An evaluation of educators’ views on the e-Bug resources in England

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ABSTRACT

Introduction: e-Bug is an international educational resource for young people covering microbes, hygiene and antibiotics. e-Bug supports NICE guidance on changing public behaviour around antibiotic use. This study aimed to determine educators’ views of the e-Bug teacher resources to inform further development and dissemination of e-Bug. Methods: Age appropriate e-Bug resource packs were posted to every primary school (N = 19,142) and secondary school (N = 5637) in England with a cover letter signed by the Chief Medical Officer, Chief Executive of PHE and e-Bug Project Lead inviting educators to complete an online survey to evaluate the e-Bug resources. The online survey consisted of nine questions and took approximately 15 min to complete. Results: 695 participants completed the online survey. 94% of participants rated the e-Bug resource as excellent or good; one fifth of respondents used the e-Bug resources at least termly. Educators who used e-Bug rated the different lesson plans as excellent or good including ‘Introduction to Microbes’ (98%) and ‘Hand Hygiene’ (95%). Educators provided suggestions for the development of additional lessons plans. Conclusions: Educators view e-Bug as a valuable resource for teaching children about hygiene and antibiotics. Further e-Bug promotion and resource development is required to increase awareness and usage in schools.

Introduction

Antibiotic resistance is one of the biggest threats facing us today (WHO 2014) and tackling this threat is one of Public Health England’s seven priorities (Public Health England 2014). As resistance to antibiotics increases, our antibiotics become less effective, making the risk of infection following operations and chemotherapy more dangerous (WHO 2014). The Chief Medical Officer, Dame Sally Davies, stated that ‘Antimicrobial resistance poses a catastrophic threat. If we don’t act now, any one of us could go into hospital in 20 years for minor surgery and die because of an ordinary infection that can’t be treated by antibiotics’ (2013). The Department of Health (2013) UK Five Year Antimicrobial Resistance Strategy 2013 to 2018 outlines seven key areas for action; one of which includes education of the public.

e-Bug, operated by Public Health England, is a health education resource for students and teachers covering microbes, antibiotics, antibiotic resistance and the spread, treatment and prevention of...
infection. e-Bug aims to tackle antibiotic resistance by educating children and young people about hygiene so reducing infections and increasing prudent antibiotic use (Lecky et al. 2011; McNulty et al. 2011). The e-Bug resources are evidence based and have been developed with input from teachers, health professionals and students (Lecky et al. 2011). e-Bug works in close collaboration with local Ministries of Health and Education (McNulty et al. 2011) across the world to translate and implement the resources; now in 26 countries and 23 languages.

e-Bug has a range of health education resources including those for 4–7 year olds (Key Stage 1), 7–11 year olds (Key Stage 2), 11–14 year olds (Key Stage 3) and 15–18 year olds (Key Stage 4/5). The teaching packs for 7–11 and 11–14 year olds were distributed to all schools in England in 2010 and 2015. The Science Show resources for Key Stage 1 were launched in 2011 with funding from the British Society for Antimicrobial Chemotherapy (Lecky and McNulty 2011) and new antibiotics and vaccination resources for 15–18 years olds at Key Stage 4/5 were launched in 2014/2015.

e-Bug evaluations have shown significant improvements in junior participants’ knowledge around antibiotics and farm hygiene (Hawking et al. 2013; Lecky et al. 2010). The online activity of users on the e-Bug website has also been evaluated and continues to be monitored (de Quincey et al. 2011). Further research has shown that the e-Bug website is frequently used throughout Europe with the majority of visitors being from the United Kingdom (Young et al. 2015).

Informal feedback on e-Bug from science and health educators at exhibitions and conferences in 2014 and 2015 suggested that many teachers were not aware of the e-Bug resources. To increase awareness of e-Bug, in 2015, a hard copy of the updated e-Bug teaching resources for 7–11 and 11–14 year olds were distributed to every school in England. This included new lesson plans on farm hygiene (KS2) (2012), oral hygiene (KS2) (2015), sexual transmission (KS3) (2012) and chlamydia (KS3) (2012).

The aim of this study was to evaluate educators’ views on the e-Bug teacher resources, and gain an insight into the current usage of e-Bug resources in schools. The study also evaluated the effectiveness of distributing the hard copy e-Bug resources to every primary and secondary school in England. The results from the study are important to inform further promotion, dissemination and future development of the e-Bug resources. Additionally, the results of the study are important to provide an indication of educators’ views on how and what school aged children should be taught about important health topics including hygiene and antibiotic resistance.

Methods
Research design

The study used an online survey of educators who responded to an invitation enclosed with the teacher resource packs sent to all schools in England in 2015. The e-Bug Key Stage 2 (7–11 year olds) resource packs were posted to 19,143 primary schools and Key Stage 3 (11–14 year olds) resource packs to 5637 secondary schools in England; this included state, independent and Pupil Referral Units. Special education schools were not included in the dissemination. The pack included a letter of endorsement from The Chief Medical Officer, Professor Dame Sally Davis, the Chief Executive of Public Health England, Duncan Selbie and the e-Bug Project Lead, Cliodna McNulty. The letter explained why e-Bug was important and how to use the resource pack. The second page asked the educators to complete a short online survey via a web link to evaluate the resource packs and in return they could win a set of Giant microbes for their school (see Appendix 1). To complete the survey respondents needed to enter the survey monkey web address and survey number (www.surveymonkey.com/S/CT52PGW). The survey included seven multiple choice and two open questions.

The survey questionnaire was developed and piloted with teachers and asked respondents for their overall view on e-Bug, if they used each of the e-Bug lesson plans and activities and how useful they found them. The questionnaire asked whether they used hard copy or online resources, and the usability, design, navigation and usefulness of the e-Bug website. The online survey took approximately 15 min to complete. All participants were educators and were over the age of 18.
Ethics

This study did not require National Research Ethics Service approval as it was outside the National Health Service and was classed as service evaluation. Consent was deemed accepted if participants completed the survey. Survey responses were collected in line with the Data Protection Act 1998 and Caldicott 1999 regulations on handling and distributing sensitive participant information.

Data analysis

Data from closed-ended questions was analysed using Microsoft Excel software and visual graphs were used to represent the findings of quantitative results. Frequency tabulations were conducted to describe the responses to the open-ended questions and analysed using thematic content analysis. The researcher (CE) examined the data using excel, interpreted it and formed themes in order to report the findings in a structured form. To ensure reliability, a second researcher (BH) participated in the development of the themes, and both researchers discussed the data and coding in order to agree on the emerging themes.

Results

Of the educators who received the resources, 2.8% completed the survey (695/24,780). 39.3% (254/646) of these were educators from primary schools, 27.7% (179/646) from secondary schools, 3.9% (25/646) were classified as primary and secondary, whilst 29% (188/646) were unclassified.

Use of e-Bug

41% of respondents reported previously using the Key Stage 2 e-Bug resources for 7–11 year olds, 25% the Key Stage 3 for 11–14 year olds, while only 4% for Key Stage 1 for 4–7 year olds and 4% for Key Stage 4/5 for 15–18 year olds. One fifth of respondents used the resources a minimum of once a term (3.2% weekly, 7.4% monthly, 9.6% termly), and 15% annually. One tenth reported they never used the resources, and 55% reported that this was the first time they had used them. Between 13 and 59% of respondents had used each individual lesson plan. The most used lesson plans were: Introduction to microbes (375, 59%), Useful Microbes (347, 55%), Harmful Microbes (337, 54%) and Hand Hygiene (332, 52%). The Key Stage 2 only lessons Farm Hygiene and Oral Hygiene were used by 19% (104) and 28% (159), respectively. The Key Stage 3 only lessons Sexual Transmitted Infection and Chlamydia were used by 19% (104) and 13% (72), respectively; these four lesson plans were the least used by educators.

The main way of accessing the e-Bug resources was by hard copy (73%), 26% of educators accessed the resources online via the e-Bug website, 6% accessed via the school’s shared drive, 2% via another website and 12% stated other means of accessing the resources.

Opinions on e-Bug

94% of the respondents rated the overall e-Bug resource as excellent (318, 46%) or good (331, 48%). Only 2% (11) rated the resources as average, none as poor, 1% (4) very poor, and 4% stated ‘other’ e.g. this was the first time they had used the resources so couldn’t comment. Individual lesson plans were rated as either good or excellent by 96% of educators. The highest rated lesson plans (as excellent or good) by educators who had used them were ‘Useful Microbes’ (98%, 339), ‘Food Hygiene’ (98%, 204) and ‘Antibiotics’ (98%, 244) (see Figure 1).

Educators were asked to what extent did they agree or disagree with statements about the e-Bug resources (see Table 1). Our results suggest that educators are happy with the resource packs, including the interactive lesson plans, and that they find the resources comprehensive and interesting. When given the option for additional comments, educators responded with themes such as ‘lesson length’
with one response being 'We have 90 min lessons. If there were a bit more extension material, that would be great, and probably useful to teachers with normal-length lessons as well'. Other responses focused on the design and visual aspect of e-Bug 'I really love the design and layout of e-Bug resources and find them incredibly useful resources that are eye catching and interactive for students'.

Other lesson plans or activities were suggested by 37% of respondents (257). The main theme to emerge was for more resources on 'Antibiotic Resistance' (16%) including MRSA, 'Superbugs' and hospital infections. Another theme emerged for the need for resources on the 'History of Science' (13%); for example the history of medicine, links to Semmelweis, Tudor (plague), trench foot and breakthroughs in science research. Further themes emerged for more resources about 'Vaccine Development' (11%) to include a vaccine timeline in the UK, a vaccine debate, side effects vs. the benefits and immunity.

'Differentiation within the resources' was a main theme suggested by 13% (32/240) of respondents and included suggestions to provide a range of options for different abilities, extended writing opportunities, homework and resources for students where English is an additional language and for students with Special Educational Needs. About a third of respondents gave suggestions on how to improve the e-Bug teacher resources (35%, 240). Some respondents suggested the need for CD/DVDs or Apps (9%) and also a need to improve promotion and dissemination of e-Bug (9%).
Discussion

Main findings

Educators value the e-Bug resources and view them as a useful resource for teaching children about microbes, hygiene, vaccinations and antibiotics, as 94% of the respondents rated the resource packs as excellent or good and 93% of respondents who have used the resources rated the individual lesson plans as excellent or good. Educators mainly agreed or strongly agreed that the e-Bug packs contain information that they need, resources are pitched at the right level, are interactive, the right length, comprehensive, interesting, easy to find and understand and that the resources have attractive graphics.

Further promotion of e-Bug is required to increase awareness of the resources and increase usage in schools as 55% of respondents stated that it was their first time using the e-Bug resources. Specific promotion is required to increase the awareness of the Key Stage 1 resources and the Key Stage 4/5 resources as they were reported as being the least used (both 4%). However, this was not unexpected as Key Stage 1 resources and the Key Stage 4/5 resources had only been available for 3 years and 7 months, and 1 year and 4 months, respectively, at the time of the survey, and hard copies were not distributed to schools.

Additionally, the more recently developed lesson plans for Key Stage 2, Farm and Oral Hygiene, and for Key Stage 3, STI and Chlamydia, were the least used lesson plans. This could be because the topics are targeted for a specific Key Stage according to the age-specific National Curriculum so not every Key Stage will need to use the lessons, and also because they are the most recently developed resources. Therefore, there is a need of further promotion of these newer lessons to increase awareness and usage in schools.

A third of respondents suggested other lesson plans or activities that they would find useful in the resources, including the topics of antimicrobial resistance, history of science and vaccine development and additional activities within the lesson plans for different abilities. Even though all the resources are freely available online, 9% of educators would still prefer to have something physical such as a CD containing all the resources. e-Bug will look into developing these new resources and materials in the future.

Strengths and limitations

More than one respondent may have completed the survey from one school and therefore it is not possible to calculate a true response rate for how many schools took part in the survey. Schools were sent the survey invitation with the hard copy of the Key Stage 2 and Key Stage 3 resource packs, therefore respondents are more likely to have used these hard copy resources provided than the Key Stage 1 or Key Stage 4/5 resources. In addition, educators will have been more likely to access the materials through the hard copy pack than online. Although the survey invitation was sent to all primary and secondary schools, respondents are more likely to include educators who are interested in e-Bug.

A limitation of the study was the low response rate; 2.8% of educators completed the survey. However, the online survey enabled a variety of educators to take part in the evaluation and 695 educators completed the survey providing a broad database of educator’s behaviours and opinions.

The survey was a reliable method of enquiry as it was standardised with the same questions and phrased in exactly the same way to each respondent which eliminated researcher bias.

Comparison with existing literature

The benefits of using e-Bug to deliver health education around microbes, hygiene and antibiotics have been well documented (Hawking et al. 2013; Lecky and McNulty 2011; Lecky et al. 2010, 2014; McNulty et al. 2011) with improvements in knowledge increasing after the delivery of an e-Bug lesson (Hawking et al. 2013; Lecky et al. 2010, 2014). Our research adds to the body of literature to support the value of the e-Bug resources as 94% of respondents rated the overall e-Bug resource as excellent.
or good. Previous research has not examined educators’ views on the e-Bug resources therefore this evaluation provides new evidence to support the importance of the e-Bug project.

Website usage has been monitored using Google Analytics to determine if disseminating the teacher packs has influenced the number of visitors to the e-Bug website. Findings show that website visits between 1st March 2015 and 31st July 2015 (34,950) were lower than that of the previous year (39,001), which may indicate that as educators received the teacher resources in the post they did not feel the need to go the website as well to download resources.

Previous research has shown that the e-Bug website is accessed most during the academic terms especially during the winter term in January and February (Young et al. 2015). Future research should explore why there is a peak in e-Bug use during the winter term but this is most likely due to cold and flu season. Our results indicate that most respondents used the e-Bug resources termly or less (20%) suggesting that the e-Bug topics are only taught termly, and the schools Curriculum could dictate this frequency of use. It would be advantageous to find out when the e-Bug topics are taught in the National Curriculum as most schools teach the same topics at the same time of year, every year. The most used lesson plans were the three ‘Micro-organism lessons’ and ‘Hand Hygiene lesson’; these topics are advisory within the PSHE Curriculum (PSHE Association 2014). Promotional work could focus around the time of year that the topics are taught in order to better inform teachers about the resources.

**Implications for future research**

e-Bug’s future priority should be to develop a promotion and dissemination strategy of e-Bug resources, in order to utilise maximum usage of the resources, as 55% of respondents stated that it was the first time they had used the e-Bug resources. This is further supported by the fact that some educators suggested developing resources that already exist in the e-Bug materials such as the vaccine debate kit and vaccination timeline. Targeted promotion surrounding the newer resources (Key Stage I and Key Stage 4/5) and newer individual lesson plans is also required to increase awareness and usage in schools. Promotion alongside health campaigns may also be beneficial.

The National Institute for Health and Care Excellence (NICE) guidance, launched in early 2017, on changing public behaviour around antimicrobial resistance recommends schools should use the e-Bug resources to teach students about health, hygiene and antibiotic resistance (NICE 2015). The recognition of e-Bug evidence-based resources by NICE should help to increase the use of e-Bug in schools and further research should be conducted to evaluate the impact of the NICE recommendation on educators views on e-Bug and the uptake of e-Bug in schools.

e-Bug will continue to work with educators to develop and promote resources for teaching children and young people about antibiotics, hygiene and infection. The e-Bug resources provide opportunities for any educator to address these important topics and contribute to tackling the public health threat of antibiotic resistance.

**Conflicts of interest**

At the time this work was conducted, the authors all worked for Public Health England to produce and disseminate e-Bug teaching resources for schools covering microbes, the spread, treatment and prevention of infection, and antibiotic resistance.

**Acknowledgements**

We would like to thank staff in the Public Health England Primary Care Unit, in particular Catherine Hayes for comments and suggestions on the manuscript.
Funding

This work was supported by Public Health England.

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Appendix 1.

e-Bug resource survey

(1) Which e-Bug teacher packs or resources do you use?

- Key stage 1 (Science show)
- Key stage 2 (Junior pack)
- Key stage 3 (Senior pack)
- Key stage 4 & 5 (Young adult)
- Haven't used e-Bug before

(2) What is your overall impression of the e-Bug teacher packs or resources?

(3) How often do you use the e-Bug teaching resources?

(4) Please advise which e-Bug lesson plans you have used and how useful you found them

0 = haven't used 1 = very poor 2 = poor 3 = average 4 = good 5 = excellent

| Lesson Plan | 1 | 2 | 3 | 4 | 5 |
|-------------|---|---|---|---|---|
| 1.1 Introduction to Microbes | 1 | 2 | 3 | 4 | 5 |
| 1.2 Useful Microbes | 1 | 2 | 3 | 4 | 5 |
| 1.3 Harmful Microbes | 1 | 2 | 3 | 4 | 5 |
| 2.1 Hand Hygiene | 1 | 2 | 3 | 4 | 5 |
| 2.2 Respiratory Hygiene | 1 | 2 | 3 | 4 | 5 |
| 2.3 Food Hygiene (KS2 only) | 1 | 2 | 3 | 4 | 5 |
| 2.3 Sexually transmitted Infection (KS3 Only) | 1 | 2 | 3 | 4 | 5 |
| 2.4 Farm Hygiene (KS2 Only) | 1 | 2 | 3 | 4 | 5 |
| 2.4 Chlamydia (KS3 Only) | 1 | 2 | 3 | 4 | 5 |
| 3.1 The Body's Natural Defences | 1 | 2 | 3 | 4 | 5 |
| 3.2 Vaccinations | 1 | 2 | 3 | 4 | 5 |
| 3.3 Oral Hygiene (KS2 Only) | 1 | 2 | 3 | 4 | 5 |
| 4.1 Antibiotics | 1 | 2 | 3 | 4 | 5 |

(5) Please list other lesson plans or activities (about the topics of microbes, infections, antibiotics, vaccines, etc.) that you would find useful in the teacher packs/resources?

(6) What do you like/dislike about the e-Bug teacher packs/resources?

Please tell us if you to what extent you agree or disagree with the following statements

- The e-Bug packs contain the information or resources I need
- The e-Bug lesson plans are pitched to the right academic level
- The e-Bug lesson plans and activities are interactive
- The e-Bug lesson plans are about the right length
- e-Bug resources are comprehensive
- Information in the e-Bug packs is interesting
- e-Bug resources are easy to find
- Information and/or resources are easy to understand
- Graphic design of e-Bug is attractive
- Other (please specify)

(7) How would you rate the e-Bug website at www.e-Bug.eu in terms of the following?

- Usefulness of student resources
- Organisation of resources
- Design and appearance
- Ease of navigation

(8) How do you usually access the e-Bug teacher resources?

(9) How did you find our teacher resources?

(10) What suggestions do you have for improving our teacher resources?