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Encouraging Learners to Drive Using Game Elements and Smartphones

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ABSTRACT

Young drivers aged 17-24 years are at a risk of death and injury from road crashes primarily due to their age and inexperience on the road. Our research aims to investigate if a gamified mobile tracking and intervention tool can help to address this issue. We aim to build a smartphone application to support the current process of logging driving hours using a physical logbook and pen in Queensland. This provides an easier way to log driving hours than recording them in a logbook. In an attempt to engage Learners and encourage them to undertake more diverse driving practice we will explore how game elements can be integrated into the experience to motivate Learners. Previous research in other domains has shown that framing tasks as game-like can help engage and motivate users, however the addition of game elements to this space provides some interesting design challenges. This paper presents an overview of the research and presents these challenges for further discussion.

Author Keywords

Driving, gameful design, gamification, smartphones

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

There is little evidence that shows driver education, training, and media campaigns are effective at reducing crash and fatality rates of young drivers (e.g., Hedlund, 2007). On the other hand there is growing evidence to show that Graduated Driver Licensing (GDL) programs can be seen as effective. In Australia these systems primarily include acquiring a learner's permit, progressing to a provisional licence and then to a full driver's licence. The benefit of GDL programs is that they provide the opportunity for Learners to undertake driving experience to develop skills over time and in low-risk driving environments (Williams and Shults, 2010).

Enhancements were made to the Graduated Driver Licensing (GDL) program for Queensland, Australia in July 2007, to require all Learners to log 100 hours of supervised driving experience (including 10 hours of driving at night) before obtaining their licence (Queensland Transport, 2012). Although the mandatory

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100 hours can be seen to encourage more driving experience, there are still some areas that could be improved (Scott-Parker et al., 2011).

This research aims to investigate if a gamified mobile application can be used as a tracking and intervention tool to address these three issues. This research also contributes to a larger study that investigates the design, evaluation and effect of game elements for non-game contexts.

PREVIOUS RESEARCH

The use of game elements and mobile devices has previously been explored as a means to influence driver behaviours. McKall & Koenig (2012) presented research that discussed how traffic congestion could be reduced by using gaming concepts and incentives. Another use of game-like elements for positive driving behaviour is the Speed Camera Lottery (Volkswagen, 2009), which was a project that aimed to reduce speeding. It encouraged people to slow down by entering those who don't speed into a lottery where they could receive cash prizes, funded by those who were fined for speeding. Game elements have also been integrated into cars in order to encourage drivers to drive in greener way, such as the Nissan Leaf (Hickey, 2010). In Australia there have also been a number of government-funded interventions that have used online games to educate Learners about driving. These include Keys 2 Drive (keys2drive, 2012) and Road Trip to your Licence (Queensland Transport, 2012).



Road Trip the Game from Road Trip to your Licence (Department of Transport and Main Roads, 2012).

Simulations have been discussed for their potential to train learner drivers, in particular for their ability to provide a safe way to encounter hazards (Wilson et al., 1997; Blackman, 2005). Broad intelligent transport

This previous research and works indicates potential for using game elements in driving setting. However there has been little research found that has focused explicitly on encouraging diverse driving behaviour in learner drivers through the use of game elements and smartphone applications.

The logbook is a physical book in which driving is recorded with a pen. Once complete the logbook is submitted to the Department of Transport and Main Roads (TMR) and audited for accuracy and completeness prior to permitting the young novice driver to undertake their practical driving assessment.

Example		Excel (columns must be visible and not changing)		Excel (columns must be visible and not changing)		Excel (columns must be visible and not changing)		Excel (columns must be visible and not changing)	
Rate	Expend	Location	Destination	Driving Expenses	Amount	Rate	Time	Amount	Expend
25/05/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	25/05/07	10000	100.00	100.00
26/05/07	85.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	26/05/07	10000	85.00	85.00
27/05/07	80.00	Hartlepool	Chesham	10000/07	Q1/07	27/05/07	10000	80.00	80.00
28/05/07	80.00	Hartlepool	Chesham	10000/07	Q1/07	28/05/07	10000	80.00	80.00
29/05/07	120.00	Hartlepool	Teesdale	10000/07	Q1/07	29/05/07	10000	120.00	120.00
30/05/07	120.00	Hartlepool	Teesdale	10000/07	Q1/07	30/05/07	10000	120.00	120.00
31/05/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	31/05/07	10000	100.00	100.00
01/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	01/06/07	10000	100.00	100.00
02/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	02/06/07	10000	100.00	100.00
03/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	03/06/07	10000	100.00	100.00
04/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	04/06/07	10000	100.00	100.00
05/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	05/06/07	10000	100.00	100.00
06/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	06/06/07	10000	100.00	100.00
07/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	07/06/07	10000	100.00	100.00
08/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	08/06/07	10000	100.00	100.00
09/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	09/06/07	10000	100.00	100.00
10/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	10/06/07	10000	100.00	100.00
11/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	11/06/07	10000	100.00	100.00
12/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	12/06/07	10000	100.00	100.00
13/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	13/06/07	10000	100.00	100.00
14/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	14/06/07	10000	100.00	100.00
15/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	15/06/07	10000	100.00	100.00
16/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	16/06/07	10000	100.00	100.00
17/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	17/06/07	10000	100.00	100.00
18/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	18/06/07	10000	100.00	100.00
19/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	19/06/07	10000	100.00	100.00
20/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	20/06/07	10000	100.00	100.00
21/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	21/06/07	10000	100.00	100.00
22/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	22/06/07	10000	100.00	100.00
23/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	23/06/07	10000	100.00	100.00
24/06/07	100.00	Hartlepool	Am Don Jostons	10000/07	Q1/07	24/06/07	10000	100.00	100.00</

Research has indicated that the mandatory logbook in Queensland has encouraged significantly more supervised driving practice than before the it was introduced (Scott-Parker et al., 2011). The results of the study also indicate that Learners appear to comply with the logbook requirements, with only a few Learners reporting that they drove unsupervised, or falsified data in their logbooks.

This research investigates if a gamified mobile application can be used as a tracking and intervention tool to address these three issues. To do this a mobile application will be built with the aim to support (and eventually replace) the current process of logging driving hours using a physical logbook and pen. This provides an easier way to log driving hours than recording them in a logbook. Game elements will then be added to this

Hours are currently logged manually in a large logbook, which is not an ideal solution. From a learner's perspective; it can take time to fill out all the details. In Queensland *“every time a learner driver goes on the road they must record the date, the number plate of the car, the origin and destination suburbs, the odometer readings before and after, and the start and finish times”* (Hurst, 2010). This requires the logbook to be carried with the Learner as they move about from car to car. Also there is a possibility that the logbook can be lost (eg. Whirlpool, 2010) and replacing it not only incurs a cost, but also the hours previously recorded need to be accurately remembered, and reliably transferred.

Games are an engaging and captivating medium, and serious games - those built for a purpose other than entertainment - can be used to educate, inspire and train a target user base (Ballagas et al., 2008). As mobile technology has continued to evolve, becoming smaller and cheaper, games have become more pervasive and are able to be embedded into real spaces and the environment around us. Research has indicated positive results when using gamification to encourage and engage people in various non-game contexts, for example taking medication on time (de Oliveria et al., 2010), drinking healthy amount of water during the day (Chiu et al., 2009) and saving energy (Bång et al., 2009).

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advanced overtime in order to engage the learner and make sure they get as much experience as possible.

CHALLENGES

Designing gamified experiences

Over the last few years the concept of gamification has often been tied to achievement, and competitive, based game elements such as badges, points and leaderboards in computer applications and social media contexts in particular (Antin & Churchill, 2011). However, these systems have been criticised by those in games research and the industry (Robertson, 2010; Bogost, 2011) as not representing the intrinsically motivating aspects of games but instead focusing on extrinsic rewards. A quick review of gamification literature reveals disparate design techniques with only a few mentioning the process involved in designing the gamification elements (eg. Flatla et al., 2011). We theorise that the addition of game-like elements has the ability to create a game-like experience for some users and this may provide new motivations for using an application. The game elements should create an enjoyable experience. If however the game elements are uninteresting or are unsuccessfully coupled with the goals of the service then this may potentially discourage use of application or devalue intrinsic motivation.

How the game elements interweave with the non-game context is an important consideration as well. For example, there are laws that prohibit driving with a mobile phone in the driver's hand, and there is a ban on all mobile phone use (including hands-free) for learners and P1 provisional drivers under the age of 25 years (Department of Transport and Main Roads, 2012). This limits the design of the application to being used before and after a Learner drives which creates an interesting design opportunity. Also how the game element influences real world behaviours needs careful consideration.

Evaluating gamified experiences

In terms of evaluating such experiences, previous research into gamification has used a range of different research methods in order to obtain results including field experiments, interviews, log data, surveys, usability testing and A/B testing (de Oliveria et al., 2010; Flatla et al., 2011; Fujiki et al., 2007; Gustafsson et al., 2009; Liu et al., 2011; Montola, 2009). Of these research studies, field experiments were found to be the most common way in which gamified systems were evaluated. It was common for mixed-method research to occur alongside field studies with interviews and surveys being administered to gather data on the experience of the user, along with log data being collected by the device to report usage and on any changes in motivation. However few reported on evaluating the player experience.

If the game elements being added will affect engagement then it is important to consider how to evaluate the game elements effectively. Play testing may be important to include in the early in development for feedback. Also questionnaires such as Game Engagement Questionnaire

(GEQ) could be explored as a means to evaluate player experience as well but may be difficult to apply to non-game contexts.

CONCLUSIONS

This paper provides an overview of a gamified mobile application that aims to encourage more diverse learning experiences for Learner drivers. It presents the motivation for the application and raises some challenges in designing and evaluating such experiences. In particular it discusses challenges related to the design and evaluation of gamified experiences.

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REFERENCES

- Ballagas, R., Kuntze, A., & Walz, S. (2008). Gaming tourism: Lessons from evaluating REXplorer, a pervasive game for tourists (pp. 244–261). Presented at the Pervasive.
- Bång, M., Svahn, M., & Gustafsson, A. (2009). Persuasive design of a mobile energy conservation game with direct feedback and social cues. Proceedings of DiGRA 2009. Presented at the Breaking New Ground: Innovation in Games, Play, Practice and Theory, London: Brunel University: Digital Games Research Association (DiGRA).
- Blackman, S. (2005). Serious games...and less! SIGGRAPH Comput. Graph., 39(1), 12–16.
- Brockmyer, J., Fox, C., Curtiss, K., McBroom, E., Burkhart, K., & Pidruzny, J. (2009). The development of the Game Engagement Questionnaire: A measure of engagement in video game-playing.
- Brovold, S., Ward, N., Donath, M., Simon, S., Shankwitz, C., & Creaser, J. (2007). The use of technology to address patterns of risk among teenage drivers. Journal of Safety Research, 38(4), 413–422.
- Chiu, M.C., Chang, S.P., Chang, Y.C., Chu, H.H., Chen, C.C.H., Hsiao, F.H., & Ko, J.C. (2009). Playful bottle: a mobile social persuasion system to motivate healthy water intake. Ubicomp '09 (p. 185). Presented at the Ubicomp, Orlando, Florida, USA.
- de Oliveira, R., Cherubini, M., & Oliver, N. (2010). MoviPill: improving medication compliance for elders using a mobile persuasive social game. Ubicomp '10 (pp. 251–260). Presented at the Ubicomp, New York, NY, USA: ACM.
- Department of Transport and Main Roads. (n.d.). Logbook Example. Retrieved from http://www.tmr.qld.gov.au/~media/Licensing/Learning%20to%20drive/Learner%20logbook/Pdf_logbook_example.pdf

- Department of Transport and Main Roads. (2011). Play the Road Trip game. Road Trip To Your Licence. Retrieved September 6, 2012, from <http://hereforlife.qld.gov.au/roadtrip/index.php>
- Department of Transport and Main Roads. (2012). Other road rules. Retrieved October 1, 2012, from <http://www.tmr.qld.gov.au/Safety/Queensland-Road-Rules/Road-rules-refresher/Other-road-rules.aspx>
- Flatla, D. R., Gutwin, C., Nacke, L. E., Bateman, S., & Mandryk, R. L. (2011). Calibration games: making calibration tasks enjoyable by adding motivating game elements. In *proc. UIST 2011*, (pp. 403–412). Presented at the UIST, Santa Barbara, California, USA: ACM Press.
- Hedlund, J. (2007). Novice teen driving: GDL and beyond. *Journal of Safety Research*, 38(2), 259–266.
- Hickey, M. (2010). Nissan's Leaf featuring automatic gaming system. Retrieved September 7, 2012, from http://news.cnet.com/8301-17938_105-20026662-1.html
- keys2drive. (2012). Online Driving Games. Keys 2 Drive. Retrieved September 6, 2012, from <http://www.keys2drive.com.au/learning/games.aspx>
- McCall, R., & Koenig, V. (2012). Gaming concepts and incentives to change driver behaviour. *Ad Hoc Networking Workshop (Med-Hoc-Net)*, 2012 The 11th Annual Mediterranean. 146 –151.
- Scott-Parker, B. J., Bates, L., Watson, B. C., King, M. J., & Hyde, M. K. (2011). The impact of changes to the graduated driver licensing program in Queensland, Australia on the experiences of Learner drivers. *Accident Analysis & Prevention*, 43(4), 1301–1308.
- Williams, A. F., & Shults, R. A. (2010). Graduated Driver Licensing Research, 2007–Present: A Review and Commentary. *Journal of Safety Research*, 41(2), 77–84.
- Wilson, P., Foreman, N., & Stanton, D. (1997). Virtual reality, disability and rehabilitation. *Disability and Rehabilitation*, 19(6), 213–220.
- Volkswagen. (2009). The Speed Camera Lottery. The Fun Theory. Retrieved September 6, 2012, from <http://www.thefuntheory.com/2009/11/12/fun-theory-award-winner-speed-camera-lottery>