



# **Evaluation of the risk education website for secondary-aged students**

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**RESEARCH REPORT 317**



# Evaluation of the risk education website for secondary-aged students

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This report describes a research project into the effectiveness of using an internet web site to improve the understanding of risk in school students aged between 14 and 18 years old. The chosen method was by group interviews which were performed before and after using the risk education website ([www.risk-ed.org](http://www.risk-ed.org)).

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## EXECUTIVE SUMMARY

This report describes a research project into the effectiveness of using an internet web site to improve the understanding of risk in school students aged between 14 and 18 years old. The chosen method was by group interviews which were performed before and after using the risk education website ([www.risk-ed.org](http://www.risk-ed.org)).

The trial consisted of 48 focus group interviews held in 9 participating schools with a total of 157 participants. Interviews lasted approximately 30 minutes, during which students were given a range of tasks which allowed them to describe their understanding of risk. Interview responses were categorised according to whether or not they showed an understanding of risk as a combination of a hazard with its probability.

After the initial interview, students were given a short task to complete by viewing the risk-ed web site. Repeat interviews were then conducted. Interview responses pre- and post-web site use were analysed using a paired-sample Student's *t*-test.

Initial interviews showed that students had a good understanding of what was meant by a hazard, with 76% of the relevant phrases describing a hazard correctly.

When students attempted to describe a risk, only 26% of phrases correctly linked a hazard with its probability. More often (71%) a risk was described purely in terms of a hazard or harmful outcome.

During the second interviews, students showed a greater understanding of risk. Over the whole trial sample, 41% of phrases described risk as a hazard with its probability which showed a significant increase in understanding after use of the risk-ed web site. Statistical analysis of the data showed a significant improvement in participants' understanding in the year 9 and year 12/13 groups. There was an increase in the frequency of correct descriptions of risk in the year 11 group but this did not satisfy the 5% significance level used to judge the data. The control group, who did not visit the web site, showed no such improvement.



# 1 INTRODUCTION

## PUBLIC UNDERSTANDING OF RISK

The public are increasingly being required to make decisions and choices based on their understanding of risk. Debates on genetically modified organisms, the use of mobile telephones and the effects of terrorist attacks are just a few examples. The media and public response to these challenges often does not match with an informed understanding of the risks involved.

In a major public consultation exercise<sup>1</sup>, the Health and Safety Commission (HSC) concluded that progress could be made by raising awareness of health and safety issues. A key area in this is the education of school-aged students in the concept of risk. Furthermore, it suggests:

Instead of treating this topic as a matter of following rules, pupils will where appropriate be taught to understand hazards and risks and how they should be managed. This better reflects the nature of society, where we all face a multitude of risks and need to know how to cope.

Revitalising Health and Safety,  
DETR.  
(p 36)

## RISK IN THE SCHOOL CURRICULUM

The value of a greater understanding of risk has been recognised in the National Curriculum for England and Wales. It requires the explicit teaching of risk in the subject areas of science; design and technology, art and design; information communication technology; and physical education. It states that pupils should be taught:

- about hazard, risks and risk control;
- to recognise hazards, assess consequent risks and take steps to control the risks to themselves and others;
- to use information to assess the immediate and cumulative risks;
- to manage their environment to ensure the health and safety of themselves and others;
- to explain the steps they take to control risks.

Post-16 curricula, citizenship and Personal, Social and Health Education (PHSE) also includes content which requires an understanding of the concepts of risk.

## RISK EDUCATION WEB SITE

This study looks at the effectiveness of the risk education web site found at the internet address [www.risk-ed.org](http://www.risk-ed.org) in helping pupils to develop their understanding of risk. The web site is aimed specifically at school students of secondary age (11-18) and consists of sections which cover hazards, probability and the concept of risk as a combination of hazard and probability. This is then reinforced by the presentation of case studies on subjects such as the use of brominated flame retardants, plasticisers in medical PVC devices and the disposal of the Brent Spar oil platform. This approach was designed to reinforce students' understanding of risk by challenging them to examine evidence and make balanced decisions on the risks involved.

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<sup>1</sup> *Revitalising Health and Safety, Department of the Environment, Transport and the Region, London, June 2000.*

## **OBJECTIVES OF THE STUDY**

The study was intended to look at the effectiveness of the risk education web site in improving secondary school students understanding of risk. To do this the following objectives were set:

- To develop, test and use a structured focus group interview format for gathering research data.
- To compare students' understanding of risk before and after using the risk-ed web site.

## 2 EXPERIMENTAL PROCEDURES

The chosen method for gathering data on students' understanding of risk and how it was influenced by using the web site was to undertake a series of group interviews before and after use of the *risk-ed* web site. A pilot study was undertaken to develop and refine the interview structure.

### PILOT STUDY

#### Introduction

The aim of the pilot study was to finalise the interview content, structure and analysis.

A total of 53 students were interviewed in two secondary schools and a sixth-form college. The groups were arranged as shown in table 1. Separate gender groups were used in year 9 students as it was felt that this may encourage a more open and responsive discussion than a mixed gender group of this age. In practice, during the trial phase of the research, year 9 groups were often combined as mixed gender groups. This was due to the constraints of participant school timetables and did not prove detrimental to the level or breadth of discussion during the interviews. Additionally, in the trial, one year 9 group was swapped for a year 8 group and in a second school, a year 10 group was substituted for a year 11 group (see appendix 2).

**Table 1** Pilot study groups

<i>Group</i>	<i>Year</i>	<i>Age (yrs)</i>	<i>Students</i>
1	9	13	Seven girls
2	9	13	Seven boys
3	11	15	Seven students (mixed gender)
4	12/13	16+	Seven students (mixed gender)

#### Findings on interview from pilot study

Students were comfortable and generally participated fully in the focus group discussion. They did not appear inhibited by the tape-recorder and adhered closely to the ground rules set out at the start of each session. It is therefore recognised that their contributions were a truthful and uninhibited reflection of their views.

Risk is an abstract concept and initial interviews highlighted that the students, of all ages, required a reasonable degree of structure to the interviews. To this end, stimulus material and tasks relating to risk were used to a greater extent than had been originally anticipated. Critics could highlight that this approach gives students guidance that could influence the outcome of the discussion. However, students engaged in more productive discussions when it was linked to a directed activity. The final interview structure is described below.

## INTERVIEW STRUCTURE

Groups of approximately 7 students were involved in focus group discussions held in classrooms familiar to the students. Seating arrangements were organised so that the students formed a "horse-shoe" facing the interviewer. Typically sessions would last 30 minutes depending on the degree of discussion and lesson timing in the school.

During the initial phase of the session, the students were asked to complete a name card to allow the interviewer to encourage participation from individuals within the group as appropriate.

Once settled, the discussion followed the sequence below:

1. Interviewer introduces students to the aims of the project, describes what will happen and sets the ground rules for the discussion. These were that the discussion should be general and not personalised, would not encroach onto activities that happens in school and would not relate to any specific person.
2. Students introduce themselves.
3. First question from interviewer asks each student in turn to describe what they understand by the term "risk".
4. Students are shown a stimulus material of a fairground rollercoaster and asked to consider what is meant by hazard and is it different to risk.
5. Guided activity in which students are given a set of cards with a method of transport on it. Cards were labelled: motorcycle, boat, aeroplane, cycling, walking, car, bus and train. The groups were then asked to discuss each one and rate them in terms of their relative risk.
6. Activity in which students are given a series of scenarios and, following discussion, rate them as high, medium, low or no risk. The scenarios included: working on a building site; working in a chemical factory; working in an office; living near a nuclear power station; bungee jumping; having an operation under a general anaesthetic, playing a game of rugby and playing a game of basketball. The number of scenarios used depended on the remaining time available in the interview.
7. The interviewer concludes the session by once more asking the students to individually describe what they understand the term "risk" means.
8. In the round-up, the interviewer thanks the group for their participation and asks for any further questions.
9. The interviewer then presents the group with their task which is to be completed by viewing the risk-ed web site (see appendix 3).
10. Finally, the interviewer describes what will happen to their input and thanks group for their participation.

The interviews were tape-recorded for later transcription and analysis. During the transcription process, comments from individual students were maintained as distinct phrases. To give students time to view the risk-ed web site and to accommodate the needs of the participating schools, follow-up interviews were typically performed three to five weeks after the initial interview

Prior to the second interview, students were asked for their general comments on the risk-ed web site.

## ANALYSIS OF INTERVIEWS

Transcripts of the interviews were analysed by classifying the phrases identified in response to the each of the questions posed.

For this study, the criteria used to judge the understanding of risk is based on the definitions used in the Health and Safety Executive (HSE) document, "5 Steps to Risk Assessment." This states that a risk is the chance, high or low, that somebody will be harmed by a hazard. A hazard is defined as anything that can cause harm.

Central to the analysis of the data is the classification of students' phrases. To reflect students' understanding of risk the following categories were used; phrases including elements that link a hazard with the probability of it happening, phrases that refer to probability alone and phrases containing hazards alone.

### Criteria for the classification of students' responses in respect of risk

In categorising phrases, the criteria described below were used.

#### Probability and hazard:

Phrases that demonstrate a combination of a possible outcome linked to a chance or likelihood of it happening. These responses corresponds to the accepted HSE definition of a risk. Also accepted were phrases that indicated an understanding of how often a particular hazard happened.

One area which proved problematic was the classification of phrases such as, "You could fall over" or "A brick could fall on you." In using words such as *could*, *can* or *might*, were the students articulating at a basic level an understanding of probability?

On many occasions, the use of this vocabulary appeared to indicate that one hazard, from a range of hazards, would happen. Using the building site example, typical hazards discussed were falling from scaffolding, being hit by falling objects, electrical hazards and machinery. In describing the risks, students seemed to use phrases such as *could happen* to indicate the particular hazard they were describing rather than its probability.

After careful consideration, it was decided to generally exclude phrases such as *could*, *can* or *might* from this category in the main analysis. This was to avoid an over-estimation of the students' link between probability and hazard which would give an inflated representation of their understanding. However, in recognition of this ambiguity, summary results from a secondary analysis, that does include these phrases in the classification, are shown in appendix 4. These too indicate an increase in understanding of risk following the use of the web site.

During this study, students' use of phrases such as *could*, *can* or *might* were not questioned further during the interviews because of the chance that this would be an external influence on the group's understanding of risk. Further investigations into how the quality of students' understanding of risk is expressed would be useful in exploring changes towards the use of more technical vocabulary.

### Probability:

Describes a risk in terms of a likelihood but does not link with hazard or outcome.

For the reasons described above, phrases including *could*, *can* or *might* were not considered to be an indication of probability.

### Hazard / outcome:

Describes risk purely in terms of the hazard involved or a possible outcome. Does not associate with its probability.

This method of classification was chosen to highlight any shift in students' understanding of risk and its components.

## **Classification of students' responses in respect of a hazard**

### Correct:

Understanding of hazard as a description of a possible outcome, or something that is able to cause harm.

Students often used the term *danger* or *dangerous* when describing a hazard. This was considered to be an indication of a harmful outcome and so was classified as a correct description of a hazard.

### Incorrect:

Phrases that were not linked with a possible outcome.

### Ambiguous:

Phrase could not be classified.

## **Data handling**

Summaries were produced as shown in table 2 and these allowed the comparison of responses before and after use of the risk-ed web site. Aggregation of the data and its conversion to a numerical form was performed to allow it to be assessed for significant differences following use of the web site.

**Table 2** Examples of summary analysis

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<i>Students' description of risk</i>	25 relevant phrases	
Probability and hazard	11	44%
Probability	0	0%
Hazard / outcome	14	56%

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<i>Students' understanding of hazard</i>	7 relevant phrases	
Correct	1	14%
Ambiguous	0	0%
Incorrect	6	86%

---

### **Statistical analysis**

Results were analysed using a one-tailed, paired-sample Student's *t*-test performed using a Microsoft<sup>TM</sup> Excel spreadsheet. This test is suitable for detecting significant changes in results from studies where data is collected from paired responses before and after an intervention. In this case, the data were paired so that the responses from a group in their first interview is paired with the responses from the same group in their second interview. It indicates whether a significant improvement has been produced by the intervention. The test is also appropriate for relatively small data sets.

### **WEB SITE TASK**

Students in the trial groups were asked to visit the risk-ed web site and answer a short series of questions. These were designed to encourage the students to view the site in a structured manner and would have taken in the region of 15-30 minutes to complete. The task was to be performed independently of any teacher input and many students completed it as a "homework". Appendix 3 shows the task that the students were set.

By asking the students to visit the web site outside of the context of a structured lesson will have meant that the students did not receive the additional support that would be given in a classroom setting. It did mean that students viewed the site on a voluntary basis and gave it as much or as little attention as they deemed fit. However, this method was chosen so that the effects of the web site alone could be judged, rather than the support and expertise of the various class teachers. It must be recognised that this structured task could, in itself, influence the students' understanding of risk. However it was chosen to ensure that participants were motivated to visit the risk-ed web site and was designed to be as minimal an additional intervention as possible.

### 3 RESULTS

#### PARTICIPATING SCHOOLS AND STUDENTS

In total, nine schools participated in the trial phase of the research. Schools were chosen to cover city, suburban and rural catchment areas. Two were used as control schools. A profile of the schools used in the trial is shown in appendix 1 and a breakdown of the groups in each school can be found in appendix 2

In total, 157 students were involved in the first interviews and 114 in the second. This represents a total of 73% of the initial interviewees who completed the second interview. The reduction in participants was due to absences and the requirement for two groups to undertake school examinations on the date offered for the second interview. These groups have been removed from the statistical analysis which requires pairs of groups pre- and post-intervention. The completion rate indicates that sufficient participants completed both sets of interviews to make the results valid.

Table 3 shows a break down of the numbers by year group.

**Table 3** Numbers of participating students

	<i>1<sup>st</sup> interview</i>	<i>2<sup>nd</sup> interview</i>	<i>completion</i>
<i>Year 9</i>	63	50	79%
<i>Year 11</i>	54	39	72%
<i>Year 12/13</i>	40	25	63%
<i>Whole sample</i>	157	114	73%

#### STUDENTS' UNDERSTANDING OF HAZARD

During both first and second interviews, students were asked to describe what they understood by the term hazard. This resulted in the analysis of 124 phrases from the first interviews and 70 from the second interviews (trial and control groups).

In general students showed a good understanding of a hazard.

When questioned in the initial interview, 76% of the trial responses correctly described a hazard as an action or object that could cause harm. In the control groups, 66% of responses were correct. There was no significant change when the same question was posed in the second interview.

Table 4 shows the percentage of correct responses for each trial and control year group in the first and second interviews.

**Table 4** Responses showing a correct understanding of hazard

		<i>1<sup>st</sup> interview</i>	<i>2<sup>nd</sup> interview</i>	
		<i>% correct responses</i>	<i>% correct responses</i>	<i>change</i>
<i>Year 9</i>	<i>trial</i>	87	93	+6
	<i>control</i>	(60)	(75)	(+15)
<i>Year 11</i>	<i>trial</i>	60	80	+20
	<i>control</i>	(72)	(38)	(-34)
<i>Year 12/13</i>	<i>trial</i>	83	69	-14
	<i>control</i>	(64)	(83)	(+19)
<i>All</i>	<i>trial</i>	76	81	+5
	<i>control</i>	(66)	(61)	(-5)

Control groups are shown in brackets.

Many participants used unsophisticated language to express their understanding of a hazard. Most often, a hazard was simply described as something that was "dangerous" or "harmful". Some typical responses were:

"Hazard is something which could be dangerous to you."

"Something that could put yourself or others in danger."

"Something dangerous."

There was no significant change in the sophistication of the language used after students had visited the web site.

## **STUDENTS' UNDERSTANDING OF RISK**

During all of the interviews, a total of 534 phrases were analysed for an understanding of risk in the first interviews and 529 in the second in the trial groups that viewed the risk-ed web site. In the control groups, who did not visit the site, a total of 191 phrases were analysed from the first interviews and 170 from the second.

The closeness in the number of phrases analysed in the first and second interviews reinforce the validity and reliability of the method used.

### **Findings at the first interview**

Students generally showed a poor understanding of the concept of risk when interviewed for the first time. The level of a risk was generally equated to the degree of harm that a particular hazard could inflict. It very rarely linked the hazard with its probability. Indeed, although not specifically measured, students generally did not appear to have a good understanding of probabilities.

A sample of typical phrases are shown overleaf to illustrate the classification used when analysing the interview transcripts.

Description of a risk involving both hazard and probability:

"Train – there aren't very many crashes but if there are they can be quite devastating. "

"At the same time, there are lots less aeroplanes in the sky at one time so it's very unlikely that they'll crash."

"If you are radio active it is more likely that you will develop cancer. So if you live next to a nuclear power station it's going to be more radio active than someone who doesn't."

Phrases used to describe a risk involving probability only:

"When you take a chance with something."

"Taking a chance on something."

(Something that is)...."not 100% certain."

Phrases that were used to describe risk in terms of hazard alone:

"Terrorist attacks – people might want to put aeroplane up near the top."

"The radiation causes cancer."

(Motorcycles)

"High risk – speed and stability. They cause more damage, the high risk ones."

Table 5 shows the classification of phrases when students were discussing risk during the first interviews.

**Table 5** Descriptions of risk during first interviews

		<i>% phrases including probability and hazard</i>	<i>% phrases using probability alone</i>	<i>% of phrases using just hazard / outcome</i>
<i>Year 9</i>	<i>trial</i>	24	4	72
	<i>control</i>	(18)	(2)	(80)
<i>Year 11</i>	<i>trial</i>	24	2	74
	<i>control</i>	(25)	(2)	(73)
<i>Year 12/13</i>	<i>trial</i>	34	3	63
	<i>control</i>	(31)	(6)	(63)
<i>All</i>	<i>trial</i>	26	3	71
	<i>control</i>	(25)	(3)	(72)

Control groups are shown in brackets.

## Findings at the second interview

The second interview followed the same pattern as the first to allow a direct comparison with students' responses before and after visiting the web site. In general, students showed the normal variation in responses that would be expected after such a short exposure to the web site, but it was apparent that responses were more likely to include a combination of probability and hazard.

Table 6 shows the classification of phrases when students were discussing risk during the second interviews.

**Table 6** Descriptions of risk during second interviews

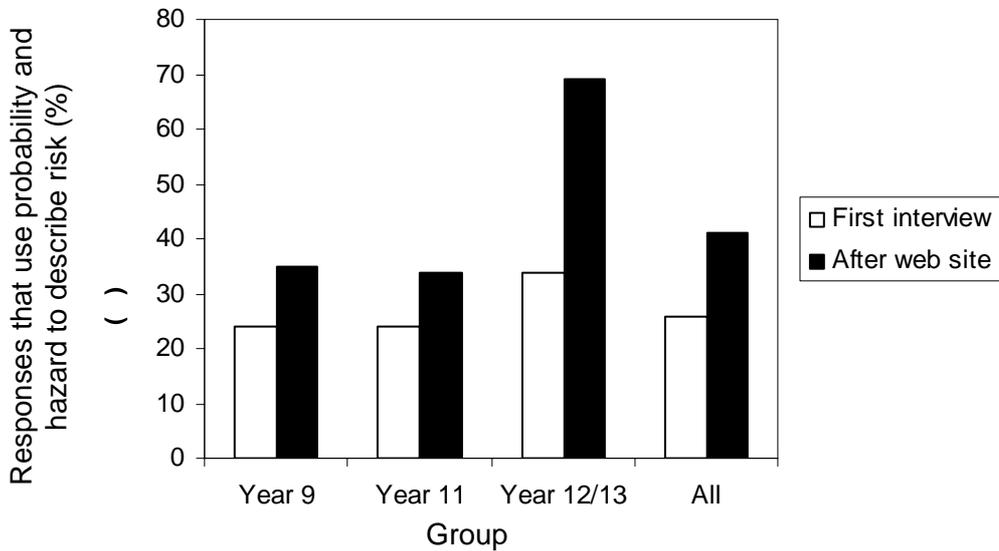
		<i>% phrases including probability and hazard</i>	<i>% phrases using probability alone</i>	<i>% of phrases using just hazard / outcome</i>
<i>Year 9</i>	<i>trial</i>	35	3	62
	<i>control</i>	(16)	(6)	(78)
<i>Year 11</i>	<i>trial</i>	34	2	64
	<i>control</i>	(20)	(0)	(80)
<i>Year 12/13</i>	<i>trial</i>	69	1	30
	<i>control</i>	(47)	(6)	(47)
<i>All</i>	<i>trial</i>	41	2	57
	<i>control</i>	(27)	(4)	(69)

Control groups are shown in brackets.

## Comparison of first and second interviews

To highlight the effects of the web site on the students' understanding of risk, the following analysis focuses onto the number of responses that linked both a hazard or harmful outcome with the probability of it happening. Figures 1a and 1b show the change in these responses from the first and second interviews for trial and control groups.

**Figure 1a** Trial groups: comparison of responses that describe risk as a combination of hazard and probability before and after use of the risk-ed web site .



**Figure 1b** Comparison of responses in control groups.

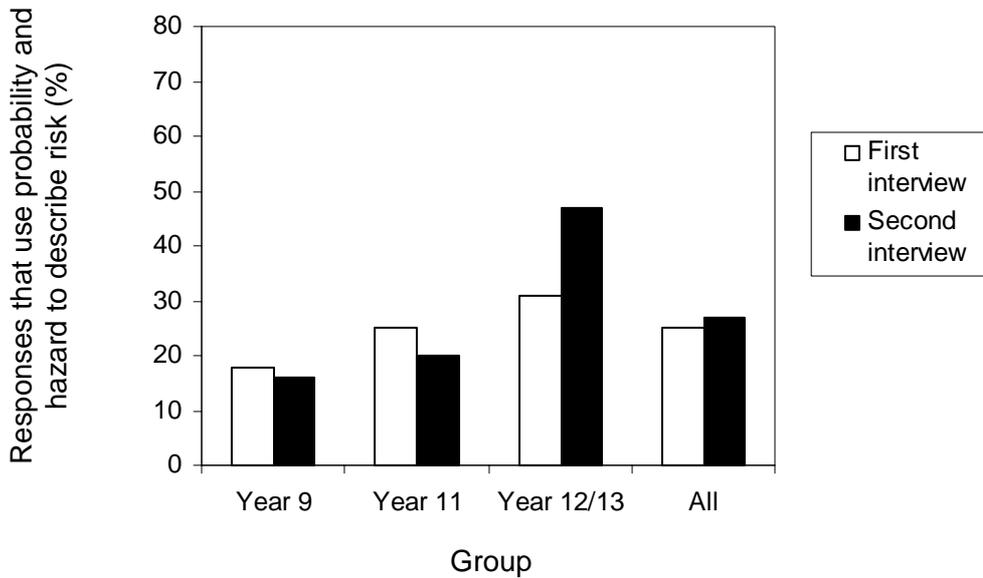


Figure 1a shows that, in each year group, there is an increase in the percentage of responses that describe risk as a combination of probability and hazard following use of the risk-ed web site. These results suggest that use of the web site does improve the understanding of risk and this was further investigated by performing a paired-sample Student's *t*-test on the data. This test

identified if the improvement in the percentage of answers that show an understanding of risk is statistically significant to a level<sup>2</sup> of  $p=0.05$  or less. The data and results are shown in tables 7a and 7b.

**Table 7a** Percentage of responses using probability and hazard

<i>School</i>	<i>Year 9</i>		<i>Year 11</i>		<i>Year 12/13</i>	
	<i>First interview % probability and hazard</i>	<i>After web-site % probability and hazard</i>	<i>First interview % probability and hazard</i>	<i>After web-site % probability and hazard</i>	<i>First interview % probability and hazard</i>	<i>After web-site % probability and hazard</i>
A (girls)	25	33				
A (boys)	40	46	18	16		
B (mixed)	14	67	32	31	29	91
C (mixed)	22	27	33	21	33	51
D (mixed)	15	35	24	44		
E (girls)	17	32				
E (boys)	29	36	24	39		
F (mixed)			21	53	40	73
G (girls)			27	36		
Significance <sup>2</sup> (p)	0.02		0.09		0.05	
Significant improvement	Yes		No		Yes	
Control schools						
H	22	15	18	16	44	25
I	11	17	30	25	41	84
Significance <sup>2</sup> (p)	0.4		0.13		0.38	
Significant change	No		No		No	

<sup>2</sup> The significance level is an indication of how valid it is to state that there is a significant difference between the paired samples following use of the web site. A level of 5% or less is deemed to be significant. This represents a 95% probability that the observed difference is real.

**Table 7b** All groups combined responses using probability and hazard

	<i>Combined trial groups</i>		<i>Combined control groups</i>	
	<i>First interview phrases combining probability and hazard</i>	<i>After web-site phrases combining probability and hazard</i>	<i>First interview phrases combining probability and hazard</i>	<i>After web-site phrases combining probability and hazard</i>
Combined %	26	25	41	27
Significance (p)	0.001		0.386	
Significant improvement	Yes		No	

When looking at all groups together, the increase in understanding of risk following use of the web site was again found to be significant. Table 8 summarises the improvement in each group.

**Table 8** Summary of the effects of the risk-ed web site on students' understanding of risk.

	<i>Significant improvement in understanding of risk as a combination of hazard and probability</i>	
	<i>trial groups</i>	<i>control groups</i>
<i>Year 9</i>	Yes	No
<i>Year 11</i>	No	No
<i>Year 12/13</i>	Yes	No
<i>All trial groups combined</i>	Yes	No

## **COMMENTS ON THE RISK-ED WEB SITE**

Prior to the commencement of the second interview, students were asked for their general comments on the risk-ed web site. The analysis of these comments was not as structured as for the main interview but several themes appeared.

- In general, students enjoyed using the site.
- The interactive nature of the site, with questions, quizzes and case studies, proved popular.
- Students felt the content was clear and understandable whilst some students in the year 12/13 groups would have appreciated a greater level of detail.
- Opinion was divided over the styling of the web site. Younger students in year 9 tended to like the appearance of the web site whereas older students in year 11 and especially the year 12/13 groups thought it was a little distracting.

## 4 CONCLUSIONS

### STUDENTS' UNDERSTANDING OF HAZARD

The assessment of the students' understanding of hazard was based on the HSE description of a hazard as anything that can cause harm.

Students showed a good understanding of what is meant by a hazard in their initial interviews. It can be speculated that possible reasons for this is the frequency that hazards are considered within the science curriculum and also the media coverage of risk which tends to emphasise the hazards involved. Also, the language used to describe a hazard is not as sophisticated as that used to describe a risk. For example, "It's something dangerous" was commonly used to correctly describe a hazard.

No clear change in students' understanding of hazard was seen after using the risk-ed web site but this is not surprising considering the high level of understanding shown in the initial interviews.

### STUDENTS' INITIAL UNDERSTANDING OF RISK

The assessment of the students' understanding of risk was based on the HSE description of a risk as the chance, high or low, that somebody will be harmed by a hazard.

Initially, the prevailing view of a risk was solely linked to the hazard involved. Table 6 shows that only 26% of responses in the first interviews linked a risk with both the hazard and its probability. There were few examples that illustrated a full understanding of the link between probability and hazard:

"You always get a thing like there is an 80% chance of this operation working."

More often, the link with probability was expressed as an amount, chance or the fact that it was rare to hear about particular hazards actually happening:

"There's loads of car crashes every day. Loads of motorcycle crashes."

"There's a chance that you might survive and there is a chance that you might not."

"Aeroplane – it's only very rare you hear of an aeroplane crashing. When an aeroplane does crash it's just death toll, everybody dies."

71% of responses described a risk purely in terms of the hazard. Greater risks were associated with hazards that had a greater effect:

"Risk is the.... the risk involved in everyday life and it can harm you. It's harmful and it's not."

"Risk is a hazard that can be prevented by other people and not just yourself."

"Risk is just a hazard."

In only 3% of the initial responses was risk associated with probability alone. Typical phrases , when asked to describe a risk, were:

"Is it like a chance that you are taking?"

"Taking chances."

## **EFFECTS OF THE RISK-ED WEB SITE ON STUDENTS' UNDERSTANDING OF RISK**

It must be noted that students were given a structured task to complete whilst visiting the web site (see appendix 3). This, in itself, could influence the students' understanding of risk. However it was chosen to ensure that participants were motivated to visit the risk-ed web site and was designed to be as minimal an additional intervention as possible.

When considering all participants in the study, there was a significantly improved understanding of risk following use of the risk-ed web site. Table 8 summarises the effects on students' understanding of risk as measured by looking at the frequency with which students used descriptions of risk that included elements of a hazard and its probability.

The results show that there was a significant improvement in students' understanding of risk in the year 9 and year 12/13 cohorts. The year 11 cohort showed an improvement but this fell within the 10% significance level and could therefore not be considered as a significant improvement. The control groups showed no significant change from the first to second interviews.

Whilst the link between a hazard and its probability was expressed more often, the language used by the students' did not appear to become significantly more sophisticated. For example, typical phrases would describe the probability component in terms of how common a hazard occurred or its likelihood of happening.

"There's more risk for more people but it doesn't happen as much. Like it's not common an aeroplane crash."

"You are more likely to die on a motorcycle but there are more likely to be more crashes on a car."

It was much more rare for students to use a more statistical description of probability and this happened more often in the year 12/13 groups.

"The probability of something bad happening."

"Risk is a danger and how likely it is to happen. The probability it will happen."

"The chance of something dangerous could happen like an accident."

The brief tasks on the risk-ed web site that were assigned to the trial students resulted in an increase in their understanding of the concept of risk but further intervention would be needed to increase the sophistication of the language used to describe risk.

## 5 RECOMMENDATIONS

Use of the risk-ed web site leads to an increased understanding of the concept of risk. Recommendations are made for the development of further educational resources.

1. Web sites should be considered as a suitable medium for the delivery of educational materials that are intended to raise the awareness and understanding of risk in secondary-aged students.
2. Web sites should be interactive, including self-test questions, guided activities and balanced case studies.
3. Emphasis should be placed on increasing students' understanding of probability as a component of risk.
4. The style and visual appearance of a web site is important in its impact. The appeal is age-dependant and should be chosen carefully to both engage younger students whilst not discouraging older users.
5. A more detailed and in-depth resource, following the pattern of the risk-ed content, should be developed which is aimed specifically at post-16 students.

## APPENDIX 1 SCHOOL PROFILES

<i>School</i>	<i>Location</i>	<i>Type</i>	<i>Number on roll (11-18)</i>	<i>% pupils achieving 5 or more grades A*-C (GCSE/GNVQ)</i>	<i>% pupils achieving no passes (GCSE/GNVQ)</i>
A	Suburban	11-18 mixed comprehensive	1621	58	0
B	Suburban	11-18 mixed comprehensive	1499	54	4
C	Suburban	11-18 mixed comprehensive	965	61	1
D	Rural	11-18 mixed comprehensive	1427	59	3
E	Rural	11-16 mixed comprehensive	1102	57	0
F	City	11-18 mixed independent	940	94	2
G	City	11-18 girls comprehensive	877	59	7
<i>Control schools</i>					
H	Suburban	11-18 mixed comprehensive	1309	44	12
I	City	11-18 mixed comprehensive	1313	81	0
<i>Average for England</i>				54	5

Source: DFES Performance tables 2003.

## APPENDIX 2 GROUPS INTERVIEWED

<i>Trial Schools</i>	<i>Year 9</i>	<i>Year 11</i>	<i>Year 12/13</i>
A (girls)	✓	✓	
A (boys)	✓		
B (mixed)	✓	✓	✓
C (mixed)	✓	✓	✓
D (mixed)	✓	✓	
E (girls)	✓	✓	
E (boys)	✓		
F (mixed)		✓	✓
G (girls)		✓ (year 10)	
<i>Control schools</i>			
H	✓	✓	✓
I	✓ (year 8)	✓	✓

## APPENDIX 3 STUDENTS' WEB SITE TASK

### Risk Education Research

Thank you for taking part in this research. It is really important that you visit the Risk-ed web site before we have our second group discussion. This will only take you about 15 minutes.

1. Log onto the internet and go to the Risk-ed web site at [www.risk-ed.org](http://www.risk-ed.org)
2. Do the activities listed below. Write **brief** answers in the boxes and bring them to our next group discussion.
3. Click on the link to the section on **risk**.

What are the two parts that go together to make a risk?

What would something that is high risk contain?

4. Look at the section on an **asteroid impact**.

What are the possible hazards of an asteroid impact?

What are the chances of the earth being hit by a large asteroid?

What is the risk to the earth of being hit by a large asteroid? Explain your answer.

5. Navigate to the section on **hazards** and find the **definition of a hazard**.
6. Look through the other parts of the site. Go to the **tiger test** and do the quiz to find out if you are a tiger or a mouse. What was your score?

Name: \_\_\_\_\_ Year \_\_\_\_\_

## APPENDIX 4 ALTERNATIVE CLASSIFICATION OF PHRASES

The tables below show the analysis of the interviews when accepting that phrases such as *could*, *can* and *might* represent a basic indication of probability.

Including these phrases led to an overall increase in the number classified as containing probability and hazard. Similar increases were seen in both first and second interviews.

Percentage of responses using probability and hazard  
(*could*, *can* and *might* accepted as an indication of probability)

School	Year 9		Year 11		Year 12/13	
	First interview % probability and hazard	After web-site % probability and hazard	First interview % probability and hazard	After web-site % probability and hazard	First interview % probability and hazard	After web-site % probability and hazard
A (girls)	30	45	26	37		
A (boys)	60	63				
B (mixed)	29	70	60	54	44	91
C (mixed)	34	41	53	39	41	54
D (mixed)	37	60	67	53		
E (girls)	37	61	45	52		
E (boys)	43	61				
F (mixed)			48	67	51	76
G (girls)			43	57		
Significance (p)	0.004		0.33		0.05	
Significant improvement	Yes		No		Yes	
Control schools						
H	37	38	36	44	33	41
I	47	43	43	46	59	84
Significance (p)	0.33		0.14		0.15	
Significant change	No		No		No	

All groups combined responses using probability and hazard  
(*could, can* and *might* accepted as an indication of probability)

	<i>Combined trial groups</i>		<i>Combined control groups</i>	
	<i>First interview phrases combining probability and hazard</i>	<i>After web-site phrases combining probability and hazard</i>	<i>First interview phrases combining probability and hazard</i>	<i>After web-site phrases combining probability and hazard</i>
Combined %	44	57	42	47
Significance (p)	0.002		0.08	
Significant improvement	Yes		No	

Summary of the effects of the risk-ed web site on students' understanding of risk  
(*could, can* and *might* accepted as an indication of probability)

	<i>Significant improvement in understanding of risk as a combination of hazard and probability</i>	
	<i>trial groups</i>	<i>control groups</i>
<i>Year 9</i>	Yes	No
<i>Year 11</i>	No	No
<i>Year 12/13</i>	Yes	No
<i>All trial groups combined</i>	Yes	No





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