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Enhancing primary school children's knowledge of online safety and risks with the CATZ co-operative cross-age teaching intervention: Results from a pilot study

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Abstract

Children are heavy users of the internet and prior studies have shown that many of them lack a good understanding of the risks of doing so and how to avoid them. This study examined if the Cross-Age Teaching Zone (CATZ) intervention could help children acquire important knowledge of online risks and safety. It allowed older students to act as CATZ tutors to design and deliver a lesson to younger schoolmates (tutees), using content material about online risks and safety provided by adults. Students in Year 6 (mean age = 11.5 years) were randomly assigned to act as either CATZ tutors (n= 100) or age-matched controls (n = 46) and students in Year 4 (mean age = 9.5 years) acted as either CATZ tutees (n = 117) or age-matched controls (n = 28) (total N = 291). CATZ tutors but not matched controls scored significantly higher on objective measures of knowledge of both online risks and safety, and CATZ tutees but not matched controls did so for online safety. Effect sizes were moderate or large. CATZ was highly acceptable to participants. The results suggest that CATZ is a viable way to help school students learn about online dangers and how to avoid them.

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Many young people use the internet[1,2] and while they gain a range of benefits,[3] they are also exposed to a variety of risks associated with inappropriate contacts, content and conduct.[4] Some of the key risks identified by researchers are summarized in Table 1. There is now a consensus that promoting a good awareness of cyber risks and how to avoid them and remain safe should be a key priority, not least because risk is more likely to result in harm when it is absent.[5] In line with other domains of development,[6] there is a recognition that building *self-regulation* concerning cyber risks and how to avoid them among young people is likely to be more effective than 'mere policing' via adult regulation and moderation.[7] Simply put, adults will not always be there to help young people deal with online risks and keep them safe. Similarly, attempts to attenuate risks by means of parental controls, filters and the like have been shown to be far from effective [7] and recent research has shown that many young people have negative views of parental mediation and often try to avoid it.[8]

With this in mind, attempts to 'formally' teach young people about online risks/safety have been advocated, especially in schools.[9] By providing opportunities for children to consolidate 'good knowledge', they can be enabled to self-regulate themselves safely online. But some important issues arise. On the one hand, many young people *are* open to being taught these things. A recent large-scale survey found that one third of young people do not think that they know more about the internet than their parents and would like more 'training' in how to use it safely.[10] On the other hand, some degree of resistance to having teachers lead sessions on these kinds of 'pastoral' issues has been found.[11,9,12]

An alternative to teacher-led instruction is to use cross-age teaching, i.e., have older students teach younger students. Young people often regard older peers as role models and hence may be more open

to learning about online safety issues from them than from teachers. Role theory [13] suggests that those delivering such teaching to younger students (tutors and tutees, respectively) would take their responsibilities seriously. Importantly, acting as a cross-age tutor is thought to facilitate effective learning as tutors work to master the material in order to teach it.[14] Cognitive theory suggest that cross-age teaching provides opportunities for learning as students work with the lesson material, make links with what they already know and hence develop more advanced cognitive structures and schemas.[15,16,17,14] In terms of Vygotsky's sociocultural theory (1978), tutors reworking the learning material that is provided to them into their own viable lesson, and tutees being made aware of salient online issues by tutors, means that both groups are likely to be working in the zone of proximal development, that is, just outside what they currently know. Thus, there are sound theoretical reasons to suspect that cross-age teaching may benefit both tutors and tutees in terms of improved knowledge about salient online issues. It has been shown to be effective in a range of domains especially when combined with co-operation among tutors working in small groups.[18] However, no study to date has tested its effectiveness for teaching children about cyber issues. Moreover, this approach is consistent with calls to more actively involve young people themselves in their online safety education.[9]

Gender differences are salient here. Boys are known to be less risk-averse than girls generally [19] and boys have been found to engage in online behavior that exposes them to more inappropriate and potentially distressing content. [20,21] It is important, therefore, to assess gender as a potential moderator of any possible effects of a cross-age teaching intervention on children's knowledge of online risks/safety.

The main aim of the current study was to conduct a pilot test of the impact of a co-operative cross-age teaching program (Cross-Age Teaching Zone, CATZ) on tutors' and tutees' knowledge of online

risks/safety, and to test if the effects (if found) were stronger for girls or boys. A subsidiary aim was to assess children's desire to be taught about online safety via cross-age teaching, since how acceptable an intervention is has been found to influence children's engagement in it.[22] Indeed, interventions have even been known to fail *because* they were not well-received or looked on favorably by children.[23] Information on all of these issues has important implications for understanding how children can be enabled to become self-regulating safe users of the internet.

Method

Participants and Procedure

Participants (N = 291) attended five UK primary schools. Permission was obtained from children, parents/guardians and school Principals, with a 99% response rate. Classes were allocated randomly to Intervention versus Control conditions. Students in Year 6 (mean age = 11.5 years) acted as CATZ tutors (n= 100, 42 girls and 58 boys) or age-matched controls (n = 46, 27 girls and 19 boys) and students in Year 4 (mean age = 9.5 years) acted as CATZ tutees (n = 117, 58 girls and 59 boys) or age-matched controls (n = 28, 13 girls and 15 boys).

Data were collected on two occasions (Time 1 and Time 2) on a whole-class basis. Time 1 was prior to the intervention and Time 2 a week later (see below). To encourage honest and considered responses, data were anonymous, participants were informed that they were not being formally tested for right or wrong answers, and questions were read out.

The CATZ Intervention

CATZ was developed by the first author (DISGUISED REFERENCE a), and we implemented in the present study. We encouraged 'buy-in' by explaining to CATZ tutors that taking part was voluntary, they

could stop at any time (and re-join) without giving a reason, they were being invited to work in small groups of about five students to design a (roughly) 30-minute lesson about online risks and how to avoid them, and to deliver it to a small group of younger students. They were encouraged to work in their class table groups but could swap groups. Because students have perceived adult-implemented initiatives to tackle pastoral/safety issues as 'boring',[11] we engendered a sense of fun and ownership of the lesson that complemented tutors' sense of responsibility. Tutors were informed that we would provide them with the required content (Table 1), and suggestions about how they might plan, test and deliver a lesson, but that the details would be left to them. We balanced between being suitably supportive on one hand and leaving tutors to take ownership of their lesson on the other. As a minimum, all CATZ tutor groups designed a *poster* that contained the required content, and prepared a *script* of what was to be said and done by each group member during their lesson. A summary sheet of the lesson content was provided to CATZ tutors and discussed with them (Table 1). It summarised key online risks and corresponding advice on how to stay safe by avoiding them. We developed this material on the basis of literature about age-appropriate risks and how to avoid them [24,10,1].

Tutors had four 60-minute sessions to prepare their lesson, spread over 2-3 weeks. Then each group of around five CATZ tutors delivered their lesson to a group of around five tutees. CATZ tutees had only indirect exposure to the information contained on the summary sheet of online risks/safety, i.e., via the lesson they received from their CATZ tutors.

The Control Condition

After being introduced by the class teacher, the same summary sheet of online safety/risks received by CATZ tutors was provided to each student (Table 1) and we engaged them in a class discussion about the issues. Other than this, they carried on with their normal school activities.

Measures and How They Were Analyzed

Knowledge of online risks/safety. Devised in collaboration with teachers to have high face validity, we used open questions that acted as objective tests of participants' actual knowledge. Knowledge of risks (KOR) was assessed with "What things might put someone in danger of harm, or make them feel upset, when they use the internet?" and knowledge of safety (KOS) with "What things can you do to stay safe from harm or getting upset on the internet?" They had previously been pilot tested with a separate group of similar-aged participants (58 9-year olds and 62 11-year olds) and test-retest reliability over a two week period was good with *r*'s >.87, $p < .001$.

Participants were encouraged to write down as many relevant things as they could. To quantify KOS and KOR for each participant, researchers independently identified which and how many of the seven separate themes (Table 1) were contained in their responses, 94% Inter-coder agreement. Correlations between KOS and KOR tallies were only moderate, $r(291) = .35$ and so these were kept as separate outcome variables.

Time 2 KOR/KOS scores were used as dependent variables in analysis of covariance tests, with corresponding Time 1 KOR/KOS scores serving as covariates, and Condition (Intervention versus Control) and gender serving as dependent variables. Cohen's d was the index of effect size (ES). Repeated measures t-tests were used to test if CATZ and/or controls improved significantly on KOR/KOS. Since some CATZ tutors had worked within several groups, group data were not independent and so multi-level analyses were not appropriate.

McNemar's tests examined the proportion of CATZ participants that did/did not mention each *individual* KOR/KOS theme prior to, and then following, the intervention. This allowed us to investigate what *specific* aspect of KOR/KOS knowledge had (had not) been acquired by CATZ participants.

Acceptability of CATZ. Participants were asked "Who would you like to teach you about keeping safe online?" and could choose as many as they wanted from "Teachers, Adults from outside the school, Parents and Older pupils". We report the results for the latter using McNemar's tests to examine the proportion of participants in the CATZ condition that did/did not mention older pupils prior to, and then following, the intervention. Acceptability of CATZ among tutors was assessed with two questions, "How much did you enjoy working on CATZ and giving your CATZ lesson?" and "How much would you like to do CATZ again?" Corresponding items for CATZ tutees were, "How much did you enjoy getting your CATZ lesson from the older pupils?" and "How much would you like to have another CATZ lesson from older pupils?" Response anchors were *not at all* and *a lot*, scored 1 and 3, respectively. For tutors and tutees, the two items were highly correlated (r's = .89 and .92, both p <.001) and so an overall acceptability score was computed for each role.

Results

Descriptive data from the study are presented in Table 2. In the ANCOVA tests, gender did not emerge as a significant factor either as a main effect or in interaction with Condition. Hence, we report the results with just Condition as independent variable. Only significant effects are reported in the text. Among tutors, there was a significant effect of CATZ on both KOS and KOR, with a large (d = .85) and medium (.69) ES, respectively. Whereas CATZ tutors improved significantly on both KOS and KOR (t's = 7.50 and 7.18, respectively, both p < .001), Controls did not (t's < .76). McNemar's tests revealed that there was a significant increase in the proportion of CATZ tutors that identified: (i) people may not be

who they say they are among their KOR from Time 1 (19.0%) to Time 2 (31.0%), exact p = .049, (ii) cyber bullying among their KOR from Time 1 (28.0%) to Time 2 (66.0%), exact p <.001, (iii) sharing personal photographs among their KOR from Time 1 (20.0%) to Time 2 (40.0%), exact p = .001, (iv) how to avoid accidentally sharing personal information among their KOS from Time 1 (4.0%) to Time 2 (18.0%), exact p = .004, (v) how to avoid cyber bullying among their KOS from Time 1 (73.0%) to Time 2 (87.0%), exact p = .024, (vi) how to avoid sharing personal photographs among their KOS from Time 1 (5.0%) to Time 2 (23.0%), exact p = .001, and (vii) how to avoid computer viruses among their KOS from Time 1 (8.1%) to Time 2 (26.3%), exact p = .001.

Among tutees, CATZ had a positive effect on KOS, with a medium (d = .57) ES. Whereas CATZ tutees improved significantly from T1 to T2 on KOS (t = 5.59, p < .001) Control tutees did not (t = .63). McNemar's tests revealed that there was a significant increase in the proportion of CATZ tutees that identified: (i) cyber bullying among their KOR from Time 1 (20.5%) to Time 2 (38.5%), exact p = .002, (ii) not sharing personal photographs among their KOS from Time 1 (12.0%) to Time 2 (24.8%), exact p = .008, and (iii) avoiding computer viruses among their KOS from Time 1 (9.4%) to Time 2 (20.5%), exact p = .035.

A McNemar's test indicated a statistically significant increase in the proportion of CATZ tutees (but not controls) that wanted to be taught about online safety by older pupils, p <.001, rising from 34.4% to 57.8%. Overall acceptability of CATZ scores were high among both tutors (mean = 2.5, SD = .03) and tutees (mean = 2.3, SD = .04), given the 1-3 scale employed.

Discussion

This study tested the effect of CATZ on school students' knowledge of online risks/safety. In line with prior theoretical and empirical work which suggests that this type of co-operative cross-age teaching intervention would promote learning, [15,16,17,14,25] tutors evidenced significant gains in their ability to articulate dangers and how to avoid them, and tutees did so for the latter. Effect sizes were medium or large, suggesting that CATZ can have practical value for participants. This is further illustrated by the gains that some of them made in terms of greater awareness of some specific online dangers and how they can be avoided. For example, more than four times as many CATZ tutors could state how to avoid accidentally sharing personal information after taking part. These results are of great importance to adults tasked with promoting children's awareness of online dangers and how to avoid them, given that so many youngsters have been found to lack such awareness and that risks are more likely to result in harm when it is absent[4,5].

Teaching children about avoiding dangers posed by other people, dangers that characterize many of the online risks identified by scholars (see Table 1), is not always easy, and sometimes they report failing to listen to 'formal' lessons delivered by teachers[11]. With this is in mind, it is also encouraging that the intervention was deemed to be acceptable by those who experienced it, and that there was a significant increase in the number of CATZ tutees who expressed a desire to learn about online safety from older students.

We tested for gender differences on all of our measures and in none of our analyses did they emerge as significant. That CATZ was as effective and acceptable for boys as it was for girls is noteworthy given that boys have been found to (i) take more risks online[20,21] and (ii) be less open to engaging in peer support generally.[26] What is it about CATZ that boys (and girls) find appealing is worthy of future studies.

Overall, these are encouraging results from such a brief intervention, with tutors having about less than four hours of CATZ experience preparing and delivering their lesson and tutees about half an hour experiencing it. They suggest that a larger scale study is warranted. This can address some of the limitations of the current study and build on its strengths.

Notable among our limitations was the convenience sample. Although typical of pilot studies, this limits confidence in the extent to which findings can be generalized. Also, we were not able to test if knowledge gains persisted across time, and future studies should incorporate longer term follow-up assessments. While our effect sizes were moderate or large, the absolute levels of knowledge even after the intervention were still quite low. It is feasible that extra 'doses' of CATZ might bring about even more learning and this again could be tested. Even though we found that gender did not moderate the effects of CATZ, future research should also address moderating and mediating variables since some have been found in other studies of school-based digital media program effects.[27]

A strength of this study was its ability to identify not just *how many* risks and safety strategies children can (not) articulate, but also *which ones*. This information can guide adults' efforts to target children's learning where it is most needed. Another virtue is that we used objective as opposed to subjective measures of children's knowledge, something that is important given that many think they know more about cyber risks/safety than they actually do (DISGUISED REFERENCE b).

In summary, while our results must be considered as preliminary, they suggest that CATZ has the potential to help students learn about online dangers and staying safe. It is easy to implement and well-received by girls and boys. We have provided a *prima facie* case for scaling up the current pilot study into a larger scale evaluation effort.

Table 1: Information Provided to Participants about Online Risks and How to Avoid Them and Used to Code Their Responses

Knowledge of risks. **What things might put us in danger, or make us feel upset, when we use the internet?**	**Knowledge of safety.** **What things can we do to stay safe when we use the internet?**
1. People may not be who they say they are. People we don't know could lie about who they really are.	Don't believe that a person you meet online is who they say they are. Remember that online it is easy for people to pretend to be someone else. Only accept a friend request from someone you don't know from real life, after you have discussed it with a parent or trusted adult.
2. Meeting strangers. People we meet online might not be who they say they are and ask to meet us in real life.	Never, ever meet anybody you have only met online, even if you have been swapping messages with them for a long time and feel that you know them, until you have discuss it first with a parent or trusted adult.
3. Deliberately sharing personal information. People we meet online might not be who they say they are and ask us to send them personal information like our name, address, which school we go to, passwords, photos.	Never, ever send your personal information to anybody you have only met online, even if you have been swapping messages with them for a long time and feel that you know them, until you have discuss it first with a parent or trusted adult.
4. Accidentally sharing personal information. We might 'accidentally' give out personal information about ourselves that people we don't know could get hold of.	Think very carefully about what you put on your profiles. People we don't know can use this to find out things about us that we only want trusted family and friends to know. If you are not sure what is safe information to post online, discuss it first with a parent or trusted adult.
5. Cyber bullying. We might get cyber bullied. People might send nasty messages to us, or post nasty things about us so that other people can see.	Don't get into an argument with someone who is cyber bullying you so they have less chance to be nasty. If you are upset, block them from your account and report it to the site where it happened. You do not have to deal with this on your own - ask a parent or trusted adult to help you stop the bullying. Remember, just because a bully says something nasty about you doesn't make it true.
6. Sharing personal photographs. We might post a photo of ourselves, or send one to a contact, and that photo could be passed on to other people. We might regret it later because we can't stop other people seeing it.	Keep your photo albums private so that only your trusted friends can see them. Ask a parent or trusted adult if you are not sure how to do this. Never, ever post a photo of yourself online or send it to someone unless you would be happy for your granny to see it.
7. Computer viruses. We might open an attachment that could damage our computer with a virus. This could allow other people to turn on our webcam or find out our private things like passwords without us knowing.	Never open any attachments or links in emails if you are not absolutely sure they have come from someone safe. Even if it comes from your friend ask them if they really have sent it and if it really is safe to open. Only then should you open it. Tell a parent or trusted adult as soon as you think you may have a virus so they can help you.

Table 2

Mean (and Standard Deviation) Scores of Knowledge of Online Safety and Knowledge of Online Risks, Results of ANCOVAs to Compare CATZ and Controls, and Effect Sizes

Outcome variable	Time 1		Time 2		F test	Cohen's d (95% CI)
	CATZ	Control	CATZ	Control		
				Tutors		
Knowledge of safety	1.20 (.70)	.87 (.62)	2.06 (1.06)	.96 (.76)	*F* (1,143) = 32.28***	.85 (.48 to 1.21)
Knowledge of risks	1.14 (.62)	1.48 (.89)	1.94 (1.11)	1.54 (.75)	*F* (1, 142) = 8.75**	.69 (.33 to 1.05)
				Tutees		
Knowledge of safety	.88 (.70)	.64 (.62)	1.33 (.93)	.71 (.53)	*F* (1, 142) = 8.56**	.57 (.16 to .99)
Knowledge of risks	1.23 (.71)	.67 (.55)	1.62 (.88)	1.04 (.76)	*F* (1, 141) = 3.42	.02 (-.40 to .43)

Note. ** p <.01, *** p < .001.

Author Disclosure Statement

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