NOVICE DRIVER SELF-MONITORING

Trevor Bailey (Transport SA, South Australia)

Abstract

There is a growing consensus that quality driver training approaches should encompass higher-level cognitive abilities, such as those involving metacognition, in anticipation that this may produce enduring effects on driving behaviour. One metacognitive ability, self-monitoring, has been shown in various educational contexts to be influential on subsequent learning achievement through the self-feedback generated. Self-monitoring of causal attributions assigned while explaining learning achievement is considered to be particularly important, as certain patterns of attributional thinking can be more adaptive to learning than others. While novice drivers, to varying extents, voluntarily self-monitor various aspects of their learning, some self-monitoring, such as on causal attributions, is best promoted by external prompting from an instructor while interacting with a learner driver. Work in progress by the author has involved on-going in-depth interviews and group discussions with a small sample of young novice drivers, with the aim of encouraging the drivers to self-monitor and assign causal attributions for their learning. The research aims to identify ways driving instruction can foster productive patterns of thinking, such as self-monitoring, already known to be influential on learning achievement.

Introduction

There is a popular, intuitive expectation that providing training to novice drivers necessarily leads to a lower crash risk once driver's licences have been obtained. While several reviews of the world's literature have consistently concluded that such a linkage has yet to be unequivocally established [e.g 10; 19], Gregersen's [13] study of 1997 shows much promise. In evaluating Sweden's requirement for learner drivers to obtain extensive amounts of supervised driving practice, Gregersen found that novice drivers who had obtained around 120 hours of supervised practice (compared with the former 50 hours), had statistically significant crash reductions of up to 35% per kilometre travelled, after obtaining their licence. As a consequence of this study, many road authorities in the UK, North America and Australia are now requiring much higher amounts of supervised driving experience of novices. However, arguably, only those educational approaches deemed most effective should prevail in the requirements for augmented driving practice. In this regard, driving instructors have a key role to play, certainly insofar as working cooperatively with the novice driver. But much of what a novice driver learns is gained experientially, from not just instructed lessons, but the less formal 'practice' sessions typically accompanying the formal instruction. Experiential learning continues to be salient when the novice is allowed to drive solo, and for many years after a full licence has been gained. Through both instructed and experiential learning, instructors can establish and nurture in drivers productive patterns of thinking about learning to drive, in anticipation that if they find value in these patterns of thinking, they will subsequently engage in them on their own volition. One such pattern of thinking that has been theoretically and empirically established in educational psychology for over the last decade or two concerns promotion of metacognitive abilities, that is, learners' awareness of their own learning.

Metacognition

The need to attend to higher-order cognitive abilities in driver training was recognised in the 1994 Australian *Young Driver Research Program* [8] and Austroads' [5] set of novice driver competencies. Recently, both the Australian Driver Trainers' Association [33] and Australia's *National Road Safety Strategy 2001-2010* [4] advocated developing driver training programs focusing more on cognitive skills. Metacognition, as a cognitive skill, concerns individuals' broad awareness of how they learn and structure knowledge, and the learning strategies they might apply to different tasks. These include, predicting outcomes, apportioning one's time, explaining to oneself in order to improve understanding, self-coaching and noting failures to comprehend [34; 1; 6]. While the valuable contribution of metacognitive ability in varied learning and training contexts has been recognised for several years, it is only comparatively recently that it has been considered in relation to driver training. Yet, many aspects of the driving task involve metacognitive skills, including awareness of risk, decision-making, scanning and the ability to plan ahead [27; 40; 9], as well as awareness of allied emotive and motivational factors such as personal values, peer group pressure, risk acceptance, goal formation, sensation seeking and impulse control [21; 17; 16]. Metacognitive ability is considered a most promising area for finding improvement in driver training methods [27; 26].

Self-monitoring – A Metacognitive Ability

One component of metacognition is self-monitoring. Self-monitoring is a cyclic process in which learners monitor the effectiveness of their learning methods and strategies, and respond to this feedback in a variety of ways [43]. It covers self-regulating, self-instruction and self-evaluation during learning activities, and therefore contains both higher-order cognitive and motivational components. There is a growing body of research-based evidence [2; 11], linking learner self-monitoring with performance success. The twelve principles for learner-centred learning, proposed in 1993 by the American Psychological Association (APA), were distilled by Alexander and Murphy [2] down to five essential principles of meaningful learning. One of these is strategic processing or executive control, the ability to reflect upon and regulate one's thoughts and behaviours. Alexander and Murphy [2] have concluded that whichever contemporary theoretical positions on cognition are used as bases, numerous investigations have demonstrated that learning is enhanced when individuals have knowledge of and apply appropriate monitoring or executive strategies during the learning process. Skills in strategic processing and executive control are optimised by factors in learning contexts such as, extending the learning over time and opportunities for learning transfer, and by a social and personal milieu supportive of strategic thinking about one's learning, including the learner's own motivation in this respect. Paris and Ayres [34] extended the APA's principles of learner-centred learning to steer principles for the assessment of learning. They argued that, to foster self-monitoring, assessment should continually be motivational in nature and relevant to students' personal goals, and should encourage students to reflect on the content and outcome of their learning, as well as the learning strategies and processes used.

Engagement in self-monitoring for specific learning activities may enhance general reflective and metacognitive ability. Mezirow [31] and Hatakka [15] stated that metacognitive skills and reflective thinking not only characterise an expert, but assist in the development of expertise. Kitsantas and Zimmerman [25] found that self-monitoring approaches in sessions to improve teenagers' physical/sports skills, not only advanced those skills, but general metacognitive ability as well. They also found that the teenagers subsequently attributed their motoric success to their having engaged in the self-evaluations. Elements of metacognitive training may be particularly productive at the beginning stages of learning programs [2], in those programs where it is implemented frequently [35], and where students also self-evaluate their progress covertly [35]. Finally, there is research support for the intuitive expectation that covert self-monitoring is just as effective as the more overt or explicit approaches inherent in self-monitoring coaching instigated by a trainer [35].

Self-Monitoring and Driver Training

Hatakka [16] gave an example of how self-monitoring abilities can be expected to have relevance in terms of driver behaviour. A driver who is aware of a tendency to fall asleep, or to be unable to resist peer pressure, or a driver who knows the limitations of his or her personal skills on slippery roads, may be able to take these factors into consideration and adapt their driving accordingly. Nevertheless, a recent world best practice review commissioned by the European Union (EU) indicated that most current driver training curricula in the Western world have not *systematically* considered the place of higher-order cognitive perspectives in the hierarchy of goals for driver training, least of all elements of self-monitoring specifically [37]. It is plausible that the lack of systematic application of self-monitoring approaches may be due to the higher reliance placed on objective, observable behaviour in driver training and assessment, and that instructors' assessments are deemed more salient than learner drivers' thoughts. Even in traffic psychology research, drivers' thoughts are often considered *not* worth studying [17]. While encouragement to self-monitor appears in some driver training curricular materials (including some recent Australian ones), the coverage is sometimes tokenistic, or an 'optional extra'. Rarely is the coverage systematic, with the necessary embodiment in cognitive psychology antecedents.

The EU review [37] examined driving at four hierarchical levels. At the top of the hierarchy are one's goals for life and skills for living, such as the importance of cars and driving on personal development, and skills for self-control. These goals impact upon the third level, the context of driving; for example, purposes of driving, the social context, and absence or presence of passengers. In turn, both the goals and driving context impact upon mastery of traffic situations, which in turn affects the lowest level of driving behaviour, vehicle manoeuvring involving control of speed, direction and position. Performance in the two upper motivational and attitudinal levels affects the lower levels. Social pressures and development of self-control in certain contexts can not only influence how a vehicle is driven in traffic, but can also increase or decrease risk levels. If the upper two motivational levels fail to translate to a careful strategy for driving, then no amount of skill in mastering traffic situations or vehicle handling will be

sufficient to alone produce a safe driving outcome. This may well explain the apparent failure of much advanced skills driver training to result in hoped for crash reductions [12; 18]. As Zimmerman [43] also stresses, in self-regulated forms of learning, metacognitive awareness, motivational factors and behavioural factors such as the above interact to influence performance.

The EU's emphasis is that, ideally, all four levels in the model should be covered in driver training [37]. Engaging in self-monitoring of learning, particularly at the EU model's higher levels, may lead to novice drivers acquiring ways to modify their motives and goals in accordance with the risks they experience. Some interview-based research from Sweden is relevant here. Differences have been found in the ways a sample of crash-involved young drivers reflected on their driving compared with the self-reflections of non-crash involved young drivers [39]. Whereas crash-involved drivers tended to reflect on specific details of their driving such as control skills and compliance with regulations, the non-crash involved group tended to express thoughts about driving on a higher level that were 'interwoven with the social context in which they live', without necessarily linking this to specific traffic situations.

Engaging in self-monitoring of learning may also assist in diluting the phenomenon of unrealistic optimism, or optimism bias. Some studies [e.g., 20; 14] have shown that drivers generally tend to believe they are better than 'average' and therefore less likely to crash or receive driving offence sanctions. Assailly [3] concluded that the need to curb optimism bias provides sufficient justification alone for re-grounding driver training in cognitive psychology. Hatakka [15] has a more focussed point. He writes that, whereas self-monitoring in relation to optimism bias commonly relies on drivers comparing themselves with others, an alternative way to tackle this lies in replacing the traditional external reference with *internal* reference involving self-comparisons of own skills within and by oneself.

The EU noted that Scandinavia has solidly embedded new novice driver training provisions in metacognitive learning theory, and this includes systematic opportunities for self-monitoring [23; 37]. Novice drivers in the Finnish program consider their self-monitoring alongside their instructors' evaluations and have reported they are better able to analyse their own driving performance as a consequence [Laapotti, cited in 21]. Recent analysis of Finnish insurance claim data for 1 319 drivers, with adjustments for general crash trends, showed that in the four years following pre-licence training, drivers taking the new Finnish curriculum had fewer crashes than those taking the former skills-only based curriculum [23]. The EU study also noted self-monitoring is integral to the new Danish driver training provision [37]. After accounting for gender, age, population, driver experience and exposure effects, Carstensen [7] recently found self-assessed defensive driving skills to be a strong determinant of crash risk in the first year of driving in Denmark. The Swedish Government's [38] proposed new curriculum for driver training is based around core ability strands such as, knowledge and skill, awareness of risk-increasing aspects, and self-assessment. The self-assessment strand relies heavily on Gregersen's research as described earlier. In its conclusion, the EU [37] recommended that practising self-evaluative and metacognitive skills should be included in training programs, as this offers a possibility for reaching and modifying motives and objectives at the highest level.

Self-monitoring of Causal Attributions in Driver Training

Causal attributions are the factors people use when explaining events or outcomes that happen to them [41]. Typical attributions given for learning successes and failures are ability, effort, task difficulty and luck or chance. Weiner (1986) used these attributions in attempting to represent certain dimensions in an individual's underlying cognitive structure. The dimension of locus of causality relates to whether an individual sees a cause for an event or outcome to reside within themselves (internal) or outside (external). For example, a driver who swerves to miss a crossing pedestrian might attribute this more to an external cause such as the pedestrian not looking before crossing, than an internal cause such as not noticing the pedestrian earlier enough.

Another dimension is that causes are considered to be either stable or unstable. In 1996 Weiner [41] classifed the above attributions as: Ability (internal/stable); Effort (internal/unstable); Task Difficulty (external/stable); and Luck (external/unstable). A third dimension is the extent to which the individual considers the causal factor to be personally controllable [41]. Causal attributions and their dimensions impact on future behaviour, goal formation, expectations of success, persistence and emotional responses. There is considerable theoretical and empirical support for causal dimensions being considered the key to the motivating properties of attributions and to shaping expectancies in goal achievement [42; 22; 24; 1].

Some patterns of attributional thinking may be more adaptive to learning to drive than other patterns, and some might well be maladaptive. When a novice driver adaptively self-monitors a learning event as a success or failure towards a goal, a success would be seen by the driver as primarily due to their own effort (internal/unstable) [42; 1] or at least an internal locus of causality. Such drivers could also be mastery-oriented, tending to exercise a high level of personal control, responsibility and persistence in attaining their outcome [11]. Dweck found that almost all students with mastery-orientations engaged in forms of self-instruction or self-monitoring designed to aid their performance. Should drivers perceive a learning event as a failure, then an adaptive trend could still prevail, provided the driver sees the failure as due to a lack of personal effort [32; 36].

A driver who consistently attributes success primarily to internal/stable factors may be developing a maladaptive attributional pattern, such as over-confidence in own ability, known to lead to an increased crash risk [12]. There might also be a belief that good luck will lead to success, or that the task is too difficult, with low persistence in completing it [42]. There may also be a low sense of personal control, progress in learning is considered slow, mistakes are repeated or failure may be seen as inevitable [1; 11; 36]. Martin et al. [29] found young drivers tend to maladaptively place less importance than older drivers on internal/unstable factors (such as attention and judgment) as causes of road crashes. Correspondingly, they place more emphasis than older drivers on external/unstable forces (such as 'bad luck'). Subsequent research by Martin and Horneman [28] confirmed the capability of driver training in attempting to reduce attributional emphasis on external/stable causes and to place greater emphasis on internal control over driving outcomes.

Unless externally prompted, however, analytical thinking about patterns of causal attributions is unlikely to occur spontaneously in a self-monitoring novice driver. Interaction and nurturing from a supportive instructor are required for the thinking to constitute useful self-feedback to the novice. A comment such as, "What do you think about that?" can prompt self-monitoring in the driver, particularly factors the driver causally attributes to learning success or difficulties. Weiner has stated that if positive attributions can be fostered, then learners might persist with their learning, in order to facilitate goal attainment, despite any difficulties experienced [36]. The instructor might assist the driver to self-analyse the causal attributions underlying the self-explanations, in terms of whether the attributions are internal or external, stable or unstable, and personally controllable or not. The instructor could also help the novice explore how a maladaptive attributional pattern can be viewed constructively, to become adaptive to successful learning of a given driving task.

Small Scale Research Study

In a current study conducted by the author, the frequency and content of self-monitoring in a small sample of novice drivers are being investigated. The study is also examining development in adaptive and maladaptive attributional patterns concerning learning to drive achievements, when external prompts to self-monitor are provided, together with feedback discussion focussing on the emergent attributional patterns. Structured in-depth individual interviews, together with journal writing and facilitated group discussion sessions, are being held with 13 sixteen year old Learner's Permit drivers (5 female and 8 male) attending the same secondary school in Adelaide. The interviews are structured to incorporate the elements supportive of self-monitoring discussed earlier. Participants are asked to discuss recent successes and difficulties experienced while learning to drive, their next lesson performance goal predictions, and their causal explanations for factors seen as affecting their achievements. The researcher endeavours to prompt causal attributions, and self-monitoring of any emergent attributional patterns by the novice driver, toward ways that are adaptive to learning to drive. Dweck's [11] and Alderman's [1] guidelines for fostering mastery-oriented learning and taking responsibility for learning guide this teaching role. The researcher assists each student in summarising the responses given, to prompt the single factor seen by the student as being influential on overall learning to drive success and that for learning difficulty up to that point in time. Each student also receives a self-monitoring score indicating the total number of interview statements indicative of self-monitoring, as defined by Zimmerman [43], for example, "I find it easier staying in the one lane, there's less to have to remember." and "Rain on the car doesn't bother me anymore." Each of these statements is indicative of self-monitoring on the effectiveness of recent learning, but also indicates the students' consideration of this information in future learning. Also during the interviews, two distinct rating scale exercises are used to measure the causal attributions assigned by the drivers. One relies on six realistic but fictitious driving scenarios presented in random order from Martin et al. [29] to measure attributional style. The other is the Revised Causal Dimension Scale (CDSII) of McAuley et al. [30], designed to measure attributions for specific actual events. A focus on actual experience permits the researcher to tap into drivers' understandings of successful and unsuccessful learning outcomes and the attributional

explanations they assign to them. Weiner perceives causal attributions as being more 'situationally-specific' in their application, than regularly consistent across different situations [36]. So far, the study is finding that not only are the youngest novice drivers capable of self-monitoring, but that when prompted, they do so more frequently, more deeply, and on a wider range of aspects about driving and learning to drive.

Summary

A considerable quantity of literature indicates that novice driver instruction would be advanced through fostering productive patterns of thinking, such as self-awareness and self-monitoring, known to be influential on learning outcomes. In particular, promoting self-awareness of learning offers promise for tapping into the higher-level cognitive aspects of the driving task. Work in progress by the author is examining how promotion of self-monitoring in a small sample of young novice drivers can influence their learning to drive. In this research, self-monitoring of causal attributions assigned while explaining learning achievement is considered to be particularly important, as certain patterns of attributional thinking can be more adaptive to learning and to learning to drive than others. Although this study is in the early stages, preliminary indications are that the novice drivers are finding learning benefits in the opportunities provided for fostering such productive patterns of thinking.

References

1. Alderman, M. K. (1999). Motivation for Achievement: Possibilities for Teaching and Learning. New Jersey, USA, Lawrence Erlbaum Associates.
2. Alexander, P. A. & P. K. Murphy (1994). The research base for APA's learner-centred psychological principles. Taking Research on Learning Seriously: Implications for Teacher Education. Invited Symposium at the Annual Meeting of the American Educational Research Association, New Orleans, USA.
3. Assailly, J. P. (1999). "Car fatalities, driver training and licensing in European countries - a comparative study." IATSS Research [International Association of Traffic Safety Sciences] **23**(1). pp 6-15.
4. Australian Transport Council (2000). The National Road Safety Strategy 2001-2010. Canberra, ATC.
5. Austroads (1995). Report on Austroads Workshop: Novice Driver Competency Specification. Canberra. Austroads. RS3C18.
6. Bransford, J. D., A. L. Brown & R. R. Cocking (1999). How People Learn: Brain, Mind, Experience and School. Washington, D C, Committee on Developments in the Science of Learning, Commission on Behavioural and Social Sciences and Education, National Research Council. National Academy Press.
7. Carstensen, G. (2002). "The effect on accident risk of a change in driver education in Denmark." Accident Analysis and Prevention **34**. pp. 111-121.
8. Catchpole, J. E., W. A. MacDonald & L. Bowland (1994). Young Driver Research Program: The Influence of Age-related and Experience-related Factors on Reported Driving Behaviours and Crashes. Canberra, Federal Office of Road Safety Report CR 143.
9. Christie, R. (2000). Driver Licensing Requirements and Performance Standards, Including Driver and Rider Training. Melbourne, Australia, National Road Transport Commission.
10. Christie, R. (2001). The Effectiveness of Driver Training as a Road Safety Measure: a Review of the Literature. Melbourne. Royal Automobile Club of Victoria
11. Dweck, C. S. (1999). Self-theories: Their Role in Motivation, Personality and Development. Michigan, USA, Psychology Press.
12. Gregersen, N. P. (1996). Young Car Drivers - Why Are They Over-represented in Traffic Accidents? How Can Driver Training Improve Their Situation? Linkoping, Sweden, Swedish National Road and Transport Research Institute, VTI Rapport 409A.
13. Gregersen, N. P. (1997). Evaluation of 16-years age limit for driver training: First report. Linkoping, Sweden, VTI Rapport 418A.
14. Groeger, J. A. (2000). Ch 8 - Appraisal, efficacy and action. Understanding Driving - Applying Cognitive Psychology to a Complex Everyday Task. UK, Psychology Press.
15. Hatakka, M. (1998). Novice Drivers' Risk- and Self-Evaluations. Department of Psychology. Finland, University of Turku.
16. Hatakka, M. (2000). What makes a good driver? - The hierarchical approach. DAN-Report: Results of EU-Project: Description and Analysis of Post-Licensing Measures for Novice Drivers. G. Bartl. Vienna, Austrian Road Safety Board.

17. Hatakka, M., E. Keskinen, A. Katila & S. Laapotti (1997a). Self-reported driving habits as valid predictors of violations and accidents. Traffic and Transport Psychology: Theory and Application. T. Rothengatter and E. C. Vaya. Oxford, UK, Pergamon.
18. Hatakka, M., E. Keskinen, A. Katila & S. Laapotti (1997b). Do psychologists have something to offer in driver training, driver improvement and selection? Assessing the Driver. R. Risser. Germany, Rot-Gelb-Grün Braunschweig, Faktor Mensch im Verkehr 41.
19. Insurance Institute for Highway Safety (2001). "Education alone won't make drivers safer. It won't reduce crashes." IHHS Status Report **36**(5). pp. 1-7.
20. Job, R. F. S. (1990). "The application of learning theory to driving confidence: The effect of age and the impact of random breath testing." Accident Analysis and Prevention **22**(2). pp. 97-107.
21. Katila, A., E. Keskinen & M. Hatakka (1996). "Conflicting goals of skid training." Accident Analysis and Prevention **28**(6). pp. 785-789.
22. Kent, R. L. & M. J. Martinko (1995). The measurement of attributions in organizational research. Attribution Theory: An Organizational Perspective. M. J. Martinko. USA, St Lucia Press.
23. Keskinen, E., M. Hatakka, A. Katila, S. Laapotti & M. Peräaho (1999). "Driver Training in Finland." IATSS Research **23**(1). pp. 78-84.
24. Kitsantas, A. (1997). Self-monitoring and Attribution Influences on Self-regulated Learning of Motoric Skill. Annual Meeting of the American Educational Research Association.
25. Kitsantas, A. & B. J. Zimmerman (1998). "Self-regulation of motoric learning: A strategic cycle view." Journal of Applied Sport Psychology **10**(2). pp. 220-239.
26. Lefebvre, C. (2001). "The inclusion of knowledge and metaknowledge in driver training: the issues." Recherche Transports Sécurité **70**. pp. 35-40.
27. Lynam, D. & D. Twisk (1995). Car Driver Training and Licensing Systems in Europe. UK. Transport Research Laboratory. Report 147.
28. Martin, D. S. & C. Horneman (1998). Evaluation of the Role of Cognitive Processes in Novice Driver Post-Licence Education. Armidale, NSW. The University of New England
29. Martin, D. S., I. R. Price & B. G. Fisher (1991). The Impact of a Driver Training Course on the Causal Attributions of Young Provisional-Licence Holders. Armidale, NSW. The University of New England
30. McAuley, E., T. E. Duncan & D. Russell (1992). "Measuring causal attributions: The revised causal dimension scale (CSDII)." Personality & Social Psychology Bulletin **18**. pp. 566-573.
31. Mezirow, J. (1991). Transformative Dimensions of Adult Learning. San Francisco, USA, Jossey-Bass.
32. Molden, D. C. & C. S. Dweck, Eds. (2000). Meaning and Motivation; Intrinsic and Extrinsic Motivation: The Search for Optimal Motivation and Performance. California, USA, Academic Press.
33. Oats, R. (2000). Novice driver competency guidelines and assessment tools. Transportation 2000: The Travel Bug AITPM International Conference, Queensland.
34. Paris, S. G. & L. R. Ayres (1994). Becoming Reflective Students and Teachers. Washington DC, American Psychological Association.
35. Schunk, D. H. & P. A. Ertmer (1999). "Self-regulatory processes during computer-skill acquisition: Goal and self-evaluative influences." Journal of Educational Psychology **91**(2). pp. 251-260.
36. Shaughnessy, M. F. (2000). "An interview with Bernie Weiner: About attribution, problem solving and thinking." The Korean Journal of Thinking and Problem Solving **10**(2). Available at: http://www.creativity.or.kr/previous7.htm.
37. Siegrist, S., Ed. (1999). Driver Training, Testing and Licensing - Towards Theory-based Management of Young Drivers' Injury Risk in Road Traffic, Results of European Union Project GADGET, Work Package 3. Berne, Switzerland, Schweizerische Beratungsstelle für Unfallverhütung. Available at: http://www.kfv.or.at/gadget/.
38. Vägverket (2000). Graduated Driver Education - a way to better road safety for novice drivers. Summary of Committee of Investigation's proposal submitted to the Swedish Government in December 1999. Borlange, Sweden. Vagverket, Publikation 2000:77E. 2000:77E.
39. VTI (2001). Ninety-nine Per Cent of Young Drivers Have Not Been Involved in Police-reported Accidents! Linkoping, Sweden. VTI - Swedish National Road & Transport Research Institute. VTI Rapport 458.
40. Watson, B., J. Fresta, H. Whan, J. McDonald, R. Dray, C. Beumann & R. Churchward (1996). Enhancing Driver Management in Queensland. Brisbane, Land Transport & Safety Division, Queensland Transport.
41. Weiner, B. (1986). An Attributional Theory of Motivation and Emotion. USA, Springer-Verlag.
42. Winne, P. H. (1991). Motivation and Teaching. Effective Teaching: Current Research. H. C. Waxman and H. J. Wahlberg. Berkley, California, McCutcheon Publishing Company.
43. Zimmerman, B. J. (1986). "Becoming a self-regulated learner." Contemporary Educational Psychology **11**. pp. 307-313.