communication, which significantly enhances learning and collaborative interactions. These features—ranging from rapid feedback and nuanced non-verbal cues to shared spatial context and implicit understanding—create a dynamic and highly responsive environment that remote or virtual settings struggle to replicate. Being context-aware is critical, especially in areas where stress and work routines shape behavior [21]. Consequently, the absence or reduction of these elements in remote learning scenarios often leads to diminished engagement, weaker interpersonal connections, and reduced effectiveness of educational outcomes.

Impact of Remote vs. In-Person Learning, Lessons from Emergency Remote Teaching – The significance of Olson and Olson's characteristics became especially apparent during the widespread shift to remote education forced by the COVID-19 pandemic. The sudden reliance on virtual learning platforms highlighted the challenges of conducting remote instruction. Numerous empirical studies reported diminished quality in learner-instructor and peer interactions, leading to notably weaker engagement and poorer educational outcomes overall [4]. However, this period also revealed specific contexts where remote learning offered valuable benefits, particularly in fostering flexibility and autonomy. For experienced learners who possessed strong self-directed learning skills, remote settings enabled them to explore unstructured topics at their own pace [4,18]. This contrast emphasizes the necessity of carefully balancing structured, guided interactions—such as those present in face-to-face coaching—with opportunities for independent, flexible learning tailored to individual experience levels.

Significance for driver coaching and education – These insights are particularly relevant when evaluating coaching methodologies in driver education. Manager-led, face-to-face coaching aligns closely with Olson and Olson's characteristics, delivering immediate clarifications and nuanced feedback, fostering implicit communication, and utilizing a shared local context. This personalized coaching approach parallels the demonstrated effectiveness of in-person tutoring and classroom environments, maximizing learner engagement and enabling rapid, context-sensitive adjustments in coaching strategy [3,5].

Conversely, remote or automated (in-cabin or self-directed) coaching resembles the COVID-era remote learning models. While these methods can provide significant logistical flexibility, scale, and accessibility, their effectiveness often suffers from reduced interpersonal interactions and weakened feedback mechanisms. Research from the educational context by Yarmand et al. (2025) identified that during forced remote learning, educators frequently struggled with an absence of immediate visual and auditory feedback, crucial for dynamic adjustment to learners' needs [4]. This mirrors the potential pitfalls in remote or automated coaching systems for drivers, where the absence of nuanced feedback and real-time human interaction may result in decreased engagement, reduced trust in the system, and ultimately, compromised learning effectiveness and safety outcomes.

Further illustrating these challenges, recent research specifically examining in-vehicle monitoring systems (IVMS) and automated coaching approaches [7] highlights significant variability and unexpected behaviors among drivers. For example, some drivers intentionally misused automated feedback, interpreting over-speed warnings as personal performance benchmarks rather than as corrective prompts. Additionally, others demonstrated progressively reduced responsiveness to such repeated automated warnings, indicative of behavioral desensitization over time. Such findings highlight critical limitations of automated coaching methods, emphasizing the need for adaptive, personalized designs capable of accounting for individual drivers' attitudes, behavioral patterns, and varying trust levels towards automated feedback systems [7].

However, remote and technology-mediated coaching methods do provide important benefits that should not be overlooked. For drivers with greater experience or strong intrinsic motivation, remote coaching and self-review systems can foster a valuable sense of autonomy, allowing personalized pacing and flexible engagement, similar to self-directed learners during COVID-19 remote instruction [4,13,14,18]. Moreover, automated feedback systems, when designed effectively, can handle routine interventions, freeing human coaches to focus on complex or high-risk cases requiring personalized attention, thus maximizing resource utilization and scalability [10].

Empirical studies further support the necessity for balanced approaches to driver coaching. Chen (2003) highlighted the importance of visual and auditory feedback for successful classroom management [12], an insight directly applicable to driving coaching scenarios—emphasizing that immediate, clear feedback is vital for behavior correction and skill enhancement. In contrast, Kotera et al. (2022) demonstrated that remote environments could reduce barriers for certain learners, a finding relevant to drivers who may feel stigmatized or

defensive in face-to-face settings, thereby suggesting that remote methods can sometimes enhance comfort and receptivity [15].

Therefore, the optimal approach for driving coaching likely involves strategic integration of in-person, manager-led sessions to leverage deep engagement and interpersonal effectiveness, supplemented by remote or automated methods for flexibility, accessibility, and autonomy—ensuring effective learning across varied driver profiles and operational constraints. This blended coaching approach ensures robust learner-coach interaction while also accommodating diverse learning preferences and situational demands.

One-to-One vs. Mass Instruction

One-to-one instruction, often referred to as personalized or individualized coaching, involves direct interaction between a learner and an instructor, providing immediate and personalized feedback tailored specifically to the individual's learning needs. In contrast, mass instruction typically involves one instructor addressing many learners simultaneously, significantly limiting opportunities for individualized attention, personalized feedback, and rapid adaptation to the learner's unique requirements.

Benjamin Bloom's seminal research on instructional effectiveness [5] provides foundational evidence supporting the superiority of personalized, one-to-one instruction. Bloom systematically compared three common teaching strategies: **Conventional instruction** (30 students per instructor), **Mastery Learning** (also 30 students per instructor, but supplemented with curated examinations and structured feedback), and **One-to-One Tutoring** (individual student-teacher interactions). His results revealed striking differences in educational outcomes. Specifically, 90% of students receiving one-on-one tutoring achieved mastery, in stark contrast to only 20% of students who mastered the material under conventional mass teaching conditions (30-to-1 ratio). Mastery Learning improved results compared to conventional instruction, but still significantly lagged behind personalized tutoring. Ultimately, the one-to-one tutoring approach yielded approximately two standard deviations superior to both mastery learning and conventional teaching (Figure 1) [5].

Translating Bloom's insights into driver coaching contexts reveals important implications. Fleet driver training often mirrors the conventional or mastery learning models—group sessions or standardized online modules delivered uniformly without personalized attention. Although these methods offer significant logistical advantages and scalability, their effectiveness in promoting deep and lasting behavior changes is severely limited due to the absence of tailored, individualized feedback [5,8,18].

Manager-led individualized driver coaching, on the other hand, closely resembles Bloom's highly effective one-to-one tutoring model, facilitating immediate, tailored interventions focused directly on each driver's specific behavior, skill gaps, or motivational challenges. Research specifically within driver training further corroborates the superior effectiveness of personalized sessions; advanced driver coaching programs, for example, demonstrated a 24% improvement in learning

outcomes and significant positive changes across multiple targeted driving behaviors compared to passive observation or mass-instruction methods [8]. Such outcomes highlight that personalized feedback, detailed and individualized explanations, and repeated reinforcement based on occupational and lifestyle factors significantly enhance learning effectiveness.

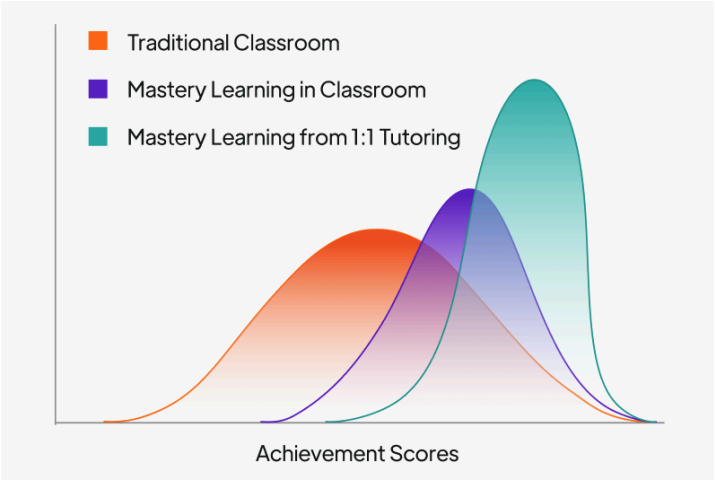

Figure 1: Bloom's Achievement distribution for students under conventional, mastery learning, and tutorial instruction. (*figure credits:* https://www.learner.com/blog/proven-power-of-1-1-tutoring)

Beyond direct skill acquisition, individualized coaching sessions also foster stronger interpersonal relationships between coaches and drivers, enhancing drivers' motivation and accountability. Adult learning theories consistently show learners are more responsive when training is directly relevant and personally engaging, rather than generic or impersonal [9]. Fleet drivers particularly benefit from individualized attention, feeling more valued and respected within the organization, thereby addressing common factors contributing to driver dissatisfaction and high turnover rates [11]. The aligned sense of values between employees and the broader company has been shown to improve organization outcomes [23]. Self-coaching techniques (in the absence of individualized attention from managers) can diminish this alignment of values, and lead to lack of employee satisfaction and productivity.

Yet, fully individualized coaching presents notable operational challenges, including logistical complexity, limited availability of expert coaches, and substantial resource requirements. Consequently, fleet managers frequently face trade-offs between the documented superior effectiveness of individualized coaching and the practical demands of scalability.

Addressing this tension, recent educational research advocates hybrid strategies that integrate personalized coaching elements within broader educational frameworks. Technologies such as AI-driven coaching platforms or automated feedback systems can deliver scalable yet personalized interventions, especially for routine cases, freeing human coaches to concentrate on complex, high-risk scenarios requiring deeper, nuanced interactions [10]. Such blended coaching approaches allow fleets to combine the effectiveness of individualized attention with the scalability and practicality of automated instruction, optimizing learning outcomes across diverse driver populations.

The empirical evidence presented in this report clearly demonstrates the significant educational advantage of personalized one-to-one coaching over mass instruction. For fleet education programs aiming at sustained behavioral change and optimal performance, strategically incorporating personalized elements within blended coaching strategies offers the most effective pathway toward improving driver safety, engagement, and overall organizational outcomes.

3. The Unique Benefits of Coaching for Sustained Driver Behavior Change

Key Points:

- **Active Engagement:** Coaching methods actively engage drivers in learning, fostering deeper self-awareness and personal responsibility compared to passive instructional methods.
- **Internal Motivation:** Personalized coaching enhances intrinsic motivation, encouraging drivers to internalize and maintain behavioral improvements long-term.
- **Organizational Culture:** Effective coaching positively shapes organizational culture, improving driver morale, reducing turnover, and fostering sustained adherence to safety practices.

Unlike traditional instructional methods — which primarily focus on delivering information — coaching emphasizes active learning, personal reflection, and intrinsic motivation, factors crucial for creating lasting behavioral change among drivers. Effective coaching interventions specifically foster deeper self-awareness, enabling drivers to recognize their own habits, biases, and risk tendencies, which are often invisible under conventional instructional methods [18,20,22]. This heightened self-awareness, facilitated through structured coaching interactions, encourages drivers to assume greater personal responsibility and accountability for their driving behaviors and decisions [9].

Psychological theories underpin the unique effectiveness of coaching compared to traditional instructional techniques. For example, instructional-based methods often rely on external guidance and rules that drivers are expected to follow without necessarily internalizing the rationale behind them. In contrast, coaching approaches typically employ Socratic questioning techniques, prompting drivers to reflect on their own behaviors, identify areas needing improvement, and independently generate strategies for behavioral change. This self-generated reflection and problem-solving approach leads to deeper learning and stronger internalization of safety practices, as drivers perceive solutions as their own rather than externally imposed [9].

Research exploring effective driver coaching (e.g., [9]) further reinforces that coaching methods, unlike purely instructional approaches, actively encourage learners to develop self-awareness, personal responsibility, and decision-making autonomy. Studies highlight that coaching prompts drivers to internalize safety principles deeply, fostering long-term behavioral retention and the

development of proactive risk management strategies. Furthermore, effective coaching methods consistently emphasize personal reflection, motivating learners to independently evaluate their actions and adapt their behaviors accordingly. This approach contrasts sharply with traditional instructional models that provide immediate corrective actions without necessarily building deeper self-awareness or lasting attitudinal change [9, 20].

Further supporting the efficacy of coaching, research consistently highlights how actively engaging drivers in their learning process enhances not only the speed at which new behaviors are adopted but also their durability. Adult learning theories emphasize that coaching, by actively involving learners and allowing them to set personal goals and strategies, aligns closely with intrinsic motivation factors that contribute to effective learning. Drivers tend to enjoy the learning process more when they perceive it as personally relevant and directly applicable to their day-to-day responsibilities, thus significantly improving the likelihood of long-term behavioral retention and application in real-world scenarios [9, 11, 20].

Empirical evaluations, such as the Institute of Advanced Motorists (IAM) advanced coaching study [8] and Precaution Adoption Process Model or PAPM [22], provide direct evidence that structured coaching approaches significantly improve driver attitudes toward safety, increasing internal motivation and reducing reliance on external regulation. The PAPM provides a framework for understanding why people need to be aware of the risks associated with their behavior before they are susceptible to behavioral change. Both findings clearly illustrate how coaching leads to knowledge becoming more structured, focused, and internally integrated, enabling drivers to apply safety principles more effectively in real-world contexts by reshaping driving styles to improve road safety [8,19].

Long-Term Psychological and Cultural Impacts of Coaching – Qualitative findings also reinforce coaching's psychological depth. In one IPA study (Interpretative Phenomenological Analysis) of adult driver learning, participants reported that coaching helped them evaluate more effectively and retain information better because they were *"coming up with their own answers, not something that has been fed to them."* Instructors observed that in this way, *"learning was more likely to stick"* [9], creating lasting behavioral change beyond immediate driving outcomes, influencing long-term values and beliefs about driving and interactions on the road [9].

This approach enabled learners to evaluate themselves more effectively and at a faster pace, as one instructor noted how learners "*were more able to evaluate, and quicker too*" [9]. The coaching process was reported to have a deeper, long-term effect—not just on technical driving behaviors, but on the learners' broader values and social awareness. One instructor emphasized that "*coaching had an impact beyond behavior into individuals' values and beliefs about driving and interacting with other road users*" [9]. Instructors also believed the benefits would endure well beyond the training period, stating that "*once qualified drivers, the impact would have a lasting effect*" [9].

Moreover, coaching positively influences driving style and drivers' broader attitudes toward driving safety and organizational culture. Driving style can be defined as a "habitual way of driving" influenced by personality, sociocultural norms, and reinforcement [19]. Therefore, by

facilitating meaningful dialogue and personalized feedback, coaching fosters stronger interpersonal relationships, increases drivers' feelings of organizational appreciation, and promotes a culture of mutual respect and continuous improvement. Such cultural impacts are directly associated with improved morale, greater job satisfaction, and reduced turnover—factors crucial to sustained operational effectiveness in fleet management [11, 20].

In summary, effective coaching is essential for driver education not only because it accelerates immediate skill acquisition but, more importantly, because it cultivates long-term behavioral change, deeper personal accountability, and sustained positive attitudes toward driving safety. These psychological and practical benefits clearly distinguish coaching from traditional instructional methods, underscoring its necessity as a central strategy for improving driver safety, engagement, and organizational outcomes.

4. Challenges in Current Driver Coaching Approaches

Key Points:

- **Operational Pressures:** Workplace demands often conflict with safety coaching, undermining intended behavioral outcomes.
- **Feedback Limitations:** Coaching effectiveness frequently suffers from inconsistent, impersonal feedback, as well as from feedback that is overly critical or too positive.
- **Behavioral Adaptation Risks:** Practical-skills training may inadvertently inflate self-confidence, leading to riskier driving behaviors.
- **Empirical Evidence Gap:** Many existing coaching programs lack robust evaluation, limiting opportunities for continuous improvement.
- **Imbalanced Coaching:** Coaching effectiveness often diminishes when strategies solely emphasize correcting risky behaviours or reinforcing positive ones. A disproportionate emphasis on positive recognition can lead to false confidence which ultimately increases risk.

Despite significant investment in driver coaching and training initiatives, many fleets continue to experience inconsistent safety outcomes. This persistent challenge stems from critical limitations inherent in existing coaching methodologies and broader organizational practices, creating a gap between intended safety improvements and real-world driver behavior.

A key limitation involves the prevailing focus on practical driving skills within conventional coaching methods. Many driver training programs emphasize vehicle handling and operational control but neglect critical psychological and behavioral dimensions such as risk perception, attitudes, and decision-making under pressure. Research indicates that purely practical training, without careful attention to drivers' psychological context, can inadvertently increase self-confidence to unsafe levels, promoting aggressive driving behaviors and reducing overall vigilance [6]. Manager-led coaching approaches, while better positioned to address

psychological and motivational factors, can be limited in their effectiveness if they rely too heavily on direct instruction rather than facilitating self-reflection and deeper attitudinal change. The limitations of passive and minimally engaged coaching approaches become particularly clear when considering detailed comparative evaluations. For example, the coaching evaluation study of the Institute of Advanced Motorists (IAM) [8] found that drivers who received passive observation or no coaching showed statistically significant deterioration in their driving quality over time, with some behaviors becoming notably worse. This emphasizes the substantial risks associated with passive coaching methods—further reinforcing the critical need for active, personalized, and engaging coaching methods to achieve sustained safety improvements [8].

Furthermore, prior research suggests that coaching effectiveness diminishes when strategies swing too far toward either extreme—overemphasizing risk-taking or relying too heavily on praise. In sports psychology, it is well documented that excessive critical feedback can drastically worsen morale and performance, especially among athletes who possess low self-confidence [27]. On the other hand, training programs that heavily emphasize practical vehicle-control skills may unintentionally inflate drivers' perceptions of their driving abilities, fostering a false sense of security [6]. This inflated self-confidence often translates into riskier behaviors, such as aggressive driving or reduced vigilance, thereby counteracting intended safety outcomes. This dynamic is further complicated by cognitive biases such as the illusion of personal control and the Dunning-Kruger effect [24]. Horswill and McKenna [25] caution that some training programs may inadvertently enhance drivers' confidence without meaningfully improving performance, increasing the risk of overestimating one's abilities. Similarly, Dunning-Kruger theory suggests that individuals with lower competence are often unaware of their limitations, leading them to misjudge their skill level. Horrey et al. [26] reinforce this by showing how drivers commonly underestimate the dangers of multitasking behind the wheel. **Together, these findings underscore the risk of relying too heavily on positive reinforcement without balancing it with accurate, constructive feedback.** Effective coaching should foster motivation and engagement while maintaining a realistic appraisal of driver capabilities, preventing false confidence that undermines safety outcomes.

Psychological research on reinforcement further supports the need for balance in driver coaching. Kubanek et al. [28] demonstrate that reward and punishment influence behavior through distinct neural mechanisms. Specifically, rewards act to reinforce specific actions, promoting their future repetition, while punishments have a broader suppressive effect, often inhibiting behavior and shifting strategy. In the context of driver coaching, this distinction is critical: excessive praise may unintentionally entrench existing habits, even if they are suboptimal, while disproportionate criticism may lead to disengagement or defensive driving behaviors. A balanced coaching approach — one that combines specific, effort-based recognition with targeted, actionable feedback — can activate both motivational systems. Such a dual strategy aligns with the findings of Kubanek et al., supporting more adaptive, reflective, and sustainable behavior change.

Additionally, workplace pressures and operational demands frequently compromise the effectiveness of coaching interventions. Even when drivers receive comprehensive, personalized coaching, organizational expectations around productivity, tight scheduling, and

efficiency often contradict safe driving practices. Specifically, organizational processes and work tasks may create significant time pressure demands, causing drivers to prioritize completing routes quickly over adhering strictly to coached safety principles. This tension between operational demands and safety coaching objectives frequently undermines the effectiveness of even high-quality coaching interventions [6, 20].

Another significant challenge involves the prevalent use of passive coaching methods that rely excessively on delivering information rather than actively engaging drivers. Research consistently highlights that passive, instructional methods—such as standardized safety videos or mass briefings—yield limited behavioral improvement, particularly over the long term [8]. In contrast, effective coaching methodologies leverage active, reflective interactions, where drivers are encouraged to analyze their own driving behaviors, actively participate in discussions, and develop personalized strategies for improvement. While manager-led, personalized coaching sessions inherently support active learning, operational constraints often lead organizations to default back to less effective, passive group coaching methods.

Moreover, inconsistent or generic feedback further undermines driver coaching effectiveness. Many coaching sessions lack the continuous, individualized, actionable feedback necessary for meaningful improvement. Feedback often comes infrequently or in formats that drivers perceive as critical rather than constructive. Effective feedback in coaching must clearly articulate the reasons behind suggested changes and provide concrete, achievable steps tailored to the individual driver's context. Without such targeted feedback, drivers may struggle to implement and sustain the improvements suggested during coaching interactions [9].

Individual driver characteristics add further complexity. Fleet drivers have diverse levels of experience, motivation, and receptivity to coaching. However, coaching interventions often apply uniform approaches across diverse driver populations, neglecting individualized needs and learning preferences. A "one-size-fits-all" approach inevitably reduces coaching effectiveness, as drivers might perceive sessions as either irrelevant or too general. Personalized, manager-led coaching can significantly alleviate this issue, but scaling personalized interventions across large driver populations poses logistical and resource challenges [11].

Finally, many coaching programs suffer from inadequate evaluation processes. Without rigorous, evidence-based assessments of long-term coaching effectiveness, fleets lack critical data needed for continuous improvement and refinement of their coaching strategies. Organizations often assess immediate knowledge gains or short-term behavioral improvements rather than sustained changes in driver behavior, limiting their capacity for strategic optimization of coaching interventions [6]. Indeed, despite being widely perceived as cornerstones of fleet safety efforts, driver training and education initiatives often lack robust empirical evidence demonstrating clear effectiveness. Studies repeatedly highlight gaps in demonstrating sustained safety outcomes, calling into question the widespread reliance on conventional training methodologies without rigorous validation of their long-term impact [6].

In summary, despite substantial efforts, current driver coaching methods face multiple barriers: the unintended psychological effects of skill-focused training, conflicting

organizational pressures, reliance on passive instructional techniques, inconsistent or inadequate feedback, lack of individualized coaching, and insufficient long-term evaluation. Effectively addressing these challenges requires adopting comprehensive, blended coaching approaches that balance personalized, active manager-led sessions with scalable, technology-enhanced interventions—maximizing coaching effectiveness, driver safety, and organizational performance.

5. Evaluating and Integrating Current Driver Coaching Techniques

Key Points:

- **In-Cabin (Automated) Coaching:** Offers scalable immediate feedback, but effectiveness varies significantly based on driver acceptance and responsiveness.
- **Self-Coaching:** Provides flexibility and autonomy suitable for motivated learners, but depends heavily on drivers' self-awareness and motivation.
- **Manager-Led Coaching:** Highly personalized, evidence-backed method demonstrating superior effectiveness but faces significant logistical and resource constraints.
- **Integrated Solutions:** Combining manager-led, automated, and self-coaching approaches leverages strengths and mitigates limitations, achieving optimal outcomes.

Driver coaching methods currently employed in fleet management typically fall into three primary categories: **in-cabin coaching**, **self-coaching**, and **manager-led coaching**. Each method has unique strengths and weaknesses, as highlighted by findings on effective learning environments and existing challenges identified earlier in this paper.

In-Cabin (Automated) Coaching

In-cabin coaching leverages automated technology to provide immediate, real-time feedback directly to drivers. Utilizing sensors and video analytics, these systems detect risky behaviors such as speeding, harsh braking, or distracted driving, triggering instant audio-visual alerts aimed at prompting immediate behavioral correction. This coaching method aligns closely with the principle of providing rapid and timely feedback—one of Olson and Olson's critical characteristics for effective communication and learning [3]. Additionally, automated feedback supports scalable mass instruction, relevant to the logistical challenges discussed in the context of driver coaching approaches.

Research on personalized, context-aware in-vehicle coaching applications further highlights the complexity of achieving universal effectiveness. A field trial involving the *Driver Coach* software, providing tailored and real-time feedback on driver behavior [7], showed mixed results across participants. While some drivers significantly improved their adherence to recommended driving

practices, others displayed minimal or no improvement. This variability was attributed to factors including individual differences in trust toward automation, past experiences with similar systems, and varying personal motivation levels. These findings underscore the necessity of customizable coaching interventions, allowing drivers to adjust feedback frequency, style, and intensity according to their personal preferences and responsiveness [7]

Self-Coaching (Self-Directed Coaching)

Self-coaching involves drivers independently reviewing recorded driving behaviors to identify mistakes and opportunities for improvement without direct oversight from a human coach. This approach emphasizes flexibility and autonomy, aligning closely with adult learning preferences and echoing the advantages seen among highly self-directed learners in remote learning contexts. Specifically, remote education studies highlight that experienced and motivated learners often thrive in self-directed settings, indicating the potential value of self-coaching for similarly self-motivated drivers [4].

Insights from behavioral intervention research in driving contexts highlight the effectiveness of self-coaching when supported by proper scaffolding and feedback mechanisms [18]. In an on-road experimental study, 33 drivers—including six professional drivers—completed a 1.5-hour route multiple times. Among those who used a self-coaching system to review their own risky driving behavior, the number of detected hazardous incidents decreased by approximately 50% between the second and third driving sessions. Notably, 27 out of 33 participants demonstrated improved safety performance after just a 10-minute review session with the system. These findings underscore the potential of self-directed learning when paired with tailored feedback and structured behavioral insights.

However, the effectiveness of self-coaching depends on individual drivers' intrinsic motivation, self-awareness, and capacity for self-directed learning. Less experienced drivers or those lacking strong self-management skills typically face significant challenges with self-coaching, similar to learners in remote educational environments who struggle without structured guidance [4]. Additionally, without external validation, self-coaching may be susceptible to cognitive biases such as overconfidence, potentially reinforcing unsafe behaviors rather than correcting them—echoing concerns raised about driver training programs inadvertently fostering risky behaviors [6].

Insights from behavioral intervention research outside driving contexts, such as smoking cessation programs [17], provide valuable strategies to enhance self-coaching effectiveness. Self-help materials, when personalized and targeted to individual learner needs, show small but meaningful improvements in behavioral outcomes compared to generic materials. These materials, including tailored manuals, video guides, and interactive online resources, can significantly enhance drivers' ability to accurately self-assess and sustainably improve their behavior independently. Although the effects of generic materials alone may be modest, customizing self-coaching resources to address specific driver profiles—such as less experienced drivers or those with specific behavior challenges—could meaningfully improve their effectiveness [9].

Manager-Led (and Face-to-Face) Coaching

Manager-led coaching involves personalized and face-to-face interactions between drivers and human coaches, typically involving experienced managers or senior trainers. In these interactions, coaches engage drivers by reviewing specific incidents, providing targeted feedback, and collaboratively developing improvement strategies. This coaching method closely aligns with several dimensions of effective learning environments identified earlier—particularly rapid feedback, nuanced communication cues, co-presence, and shared spatial context outlined by Olson and Olson [3]. Additionally, manager-led coaching strongly reflects the personalized, one-to-one tutoring approach validated by Bloom's "2 Sigma Problem," underscoring significant learning advantages of individualized interactions [5].

Empirical evidence consistently supports the efficacy of manager-led coaching in producing sustained improvements in driver behavior. An extensive evaluation conducted by the Institute of Advanced Motorists (IAM) [8] offers additional robust empirical evidence for manager-led coaching's effectiveness. Utilizing the structured IPSGA (Information, Position, Speed, Gear, Accelerate) coaching methodology, IAM coaching demonstrated measurable improvements across multiple driver competencies—knowledge, skills, and attitudes. Compared to control groups who either received no coaching or passive observation, IAM-coached drivers showed statistically significant improvements in 7 out of 12 specific driving behaviors directly observed during sessions (see Table 1), and further demonstrated enhanced performance in 18 out of 26 behaviors evaluated post-session using formal assessments. Notably, the coached drivers experienced a substantial net increase in relevant driving knowledge (from 28 to 37 identified knowledge elements), significantly outperforming the control groups, whose knowledge levels either stagnated or declined over the same period.

		Control groups	
Behaviour category	IAM	8-drives	2-drives
Speed	Improvement		
Limit points	Improvement		
Roadcraft	Improvement		
Handbrake			
Smoothness			
Signalling			
Steering	Improvement	Decrement	Decrement
Road position			
Headway	Improvement		
Response to hazard			Decrement
Use of mirrors	Improvement		
Gear changes	Improvement	Decrement	Decrement
Overall	Improvement		Decrement

IAM = Institute of Advanced Motorists.

Table 1: IAM Summary of statistically significant results within each observed behaviour category, accompanied by the direction of change.

Furthermore, network analyses of knowledge consolidation indicated that coached drivers developed more interconnected, robust knowledge structures, improving their long-term retention and practical application of driving competencies. These findings reinforce manager-led coaching's unique capacity to deliver enduring and deeply integrated learning outcomes beyond those achievable through self-coaching or automated in-cabin feedback alone [8]. Moreover, manager-led coaching fosters interpersonal relationships and enhances drivers' perceptions of organizational support, directly addressing critical motivational and psychological challenges previously discussed [11].

Supporting these findings, research from behavioral counseling interventions in healthcare contexts [17] emphasizes the particular effectiveness of face-to-face, motivational interviewing-based coaching approaches. Such methods facilitate deeper self-examination, effectively address drivers' ambivalence towards behavioral change, and lead to more sustained improvements. Regularly scheduled face-to-face coaching sessions are especially beneficial when combined with structured follow-up, providing continuous reinforcement over extended periods. Similar to findings in driver coaching, longer and more frequent individualized sessions consistently produce stronger and more durable behavior changes, further reinforcing the practical value of manager-led coaching [9,19].

Nevertheless, manager-led coaching faces considerable logistical and operational constraints. The personalized nature of face-to-face coaching demands significant investments in experienced personnel and dedicated coaching time, making broad-scale implementation difficult. This limitation aligns with earlier discussions about practical constraints that restrict exclusive reliance on individualized coaching despite its clear effectiveness [6].

One promising strategy to address these logistical constraints is the 'Tool Box Meeting' or 'train-the-trainer' model [6]. This approach enables supervisors or senior drivers to conduct targeted, small-group coaching sessions, combining scalability with the benefits of personalized interaction. International fleet safety research has repeatedly demonstrated the effectiveness of small-group discussions led by trained supervisors, highlighting their ability to significantly influence driver behaviors and foster robust organizational safety cultures. By distributing coaching responsibilities to mid-level management, fleets can achieve a practical balance between personalization and scalability, enhancing engagement without overwhelming available resources [6].

Comparative Considerations and Integrated Solutions

Each coaching methodology—automated in-cabin feedback, self-coaching, and manager-led interactions—addresses specific learning needs and operational constraints highlighted throughout this paper. The identified strengths and limitations underscore the need for adopting an integrated coaching approach rather than relying exclusively on any single method. Effective integrated solutions would combine the immediacy and scalability of automated feedback, the flexibility and autonomy of self-coaching, and the interpersonal depth provided by personalized manager-led coaching.

Emerging research [1,19] highlights the promising role of artificial intelligence (AI) in further optimizing coaching effectiveness, particularly within blended coaching solutions. AI-driven systems are increasingly capable of handling routine coaching tasks, providing precise and timely feedback, and efficiently monitoring large groups of drivers simultaneously. For example, AI-powered feedback platforms can automatically identify and prioritize incidents requiring immediate human coach intervention, thus significantly reducing the coaching workload on managers and enabling them to focus exclusively on high-priority cases or drivers needing personalized attention [10]. Furthermore, intelligent systems can personalize driver feedback by analyzing individual behavior patterns, driving histories, and personal preferences, creating tailored interventions that drivers are more likely to accept and internalize. This sophisticated approach effectively combines the scalability and immediacy of automated coaching with aspects of personalization previously achievable only through direct human coaching [10]. Thus, integrating AI technologies into existing coaching frameworks represents a strategic pathway towards overcoming traditional scalability and resource constraints, ultimately delivering more effective, sustainable, and personalized driver safety outcomes.

Strategically integrating these approaches enables fleets to leverage the strengths of each method while mitigating their respective weaknesses—ultimately driving optimal safety outcomes, driver engagement, and overall organizational performance.

Comparative Analysis of Coaching Techniques

Technique	Pros	Cons
In-Cabin Coaching	- Immediate, just-in-time feedback - Scalable for large fleets - Supports rapid behavior corrections	- Can feel intrusive and impersonal - Varies significantly based on driver trust and acceptance - Overly negative feedback may demotivate drivers
Self-Coaching	- Flexible and adaptable to driver schedules - Promotes autonomy and intrinsic motivation - Ideal for experienced, self-directed learners	- Effectiveness is highly dependent on driver motivation and self-awareness - Risk of reinforcing incorrect behaviors due to a lack of external feedback
Manager-Led Coaching	- Highly personalized and effective - Deep interpersonal engagement enhances motivation and accountability - Strong evidence supporting long-term behavior change	- Logistically challenging, resource-intensive - Difficult to implement broadly across large driver populations

6. Summary and Strategic Recommendations: Differentiation & Optimization of Driver Coaching

Key Points:

Personalized, manager-led coaching coupled with automated and self-directed methods can effectively deliver learning outcomes while mitigating logistical challenges:

- **AI Integration:** Leveraging AI-supported coaching systems optimizes scalability and personalization, allowing managers to focus strategically.
- **Regular In-Person Short Sessions:** Frequent and short in-person coaching sessions provide continuous reinforcement, effectively enhancing learning retention and engagement.
- **Balanced Feedback:** Integrating some targeted positive recognition to existing feedback mechanisms can significantly boost driver motivation, morale, and sustained adherence to coaching objectives. Too much positive recognition, however, can negatively impact driver performance, particularly for the riskiest drivers.
- **Enhanced Measurement:** Utilizing key performance and behavioral indicators ensures ongoing evaluation, optimization, and evidence-based refinement of coaching strategies.

Based on the comprehensive review of effective learning dimensions, current coaching challenges, and empirical evidence presented, the following strategic recommendations explicitly address how integrated coaching methods have the potential to outperform each individual coaching technique and identify opportunities for mitigating shortcomings, leading to future optimization.

Differentiation: The Human Catalyst in Coaching Synergy

The evidence presented in this report demonstrates that manager-led and personalized coaching approaches, complemented with the strengths of in-cabin and self-directed coaching, can deliver greater long-term effectiveness. Unlike standardized or technology-only coaching approaches commonly adopted within fleet management, personalized manager-led coaching uniquely leverages multiple critical dimensions of effective learning:

Personalized Interactions: One-on-one or small-group interactions allow targeted, context-specific feedback, substantially enhancing drivers' understanding, self-awareness, and internalization of safety behaviors.

Immediate and Nuanced Feedback: Manager-led coaching aligns closely with Olson and Olson's characteristics, offering nuanced communication cues, co-presence, and shared spatial context—factors impossible to fully replicate in automated systems.

Sustained Behavioral Impact: Empirical studies, such as advanced driver coaching evaluations, consistently confirm that personalized coaching leads to sustained behavioral improvements and knowledge retention significantly beyond automated or mass instructional methods.

Stronger Organizational Engagement: Direct human interaction fosters stronger interpersonal relationships, significantly improving drivers' morale, job satisfaction, and perceptions of organizational support.

These combined strengths can differentiate personalized, manager-led coaching from competing methods focused predominantly on automated feedback or self-coaching materials. Yet, manager-led coaching can have drawbacks that hinder wide-scale implementation, mainly, the scarcity of expert coaching that leads to limited extent and availability of support. In this section, we discuss how to complement manager-led coaching to unlock its great potential for wider use.

Optimization: Recommended Future Directions

While the current manager-led coaching strategy provides clear value, several strategic opportunities (informed by in-cabin and self-coaching) can mitigate shortcomings of manager-led coaching and lead to an effective coaching environment for sustained behavior change:

AI-Enhanced Coaching Integration: Integrating AI-driven coaching platforms into existing personalized coaching practices can substantially enhance scalability without sacrificing personalization. AI systems can manage routine behavioral interventions, prioritize high-risk incidents for human coaches, and personalize interventions based on individual driver profiles, improving both resource efficiency and coaching effectiveness.

Balanced Positive and Risk Mitigation Feedback: Future coaching strategies should systematically integrate positive reinforcement to existing systems that warn drivers of risky behaviors (commonly seen in many in-cabin dashboard systems). Empirical evidence indicates structured recognition significantly enhances motivation, reduces turnover, and fosters deeper, sustained adherence to safety behaviors. Incorporating frequent positive feedback explicitly tied to performance indicators can further improve coaching impact.

Balancing Praise and Critique: Recent neuroscientific evidence confirms that rewards and punishments act through distinct behavioral mechanisms: rewards tend to reinforce specific actions, while punishments trigger broader behavioral suppression or strategy shifts. When coaching relies too heavily on praise without challenge, it can unintentionally reinforce risky behaviors by inflating perceived competence. Conversely, persistent negative feedback may erode driver confidence or motivation. Therefore, integrating feedback mechanisms that align with these principles—such as pairing positive reinforcement for specific safety behaviors with goal-oriented, constructive criticism—can optimize learning retention and behavioral adaptability across driver profiles.

Regular Short-Session Model: Research consistently supports frequent, short coaching interactions as more effective than infrequent, longer sessions. Implementing a structured schedule of shorter sessions (e.g., weekly 15–30 minute coaching meetings) provides continuous reinforcement, allows timely feedback, and helps mitigate behavioral desensitization or disengagement that often occurs with automated systems. In addition, short sessions can be more manageable for coaches who can provide support to a wider set of audiences.

By addressing these optimization strategies, coaching programs can further amplify their current competitive advantage, increase operational scalability, and achieve deeper, sustained impacts on driver safety and organizational performance.

Summary of Key Statistics and Evidence-Based Findings

- **Human factors in vehicle crashes:** Approximately **92.6%** of motor vehicle crashes result directly from human factors such as speeding, distraction, fatigue, or judgment errors, underscoring the critical importance of effective driver coaching interventions [1].
- **Fleet safety risks:** Each year, an average of **2,783 fleets** are identified as high-risk by the Federal Motor Carrier Safety Administration (FMCSA), highlighting widespread fleet safety management challenges [2].
- **Effectiveness of personalized instruction (Bloom's 2 Sigma Study):** Personalized one-to-one tutoring yields mastery rates of approximately **90%**, compared to only **20%** in conventional mass instruction scenarios, representing a significant **two standard deviation advantage** in educational effectiveness [5].
- **Impact of advanced driver coaching (IAM Study):** Manager-led personalized coaching resulted in a **24% improvement** in knowledge retention, significant improvements in **7 out of 12** directly observed driving behaviors, and notable improvement in **18 out of 26** post-session assessed behaviors compared to passive methods [8].
- **Risks of excessive self-confidence from skill-only training**: Training focused solely on operational vehicle skills without addressing psychological components has been shown to unintentionally boost drivers' self-confidence without a corresponding improvement in actual ability. This can result in a net negative effect on road safety due to increased risk-taking behavior [25].
- **Limitations of driver training:** Training emphasizing practical driving skills without psychological context often leads to **inflated driver self-confidence**, inadvertently encouraging riskier driving behaviors and undermining intended safety outcomes [6].
- **Distinct behavioral effects of reward and punishment**: Neuroscientific research demonstrates that rewards reinforce specific behaviors while punishments trigger broader strategy changes or behavior suppression. Over-reliance on generalized praise

in coaching may inadvertently reinforce unsafe driving habits, while excessive criticism can lead to disengagement. Balanced feedback—combining targeted recognition with constructive challenge—has been shown to promote more adaptive and sustained behavioral improvement [28].

- **Positive recognition and driver engagement:** Inclusion of targeted positive recognition into risk coaching improves driver morale and organizational engagement, thereby enhancing the effectiveness and sustainability of coaching outcomes [11].
- **Optimal frequency of coaching interactions:** Regular coaching sessions of approximately **15–30 minutes** significantly outperform infrequent, lengthy sessions, providing continuous reinforcement and improved behavior retention [11].
- **Impacts of self-coaching system:** In an on-road experimental study, 33 drivers—including six professional drivers—completed a 1.5-hour route multiple times. Among those who used a self-coaching system to review their own risky driving behavior, the number of detected **hazardous incidents decreased by approximately 50%** between the second and third driving sessions. Notably, 27 out of 33 participants demonstrated improved safety performance after just a 10-minute review session with the system. [18]
- **Qualitative impacts of coaching**: Instructors in an Interpretative Phenomenological Analysis (IPA) study reported that coaching led to more durable and self-generated learning. One noted that "*learning was more likely to stick, as it is their own answers, not something that has been fed to them*," while another observed that learner "*were more able to evaluate, and quicker too*." The coaching approach was said to have an impact beyond technical behavior, influencing *"individuals' values and beliefs about driving and interacting with other road users.*" Instructors also believed that "*once qualified drivers, the impact would have a lasting effect*," reinforcing the long-term psychological and cultural value of personalized coaching [9].

Disclosure and Acknowledgments

The research was made possible via a grant from Lytx, Inc. who helped shape the scope of the research.

References

[1] Yang G, Ridgeway C, Miller A, Sarkar A. Comprehensive Assessment of Artificial Intelligence Tools for Driver Monitoring and Analyzing Safety Critical Events in Vehicles. Sensors (Basel). 2024;24(8):2478. Published 2024 Apr 12. https://doi:10.3390/s24082478

[2] Camden, M. C., Hickman, J. S., & Hanowski, R. J. (2022). Reversing Poor Safety Records: Identifying Best Practices to Improve Fleet Safety. Safety, 8(1), 2. https://doi.org/10.3390/safety8010002

[3] Olson, G. M., & Olson, J. S. (2000). Distance Matters. Human–Computer Interaction, 15(2–3), 139–178. https://doi.org/10.1207/S15327051HCI1523_4

[4] M Yarmand, H Li, & N Weibel. (2025). Interactions Beyond the Pandemic: Lessons Learned from Large‑scale Emergency Remote Teaching. Proc. CHI 2025: ACM Conference on Human Factors in Computing Systems.

[5] Bloom, Benjamin S. "The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring." Educational researcher 13.6 (1984): 4-16.

[6] Davey, J., Freeman, J., Wishart, D., & Rowland, B. (2008). Developing and implementing fleet safety interventions to reduce harm: Where to from here?. In Proceedings of the International Symposium on Safety Science and Technology (pp. 1-9). Science Press.

[7] J Orlovska, C Wickman, R Söderberg, D Bark, C Carlsson, P Gustavsson. (2024). Design and implementation of driver coach application for pilot assist: A first validation study. Transportation Research Interdisciplinary Perspectives, Volume 25, 2024, 101130, https://doi.org/10.1016/j.trip.2024.101130.

[8] Stanton, N. A., Walker, G. H., Young, M. S., Kazi, T., & Salmon, P. M. (2007). Changing drivers' minds: the evaluation of an advanced driver coaching system. Ergonomics, 50(8), 1209–1234. https://doi.org/10.1080/00140130701322592

[9] Passmore, J., & Mortimer, L. (2011). The experience of using coaching as a learning technique in learner driver development: An IPA study of adult learning. International Coaching Psychology Review, 6(1), 33-45.

[10] M Yarmand, C Chen, K Cheng, J Murphy, and N Weibel. 2024. "I'd be watching him contour till 10 o'clock at night": Understanding Tensions between Teaching Methods and Learning Needs in Healthcare Apprenticeship. In Proc CHI 2024, ACM Conference on Human Factors in Computing Systems. Article 457, 1–19. https://doi.org/10.1145/3613904.3642453

[11] Workhuman and Gallup, The Human-Centered Workplace. 2024. https://www.workhuman.com/resources/reports-guides/the-human-centric-workplace-gallup-report/

[12] M Chen. 2003. Visualizing the pulse of a classroom. In Proceedings of the eleventh ACM international conference on Multimedia. Association for Computing Machinery, New York, NY, USA, 555–561. https://doi.org/10.1145/957013.957130

[13] De Gagne, J. C., & Walters, K. (2009). Online teaching experience: A qualitative metasynthesis (QMS). MERLOT Journal of Online Learning and Teaching, 5(4).

[14] Bruggeman, B., Garone, A., Struyven, K., Pynoo, B., & Tondeur, J. (2022). *Exploring university teachers' online education during COVID-19: Tensions between enthusiasm and stress.* Computers and Education Open, 3, 100095.

[15] Kotera, Y., et al. (2021). *Loneliness in online students with disabilities - qualitative investigation for experience, understanding and solutions.* Journal of Educational Technology in Higher Education, 18:64. https://doi.org/10.1186/s41239-021-00301-x

[16] Moster, M., Kokinda, E., Rodeghero, P., & McNeese, N. (2023). Both Sides of the Story: Changing the" Pre-Existing Culture of Dread" Surrounding Student Teamwork in Breakout Rooms. Proceedings of the ACM on Human-Computer Interaction, 7(CSCW1), 1-33. https://doi.org/10.1145/3579463

[17] Roberts NJ, Kerr SM, Smith SMS. Behavioral Interventions Associated with Smoking Cessation in the Treatment of Tobacco Use. Health Services Insights. 2013;6. doi:10.4137/HSI.S11092

[18] Takeda, K., et al. (2012). Self-coaching system based on recorded driving data: Learning from one's experiences. *IEEE Transactions on Intelligent Transportation Systems, 13*(4), 1821–1831. https://doi.org/10.1109/TITS.2012.2205917

[19] Sagberg, F., Selpi, Bianchi Piccinini, G. F., & Engström, J. (2015). A review of research on driving styles and road safety. *Human Factors, 57*(7), 1248–1275. https://doi.org/10.1177/0018720815591313

[20] Jones, R. J., Woods, S. A., & Guillaume, Y. R. F. (2016). The effectiveness of workplace coaching: A meta-analysis of learning and performance outcomes from coaching. *Journal of Occupational and Organizational Psychology, 89*(2), 249–277. https://doi.org/10.1111/joop.12119

[21] Corcoba Magaña, V., García Pañeda, X., Garcia, R., Paiva, S., & Pozueco, L. (2021). Beside and behind the wheel: Factors that influence driving stress and driving behavior. *Sustainability, 13*(9), 4775. https://doi.org/10.3390/su13094775

[22] Hassan, H., King, M., & Watt, K. (2015). The perspectives of older drivers on the impact of feedback on their driving behaviours: A qualitative study. *Transportation Research Part F: Traffic Psychology and Behaviour, 28*, 25–39. https://doi.org/10.1016/j.trf.2014.11.003

[23] Fitzgerald, G. A., & Desjardins, N. M. (2004). Organizational values and their relation to organizational performance outcomes. Atlantic journal of communication, 12(3), 121-145.

[24] Dunning, D. (2011). The Dunning–Kruger effect: On being ignorant of one's own ignorance. In *Advances in experimental social psychology* (Vol. 44, pp. 247-296). Academic Press.

[25] Horswill, M. S., & McKenna, F. P. (2004). Drivers' hazard perception ability: Situation awareness on the road. *A cognitive approach to situation awareness: Theory and application*, *1*, 155-175.

[26] Horrey, W. J., Lesch, M. F., & Garabet, A. (2009). Dissociation between driving performance and drivers' subjective estimates of performance and workload in dual-task conditions. *Journal of safety research*, *40*(1), 7-12.

[27] Kenow, L. J., & Williams, J. M. (1992). Relationship between anxiety, self-confidence, and evaluation of coaching behaviors. The Sport Psychologist, 6(4), 344-357.

[28] Kubanek, J., Snyder, L. H., & Abrams, R. A. (2015). Reward and punishment act as distinct factors in guiding behavior. Cognition, 139, 154.