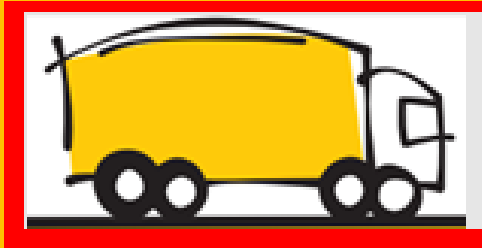


Evaluation of Trucks and Child Safety:

Findings from children, teachers, and demonstrators



Report commissioned by the DHL UK Foundation. Ethical approval was obtained by Staffordshire University in March 2020.

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Executive Summary

Background

Most traffic deaths and injuries involve vulnerable road users, such as children who are walking or cycling. In the UK, according to the Department of Transport, in 2022 there were 1,416 child (≥ 15 years) pedestrians killed or seriously injured because of road traffic accidents, with a total of 19,384 casualties across all age groups (of which 4,913 were in children) (2).

Trucks face unique problems regarding road safety, in particular issues around blind spots. In comparison to other road vehicles there are more blind spots (due to their large size), which, can result in more road accidents. Trucks and Child Safety (TACS) is a national safety training programme funded by the DHL UK Foundation. It aims to help keep children safe around larger vehicles on the road and targets children aged seven to eleven years old, as they start to travel independently.

The DHL UK Foundation wanted to understand: the impact of TACS on children and teachers; whether use of resource in setting up and running the programme is appropriate to meet the Foundation's aim to *'Educate children about all aspects of safety around large trucks'*.

Methods

The evaluation of TACS consisting of using the RE-AIM framework (8,9) to guide a mixed-methods' approach using surveys (with pupils and demonstrators) focus groups (with pupils) and interviews (with teachers). There was some between-group analysis, when survey data from children who had received the TACS programme was compared to those who had not yet received the programme. Survey data was also compared before and after programme delivery.

Summary of findings

Overall, the TACS programme appears to be effective in improving truck safety knowledge, which children retain for at least 4-6 months. This meets the aims of the DHL UK Foundation. The programme was viewed positively by all stakeholders (children, teachers and DHL trained demonstrators). Schools see the importance of TACS and are supportive of its inclusion within their curriculum. Schools have requested additional demonstrations further indicating its worth and their ongoing support.

Recommendations

- Whilst there was an increase in truck safety knowledge following the TACS demonstration, there was still a general lack of knowledge regarding certain blind spots post-TACS. This might be an area for TACS demonstrations to develop.
- Consider allowing more than one child into the truck. Children may have been able to take more away from the demonstration through this experience. Incorporating this into future TACS demonstrations may in turn allow for a greater understanding of blind spots.
- A tonal disparity was identified between explaining the potential threats surrounding heavy goods vehicles but using animals as a comparison, particularly for older children which needs addressing.
- Teachers suggested adding a topic relating to truck safety in the dark, which would be in line with the suggestions of reflective merchandise.
- Consider a central booking system to arrange demonstrations. This would remove the need for demonstrators to have existing relationships with schools or identify new ones, potentially increasing the number of demonstrations and reach of the programme.

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1. Introduction

The research outlined in this report was conducted by the Centre for Health and Development ([CHAD](#)). CHAD was established as an innovative partnership between Stoke-on-Trent City Council, Staffordshire County Council and Staffordshire University. Its purpose is to contribute to the reduction of health and social inequalities and improve health and wellbeing through carrying out high quality translational and internationally recognised research.

According to the World Health Organization, 1.2 million people die annually in road collisions worldwide and about 20 to 50 million more people are injured (1). Most traffic deaths and injuries involve vulnerable road users, such as children who are walking or cycling. In the UK, according to the Department of Transport, in 2022 there were 1,416 child (≥ 15 years) pedestrians killed or seriously injured because of road traffic accidents, with a total of 19,384 casualties across all age groups (of which 4,913 were in children) (2). Efforts to increase health among children have included interventions such as walking buses/walking to school days, which further increases the risk of road traffic accidents, especially if children are unsupervised and are walking in urban areas. Educational interventions have been found to be successful in increasing knowledge of safety and injury prevention (3,4).

Trucks face unique problems regarding road safety, in particular issues around blind spots. In comparison to other road vehicles there are more blind spots (due to their large size), which, can result in more road accidents. Trucks are also considered one of the most dangerous collision opponents a cyclist can encounter (5). Given the rise in blind spot crashes (6) and the fact that blind spot mirror research under European regulations only accounts for stationary trucks and other stationary road users (7), it can be argued that truck safety interventions should highlight the dangers of these blind spots.

Trucks and Child Safety (TACS) is a national safety training programme funded by the DHL UK Foundation. It aims to help keep children safe around larger vehicles on the road and targets children aged seven to eleven years old, as they start to travel independently. Approximately 25,000 children have taken part through their school each year.

DHL organises mandatory one-day TACS training courses for UK employees to become demonstrators; there are currently over 165 trained demonstrators. Using a truck as a highly memorable visual aid, they educate children on key messages regarding sight, sound and safety. TACS delivers vital road safety messages and information to children, via live, interactive on-site demonstrations. TACS is the only road safety programme to do this using a 44 tonne truck. Schools receive a teachers' pack full of class activities, designed within the National Curriculum, supporting continued learning.

The DHL UK Foundation wanted to understand: the impact of TACS on children and teachers; whether use of resource in setting up and running the programme is appropriate to meet the Foundation's aim to *'Educate children about all aspects of safety around large trucks'*.

2. Aim and objectives

The overarching aim was to evaluate programme impact and processes to explore the impact of TACS on children receiving the programme and whether the resource provided by the Foundation and business is best used.

Specific objectives are listed in terms of the evaluation outcomes (i.e., programme impact) and process (i.e., programme delivery).

Outcome evaluation objectives:

1. Assess child learning and retention of key safety messages from the TACS demonstration.
2. Explore the perceived importance of the programme and its messages for children and teachers.
3. Explore what children feel they learn during the programme.

Process evaluation objectives:

4. Evaluate programme reach (school and children).
5. Evaluate programme adoption (take up by schools using existing DHL data, as appropriate).
6. Explore teacher's perceptions of the programme (and allocation of curriculum time).
7. Explore areas for improvement / alternative delivery models.

3. Methods

3.1 Design and framework

The project involved an evaluation of TACS, consisting of a mixed-methods' approach using surveys, focus groups and interviews. There was some between-group analysis, when survey data from children who had received the TACS programme was compared to those who had not yet received the programme. Survey data was also compared before and after programme delivery.

The RE-AIM framework (8,9) was used, adapted to suit the specific needs of this evaluation as it was felt this was the most effective framework to use.

- **Reach** - the number and profile of schools and children reached
- **Effectiveness** - ability to effect changes in children's learning of key safety messages
- **Adoption** - level of engagement by schools
- **Implementation** - how the programme is delivered (i.e., strengths, weaknesses, areas for improvement)
- **Maintenance** - children's longer-term retention of key safety messages.

A combination of quantitative and qualitative methods was used. Table 1 summarises how each aligns within the RE-AIM framework and stated objectives.

Table 1. Overview of indicators and data collection methods to address each objective within the RE-AIM framework element

RE-AIM component	Methods / indicators	Data source	Process / Outcome	Associated objective(s)
Reach	- Number and characteristics (deprivation, urban-rural) of participating schools - Number and school year of participating children	DHL database of participating schools	P	4
Effectiveness	- Pre-post changes in children's knowledge of truck safety - Overall experiences of the programme - Perceived impact of the programme	Classroom-base survey of participating children Focus groups with children Interviews with teachers	O P	1, 2, 3 6, 7
Adoption	- School coverage and uptake - School perceptions of programme	DHL database of participating schools Online survey of DHL trained demonstrators Focus groups / interviews with teachers	P	4, 5, 6
Implementation	- DHL trained demonstrators experiences of recruiting / engaging with schools - Interviews with teachers (post-programme)	Survey of DHL trained demonstrators (optional) Interviews with teachers	O P	2 6, 7
Maintenance	- Retention in children's knowledge of truck safety at 4/6-months post-programme (see Effectiveness)	Classroom-based survey of participating children	O	1

3.2 Participants and Settings

This evaluation took place across 7 intervention schools and 4 control schools in England. Potential schools were identified and approached by the DHL UK Foundation, giving them details of the TACS programme and this evaluation. Participating schools received a TACS demonstration day, run by trained DHL colleagues (demonstrators). The demonstrators arranged dates and times with the school and undertook a risk assessment to get a large vehicle onto the school grounds.

The TACS programme provides road and truck safety demonstrations and information for pupils at primary schools. Demonstrators from the DHL business attend schools in face-to-face outdoor sessions, which allows pupils to safely get up close to 44-tonne trucks. This practical approach shares important safety awareness information about trucks' blind spots, braking distances, and general information about the trucks in a child appropriate, interactive and entertaining way. The demonstrators share information, for example, about the height and weight of the trucks and compare them to animals and objects that the children can relate to. The programme also allows some pupils to sit in the truck's cab and experience how difficult it is for drivers to see anyone at the side of the vehicle, demonstrating that pupils need to keep a clear distance away from trucks.

The participants for this evaluation include children and teachers from participating schools as well as DHL trained demonstrators.

3.3 Data Collection and Analysis

3.3.1 Classroom-based pupil survey (objective 1)

Survey design

To accommodate the range of ages and abilities, we developed a survey, delivered by teachers, that pupils completed individually (Appendix 1).

Based on the training materials for TACS demonstrators, the key learning outcomes provided by TACS are:

- The distance a child needs to stand in front of the truck to be seen by the driver
- What the driver can and cannot see from the cab down the sides of the truck
- What the drivers can see in their mirrors; where their 'blind spots' are around the truck
- The size of a truck compared with other vehicles, e.g., bicycles, cars, buses.
- The distance on the nearside a truck requires when turning left at a road junction
- The noise of the engine relative to the shout of a child.

The survey was, therefore, designed to assess whether the learning outcomes from TACS were met, and it included aspects of the recently developed student workbook already familiar to the children. The survey was largely visual to accommodate a younger age group and different levels of learning in classrooms. The survey took no more than 10 minutes to complete, ensuring it was completed in class and did not take too much time up from the planned curriculum. The commissioner reviewed and agreed the survey to ensure that the questions met the learning outcomes of TACS. The survey was piloted by a school not participating in the research and a few minor changes were made. Data was anonymised and aggregated at school- level.

Three surveys were completed by participating children:

- Pre-TACS – data was collected up to two weeks before the TACS session (see procedures).
- Post-TACS – data was collected again as soon as possible following the TACS session (within 1-2 days)
- Long-term post-TACS – data was collected again 4-6 months after the TACS session.

Recruitment

Within each participating school, teachers identified class groups to take part in the TACS demonstrations. Participating schools had *loco parentis* and followed their standard procedures in terms of child consent/assent.

Data collection

The DHL UK Foundation sent out the appropriate questionnaire to the participating schools at the appropriate time. They also arranged for collection of the completed surveys to be sent onto CHAD researchers. Co-ordinating staff within the schools were responsible for organising data with the children to fit in with the evaluation time scales and their own curriculum time. Teachers administered the surveys during class time.

Sample size and data analysis

We based our sample size on analysis that initially treats each pupil's data as individual (i.e., not taking class and school level effects into account). We proposed a pragmatic estimate of sample size based initially on ten schools being recruited, with a minimum of 30 pupils (approximately one class per school, although we would advocate collecting data from all participating classes/children in these schools), which would provide a baseline sample of 300 pupils. The actual number of pupils who completed the pre-TACS survey is 1,238 (shown in Table 2)

Ideally, we wished to follow-up the same pupils from baseline to post-session and longer-term follow-up using an anonymous unique identifier, since this is a stronger design and increases the statistical power to detect differences for a given sample size

Control schools

A control group was included to allow stronger inferences around effectiveness/impact by allowing comparison of outcomes in pupils who had the training, with those who did not. 'Control' schools (n=4) were, therefore, recruited from those schools who were on the waiting list to have a TACS demonstration the following year. The DHL UK Foundation were able to recruit these schools and co-ordinate sending the surveys (baseline/4-6months post) at the appropriate time.

Table 2: Number of intervention and control schools and numbers of pupils in each school who were initially recruited at baseline (prior to the TACS demonstration), immediately after the TACS demonstration, and 4-6 months after the TACS demonstration. Control schools were only assessed at two time points

Grouping	School	Indices of Deprivation*	Number of pupils and characteristics (e.g., age group, gender)			
			Pre-TACS	Post-TACS	4-6 months post-TACS	All surveys completed
Intervention schools	Int school 1	8	51	49	51	43
	Int school 2	6	93	115	112	69
	Int school 3	10	58	57	55	55
	Int school 4	10	80	74	19	17
	Int school 5	5	171	160	164	140
	Int school 6	7	26		21	21
	Int school 7	6	107	104	72	71
	Int school 8	1	209			
	Int school 9	3		27		
Control schools	Control school 10	5	84	n/a	73	73
	Control school 11	5	55	n/a		
	Control school 12	5	56	n/a	45	45
	Control school 13	3	159	n/a	130	130
	Control school 14	2	89	n/a	56	56

**Indices of deprivation – 1 the most deprived and 10 being the least deprived*

Some schools failed to complete all 3 surveys so subsequently were not included. Therefore, there were 7 intervention schools (1 of which just provided pre-TACS and 4-6 months post-TACS data) and 4 control schools included in the analysis. In total, 416 children were included in the intervention schools and 304 children in the control schools, giving a total of 720 children who completed the survey, so even though there were a lesser number of engaged schools than originally planned a higher number of students completed the survey

3.3.2 Child focus groups (objectives 2, 3 and 7)

The aim of the focus groups was to explore further the impact of the TACS demonstration, including what the children had learnt, and what they thought of the free TACS merchandise.

Recruitment

All intervention schools receiving a TACS demonstration were invited to participate. Two agreed. The initial invitation emails were sent out via the DHL UK Foundation. Once a school agreed, details were passed onto the CHAD researchers. Dates and times for the focus groups were then arranged directly. Focus groups were held at the schools, organised in collaboration with the teachers. Even though only 2 schools participated they were larger schools which allowed for researchers to speak with a high number of students to gather data.

Data collection

Six semi-structured, face-to-face, focus groups were conducted with a sample of pupils (n=41) across two schools (post-TACS demonstration and final survey). Focus groups were conducted by two experienced qualitative researchers CHAD researchers, who led the discussions, using a pre-designed topic guide (Appendix 2) Each focus group contained between five and eight participants. The participating children were in years 3-5 (age range 7-10 years old).

Data analysis

All focus groups were audio-recorded and transcribed verbatim. See footnote for more detail.

3.3.3 Teacher interviews (objectives 2, 6 and 7)

The aim of the interviews was to understand the importance of the programme for teachers, their experiences of co-ordinating the DHL demonstration, areas of success and areas for improvement.

Recruitment

For the teacher interviews, all intervention schools who had received a TACS demonstration were asked to participate. Initial invitations were sent out by the DHL UK Foundation. Details of those who agreed were passed onto the CHAD research team. Teachers were provided with details about the interview, and an information sheet and consent form for their consideration. Those agreeing were invited to undertake the interview at a convenient time, but ideally not more than 6 weeks post-TACS demonstration. As recruitment proved difficult, additional schools outside of the impact study who had received a TACS demonstration were approached to see if teachers would participate in an interview.

Data collection

Semi-structured, one-to-one telephone interviews were conducted with teachers (n=7) from seven different schools. A pre-designed topic guide (Appendix 3) was used to guide discussions, again interviews were conducted by experienced qualitative researchers.

Data analysis

As with the child focus groups, interviews were audio-recorded and transcribed verbatim for analysis. See footnote for more detail.

3.3.4 DHL demonstrator survey

An online survey was developed to seek information on volunteer DHL demonstrator experiences (Appendix 4). The survey examined:

- Perceptions of the common barriers associated with delivering TACS
- Perceptions of effectiveness of TACS (in terms of children's understanding and learning of key safety principles and perceived importance), and how this relates to school age, school type, school location
- Perceptions of things to improve or alternatives

Recruitment

The survey was sent to all demonstrators registered with the DHL UK Foundation and completed between 30/11/22 and 14/02/23. The email was sent on behalf of the CHAD research team, by the DHL UK Foundation.

Data collection and analysis

The survey was completed by 32 demonstrators of the 66 who started it. Descriptive statistics were run to summarise responses. For the open text questions, data were analysed and incorporated into the themes identified by the children and teacher interviews.

3.3.5 Additional programme data (objectives 4, 5 and 8)

Additional data from the programme commissioners was obtained on various programme aspects, including:

- List of postcodes for schools in which TACS has been delivered between 2018-2022 (used to derive deprivation of surrounding area)
- Number of children completing a TACS demonstration since 2007
- Number of TACS demonstrations since 2007

4. Results

4.1 TACS additional and school survey data

Between 2007-2022 a total of 339,695 children were educated in TACS across 1,762 demonstrations. Figures 1 and 2 illustrate the breakdown of the number of children and TACS demonstrations, respectively, by year from 2007-2022.

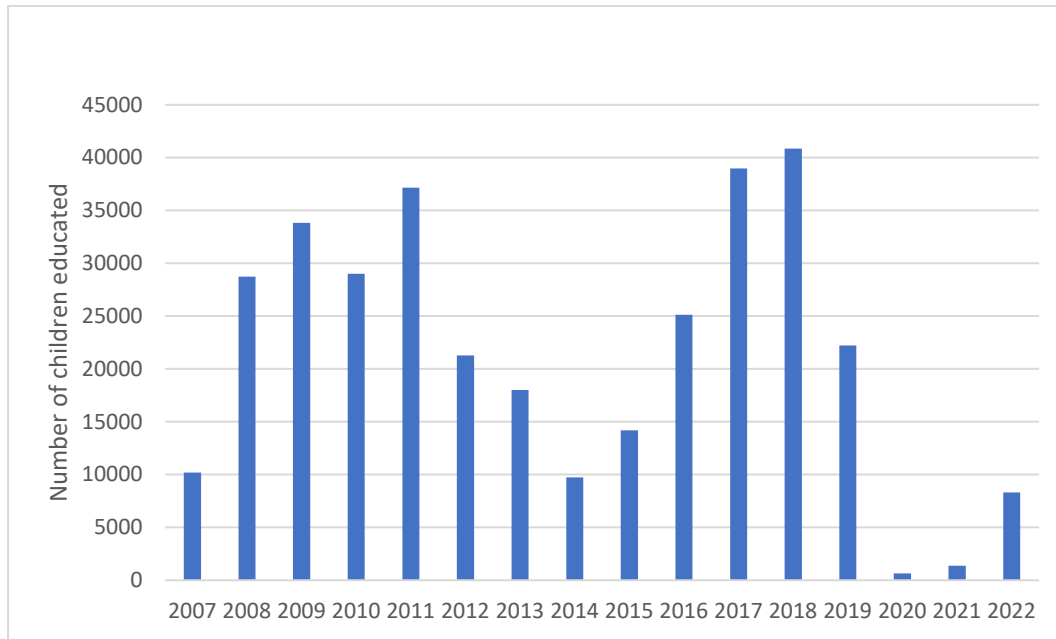


Figure 1. Number of children educated through the TACS programme by year, to note, year 2020 and 2021 were affected by COVID

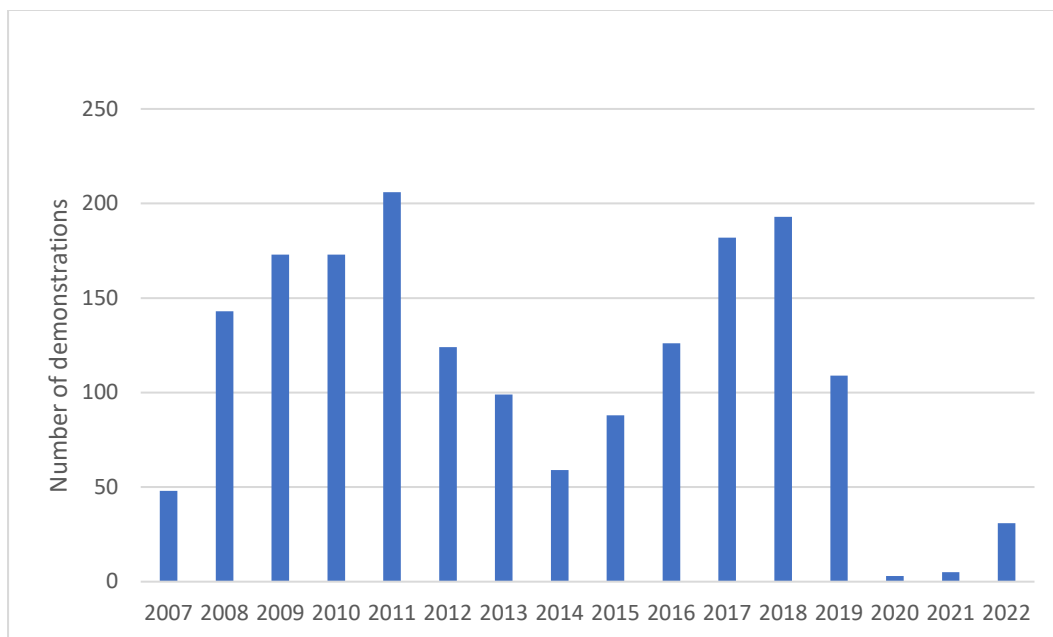


Figure 2. Number of TACS demonstrations by year

Figure 3 provides the Indices of Deprivation (quintiles) for each school taking part in TACS during 2018, 2019 and 2022. Deprivation was derived from the postcode of each participating school. This highlights that across the 3 years represented, there was a similar number of participating schools from the most and least deprived areas. However, there has been some variation over time, with substantively more demonstrations in schools in the most deprived areas in 2018, a fact that is somewhat reversed in 2022. Between 2018-2022, a total number 226 individual schools were in receipt of a TACS demonstration (with demonstrations stopped 2020-2021 due to COVID-19).

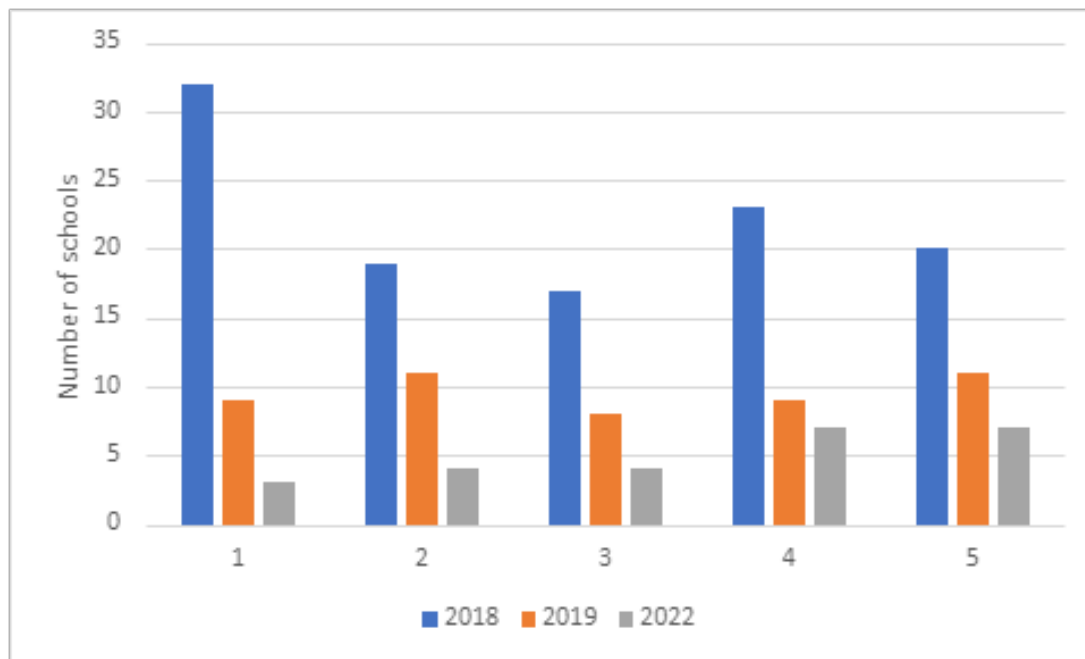


Figure 3. Schools taking part in TACS IMD Ranking by quintile for 2018, 2019 and 2022 (1=most deprived)

The following data presented is taken from the surveys completed by children to explore the impact of the demonstrations. Children in intervention schools completed surveys at three time-points: pre-demonstration (baseline), post-demonstration and 4-6 months later. In control schools, surveys were completed at baseline (equivalent to pre-demonstration) and post, 4-6 months. The baseline control data were compared with baseline intervention data to examine any pre-existing differences between the intervention and control groups prior to the demonstration. The follow-up control data were compared to the 4-6-month data from the intervention group to highlight how well the information from the demonstration was retained.

The survey comprised 10 questions with an additional question, as part of the follow up survey, around general feedback and merchandise (Appendix 1).

The questions supported the following:

- 1 to 4 assessed visibility and blind spots from the driver's perspective,
- 5 to 8 assessed the size of the truck and the volume of the engine,
- 9 and 10 assessed the space required for the truck in transit.

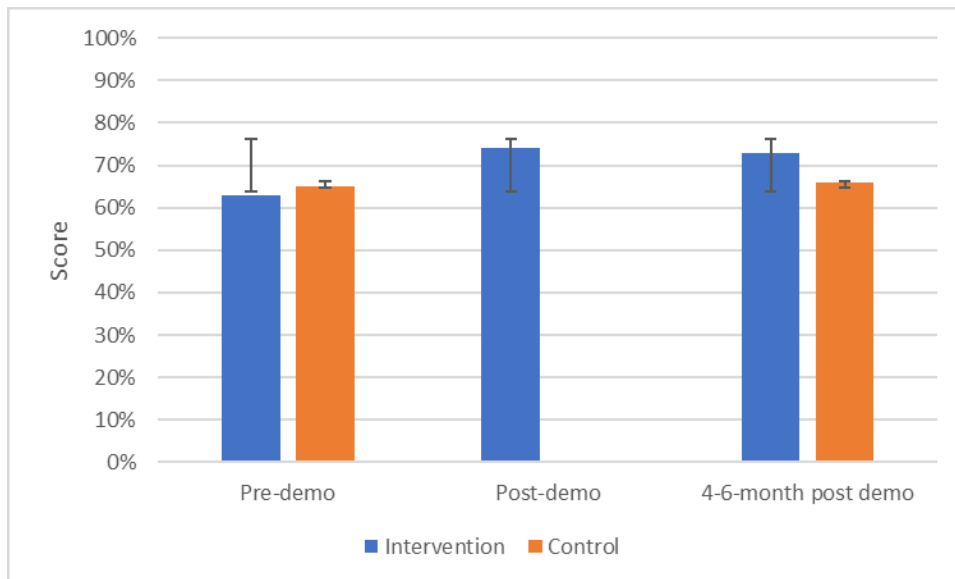


Figure 4. The mean score for the intervention and control groups at the three time points

Figure 4 shows that the average score for the intervention group increased from 11.32 ($SD = 2.45$) post-intervention and remained higher than baseline at 4-6-month follow-up showing an increase to 13.09 ($SD = 2.27$), showing a significant improvement in the participating students' knowledge. Comparatively, the average scores in the control group remained similar at baseline (11.63, $SD = 2.35$) to 4-6-month follow-up (11.88, $SD = 2.34$).

The scores of the intervention group at the three time points and revealed a significant difference ($\chi^2_{(2)} = 200.972$, $p < .001$, $N = 379$). Follow-ups were run to compare the pre and post scores, and the post and 4-6-month scores. There was a significant difference indicating that the post-intervention scores were significantly higher than at pre-intervention ($Z = -12.467$, $n = 392$, $p < .001$, 2 tailed test), but no significant difference between post-intervention and the 4-6-month follow-up scores, indicating that the improvements from baseline were maintained ($Z = -1.213$, $n = 392$, $p = .225$, 2 tailed test).

There was a significant difference with the control group scoring slightly higher on average than the intervention group prior to the demonstration ($U = 56454.0$, $n_1 = 414$, $n_2 = 299$, $p = .043$, 2 tailed test). The intervention group scored significantly higher on the post 4-6-month score than the control group ($U = 39622.5$, $n_1 = 402$, $n_2 = 291$, $p < .001$, 2 tailed test).

Table 3. Percentage of correct scores by question for intervention and control groups at all three time points

			Pre	Post	4-6
Q1	Intervention		19%	30%	26%
Blind spot front	Control		20%	-	21%
Q2	Intervention		30%	32%	35%
Blind spot behind	Control		38%	-	31%
Q3	Intervention	1	24%	10%	7%
Blind spots around the truck		2	42%	29%	29%
		3	27%	56%	62%
	Control	1	18%	-	10%
		2	41%	-	45%
		3	37%	-	43%
Q4	Intervention		78%	84%	80%
Blind spot side	Control		77%	-	81%
Q5	Intervention	1	2%	1%	1%
Vehicle size		2	21%	10%	21%
		4	75%	87%	77%
	Control	1	0%	-	1%
		2	21%	-	21%
		4	77%	-	77%
Q6	Intervention	1	3%	2%	2%
Engine sound		2	14%	8%	8%
		3	44%	21%	24%
		4	36%	66%	62%
	Control	1	5%	-	5%
		2	15%	-	14%
		3	35%	-	41%
		4	42%	-	38%
Q7	Intervention		3%	47%	25%
Truck weight	Control		2%	-	3%

Q8	Intervention	64%	94%	90%
Truck length	Control	59%	-	64%
Q9	Intervention	38%	38%	37%
Left turn	Control	35%	-	40%
Q10	Intervention	58%	53%	50%
Braking distance	Control	59%	-	60%

Table 3 highlights that from pre-intervention to post-intervention, scores for each question, except question 10, increased with questions 7 and 8 showing the biggest increases. However, post-intervention scores for questions 1, 2, 7, 9 and 10 were still low and were 50% or lower when tested 4-6 months later for retention.

Children in the intervention schools were also asked how they viewed the session and the merchandise. As shown in Figures 5 and 6, the overall feelings towards both the session and the merchandise were very positive.

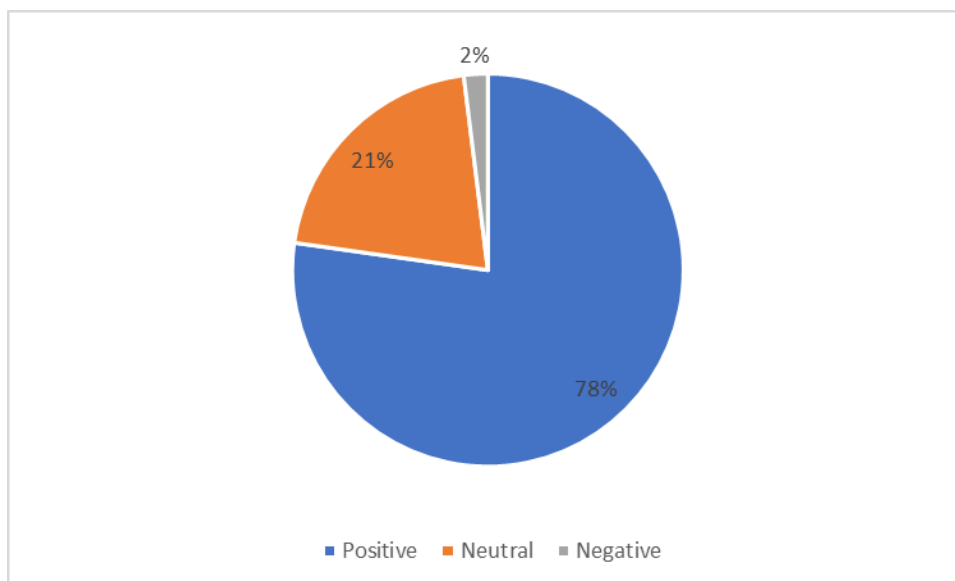


Figure 5. Feelings towards the session

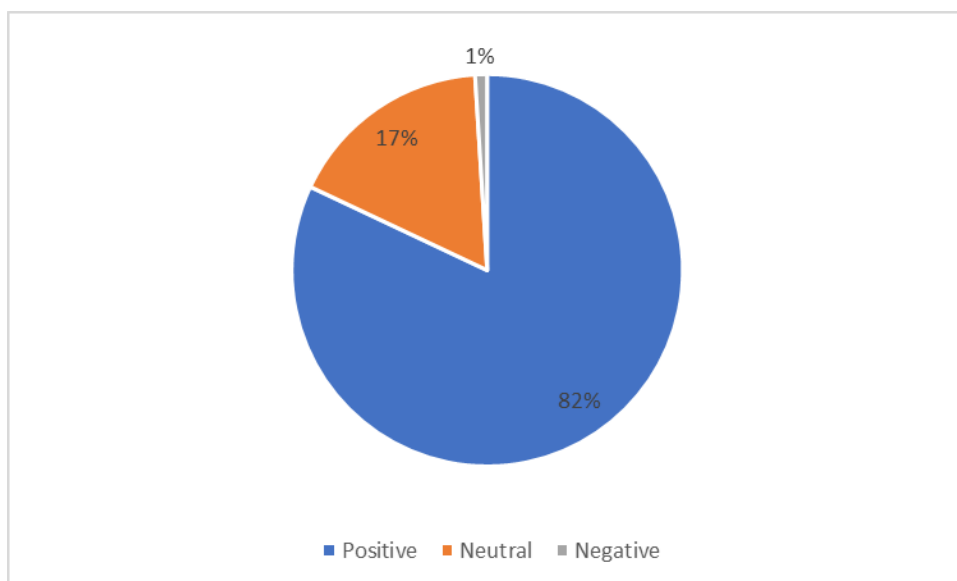


Figure 6. Feelings towards the merchandise

Between school comparison

Table 4. Average survey scores by school at the three time points

School	Pre	Post	4-6
Intervention school 1	10.77	13.35	13.33
Intervention school 2	11.11	14.04	13.70
Intervention school 3	11.37	12.45	12.84
Intervention school 4	11.76	13.30	13.60
Intervention school 5	11.70	14.84	13.41
Intervention school 6	11.94	13.82	12.88
Intervention school 7	10.57	-	9.95
Control school 10	10.32	-	10.96
Control school 12	12.40	-	12.00
Control school 13	11.65	-	11.95
Control school 14	12.66	-	12.73

These data confirm that, despite significant variation across intervention and control schools' survey scores, the overall trend of improvements from baseline to follow-up were observed across interventions schools, and maintained at 4-6 months, whereas a lack of change from baseline to 4-6 months was clear across control schools.

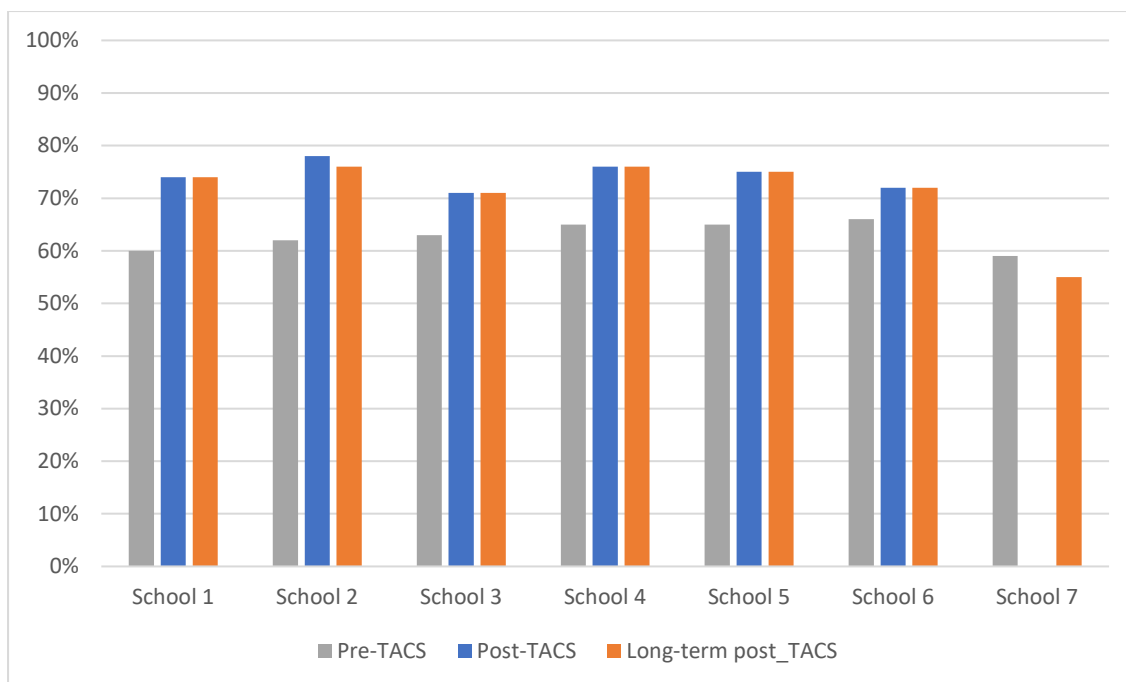


Figure 7. Average score at the three time points by intervention school

4.2 Online demonstrator survey

The survey for the TACS demonstrators first asked how long they had been working for DHL, how long they have been TACS demonstrators (Figure 8) and how many sessions they had run since becoming a TACS demonstrator (Figure 9). The survey also contained five questions to examine views on the demonstration itself. As shown in Figure 10, demonstrators felt that the schools were responsive and easy to make arrangements with. They also felt that the staff were supportive and that the children enjoyed both the session and the merchandise. For instance, 66% of demonstrators strongly agreed with the statement that the schools were responsive when making arrangements, and only 3% said that they disagreed with this statement.

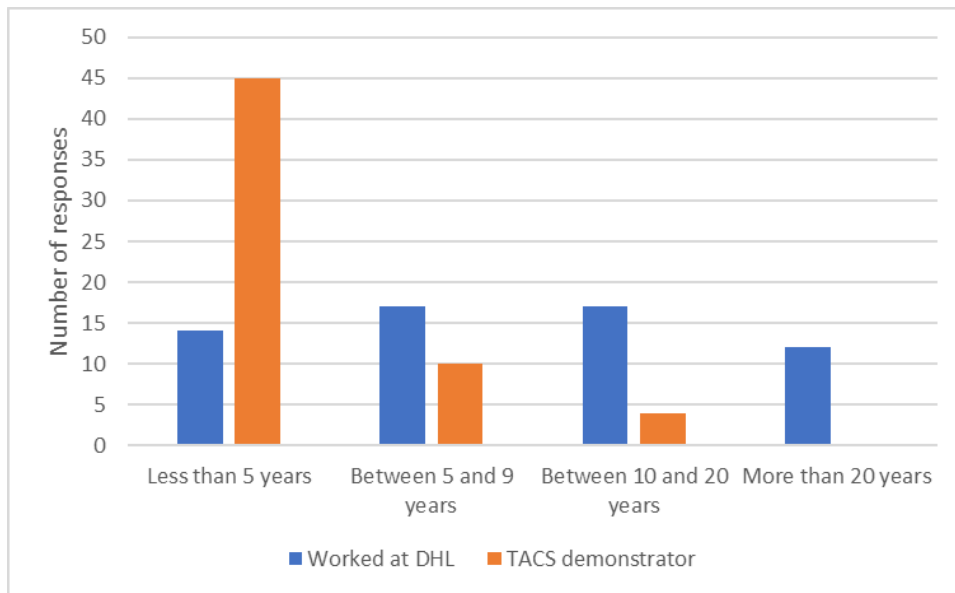


Figure 8. Duration responders worked at DHL and how long they have been TACS demonstrators

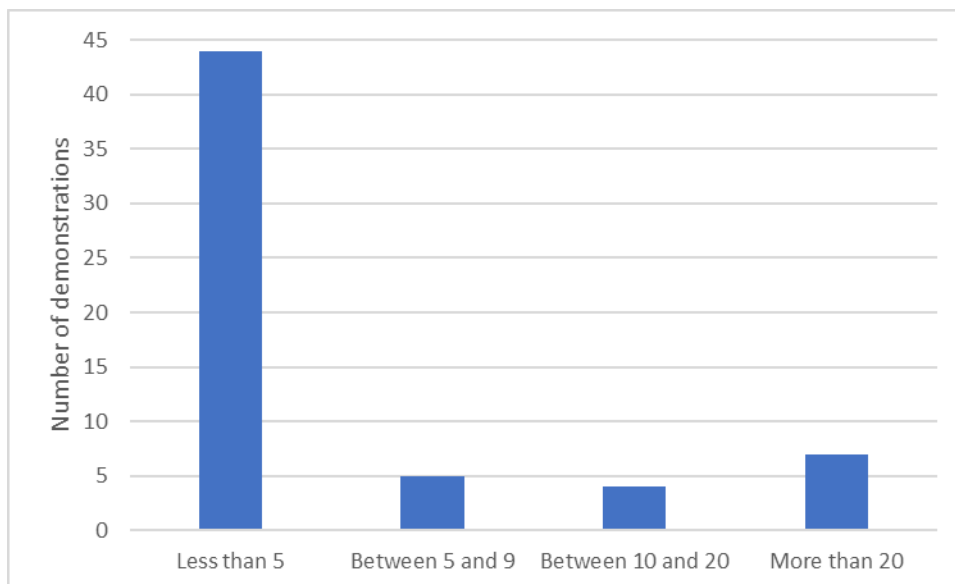


Figure 9. Number of demonstrations delivered since becoming a TACS demonstrator

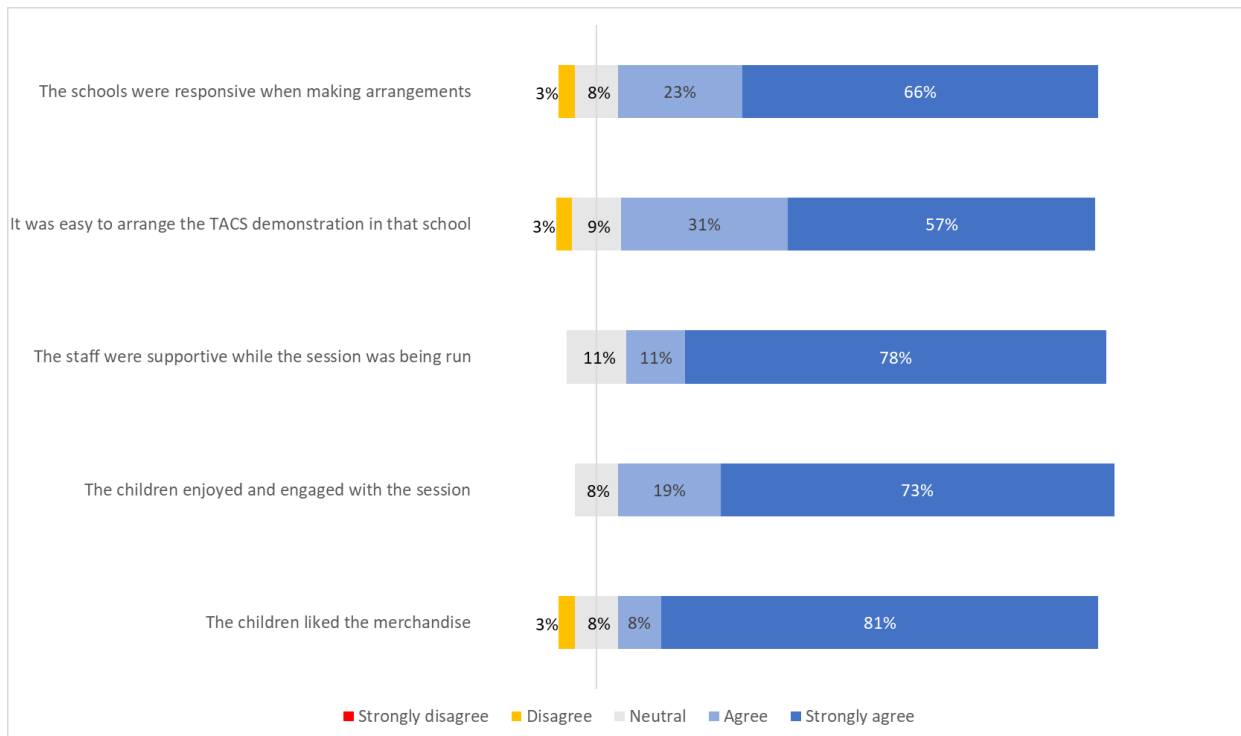


Figure 10. Demonstrator views from the survey

4.3 Qualitative data

Analysis of qualitative data (teacher interviews, demonstrator surveys and child focus groups) produced four themes: “overall experience”, “perceived impact”, “merchandise” and “overall improvements”. Each theme is supported with participant quotations denoted by a participant number for anonymity (e.g., T1 for a teacher; D1 for a demonstrator and FG1 for a child focus group participant).

Theme 1: Overall experience

The first theme outlines both the children and teacher’s overall experience of TACS visiting their school incorporating *Experience of the demonstration, children’s reactions to the demonstration, getting involved in the demonstration and the ease of incorporating into the day.*

Experience of the demonstration

Once the truck had arrived at the school, the children and teachers went outside where they “weren’t just static in one place and being [lined up]; there was lots of active involvement throughout” (T5). The children stood outside the truck where they went through different safety measures: “we show[ed] them how much a truck can or cannot see, and where to stand to check the driver can see them” (D10). There was also an activity which demonstrated how loud the truck is: “the whole crowd started screaming as loud as we could, but the engine was too loud, and [the driver] couldn’t hear us still” (FG2).

The demonstrators put different scenarios into place for children to be actively involved and learn about safety. Teachers were sat in the cab and children were outside: “everyone was shouting, trying to...get attention, but you can’t see them.

And then they...had to scream at them...loud as they could to see if we could hear them" (T2). Children also "lined [up] outside...the lorry and they had to talk about the viewing distance" (T6). Another demonstration that the children spoke about was them being shown how the truck could easily crush different objects: "so...we lost a ball, and then a truck was coming that's where the ball was going...and we shouldn't go after it" (FG3) as well as demonstrating "things like running the cone over [and] how it was crushed and where they couldn't...be seen" (T3).

Children's reactions to the demonstration

Overall, the children's reactions were positive as "originally, they didn't...know what it was...and because it was some sort of activity that didn't involve writing they [were] over the moon with it straightaway and...[went] outside to see [the truck...and get] involved with it" (T2). The idea of a truck coming into the school excited the children "to see how big it was" (T6) as they didn't believe that the teachers "were going to be bringing a truck on to the school property" (T5). The demonstrators felt as though "the children [were] in awe of [their] drivers" (D10) and they "got to see "the fun and enjoyment for the children" (D15). The children remembered the truck coming in and overall, they "found it really fun to do" (FG1) and "liked the whole thing" (FG2).

Getting involved in the demonstration

One of the main comments was the idea of the children enjoying being able to scream: "when we went behind the truck and we had to scream" (FG3). Both teachers and demonstrators also commented on this as they "got to sit in the cab and the others were at the back shouting to the driver" (D7) and the children kept "moving around the lorry which was good" (T3). Children being able to scream was mentioned regularly by children, teachers and the demonstrators. It made a change to the normal school day as it gave the children "a chance to make lots of noise out of the classroom" (D3).

Other comments were around finding it "fun to hear the comparisons to animals' sizes and to football pitches [and] we were learning about the length and weight of the trucks" (FG1). One child also enjoyed being involved with "learning about safety because it...teaches that it protects you from danger" (FG1). It was seen as a positive that the demonstrators had "the whole class...involved in some of the demonstrations" (T4).

Ease of incorporating into the day

This subtheme came solely from the teacher interviews.

It is just as important to make sure the demonstration can be easily incorporated by the teachers into a school day. From the teacher interviews, the overall message was that it was "nice and easy" (T3), "not a problem" (T2). As schools are always busy, it is key that when extra-curricular activities come in, they can be easily fitted into the children's timetable. One teacher said that "it worked really well, people were.... given a time slot...fitting it around their...classroom activities and it went really well" (T6). It was also mentioned that if the teachers are aware that the visits will be beneficial then they will "always give time...because it means so much to the children and they learn so much better when it's hands-on" (T3). The importance of this demonstration meant that the schools made time for them to visit.

Theme 2: Perceived impact

This second theme outlines the children's and teacher's perceived impact of the demonstration incorporating *impact and importance*.

Impact

One key message, which was mentioned by both the children and teachers, was learning about the blind spots on a truck: "when we went to learn about the safety, they talked about...the blind spots...where they can't see" (FG1).

The children learnt a lot about the dangers of getting too close to the trucks as they can't be seen: Especially "if you are riding your bike right next to the lorry, with the blind spots, you could get run over" (FG4). This impact was also portrayed by what the teachers said as well: "[the children] realised how the visibility of a driver on a truck is very little compared to them, and how to keep themselves safe" (T7). The children left the demonstrations having learnt the primary areas where truck drivers can't see them, being "the two sides, the front and the back" (FG2) and "if you stand too close to the lorry you won't be seen" (FG4). Not only did it have an impact on the children, but the teachers also came away feeling as though they have learnt something: "I think staff as well have taken [away] how poor visibility can be from in a lorry" (T6). Not being seen around certain areas of the truck was mentioned frequently by both the children and their teachers proving it to have a significant impact on both of them.

As children enjoy kicking a ball around outside on the pavements, it was important the demonstration made an impact on how dangerous it is to run in front of a truck to pick it up and children need to understand how to behave: "Children's understand[ing] of how to behave around trucks...if the football, for example, has rolled underneath it. I just think the children's awareness of safety around these kind of vehicles is the only reason we did it really" (T5). One scenario which stood out was a child giving an example of when they were put into a situation where they used what they had learnt: "when my brother kicked the ball, a truck was coming so I told him to wait. So, when it stopped we could have got it" (FG2). What made a profound impact to the children was giving demonstrations: "They showed us...that the truck could easily crush [a ball], so that if...we lost a ball...and...a truck was coming...we shouldn't go after it" (FG3). From both the children and teacher interviews, being actively involved throughout the demonstration seemed to have a significant impact.

The demonstration has certainly had an impact on the children, and they have come away having learnt something. For example, "a couple of weeks ago, we did a road safety walk, and they were saying about standing back from the curb [when] the lorry [came] down" (T2) showing that they can prove what they have learnt from the demonstration in real world situations.

Importance

This subtheme has come from just the teachers' and demonstrators' feedback.

The most important aspect of the visit was "getting the safety information out to the children and also the teachers who attend" (D39). The teachers have seen the TACS visit to the school to be highly important for everyone. With this being the case, when there is a new cohort of children, it is "something [teachers] will look to do again in the future, just to ensure that the children....are aware of the dangers of the trucks" (T5) and "for a refresh for those that have already done it once" (T2). One teacher mentioned the impact Covid-19 had on children's awareness of trucks "because [in] lockdown...being at home, they didn't really have much knowledge, so it was really, really informative...really important" (T1).

As mentioned before, it was not just the children benefitting from this visit as "it showed staff actually that there's more to road safety than just looking left and right...that's important as well...it really opened our eyes up...that was to me the best bit I think" (T6). They were able to get "the safety information out to the children and also the teachers who attend[ed]" (D39). From the teachers' feedback, it came across that the demonstration was as important to them as for the children as they were able to learn things as well: it "showed you...how to be careful...when you're cycling on the road or even if you're driving or walking by a lorry" (T4). This is echoed by the demonstrators: "Highlighting the dangers of truck to not just the kids but the teachers who are drivers and so unaware of how little a lorry driver can see" (D7).

Theme 3: Merchandise

At the end of the demonstration, all the children were given a selection of merchandise. This theme covers the children's and teachers' opinions on *what was good* and *what needs improving*.

What was good

Overall, it was felt that "the merchandise went down well at the schools" (D7). Both the children and teachers gave a range of positive feedback about the merchandise that the children were given. The activity books seemed to go down well with the children: "my favourite one was the booklet because I can...always go there and check so I can always remember" (FG2). This suggests that the booklets have helped the children retain the information they have learnt from the demonstrations. "There were questions about the entire workshop" (FG2) which is positive as it has kept the children actively involved in what they've learnt and see how much they are able to remember. The children also liked the pencils: "I use my pencils at home and at school" (FG1). One teacher commented on them being "great because it was just that visual reminder of the event...and the importance of what they've learnt" (T5).

Another aspect which is felt to be good about the merchandise is that it has allowed the children to have something to take back home with them to help generate a conversation with their parents and siblings about their day as it "prompted them to share their memories with other people" (T6). This then also meant that they could "raise...awareness within their families" (T6) which is important. The merchandise also generated conversations around the playground so that children who maybe didn't attend the demonstration could learn from their peers: "I think the wristband...it was [an] opening conversation with other children" (T1).

The overall feedback was mainly positive, and it was seen as "a really nice touch at the end and it was really useful for [the children]" (T7).

What needs improving

There was a small amount of feedback given in regards to improvements needed to the merchandise. Most of the comments came from disliking the wristbands given out: "I don't like [that] there's no use of it" (FG1). They became an issue in the classrooms with them being "turned into a slingshot...yeah, need to rethink the wristbands" (T3) and they often got lost and so the children would fight over them. The demonstrators agreed and they felt as though "the wristbands need changing...to pen and pencils, rulers, rubber [and] sharpener...[or a] pencil case with [a] truck on it" (D47).

One suggestion made by a teacher was to have "something in the book about a diagram regarding blind spots...might be useful just to reaffirm" (T5). Although it was touched on in the booklet the teacher felt as though more of a "visual representation of it would be useful" (T5). Another suggestion given was maybe to give out reflective coats as "it's a road safety thing...[it] would tie in so much better with the road safety aspect than a pencil" (T3) and would encourage children to be road safe when they are out walking in the dark. This was also highlighted by the demonstrators who suggested "a reflective clip-on badge they could put on their bag or coat" (D1) or "a reflector keyring instead of [a] wristband" (D5).

Theme 4: Overall improvements

The main suggestion for improvements was to allow more than one child to sit in the truck. Both the children and teachers felt as though they had missed out by seeing one of their peers go in and not them. Although letting more children sit in would have taken more time, the children felt as though it "would make it more fun...sitting in for like five seconds" (FG1) and "it would be better so more people get a chance" (FG3). One teacher felt as though the "older children...really wanted to go in the cab...they wanted to see it for themselves to experience it" (T6).

By being able to sit in the truck, children were able to take more away and really understand the different perspectives: "If you're not the child in the truck, I don't think you get the perspective that we do [being] in the truck" (T3) and a lot of the children would have liked to have seen "how big the space was inside...the container at the back ... open the door for the container...see like how big it is" (FG2). One suggestion was to "maybe do less classes a little bit longer....[as there were] a few disappointed ones" (T1) to allow for more time for the children to sit in the cabs.

One teacher mentioned that it would have been good for the children to learn about being safe around a truck when its dark: "I don't think we talked anything at all about what would happen in the dark, whether the aspects of safety are worse, or better, in the dark...the visualisation becom[ing] less" (T3). In the future, this could maybe be considered as one of the topic areas for TACS to cover.

There was also a comment made about some of the activities within the demonstration, such as comparing the size of the truck to different animals, not being suitable for some of the older age groups: "The animal aspect is not really relevant to Years 6 and maybe 5 anymore...it's fine for comparisons for younger children but the older ones need something more relatable" (D13). One suggestion was "equating it by the equivalent number of cars rather than elephants" (D38). So, in the future "perhaps rethinking maybe for the older children a better way for them to understand the size of the truck compared to other things" (T5) would work better.

5. Discussion

5.1 Main findings

Summarise here using the RE AIM framework as headings.

Reach

In total, seven intervention schools, of which six completed all surveys (one school completed pre and 4-6months), participated. That comprised 795 children undertaking the pre-TACS survey and taking part in the subsequent intervention (intervention schools). A final total of 416 children from the intervention schools completed all three surveys and were included in the analysis. Over 300 children undertook surveys within a control school, taking the final total of children engaging with this evaluation to over 1,000. Between 2007-2022 a total of 339,695 children received TACS demonstrations across 1,762 demonstrations. Although some schools will have more than one demonstration, over two thirds represent different schools (e.g., in 2018, 195 demonstrations were conducted across 135 different schools).

Deprivation data based on school postcodes indicates that TACS has been delivered to schools in areas that vary, from the least to the most deprived. In 2018, there appears to have been more targeting of schools in more deprived areas than in 2022.

Effectiveness

Analysis of survey data indicated that TACS was successful in improving children's knowledge and understanding of truck safety and related information, and that this knowledge was retained 4-6 months later. There was a significant difference between the scores at the three time points for the intervention schools, within that a significant difference between the pre-intervention and post-intervention scores, and no significant difference between the post-intervention and long-term post-intervention scores. The analysis also found a significant difference between the long-term post-intervention scores from the intervention and control schools.

Children's perceptions of TACS demonstrations were positive overall. They were excited about seeing the truck and enjoyed engaging with the session (e.g., being able to shout). The TACS demonstration was very different to a normal classroom environment, which added to their enjoyment. Blind spots were seen as the main take home message from children's focus groups and teacher interviews. Learning how little visibility there was, was surprising and had a lasting impact on children and teachers. The truck demonstrations, such as showing the truck crushing a ball/bike or trying to make themselves heard, were effective in getting the safety messages across.

Teachers considered the demonstration to be very easy to incorporate into the school day. The perceived importance meant that it was prioritised by teachers, who made time for it. Getting the safety message to the children was believed to be very important, especially as some children seemed to lack road safety skills/knowledge after spending much time at home during lockdowns. Teachers also felt they learnt some aspects of road safety, which would help them to reinforce the messages to children.

Adoption

At the peak of TACS programme delivery over 40,000 children received a demo in one year (2018). Numbers of demonstrations have fluctuated since 2007 (we are not clear of the reasons for this, but likely to link to the number of trained demonstrators/COVID). Despite this fluctuation, thousands of new children have attended a TACS demonstration, receiving the important safety messages.

Teachers suggested that they would like each new cohort of children to have a TACS demonstration, indicating satisfaction and a desire to adopt the programme as part of their curriculum.

Implementation

Overall, DHL trained demonstrators found that schools were responsive, and found it easy to coordinate the arrangements. School staff were supportive of the intervention, creating time within the curriculum for children to receive a demonstration. Email and personal contact were the two most popular means of contact however, it was suggested that the a central booking process for demonstrations would make it more efficient. A logistical issue of space was mentioned with some demonstrators reporting difficulties finding schools with the necessary space to accommodate a large vehicle. Alongside this was the suggestion for a dedicated truck and trailer for demonstrations.

Maintenance

Children within the intervention schools demonstrated an improvement in their knowledge by the number of survey questions correctly answered following the TACS demonstration. This improvement was maintained at the 4-6 month follow-up suggesting the safety information was retained.

5.2 Future provision and recommendation for TACS

- Whilst there was an increase in truck safety knowledge following the TACS demonstration, as highlighted in the question breakdown, there was still a general lack of knowledge regarding certain blind spots post-TACS, coupled with the increase in blind spot crashes (6). This might be an area for TACS demonstrations to develop.
- Consider allowing more than one child into the truck. Children may have been able to take more away from the demonstration through this experience. Incorporating this into future TACS demonstrations may in turn allow for a greater understanding of blind spots.
- Demonstrators noted the tonal disparity between explaining the potential threats surrounding heavy goods vehicles but having to use animals as a comparison. This was echoed by the teacher comments suggesting using non-animal comparisons to stress the possible dangers and importance of truck safety, particularly for an older age group.
- Teachers suggested adding a topic relating to truck safety in the dark, which would be in line with the suggestions of reflective merchandise.
- Consider a central booking system to arrange demonstrations. This would remove the need for demonstrators to have existing relationships with schools or identify new ones, potentially increasing the number of demonstrations and reach of the programme.

5.3 Strengths and limitations

A strength of this research was the novel intervention evaluated using a mixed methods design. The design incorporating children, teachers and demonstrators offered unique insights into TACS from all stakeholders.

Some schools dropped out from intervention and control group (initial intention was intervention (n=10) and control (n=5)). This limited potential numbers and delayed recruitment (and therefore the evaluation). However, the number of children participating in each school was higher than anticipated, meaning target participant number in the three children surveys were still met.

There were some issues with matching survey data from schools across the survey time points, with some schools not using the same student identifiers across each survey (either forgetting or losing the information). This limited the number of surveys that could be matched across all three time points to allow individual student scores to be compared over time.

There were challenges in recruiting teachers for interview. Lack of teacher time was cited as the main reason. Although there were slightly fewer teachers in the final interview sample, data appeared to reach saturation and it was not felt this limited the findings.

This evaluation was originally due to take place in the spring and summer terms of 2020. Due to COVID-19 this was impossible. Schools were either in lockdown or under strict restrictions due to the pandemic. The impact of this lasted into 2022 (when the evaluation was able to start). Being able to go into schools to view demonstrations or interview teachers became difficult and not something schools were keen to do. Interviews on Teams/telephone were effective in providing quality data, but in-person interviews on the day of the demonstration would likely have resulted in more teachers being recruited.

The postcode data from DHL UK Foundation, is likely to have missing data e.g., a number if intervention schools from this study were not listed in the data set. While it is unlikely to have impacted the Indices of Deprivation spread of schools significantly, it may have meant that the overall reach of TACS was underestimated.

5.4 Conclusion

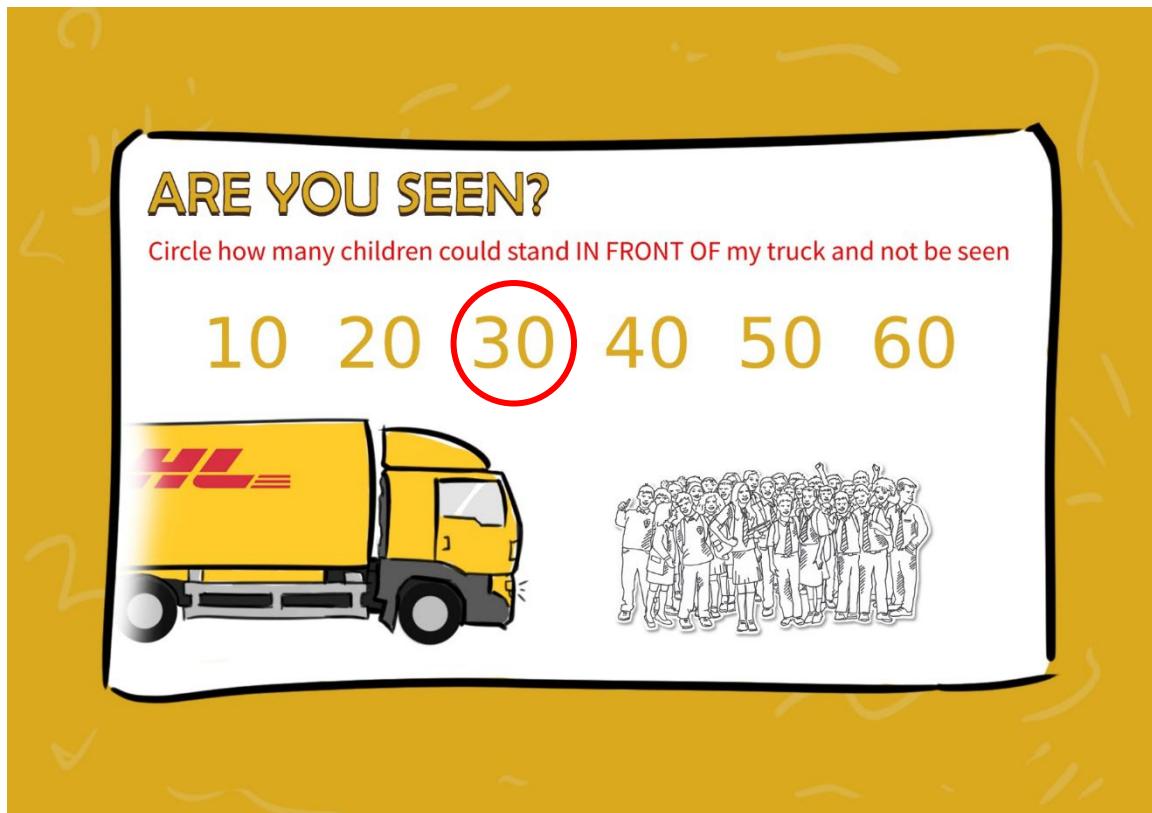
Overall, the TACS programme appears to be effective in improving truck safety knowledge, which children retain for at least 4-6 months. This meets the aims of the DHL UK Foundation. The programme was viewed positively by all stakeholders (children, teachers and DHL trained demonstrators). Schools see the importance of TACS and are supportive of its inclusion within their curriculum. Schools have requested additional demonstrations further indicating its worth and their ongoing support.

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7. Appendices

Appendix 1. School survey with correct answers



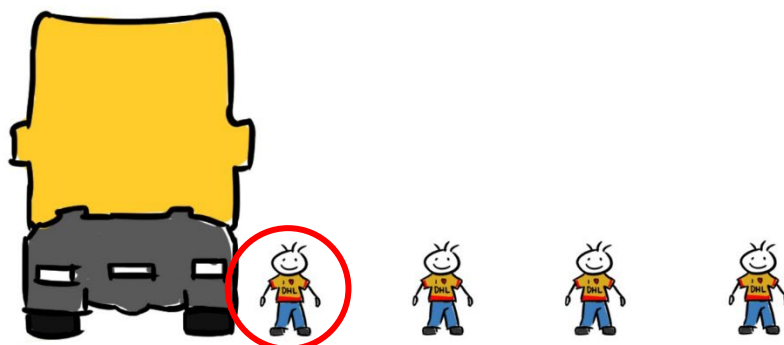
ARE YOU SEEN?

Draw circles for the spaces AROUND my truck that I cannot see



ARE YOU SEEN?

Circle which of these children I cannot see from inside my truck



SIZE MATTERS!

Using the boxes label the vehicles as:

1 = smallest 2 = second smallest 3 = third smallest 4 = biggest



2



3



4



1

ARE YOU HEARD?

My engine is really loud,
circle all of the sounds that I CANNOT hear over the engine.



Dog Barking



Police Siren



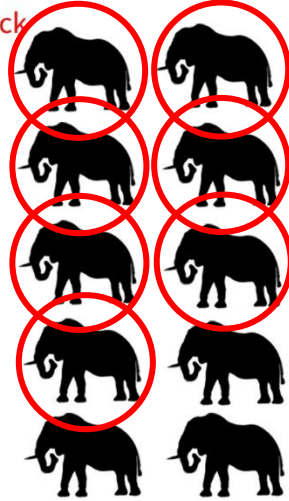
Bicycle Bell



A Class Full of
Children

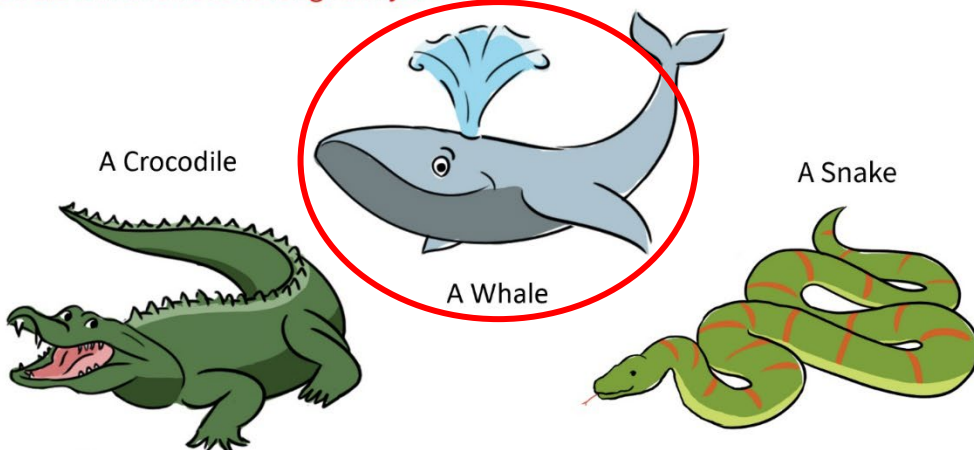
HOW HEAVY!?

Circle how many elephants weigh the same as my truck



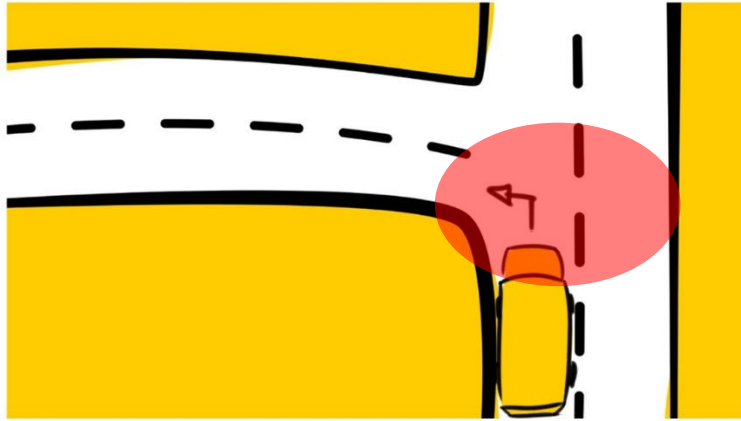
AS LONG AS A...

Circle which one is as long as my truck



LEFT TURN

It can be tricky to steer big trucks around corners.
Colour which bits of the road I need to turn left.



STOP!

When I am driving at speed it can take a while to stop. Circle how many football pitches I go before coming to a complete stop?

1



Half-pitch

2

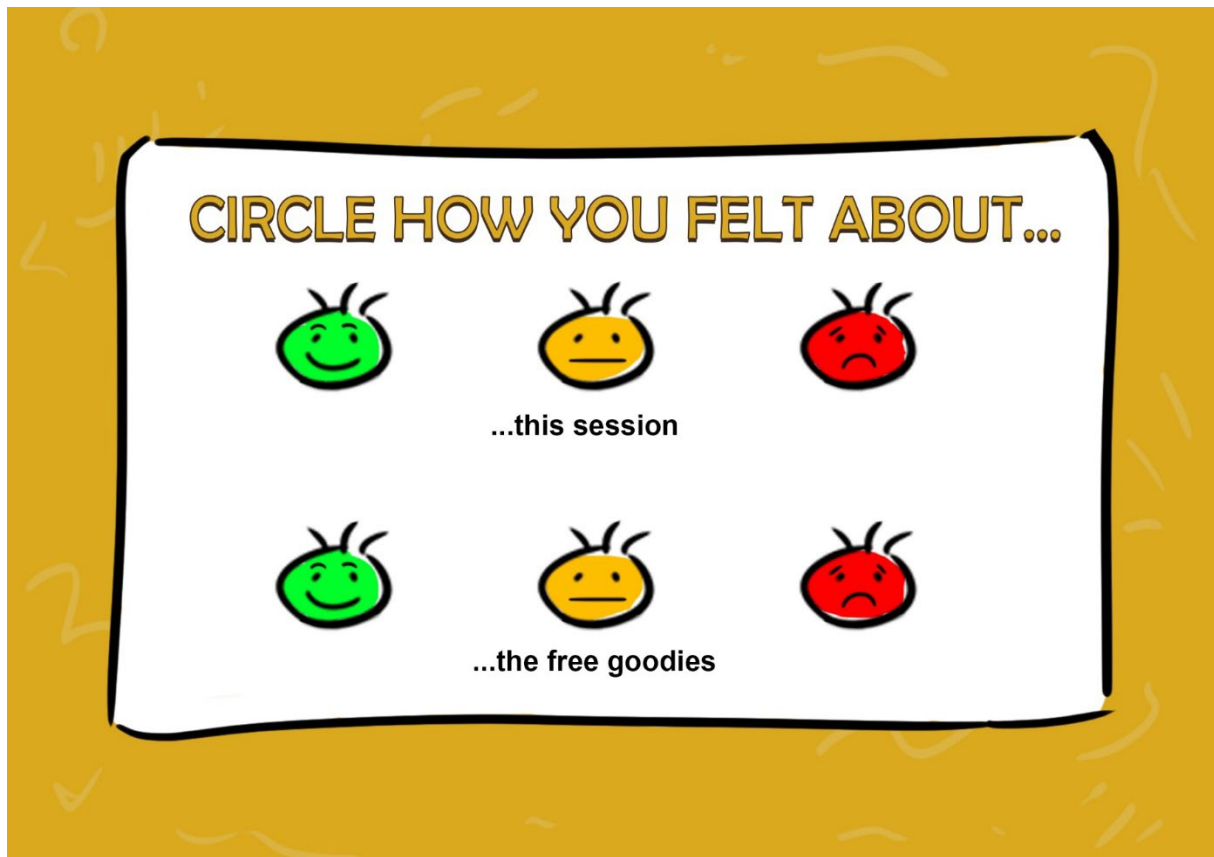


1 pitch

3



2 pitches



Appendix 2. Focus group topic guide

DHL TACs focus group questions with children

Introduction

- Introduce the researchers and why they are doing the study
- Ice-breaker – get the children to play a short game/activity to make them feel comfortable with the researchers (if conducted face to face)
- Ask the children to give their names and ages

Experiences of the DHL TACs programme

- Can you remember when the man/woman came to talk to you about being safe around big trucks/lorries?
- Can you tell me what happened when the man/woman came to talk to you about being safe around big trucks/lorries?
- What was the best thing about the talk? /What did you like best?
- Was there anything about the day that was not so much fun, or you did not like?
- Can you think of anything else that would have made the talk better?
- Learning experiences
- Can you remember any of the things they taught you about staying safe around trucks/lorries?
- Have you used any of this when you have seen trucks/lorries when you are out walking or playing?
- Merchandise
- Did you get given any bits to take home with you after the TACs session?
- Can you remember what they were? (pencil, wrist band, booklet)
- Which did you like best?

- Have you used [the pencil/ wristband/ booklet]? Did you use it at school or at home?
- Were there any bits you did not like?
- Were there any bits you did not use?

Appendix 3. Teacher interview topic guide

DHL Interviews with teachers

Background

- What is your role at the school?
- How long have you been working there?
- How did you hear about the DHL TACs programme?
- Have you had a class take part in the DHL TACs programme before?

Implementation of the DHL TACs programme

- How easily were you able to fit the DHL TACs visit into the class timetable?
- What was your understanding of the DHL TACs programme before they visited?
- What has been your involvement with the DHL TACs programme? For example, time spent organising, delivering the survey, supporting children

Experiences of the DHL TACs programme

- Can you describe what happened when the DHL TACs visited?
- What was your experience of the DHL TACs visit? Positive/negative?
- What was the best part of the DHL TACs programme?
- Any areas for improvement?
- Would you like to see TACs come back to your school?
- How do you feel the children benefited from taking part in the session?

Children's reactions

- How did the children react when they found out about the TACs programme?
- How well did the session gain their attention?
- Were the children actively involved in the session?
- What do you feel were the main things that the children took from the session?
- Do you think the children benefited from the merchandise?
 - What do you think they liked best?
 - Did the merchandise make the session more memorable? What merchandise would make the session more memorable?
 - Is there anything more useful you can think they would like?

Appendix 4. TACS demonstrator survey

Q1. What is your role at DHL?

Q2. How long have you been working at DHL?

- More than 20 years
- Between 10 and 20 years
- Between 5 and 9 years
- Less than 5 years

Q3. How long have you been a trained demonstrator for the TACS programme?

- More than 20 years
- Between 10 and 20 years
- Between 5 and 9 years
- Less than 5 years

Q4. How many TACS demonstrations have you run in schools since becoming a trained demonstrator?

- More than 20
- Between 10 and 20
- Between 5 and 9
- Less than 5

Q5. Thinking about this last school, how did you make contact with the school?

Q6. Please rate how responsive you found the school when making arrangements. (1 = not at all responsive, 5 = extremely responsive)

Q7. Please rate how easy it was to arrange the TACS demonstration in that school. (1 = extremely difficult, 5 = extremely easy)

Q8. Please rate how supportive the staff were when you ran the session. (1 = not at all supportive, 5 = extremely supportive)

Q9. Did you feel that the children enjoyed and engaged with the session? (1 = definitely not, 5 = definitely yes)

Q10. Did you think the children liked being given the merchandise? (1 = definitely not, 5 = definitely yes)

Q11. Can you identify up to three best things about engaging in the TACS programme?

Q12. Can you identify up to three most challenging things about engaging in the TACS programme?

Q13. Which parts of the TACS demonstration do you think that the children most enjoy or engage with?

Q14. Are there any aspects of TACS that you think children find difficult to understand and can you describe them?

Q15. Is there any element of the TACS programme you would like more support with?

Q16. Can you make any alternative suggestions to the merchandise given to children if you think it needs improving?

Q17. Do you have any further comments about the TACS programme, not already mentioned?

Footnotes

Sample size and data analysis

The number of pupils that we initially wished to recruit was therefore based on the following:

- If a within-pupil design were possible: using a within subjects t-test with a two-tailed probability and alpha of .05, even with loss to follow-up of 30%, we would have statistical power of at least .8 to detect an effect size (Cohen's d) of 0.2 (small effect).
- If this design were not possible: using a between subjects t-test with a two-tailed probability and alpha of .05, we would have the statistical power of at least .8 to detect an effect size (Cohen's d) of ~0.25 (small-medium effect).

We intended to explore school-and class-level effects, but also realised that the opportunities for multi-level analysis might be limited by the number of schools that could be recruited.

Data analysis

They were analysed using inductive reflexive Thematic Analysis following the processes set out by Braun and Clarke (10). Analysis was conducted using NVivo R1 (11,12). Extensive reading was conducted for familiarisation of data before data were coded and initial themes generated. Themes were then reviewed and developed to ensure they were data driven. The process allowed for the development of themes that reflected participant opinion. Data coding was conducted by two experienced qualitative researchers, before agreement of initial themes and relationships. These were then refined, defined, and verified by a third member of the evaluation team, before being named and finalised.

Ethics and data protection

All activities were conducted in accordance with Staffordshire University code of conduct (13). University ethical approval was from Staffordshire University Ethics committee.