Informing realist evaluation of health-themed public engagement activities: Lessons from Thai science drama to raise awareness for antimicrobial resistance and research with children

Full Evaluation Report

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Disclaimer
This internal evaluation report, drafted and delivered by Marco J Haenssgen, does not necessarily reflect the views of the Mahidol Oxford Tropical Medicine Research Unit.

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Abstract

Background: The salience of public engagement in global health research and funding has grown rapidly. Engagement activities can help to broaden the appreciation and impact of medical research, but they can also be a means for community mobilisation and for bidirectional communication with the target groups and users of academic research. These activities sometimes involve creative means of expression (e.g. theatre, dance) in collaboration with the arts. However, there is currently no guidance on how to evaluate such public engagement activities in clinical medicine. This paper provides a structured and detailed public engagement evaluation case study of drama performances in Thailand to inform and guide future evaluations of health-themed public engagement activities involving creative forms of expression. The drama performances involved puppet shows with the themes of antimicrobial resistance and research with children.

Methods: We followed a six-step evaluation process that (1) defines project objectives, (2) identifies the evaluation approach, (3) develops an evaluation framework, (4) identifies indicators and appropriate methods for data collection, (5) collects and analyses data, and (6) produces evaluation findings for dissemination. Our realist evaluation framework was cognizant of artistic and medical goals of the engagement activity, of implementation processes and outcomes, and of target group heterogeneity. We gathered qualitative and quantitative data from audience members and project stakeholders to inform the evaluation.

Results: The theatre performances were attended by 1,440 audience members, 880 of whom returned at least a partially complete self-completion evaluation form. We complemented the quantitative evaluation forms with 24 stakeholder and audience member interviews and group discussions. We found mixed outcomes across our target groups depending on their prior level of information and education, but also varying across the medical and artistic objectives. Process analysis indicated that the collaborative setup facilitated the development of locally appropriate content and sustainable professional relationships between arts and science.

Conclusions: Our process description and realist approach can guide future evaluations for public engagement in global health and beyond. This would not only help researchers to respond to growing funder requirements for effective public engagement, but more widespread evaluation would also help to build a knowledge base of effective, target group specific, and locally appropriate public engagement activities.

Keywords

Public engagement; Global health; Realist evaluation; Theatre; Thailand
List of Abbreviations

AMR Antimicrobial Resistance
JITMM Joint International Tropical Medicine Meeting
MORU Mahidol Oxford Tropical Medicine Research Unit
OECD Organisation for Economic Co-operation and Development
OxTREC University of Oxford Tropical Research Ethics Committee
FTMEC Mahidol University Faculty of Tropical Medicine Ethics Committee

Conflicts of Interest
PYC commissioned the evaluation and led the public engagement activity that was being evaluated in this project.

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Informing realist evaluation of science-themed public engagement activities: lessons from Thai science drama to raise awareness for antimicrobial resistance and research with children

1 Background

Communication between the sciences and the public has evolved “from deficit to dialogue” (Stilgoe et al., 2014:5)—an evolution that over past decades has replaced public education and understanding with the idea of “public engagement” (Leshner, 2003; Retzbach & Maier, 2014). Mirroring the developments in UK higher education, the public engagement with the sciences in general and the medical sciences and global health in particular has been receiving growing attention among researchers and research funders (Cohen et al., 2008; Hamlyn et al., 2015; Research Councils UK, 2011; Wilson et al., 2014). Engagement activities are understood as a way to broaden the appreciation and impact of research, but they can also be a means for community mobilisation and for bidirectional communication with the target groups and users of the research (Kilroy et al., 2007; Lafrenière & Cox, 2013). A broad variety of activities has been carried out globally, including, for instance, infographics, science cafés, festivals, showcasing events, village drama, or applied theatre plays (Dalrymple, 2006; Etherton & Prentki, 2006; Skinner et al., 1991; Stilgoe et al., 2014). Such activities can have creative and collaborative elements, for example where theatre groups collaborate with funders or are involved in conveying health-related messages (Etherton & Prentki, 2006; Haddon, 2006; Lafrenière & Cox, 2013).

While the salience of public engagement in global health research has grown, methods to evaluate its effectiveness have developed comparatively slowly (Galloway, 2009; Lafrenière & Cox, 2013). Collaborative arrangements with the arts add another layer of complexity through the importance of pursuing artistic goals alongside education and awareness raising (Thomson et al., 2013a), and evaluation techniques for public engagement and activities the involve artistic expression are still very limited (Etherton & Prentki, 2006; Galloway, 2009; Ledgard, 2013, 2016). The lack of methodological guidance is especially problematic for forms of engagement that are based on creative and non-verbal
forms of expression without a straightforward health message (Lafrenière & Cox, 2013). In this report, we aim to contribute to the evaluation methodology on public engagement with a focus on non-verbal forms of creative expression, using the case study of a puppet theatre play in Thailand with the combined theme of antimicrobial resistance and research with children.

We used a realist approach to establish an evaluation framework and gathered qualitative and quantitative data from attendees and project stakeholders to understand the outcomes of the theatre performance across our target groups. We embedded this technique within a process evaluation design whose ultimate assessment criteria were effectiveness, relevance, efficiency, impact, and sustainability (OECD Development Assistance Committee, 1991, 2010). The process description and indicators used in this study can guide other researchers and public engagement specialists to evaluate their engagement activities more systematically, appropriately, and transparently.

2 Methods

2.1 Case Study

We evaluate a public engagement activity in Thailand, involving a touring production of puppet theatre entitled Fishy Clouds, which has the combined theme of antimicrobial over- and misuse and research with children (the show can be viewed at https://vimeo.com/209001558). The activity was part of ongoing public engagement activities at the Mahidol Oxford Tropical Medicine Research Unit (MORU; http://www.tropmedres.ac/) and arose in collaboration with the Bangkok-based theatre company B-Floor Theatre (http://bfloortheatre.com/). Although all decisions were made jointly, the collaboration was initiated and led by MORU, who operated a 4-member team headed by MORU’s Department of Bioethics and Engagement in order to contribute scientific inputs to the production. B-Floor had worked with MORU before, and its team for the Fishy Clouds production comprised 14 members (some of whom were freelance and contracted staff). The total budget for the production with 12 planned shows and an accompanying documentary production was GBP 32,000.
The production process commenced in May 2016 with a 4-month research and data-gathering phase in which B-Floor conducted interviews with MORU scientists and other groups relevant to the themes of the production (e.g. farmers and paediatricians). The resulting product was a 45-minute non-verbal puppet play whose story focused on antibiotic overuse throughout the ecosystem (e.g. personal use, agricultural use), which contributes to antibiotic resistance. A non-verbal performance was chosen for the play to be accessible for non-Thai-speaking audiences, and an accompanying multi-lingual leaflet handed out to audience members provided supporting information about the storyline and the main themes of antibiotic over- and misuse and research with children. *Fishy Clouds* also has an interactive element in which audience members vote by wearing a hat whether they would want the character of a father to allow his child to participate in medical research. Due to ongoing learning processes during the performances, a written synopsis had been developed during later shows to aid understanding among the audience members. The show targeted five main groups in Thailand:

1. Bangkok metropolitan theatre goers
2. School children in Bangkok
3. Scientists and healthcare workers at the Antimicrobial Awareness Week, Bangkok
4. Migrant workers in Thai-Myanmar border zones
5. Healthcare workers in Thai-Myanmar border zones

The first of the 12 planned performances was initially scheduled for October 2016, but the premiere had to be postponed due to the passing of the King of Thailand. As a result of the re-scheduling, 11 performances eventually took place between 11 November and 14 December 2017—coinciding with antimicrobial resistance awareness activities in Thailand—at the following venues:

- Chang Tong Eiem elementary school, Bangkok (1 performance)
- Baan Ma Muslim community, Bangkok (1 performance)
- Antimicrobial Resistance (AMR) Day Press Conference, Bangkok (1 performance)
• Thammasat University Open Day, Bangkok (2 performances)
• Democrazy Theatre, Bangkok (2 performances)
• Joint International Tropical Medicine Meeting (JITMM) conference, Bangkok (1 performance)
• A village resort and clinics at the Thai-Myanmar border, Mae Sot (3 performances)

Some of these venues were open and therefore not all audience members partook in the full show.

The evaluation for Fishy Clouds took place between September 2016 and March 2017. Ethical approval for this study has been received from the University of Oxford Tropical Research Ethics Committee (OxTREC Ref. 5125-16) and from the Mahidol University Faculty of Tropical Medicine Ethics Committee (No. TMEC 16-102). The evaluation was led by an external evaluator who had not been involved in the Fishy Clouds production, but it also had a capacity building objective, owing to which two research interns, two consultants, and three assistants participated in the evaluation. We explain the evaluation process in the following section.

2.2 Evaluation Process
Noting the sparse literature to inform this evaluation, we decided to develop a detailed case study to inform future evaluation practice in public engagement with global health. We employed a realist approach using a mixed method evaluation design and judge the success of the engagement activity through evaluation criteria developed by the OECD Development Assistance Committee (which are widely used in the area of aid project evaluation, OECD Development Assistance Committee, 1991, 2010). The evaluation project adhered rigorously to the process description in Figure 1 to build the evaluation case study. During the development of the Fishy Clouds performance, project objectives for the evaluation were formulated, an evaluation approach selected, an evaluation framework developed, and concrete indicators and methods for their measurement identified. We collected qualitative and quantitative data during and after the theatre performances, and data analysis took place in the following two months for dissemination thereafter.
The first stage of the evaluation consisted of formulating explicit objectives for the engagement activity against which success could be measured. For the evaluation to be meaningful, the engagement objectives had to reflect both parts of the artistic-scientific collaboration (Thomson et al., 2013a). This process required multiple iterations between the medical and artistic partners of the project. The final agreed project objectives were:

1. To raise awareness of antimicrobial overuse and misuse (the fact that there simply is a problem)
2. To raise awareness of the importance of research with children – including those involving antimicrobials (to help children themselves, provided that the research is useful, carefully thought out, ethical)
3. To produce a science-themed performance of entertainment value and high artistic quality
Following the agreement of the objectives to evaluate project success, the second step involved identifying an evaluation approach. Guiding considerations thereby were that (a) the evaluation is independent (rather than an action research approach), (b) responses between different target groups are likely to be heterogeneous, (c) the possible outcomes and underlying mechanisms of drama-based public engagement activities are little understood and project specific, (d) limited guidance regarding theatre and drama evaluation methods exists, and (e) the public engagement activities are implemented without scope for an experimental evaluation design. Considerations (d) and (e) prevented an impact evaluation approach. Among the remaining options were ex post evaluation approaches using logical frameworks, and process evaluation approaches using participatory action research and realist evaluation frameworks (Blakewell & Garbutt, 2005; Chinyowa, 2011; Galloway, 2009; Mirzoev et al., 2016; Reason, 2006; Wong et al., 2012). The need for independent evaluation (consideration [a]) rendered a participatory action research approach infeasible because it would entail influencing the engagement activity while it is still ongoing (Breel, 2015; Reason, 2006). The probable presence of group-specific outcomes and the yet limited methodological evaluation knowledge around drama performances for public engagement (considerations [b] and [c]) further meant that we judged a closed-ended logical framework approach inferior to a realist evaluation (Mirzoev et al., 2016).

We therefore decided to pursue a theory-based and process-oriented realist evaluation approach (Galloway, 2009; Mirzoev et al., 2016), the framework for which was developed in the third step. The framework draws on the existing yet limited evaluation literature around culture and the arts, within and outside of the health sector (Calzia et al., 2005; Galloway, 2009; Jackson, 1998; Jackson et al., 2003; Lafrenière & Cox, 2013; Thomson et al., 2013a). Based on our literature review and the project characteristics, we constructed a two-part framework that gives equal weight to the medical and artistic project objectives, depicted in Figure 2 and described below. (Whereas the evaluation of 1a, 1b, 1c, 2a, and 2b focused primarily on the outcomes of the performance, the evaluation of 2c, 2d, and 2e also involved a more explicit consideration of the collaborative process of production.)
For the medical objectives of raising awareness, we argued that awareness generated from the non-verbal, metaphorical performance is not of a factual nature but instead involves (1a) a growing interest in, (1b) a desire to learn more about, and (1c) reflection about one’s own ideas and values regarding antimicrobial resistance and research with children. We hypothesised that the principal mechanism underlying these outcomes is the stimulation of active thoughts through the creative expressions of the performance (Jackson, 1998; Jackson et al., 2003). However, the context of the intervention involved audiences with varying degrees of prior information and education to absorb and reflect on the expressions in the drama performance (e.g. school children vs. scientists).
For the artistic objective of producing an artistically worthwhile and entertaining product, we considered target group as well as stakeholder outcomes. Target group outcomes included (2a) the acknowledgment of the performances as “art” and (2b) a sense of enjoyment stemming from it, enacted by validating the performances through active appreciation (Lafrenière & Cox, 2013). Because we considered art as an intrinsic element of this play, the target group for this objective did not only include the theatre audiences listed in Section 2.1, but also critics and performing arts experts. We recognised the challenges in imposing a definition of “art” onto the audiences (Jackson, 1998; Jackson et al., 2003), and therefore embraced their own understanding and descriptions of the artistic value of the performance.

Stakeholder outcomes included (2c) the production of locally appropriate content, (2d) a lasting network of multi-stakeholder relationships, and (2e) a sense of success and improvement within the participating organisations. We hypothesised that these outcomes are realised through the collaborative development of creative forms of expression between artistic and scientific project partners (Jackson, 1998; Lafrenière & Cox, 2013). However, we expected that variation in these outcomes emerges across different organisational and regional backgrounds of the stakeholders. This being an evaluation, we were also aware of unintended negative outcomes (Etherton & Prentki, 2006; Guetzkow, 2002), although the absence of established evaluation frameworks prevented us from pre-formulating such outcomes. Our choice of qualitative methods (see below) was designed to identify both positive and negative unintended outcomes.

The fourth preparatory step prior to the performance consisted of identifying data collection methods to inform the evaluation framework. Considering the logistical constraints of gathering data from touring theatre audiences, we decided to utilise one-page self-completion evaluation forms owned by the theatre company and to substantiate them through qualitative data (interviews, focus group discussions) with audience members and stakeholders (UCL Public Engagement Unit, 2010). We chose to combine these qualitative and quantitative instruments in order to utilise their individual
strengths, namely an understanding of scale from the standardised evaluation forms and a more nuanced and personal understanding of experiences related to the project processes and outcomes (Onwuegbuzie & Leech, 2005; Teye, 2012). Qualitative methods in isolation would be unable to produce defensible claims about the entire study population, and quantitative instruments alone would invite misleading and decontextualized interpretations (Teddlie & Tashakkori, 2009). Due to the lack of benchmark indicators for public engagement projects, we refrained from assigning target values, intending instead to build a reference point for future work.

The quantitative evaluation forms asked the same 11 questions (plus basic demographic information) to all audience members. The questions on the form therefore had to be held simple as it would be used with general public of all age ranges and educational backgrounds (e.g. asking about reflections on medicine use in general rather than antimicrobial resistance specifically). The qualitative interview and discussion guides were developed to inform the categories of the evaluation framework, but also to understand how the target audiences answered the evaluation form questions (e.g. how is “correct use of medicine” understood?), and the various interpretations of the non-verbal performance and potential unintended consequences resulting therefrom.1 Audience members included in this evaluation were theatre goers, school children, and scientists and healthcare workers interested in antimicrobial resistance in Bangkok; and healthcare workers and migrant workers in Thai-Myanmar border zones. We also included drama critics as relevant stakeholders to evaluate the artistic and entertainment value of the performances more broadly (two reviews published during the evaluation period were included thus in the analysis; Mahasarinand, 2016; Pongpipat, 2016). Project stakeholders relevant for this evaluation were scientists working in MORU and B-Floor Theatre staff collaborating

1 Note that variations in interpretations are to be expected in an artistic performance and do not mean that the audience “misunderstands” the play. Deviations from the intended messages are relevant for the assessment of whether the project itself achieved its stated goals.
in the production of Fishy Clouds, and medical doctors and scientists specialising in antimicrobial resistance and research with children.

The evaluation forms were administered to all audience members after the performances. The audience member interviews and group discussions were intended to inform the interpretation of the evaluation forms and to gauge the retention of the theatre play approximately three weeks after the actual performance. Interviews with stakeholders were intended to assess the nature of the collaboration in the process of developing the performances. Sampling was purposive to include all across audience member and stakeholder categories (including recruiting male as well as female audience members).

The interview guides, evaluation forms, and consent documents were produced in English, Thai, Karen, and Burmese to be inclusive for all target groups.

Following this preparatory work, the data collection commenced together with the performance of the theatre shows on 11 November 2016. Self-completion evaluation forms were collected immediately after the shows between 11 November and 14 December 2016; audience member interviews followed three weeks after each show (respondents were recruited based on contact details provided on the evaluation forms); and stakeholder interviews were carried out between 1 December 2016 and 12 January 2017.

We analysed the data from the evaluation forms quantitatively, using descriptive statistical analysis to identify responses to the forms across target groups. Considering that the quantitative sampling was non-probabilistic (every audience member was invited), we can only speak for the sample of respondents (880 out of 1,440 participants). The qualitative data was analysed using thematic analysis that considers responses in the context of the personal characteristics (e.g. target group) and institutional constraints (e.g. employing organisation) of the respondents (Kohler Riessman, 2006; Lieblich et al., 1998). We pre-formulated themes for the analysis based on the evaluation framework, but were also receptive to emerging themes in the qualitative data. Following the data analysis, we judged the overall success of the project according to the criteria of effectiveness, relevance, efficiency,
impact, and sustainability. We used Stata 13 for quantitative analysis, and Nvivo 11 for qualitative analysis (QSR International, 2017; StataCorp, 2013).

The final stage culminated in knowledge sharing of the experience through a collaborative workshop and a stakeholder meeting at MORU, and through case study publications (including on the Global Health Network) to share lessons of the evaluation with the wider community of global health researchers.

3 Results

By the time of this evaluation, 11 Fishy Clouds shows had been completed with 1,440 people attending the performances in total, nearly twice the anticipated audience of 800. Due to the higher-than-anticipated demand (especially at a Bangkok school, where almost 500 instead of expected 200 children attended), only 1,276 evaluation forms were distributed, of which 943 were returned by the audience members. The sample of returned questionnaires does therefore not reflect the entire audience. For example, during the first school performance, 360 evaluation forms were handed out to an audience of 480. Because students in lower grades entered the performance venue first, the 120 omitted audience members are older children from higher grades (5th and 6th grade, aged 10 to 12 years). Similarly, observations when handing out evaluation forms at Bangkok AMR events showed that specialist audiences occasionally declined completing the form, indicating that their possibly critical view would skew the analysis.2

Ultimately, 880 forms had partial or complete information, which were the basis for our quantitative descriptive analysis (summary statistics are presented in Table 1). We complemented this information with interviews and focus group discussions, involving 21 female and male respondents from all target

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2 The self-administered questionnaires did not permit us to capture reasons for refusal systematically, but informal conversations with audience members during the AMR Day Press Conference and the JITMM Conference highlighted the reasons given above. The lower inclination of scientists to participate in the evaluation can also be seen in the low response rate of 13% at the JITMM Conference (39 out of administered 289 forms were returned), compared to an average response rate of 92% in all other performances.
audience groups (incl. 3 focus group discussions with school children, theatre goers, and Mae Sot healthcare workers), and 10 “stakeholders” comprising theatre critics, the B-Floor Theatre and MORU teams, and subject specialists in antimicrobial resistance and research with children. Interviews were conducted in Thai, English, and Karen, yielding approx. 11:30 hours of recorded interview material and 135,000 words of transcripts and interview notes. Field notes collected during the performances served to contextualise the analysis. A summary of the evaluation form responses is displayed in Figure 3, indicating variations across the five main target audiences. Overall, our analysis of the qualitative and quantitative data suggests that the *Fishy Clouds* project was partially successful in achieving its objectives.

### Table 1. Summary Statistics of Evaluation Form Responses

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangkok School Children</td>
<td>418</td>
<td>57.5</td>
</tr>
<tr>
<td>Bangkok Theatre Goers</td>
<td>155</td>
<td>21.3</td>
</tr>
<tr>
<td>AMR Scientists and Medics</td>
<td>37</td>
<td>5.1</td>
</tr>
<tr>
<td>Mae Sot Migrant Workers</td>
<td>107</td>
<td>14.7</td>
</tr>
<tr>
<td>Mae Sot Healthcare Workers</td>
<td>10</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>727</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 12 Years</td>
<td>342</td>
<td>38.9</td>
</tr>
<tr>
<td>12 to 17 Years</td>
<td>171</td>
<td>19.4</td>
</tr>
<tr>
<td>18 to 29 Years</td>
<td>149</td>
<td>16.9</td>
</tr>
<tr>
<td>30 to 49 Years</td>
<td>156</td>
<td>17.7</td>
</tr>
<tr>
<td>Above 50 Years</td>
<td>62</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>880</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Venues</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangkok School</td>
<td>314</td>
<td>35.7</td>
</tr>
<tr>
<td>Bangkok Muslim Community</td>
<td>63</td>
<td>7.2</td>
</tr>
<tr>
<td>AMR Day Press Conference</td>
<td>32</td>
<td>3.6</td>
</tr>
<tr>
<td>Thammasat University Open Day</td>
<td>98</td>
<td>11.1</td>
</tr>
<tr>
<td>Democracy Theatre</td>
<td>82</td>
<td>9.3</td>
</tr>
<tr>
<td>JITMM Conference</td>
<td>30</td>
<td>3.4</td>
</tr>
<tr>
<td>Mae Sot Wattana Resort</td>
<td>98</td>
<td>11.1</td>
</tr>
<tr>
<td>Mae Sot Wang Pa Clinic</td>
<td>66</td>
<td>7.5</td>
</tr>
<tr>
<td>Mae Sot Mawker Thai Clinic</td>
<td>97</td>
<td>11.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>880</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>9</td>
<td>1.1</td>
</tr>
<tr>
<td>Primary</td>
<td>418</td>
<td>52.7</td>
</tr>
<tr>
<td>Secondary</td>
<td>221</td>
<td>27.9</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>86</td>
<td>10.8</td>
</tr>
<tr>
<td>Graduate and Above</td>
<td>59</td>
<td>7.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>793</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Ethnic Background</strong></td>
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<td></td>
</tr>
<tr>
<td>Myanmar and Burmese Ethnic</td>
<td>217</td>
<td>25.5</td>
</tr>
<tr>
<td>Groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thai</td>
<td>39</td>
<td>4.6</td>
</tr>
<tr>
<td>Other Asia</td>
<td>577</td>
<td>67.7</td>
</tr>
<tr>
<td>Rest of the World</td>
<td>17</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>850</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Authors.

Notes. A complete audience member census was attempted, therefore no underlying random sampling procedure and no standard errors reported. Total population of audience members comprised a larger fraction of Thai school children aged 11 to 12 years old (i.e. 5th and 6th grade students). Discrepancies in total percentages due to rounding errors.

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For simplicity, we refer to freelance and contracted staff working with B-Floor on the production as “B-Floor team.”
3.1 Achievement of Project Objectives

3.1.1 Awareness

The first part of the evaluation considers the awareness-raising objectives of Fishy Clouds, focusing on antimicrobial resistance and research with children. The play intended to draw attention to these broad problem areas rather than conveying precise factual knowledge. We considered that such awareness-raising activities therefore stimulate the interest in (Outcome 1a), a desire to learn more about (Outcome 1b), and a process of reflection about one’s own ideas and values (Outcome 1c) regarding these two themes. We argue that these outcomes are realised through an active thought process, enabled by the creative expressions within the performance. However, we are also cognizant of variation and emerging themes in people’s interpretation of the performance, which we explored through qualitative research. Overall, the quantitative indicators from the evaluation forms draw a positive picture (Table 2), but the qualitative evidence from the audience members indicates that
interpretations can be various and partly at odds with the intended message (we discuss the limitations of the data collection methods in Section 4). We consider the overall achievement of the awareness-raising objectives as mixed.

The overall response to the awareness-related evaluation form items among all audience members was high, indicating a positive reaction related to increased interest in (88%), desire to learn more about (84%), and reflection about medicine use (81%); research with children received similarly high results with 78%, 79%, and 80%, respectively. Bangkok theatre goes and Mae Sot migrant workers responded most positively to the questions about correct medicine use (related to antimicrobial resistance), whereas the Mae Sot healthcare workers produced the most positive responses about research with children. The scientific and healthcare audiences of the AMR Day Press Conference and the JITMM Conference exhibited the lowest responses, with 58% agreeing that the play gave them new ideas about medicine use and increased their desire to learn more about research with children. However, still 81% of this group indicated that they would like to learn more about correct medicine use. Bangkok school children also had high results ranging from 74% to 88% across the various awareness-related questions (Q4-Q7, Q9-Q11).

We are acutely aware that a self-administered evaluation form is prone to response biases, including primacy effects of the “yes” option presented first, and the possibility of a more general tendency for yes-saying in self-completion questionnaires (Bowling, 2005). Yet, even if response biases and mode effects existed in the administration of self-completion evaluation forms, the extensive literature comparing various questionnaire administration modes suggests that it is improbable that the majority of Fishy Clouds’ audience members produced systematically misleading answers (e.g., Fouladi et al., 2002; Kaplan et al., 2001; Siemiatycki, 1979). We therefore have reason to believe that the performance has indeed raised awareness among the audience groups with respect to medicine use and research with children.
<table>
<thead>
<tr>
<th>Theme: Antimicrobial Resistance</th>
<th>Target Groups</th>
<th>Education Level</th>
<th>Venues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4 Before watching the drama, were you interested in the correct use of medicines?</td>
<td>Bangkok School Children: 75% (410), Bangkok Theatre Goers: 76% (148), AMR Scientists and Medical Professionals: 86% (37), Mae Soi Migrant Workers: 73% (96), Mae Soi Healthcare Workers: 60% (10)</td>
<td>None: 57% (7), Primary: 74% (405), Secondary: 78% (215), Undergraduate and Above: 75% (84)</td>
<td>Graduates and Above: 90% (58)</td>
</tr>
<tr>
<td>Q5 Did the drama increase your interest in the correct use of medicines?</td>
<td>Bangkok School Children: 88% (418), Bangkok Theatre Goers: 91% (150), AMR Scientists and Medical Professionals: 72% (36), Mae Soi Migrant Workers: 91% (101), Mae Soi Healthcare Workers: 80% (10)</td>
<td>None: 88% (8), Primary: 86% (411), Secondary: 93% (220), Undergraduate and Above: 91% (85)</td>
<td>Graduates and Above: 71% (59)</td>
</tr>
<tr>
<td>Q6 Do you want to learn more about the correct use of medicines?</td>
<td>Bangkok School Children: 81% (414), Bangkok Theatre Goers: 89% (150), AMR Scientists and Medical Professionals: 81% (37), Mae Soi Migrant Workers: 89% (96), Mae Soi Healthcare Workers: 90% (10)</td>
<td>None: 89% (9), Primary: 78% (404), Secondary: 90% (218), Undergraduate and Above: 92% (86)</td>
<td>Graduates and Above: 83% (86)</td>
</tr>
<tr>
<td>Q7 Did the drama give you new ideas regarding the correct use of medicines?</td>
<td>Bangkok School Children: 81% (417), Bangkok Theatre Goers: 85% (151), AMR Scientists and Medical Professionals: 58% (36), Mae Soi Migrant Workers: 89% (95), Mae Soi Healthcare Workers: 80% (10)</td>
<td>None: 67% (9), Primary: 78% (409), Secondary: 90% (216), Undergraduate and Above: 80% (85)</td>
<td>Graduates and Above: 63% (57)</td>
</tr>
<tr>
<td>Q8 Before watching the drama, were you interested in the participation of children in research?</td>
<td>Bangkok School Children: 58% (416), Bangkok Theatre Goers: 53% (152), AMR Scientists and Medical Professionals: 53% (36), Mae Soi Migrant Workers: 69% (98), Mae Soi Healthcare Workers: 100% (9)</td>
<td>None: 44% (9), Primary: 60% (406), Secondary: 64% (219), Undergraduate and Above: 56% (86)</td>
<td>Graduates and Above: 55% (58)</td>
</tr>
<tr>
<td>Q9 Did the drama increase your interest in the participation of children in research?</td>
<td>Bangkok School Children: 74% (417), Bangkok Theatre Goers: 81% (150), AMR Scientists and Medical Professionals: 65% (37), Mae Soi Migrant Workers: 88% (93), Mae Soi Healthcare Workers: 90% (10)</td>
<td>None: 67% (9), Primary: 73% (403), Secondary: 83% (215), Undergraduate and Above: 84% (86)</td>
<td>Graduates and Above: 73% (59)</td>
</tr>
<tr>
<td>Q10 Do you want to learn more about the participation of children in research?</td>
<td>Bangkok School Children: 74% (410), Bangkok Theatre Goers: 84% (152), AMR Scientists and Medical Professionals: 58% (36), Mae Soi Migrant Workers: 85% (97), Mae Soi Healthcare Workers: 90% (10)</td>
<td>None: 100% (8), Primary: 74% (401), Secondary: 86% (219), Undergraduate and Above: 83% (86)</td>
<td>Graduates and Above: 78% (59)</td>
</tr>
<tr>
<td>Q11 Did the drama give you new ideas regarding the participation of children in research?</td>
<td>Bangkok School Children: 80% (417), Bangkok Theatre Goers: 85% (150), AMR Scientists and Medical Professionals: 68% (37), Mae Soi Migrant Workers: 90% (99), Mae Soi Healthcare Workers: 70% (10)</td>
<td>None: 89% (9), Primary: 77% (408), Secondary: 90% (220), Undergraduate and Above: 82% (85)</td>
<td>Graduates and Above: 61% (57)</td>
</tr>
</tbody>
</table>

Source: Authors.

Notes: Values as fraction of people responding “yes” to respective questions. Number of observations per question and group in parentheses.
However, while the questions in the self-completion forms indicate a positive response to the play among the target audiences, they do not illuminate the nature of awareness, and whether people’s interpretations and sense-making processes were in line with the intentions of the play. With the help of the qualitative data, we consider in the following the outcomes and the underlying mechanisms in greater depth. The overall conclusion of the qualitative analysis is that the positive responses to the evaluation forms may overstate the awareness gains in the specific areas of antimicrobial resistance and research with children. We will demonstrate that, firstly, the intended awareness-raising outcomes of “interest,” “desire to learn,” and “reflection” appeared to be more prevalent and more nuanced with regard to antimicrobial resistance (AMR) rather than research with children. Secondly, audience members rarely related to the specific themes of AMR and research with children, but rather to the broader themes of health, illness, and medicine (AMR) and general medical research and treatment (research with children). Thirdly, the non-verbal performance created a wide range of interpretations, some of which were at odds with the scientific messages.

As far as the first point on awareness outcomes is concerned, respondents from different groups indicated that the play “was clear” (male migrant worker, 53 years, primary education), “easy to understand” (male theatre goer, 37 years, undergraduate-level education), and that “the science message came out quite clearly” (female AMR scientist, 28 years, currently pursuing PhD). Some of the interviewed audience members were indeed clear about the subject matter and echoed the expected outcomes, highlighting for example that,

“There’s a comment from […] my daughter [who attended the show with the respondent], that she couldn’t relate the rain … so feeding the fish with antibiotics, she understood that the colourful glitter was antibiotics and she was quite sure. But how does growing the plants and the animals using antibiotics make people sick?” (female theatre goer, 49 years, graduate-level education)
“I was wondering since there’s a drama that tries to communicate this [research with children], I was wondering if it actually exists, if they’re really doing it [research], and where […]. Is the problem actually real?” (theatre goer focus group discussion, female, 24 years, currently in graduate education)

“I think that, one thing that was kind of like ‘Hey, I’m secretly impressed and I never thought of’ was about that, about the experiments using kids as participants.” (female AMR scientist, 28 years, currently pursuing PhD)

Such statements indicate that is plausible that some audience members considered and reflected on the intended themes in Fishy Clouds. However, the interviewees would typically articulate interests, desire to learn, and reflection in relation to antimicrobial resistance rather than research with children, which was less readily recognised as a theme (“far-fetched;” male theatre goer, 37 years, undergraduate-level education) and required deeper probing during the interviews (we explain in Section 3.1.2 that “research with children” had become subordinated to the theme of AMR in the production process, which may be reflected in the audience members’ perception). Consider for example the following exchange on a Fishy Clouds scene on research with children:

Q: “[Referring to a scene a doctor measures a child’s head to determine appropriate medicine dosage through clinical research] So did that scene give you any thoughts or views about …”

R: “Oh, yes, I forgot. I forgot to tell you about that.”
Q: “Yes, what is it?”

R: “Oh, that, I mean I don’t know how it’s related to drug resistance.” (male theatre goer, 37 years, undergraduate-level education)

Even where a theme was recognised, an articulated desire from the respondent to learn more about the subject was often connected with an admission that no information was actually sought.

The nonetheless positive responses in the evaluation forms relate to the second point, namely that audience members tended to relate to broader themes than antimicrobial over- and misuse and research with children. Especially non-medical and non-academic respondents without prior knowledge of AMR tended to relate to antibiotics in particular (in line with imagery in the show and the messages in the accompanying information leaflet) as well as to medicine use and illness more generally:

“I think [I want to learn more about] antibiotics – […] how many types there are and what types that ... in fact the medicines that we take every day or even our food, they never tell us about the ingredients.” (male theatre goer, 40 years, high school education)

“It was interesting because every time I take medicines – if I have a stomach ache, I’d take Paracetamol to ease the pain.” (male school child, 13 years, 7th grade)

“[Fishy Clouds] wanted to tell us about, about germs and things, and wanted to […] tell us that the germs are easy to pass on. […] Even the smallest things can get us sick, diseased.” (female school child, 16 years, 11th grade)
The theme of “research with children” was more often understood as stressing the importance of research in general and the correct dosage of medicine:

“[Referring to the audience vote on the child character’s participation in research] I understood that the show wanted to emphasize the final [message], meaning they wanted to know if after watching the whole show, the audience realises the importance of research or not. Right? Because it’s about doing research.” (female theatre goer, 49 years, postgraduate-level education)

“I want to learn more on how much medicine we should give to children so we can treat them properly.” (healthcare worker focus group discussion, all female, 21 to 32 years, all high school education)

The wide interpretation of the play’s themes suggests that Fishy Clouds raised awareness with regard to health, medicine, and research more broadly, rather than specifically for antimicrobial use and research with children.

While the overall direction of the interpretations in the interviews is line with the intention of the science-themed drama, also unexpected and potentially detrimental interpretations emerged. This is the third and final point relating to the awareness-raising outcomes of the play (the entire spectrum of interpretations within the interviews and focus group discussions is displayed in Figure 4). Some of the unexpected interpretations revolved for instance around the spread of germs and the need for handwashing to limit their spread:
“[The drama is trying to tell the audience] to take care of ourselves, take care of ourselves and avoid doing things, what it is? Things that can negatively impact us. For example, be mindful when eating or wash our hands before eating, things like that. We have to take care of ourselves first.” (female school child, 16 years, 11th grade)

Q: “What did the teacher [drama teacher who brought the school children to see Fishy Clouds at Democrazy theatre] teach you after seeing the show?”

R1: “She says if you get diseased you have to protect yourself, you have to use medicines.”
   (female, 13 years, 7th grade)

R2: “Wash your hands often.” (male, 14 years, 2nd grade)

R3: “But not protect in the way that …” (female, 12 years, 7th grade)

R1: “When you want to eat something, you have to wash your hands to prevent the germs from getting in.” (female, 13 years, 7th grade)

R3: “When you protect yourself, you can’t protect yourself in the way that you use medicines for everything, no matter how minor.” (female, 12 years, 7th grade)

R1: “You have to be careful.” (female, 13 years, 7th grade)

(school child focus group discussion)

Other unintended interpretations were more concerning, relating to the use of medicine specifically, but with diverging implications:
“I’m not comfortable taking medicines anymore.” (theatre goer focus group discussion, female, 24 years, undergraduate-level education)

“This drama teaches me that if I don’t take the medicines, the germs will increase and make us sick, then we would have to take even more medicines and get injections and take 3-4 pills every day. So I’m scared. And from then on, I take all the medicines.” (school child focus group discussion, female, 14 years, 7th grade)

 “[Interpreting the scene where a pill-shaped hat was measured for a child:] We should take medicines and take care of ourselves to be safe from the germs so we can feel better.” (female school child, 16 years, 11th grade)

These statements illustrate that the spectrum of interpretations emanating from Fishy Clouds can include potentially problematic conclusions. Increased awareness about antimicrobial use and the “correct” use of medicine can therefore also include conclusions that one should take more medicine rather than less (or more appropriately), which might not be desired or supported by the play. Especially groups with presumably little contextual experience with the topics of AMR and research with children (migrant workers, school children) uttered a broader and unexpected range of interpretations of Fishy Clouds.
Figure 4. Interpretations of *Fishy Clouds* Across Target Audiences

Source: Authors.

*Notes.* Themes as emerging from interviews and focus group discussions with audience members. Shaded cells indicate that theme arose within the respective target group.
We explain below how the hypothesised mechanism of “active thought processes” contributes to the heterogeneous interpretations of *Fishy Clouds*’ main themes.\(^4\) To begin with, active thought processes in relation to the themes of antimicrobial resistance and research with children were influenced by audience members’ prior interest in, knowledge of, and understanding of the problem areas:

“*Do they want to say that the fish is sick and spreads the germs to the girl? At first I thought that because from the material [referring to accompanying information leaflet] and my own understanding, I knew they wanted to do the play on antibiotics, right? So from my basic knowledge I know that antibiotics are used for feeding, it’s in the food, the food for fish, something like that. It can be for both planting and raising animals.*” (female theatre goer, 49 years, postgraduate-level education)

“*[Drug resistance] is something I’ve read about before. But it [the drama] might enforce the impact, because before this I just read it through and may have forgotten it without caring that much. But with this drama, it’s embedded in my head more so now I know that it’s serious […].*” (male theatre goer, 40 years, high school education)

While some audience members suggested that awareness-gains may be limited in light of their existing knowledge (“*It didn’t change [my ideas about antibiotic use] because I’m already aware about this;*”

\(^4\) Note that respondents also reflected in response to the evaluation form and interviews. For example, a theatre-going focus group respondent indicated that, “*When I saw the questions [on the evaluation form] I thought ‘Is it [research with children] really that serious?’*” The evaluation process itself has therefore influenced the active thought processes of respondents, but spontaneous reflection in response to interview questions have not been considered in this evaluation.
male theatre goer, 49 years, postgraduate-level education), prior knowledge and awareness about the topic appeared to help audience members to interpret the performance.

The audience members also related the story and its imagery to their personal experiences in the process of interpretation. For instance, a male scientist stated that the play can enable patients to “see their own mistakes by not taking medicine while somebody is advising it [...] That’s good that they get like a ... mirror to see” (male scientist, 29 years, PhD-level education) Similarly, respondents in focus group discussions related the show explicitly to their own experiences:

“There were parts that are just like my life. Sometimes my mother takes me to the doctor and the medicines are too large for kids, so she would try... It was like the doctor was trying to ask her for permission.” (school child focus group discussion, female, 12 years, 7th grade)

“It makes me look back to [pause] to the real treatment method for myself. What medicines I should use for specific conditions. I started to realise and think ‘If I have a stomach ache, what should I actually do? I should do this, right?’ [...] In the past it’s been quite wrong [laughed].”

(theatre goer focus group discussion, female, 24 years, undergraduate-level education)

These statements indicate that personal experiences can be important to realise the awareness-related outcomes of Fishy Clouds. This reflective process is complicated if an audience member does not have a clear, pre-formulated concept of antimicrobial resistance and research with children (especially non-academics and non-medics). The play itself is not necessarily able to establish these categories on its own. For example, the interviewed children typically referred to medicine in general, being unfamiliar

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5 Similar responses were uttered by researchers as a reason to refuse completing the evaluation forms for Fishy Clouds.
with the colloquial as well as the technical terms for antibiotics. Interpretations therefore revolved around medicine use more general. Likewise, interviews with migrant workers at the Thai-Myanmar border indicated that the respondents had a general interest in health-related subjects, but the play did not appear to have stimulated any interest or desire in relation to the specific thematic foci. A female migrant worker in Mae Sot was asked if the play changed her view relating to antibiotic resistance, replying that, “I do not know about that. But those working in the factory and do not get enough sleep, it damaged their brain and exposed them to viruses” (female migrant worker, 15 years, primary education). This suggests that the play may be insufficient to produce a first awareness about the scientific themes without complementary information or pre-existing knowledge (indeed, pre-existing awareness).

The show did provide complementary information in the form of information leaflets, but the interviews and our own observations during the performances indicate that they weren’t necessarily read (“If I read the brochure they handed out before the show, I would have understood it more but I didn’t read it;” male theatre goer, 37 years, undergraduate-level education). In addition, the language in the leaflets could be ambiguous for groups not familiar with drug resistance. For example, the English version of the leaflet’s title (“The antibiotic resistance story”) translates into Thai as “เรื่องดื้อๆ” (“Rueang due due,” can be translated as “The story of resistance” but also as “The story of stubbornness”). The expression “ดื้อยา” (“due yaa”) is the only (and unambiguous) description of “drug resistance” in Thai. Yet, the terminology of “stubbornness” has been misinterpreted by a child in the focus group discussion, who indicated that, “I also have drug resistance,” meaning that she is “stubborn” and often refuses to take medicine. Her reflections based on this interpretation led her to conclude that, “even though I can’t take the pills, I would try very hard to take them” (school child focus group discussion, female, 14 years, 7th grade). Though uncommon, such observations reinforce

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6 Later shows in Mae Sot also involved short sessions to explain antimicrobial resistance and research with children to audience members, but we have no qualitative information about the effectiveness of these measures.
the notion that interpretations of the performance without prior knowledge and awareness can be ambiguous.

Discussion about *Fishy Clouds* is a facilitator for raising awareness in light of the possible misunderstanding or confusion about the non-verbal messages. The interviews revealed that conversations during and after the performance took place between peers, between children and their parents, and between audience members and the theatre staff. Such discussions can involve the meaning of specific metaphors and images as well as the overarching message of the play, entailing clarification and refinement of understanding:

“I told him, I said, ‘Son, I think they’re talking about people who don’t know how to take medication properly.’ But I didn’t look away when I said that. I only used my shoulder to nudge him so I don’t disturb his viewing. Only used my shoulder to nudge him to look, and he did. But I don’t know while watching if he followed my thoughts or had the same thoughts as me. But one thing that I got from that performance was he paid decent attention on it, even when I nudged him and said ‘I think he’s not taking those medicines correctly, wrong type,’ I tried to communicate with him that way. We somewhat talked after the performance, to some extent.”

(male theatre goer, 40 years, high school education)

“I asked him [a theatre staff member after the show] what the fish [a character in *Fishy Clouds*] represented because the most confusing point for me was the fish, I didn’t know if the fish … Because everything is fantasy, it requires imagination, it’s surreal so I couldn’t tell how real the fish was. Was it a normal fish, was it sick, or was it an overdosed fish?” (male theatre goer, 37 years, undergraduate-level education)
“There were some [parts of the show] that I did not understand so I asked my husband and he said it was about getting ill and getting diseases.” (female migrant worker, 15 years, primary education)

Conversations about the play did not follow automatically, did not necessarily entail active discussion (“I told my mom that I went to see that. And my mom didn’t say anything;” female school child, 16 years old, 11th grade), and did not inevitably adhere to the intended messages of the show. But our qualitative research underlines that Fishy Clouds stimulated discussion as an important mechanism to support active thought processes to interpret the play and to achieve its awareness-raising objectives.

The final theme in understanding the active thought process underlying the intended awareness-raising outcomes of Fishy Clouds was the retention of the play’s message. Our post-performance interviews between 2 and 4 weeks after the play indicated that audience members retained what they considered the main messages of the show, but struggled to recall details. A male theatre goer for example warned that our post-performance interviews might be ambitious, considering that, “As soon as the performance is over, we know we have the same understanding, then our brains immediately go somewhere else” (male theatre goer, 40 years, high school education). While imperfect retention should be expected, it appeared to be weaker with topics that were more remote to respondents’ personal experiences: Compared to medicine use, the topic area of research with children was rarely raised by respondents, and spoken about less readily even after probing. This does not necessarily mean that reflections and discussions about the broader topic cease, but we may argue (once more) that the intended message associated with the play may require more systematic reinforcement, for example as part of the school curriculum (as suggested by a theatre critic).

In summary, we consider the awareness-raising objectives of Fishy Clouds as partially achieved. The quantitative indicators from the evaluation forms depicted a positive response to the awareness-raising
objectives of *Fishy Clouds*, but the qualitative analysis suggested that messages received by the audience extended beyond AMR and research with children. It appeared thus that the play raised awareness about health, medicine, and research more generally, and that the theme of “research with children” was less easily received by the audiences than the theme of antimicrobial over- and misuse. Target group differences thereby emerged especially with respect to prior awareness about and understanding of the intended themes:

- Children and migrant workers without contextual knowledge exhibited the widest range of interpretations and therefore might benefit from more explicit guidance on the topic and ongoing reinforcement of the messages through discussion and complementary information campaigns.
- Scientists and healthcare workers had existing subject knowledge and might not consider themselves to be an awareness-raising priority group, but may find the play inspiring as the evaluation forms indicate.
- Metropolitan theatre goers with comparatively high education (two-thirds had at least undergraduate education) represented an intermediate group who appeared more likely to absorb, reflect on, and discuss the intended themes with their children.

We conclude that the imagery and depiction of health-and research-related topics interacted with and reinforced existing conceptions among the target audiences. Audience members with more background knowledge were therefore more likely to absorb and reflect on the intended themes of *Fishy Clouds*, while less informed groups were more likely to exhibit varied and potentially problematic interpretations of the play. As a result, *Fishy Clouds* appeared to be more effective in raising existing awareness about medicine use and health, rather than generating specific awareness about antimicrobial misuse and research with children where before there was none.
3.1.2  Artistic and Entertainment Value

3.1.2.1  Art and Enjoyment

Two outcomes related to the artistic objective of the theatre production are (2a) the acknowledgment of the performances as art and (2b) a sense of enjoyment stemming from it. We argued that a key mechanism to realise these outcomes is the active appreciation of the show among the target audiences (rather than mere attendance). We considered audience as well as critics’ views about the artistic validity of the performance. Our evaluation indicates that *Fishy Clouds* achieved these outcomes: Although the artistic expression received mixed reviews, its entertainment value was agreed among audience members and critics. The show also appeared to exercise a positive influence on promoting the (performing) arts more broadly.

As far as validation of among the target group is concerned, three questions in the evaluation forms related specifically to the impressions of the play and the overall response among all audience members was positive. The first question in the forms asked whether the audience member liked the drama, with 95% agreeing overall. The second question asked whether they think it is art, with 81% agreeing that it is. The third question asked whether the elements of the play relate to the respondent’s culture, which attracted a more conservative yet still positive response of 64% overall. Group-specific responses are depicted in Table 3 and explained below.
<table>
<thead>
<tr>
<th>Target Groups</th>
<th>Education Level</th>
<th>Venues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangkok School Children</td>
<td>None</td>
<td>Bangkok School</td>
</tr>
<tr>
<td>Bangkok Theatre Goers</td>
<td>Primary</td>
<td>Bangkok Muslim Community</td>
</tr>
<tr>
<td>AMR Scientists and Medics</td>
<td>Secondary</td>
<td>AMR Day Press Conference</td>
</tr>
<tr>
<td>Mae Soi Migrant Workers</td>
<td>Graduate and Above</td>
<td>Thammasat University Open Day</td>
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<tr>
<td>Mae Soi Healthcare Workers</td>
<td></td>
<td>Democracy Theatre</td>
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<td></td>
<td></td>
<td>JITMM Conference</td>
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<td></td>
<td></td>
<td>Mae Soi Wattana</td>
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<td></td>
<td>Mae Soi Wang Pa</td>
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<td></td>
<td></td>
<td>Mae Soi Mawker Thai Clinic</td>
</tr>
<tr>
<td>Q1 How do you feel about the drama?</td>
<td>95% 97% 76% 94% 70%</td>
<td>95% 100% 90% 97% 75% 94% 95% 94% 94% 94%</td>
</tr>
<tr>
<td>(% &quot;Like it&quot;)</td>
<td>(417) (151) (37) (99) (10)</td>
<td>(313) (63) (31) (98) (79) (28) (97) (62) (93)</td>
</tr>
<tr>
<td>Q2 Do you think this is art?</td>
<td>79% 93% 89% 79% 40%</td>
<td>74% 87% 97% 97% 92% 86% 80% 70% 76% 76%</td>
</tr>
<tr>
<td>(% &quot;Yes&quot;)</td>
<td>(418) (150) (37) (99) (10)</td>
<td>(314) (63) (32) (98) (77) (29) (94) (61) (93)</td>
</tr>
<tr>
<td>Q3 Did you find any element of this drama related</td>
<td>57% 80% 68% 70% 33%</td>
<td>51% 84% 78% 76% 75% 62% 65% 65% 64% 64%</td>
</tr>
<tr>
<td>to your culture? (% &quot;Yes&quot;)</td>
<td>(416) (150) (37) (96) (9)</td>
<td>(312) (63) (32) (98) (77) (29) (95) (60) (91)</td>
</tr>
</tbody>
</table>

Source: Authors.

Notes. Values as fraction of people responding “yes” to respective questions. Number of observations per question and group in parentheses.
The results of the evaluation forms indicate that the overall high level of validation of the play varied among audience groups. Bangkok metropolitan theatre goers and Mae Sot migrant workers indicated the highest level of approval according to the evaluation forms. The international scientists and healthcare workers attending the Antimicrobial Resistance Week appeared to be less in favour of the play, but still appreciated its artistic value. The small group of healthcare workers at the Thai-Myanmar border in Mae Sot produced the lowest responses, with only 4 out of 10 understanding the play as a piece of art. School children reported a positive attitude towards the play but were also less likely to validate the artistic expression. School children also indicated a relatively weak relationship between the elements of the drama and their own culture, which might result from the concept of “culture” being difficult to assess in a short evaluation form. However, school children had a similar response rate for this question as for other questions in the self-completion form. Furthermore, migrant workers and healthcare workers at the Thai-Myanmar border and international audiences (JITMM, Mae Sot Wattana Resort) indicated relatively low responses in this category as well, which may reflect the fact that the show was initially targeted at urban Bangkok families (see next section on locally appropriate content).

The comparatively low overall rating by the healthcare workers and migrant workers in Mae Sot suggests that the play was perceived by some audience members as factual health education rather than a creative play. For instance, a migrant worker explained that the show was not art because it “demonstrated illness and different kinds of symptoms” (male migrant worker, 53 years, primary education). Similarly, a healthcare worker in a focus group discussion described the play as “knowledge” instead of art. This does not necessarily mean that they do not appreciate Fishy Clouds, but that for some people entertainment value arose from an interesting subject rather than from artistic expression:
“In the beginning I was not interested because the big fish came out and I thought it was a show for small children, and later as I continued watching I understood that it was related to taking medicines and I became interested.” (healthcare worker focus group discussion, all female, 21 to 32 years, all high school education)

Yet, other audience members, both in Mae Sot and in Bangkok, highlighted the artistic quality of the puppetry, performance, and live music in particular. Especially the interviewed school children enjoyed the puppets and music as both artistic and entertaining. The following statements illustrate the largely positive reception of the performance:

“I’ve always liked puppets. [...] Especially with something very academic, if I had to only sit and listen, I would fall asleep. But when they make the story interesting by sharpening it with art, I feel that it’s... it’s got more to offer. It’s enthralling.” (theatre goer focus group discussion, female, 24 years, undergraduate-level education)

“It was art in many ways because for example, the... the characters, the materials, those are artwork. The performance, the presentation as a nonverbal drama, that’s one kind of art.” (female theatre goer, 49 years, graduate-level education)

“I think it is art because there’re puppets that they made themselves. And I really liked the music, they make that themselves.” (male school child, 13 years, 7th grade)
“The cartoon characters, the sounds, things like that. It was interesting.” (female school child, 16 years old, 11th grade)

While part of the show’s appeal emanated from an active appreciation of the performance and the theme, B-Floor Theatre’s reputation as an avant-garde theatre company was arguably an attractor as well. After having seen earlier rehearsals, a theatre goer focus group participant stated that she came to the Democracy Theatre performance because of B-Floor Theatre, but she “never thought it was a science drama” (theatre goer focus group discussion, female, 24 years, undergraduate-level education).

A scientist familiar with public engagement similarly stated that “I’d seen the name B-Floor before and I saw it again then so I knew they’d perform and I also knew it’d be about antibiotic resistance” (female scientist, 28 years, currently pursuing PhD).

From an audience member perspective, the objective of creating an artistic product with high entertainment value has therefore been achieved. But the project also had another unforeseen positive consequence in the artistic sphere, namely promoting the arts among local Thai audiences. Two excerpts from the interviews demonstrate how the performance itself had been inspiring for artistic endeavours among the audience:

“I think the puppets were interesting because the school [my son is attending] is also starting to make puppets. They have different methods. It was the puppets and the music that I went to see after the show ended. […] But when I watched [the show.] I didn’t watch the performers, I watched the facial expressions and props – the props they make – because they kids were very interested in those so I went to see with the kids. I want to know their interests because when they have an interest, they’ll pick that up and apply it.” (male theatre goer, 40 years, high school education)
R5: “This show, if there’s a chance, we’d make it our show that we perform.” (female, 14 years, 7th grade)

R2: “But teacher [teacher’s name] told us we had to rehearse a lot.” (male, 14 years, 2nd grade)

R3: “But we’re willing to.” (female, 12 years, 7th grade)

R5: “We want to continue performing this drama [Fishy Clouds]. Like they’re our original and we take it over from them.” (female, 14 years, 7th grade) […]

R3: “We’re about to create a performance, a puppet performance. But the puppets ... we still haven’t mastered handling them. […] We went to watch the show [Fishy Clouds] so we can do it more smoothly because when we do it [currently], the audience pays more attention on us when they should pay more attention on the puppets.” (female, 12 years, 7th grade)

(school children focus group discussion)

This emerging theme is therefore consistent with the artistic objective of the project. The B-Floor-MORU collaboration has not only produced a product that is validated as artistic and enjoyable by most parts of the target audience, but that also has the potential to inspire further artistic activity among them.

The perspective of the critics is more conservative than the audience’s. The critics acknowledged the artistic dimension of the play, in particular the artistic skills of the performers, the ability of Fishy Clouds to stimulate meaningful discussion, and the live music accompanying the performance. As an artistic product, however, they deemed the play “only partially successful” (critic). One reason for this view was the storyline of the play. On the one hand, a published review described the play as “easy to
understand and straight to the point” (Mahasarinand, 2016:10B). On the other hand, one reviewer argued that the play struggled to convey its story (“If I'm brutally honest, I didn't really know what was going on most of the time;” critic) and suggested that too little interaction between the puppets and the audience took place (“maybe the contact with the audience would have helped the narrative;” critic). Another point of concern was that the accompanying leaflet, though considered to be essential for understanding the moral of the play, was also criticised for framing the performance in a way that contradicts artistic expression. The play therefore appeared to be geared more towards messaging than artistic expression: Asked whether Fishy Clouds broadened the outreach of the arts to audiences with hitherto little exposure, one critic responded, “Well, I think the main message is about the—like we should not just like popping pills—and they shouldn’t be like just popping pills into your body. […] For me, it’s more of that message than like exposure to art” (critic). Although B-Floor Theatre had been acclaimed in a published review of Fishy Clouds to be “more than capable of going beyond their usual tag of politically oriented physical theatre company” (Mahasarinand, 2016:10B), they also appeared to be somewhat uncomfortable with the scientific theme in the view of the critic (“it seems like it’s not their cup of tea;” critic).

The critics’ nuanced positions were somewhat at odds with the stakeholders who were involved in the production process, whose views were unambiguously positive. For the theatre staff, the play was an abstract means to communicate ideas and stimulate discussion; the scientists appreciated the creative interpretation of the subject by skilled artists:

“[Fishy clouds] is specifically designed to promote discussion about a particular topic that is generally concern at the moment. So it’s contemporary art because it’s of the moment, it’s facing a problem that we are facing right now.” (B-Floor Theatre team)
“Art always communicates but what it communicates, it depends on each piece of art.” (B-Floor Theatre team)

“I feel that they tried to make it into the theatre style, with our voice, with our narrations.”
(MORU team)

 “[Fishy clouds] includes creativity. It includes colours. There’s a whole scenario. And even though there’s a scientific, like health-related message that you don’t decide, of course, that is based on evidences. There’s still a part to know how to make the message, how to transmit it. So, it’s about creativity. It’s about imagination. It’s about trying to inspire people. And so, of course, it’s art. Yes, it is.” (MORU team)

However, even if the artistic expression in the play is partly compromised, critics, stakeholders, and audiences agree that the play offers high entertainment value (“visually entertaining;” critic), especially for children. This facet of the artistic objective can therefore be understood as achieved.

3.1.2.2 Collaborative Process
Aside from audience and stakeholder validation, we considered outcomes resulting from the collaborative production of the science-themed drama. The outcomes in our evaluation framework included (2c) the production of a locally appropriate science-themed drama, (2d) lasting relationships in this collaboration between the arts and the sciences, and (2e) a shared sense of organisational learning and success. This section will focus first on the collaborative process and its outcomes on the organisation, before discussing the appropriateness of the content from the stakeholder perspective.
This section demonstrates overall project success with respect to the collaborative process (2d and 2e), but stakeholders’ feedback also questioned the cost-effectiveness of the collaboration (2e) and raised doubts about the appropriateness of the play for target groups beyond families with children (2c).

As far as the process itself is concerned, the project stakeholders acknowledged that the collaborative production was constructive:

"During the research process, we worked with the research team and met with different doctors that work in this field. And then we also worked with the playwright, yes, to like, to identify the topic that we’re interested [in] from the research process with the doctors.” (B-Floor Theatre team)

“I think I quite like it [the process] in the way that they [B-Floor Theatre] tried to get a lot of researchers, they ask all stakeholders as much as they can and I point to the outside doctors outside of Thailand, the pharmacies, the activist[s] who work on this area and they try to research everything.” (MORU team)

The process naturally involved reconciling different positions and translation between the artistic and scientific stakeholders, which was a new experience and partly challenging, but not an obstacle for project implementation:

“Actually it’s kind of, I think that scientists are like a book. Maybe more like a text book. We have to like decode and find what they are interesting in, and we have to decode that to become like a performance. This is the most hard work I think. Because it’s not [an] easy topic, that
you can explain easy to the people can understand this. That is the most exciting part for this project.” (B-Floor Theatre team)

“In terms of my early involvement with interviews I think that was all fine. They [B-Floor] seemed to pick up on […] what I would say was the important themes related to AMR.” (MORU team)

“I mean we see how [the themes of antimicrobial resistance and research with children] are related but to weave it into a smooth kind of narrative, and one round story for action was quite difficult I think.” (B-Floor Theatre team)

Concerns only arose with respect to operational processes, where photography demands and the evaluation process itself (i.e. handing out evaluation forms) interfered with the delivery of the performances, making the theatre staff “uncomfortable” (B-Floor Theatre team). The scientific collaborators also voiced concern about not having a focal contact person in their own team who speaks the local language, stating that, “Having some persons in the main [MORU] team who are Thai to work with them [B-Floor Theatre] would be better [for the communication between the teams]” (MORU team). Despite occasional frictions, the stakeholders overall perceived the process to be collaborative and a constructive learning experience that compromised neither side’s fundamental interests in the collaboration.

The project stakeholders understood the outcomes of the collaborative process to be successful from an organisational perspective (2e). This included statements which reflected satisfaction, excitement, and pride, but also the impression of breaking new ground, doing something useful, and having a supportive organisational environment. For example,
“I thought they did a very good job.” (MORU team)

“It’s been an honour that MORU is still interested to work with us for a second time.” (B-Floor Theatre team)

An unintended outcome in this respect was that the stakeholders themselves learned and reflected, which arguably contributed to the impression of organisational success. This impression of learning was prevalent among both the artistic and scientific stakeholders – artists learning about scientific topics and scientists reflecting on the value of the arts for scientific communication and engagement. A selection of responses to the question “What have you learned from this process?” illustrates this process of mutual learning and reflection:

“We start to […] tell the people around us more about what we’ve learned. […] There’s more thinking, there’s more ‘Okay, there’re good bacteria, too. Don’t forget them.’” (B-Floor Theatre team)

“I’ve learnt that you can actually do quite a lot in terms of bringing [across] these kind of, you know, normally dry sciencey things.” (MORU team)

In line with the positive collaborative experience, the stakeholders perceived the relationships created and reinforced by this project as sustainable (2d). The Fishy Clouds project was itself a continuation of a previous joint project entitled Survival Games, which already indicates the partners’ willingness to engage in a longer-term collaboration. The present project appeared to have fortified these previous
links, although the attitudes towards future project opportunities vary. On the one hand, the theatre team was explicitly in favour of continued work with Fishy Clouds and of collaborating with MORU in particular (“I hope MORU and Wellcome Trust [are] up for it;” B-Floor Theatre team), but MORU was understood to be the driver of such a collaboration (“I suspect it’s more to do with if MORU perceives there to be continuing value;” B-Floor Theatre team). On the other hand, MORU scientists expressed future collaborative potential in vaguer terms, stressing that both partners would have to want to work together again (“possible if both sides want to;” MORU team), and reflecting on the general value of collaborations between arts and science relative to their impact and cost-effectiveness:

“I strongly believe that art can be a powerful vector […] but it has to be well-thought and adapted to the population you’re targeting.” (MORU team)

“I can see the kind of added value of theatre. It is much more engaging. You’re in there, you’re drawn into it a lot more than you would by watching a video. But yeah, the down side is it’s not really scalable in any meaningful way.” (MORU team)

Though partly sceptical, the overall positive viewpoints and experiences of the collaborators suggest that the project was successful in reinforcing and developing sustainable relationships between the two organisations. The processes of mutual learning and reflection also holds promise that MORU and B-Floor Theatre engage in and expand future arts-science collaborations, potentially also with other partners.

The production of locally appropriate content (Outcome 2c) received more heterogeneous views. The dominant position among the stakeholders was that the presentation of the content was appropriate. The theatre group members thereby emphasised the non-verbal modes of communication and the
logistical requirements for a touring production, whereas subject specialists and MORU staff involved in the project highlighted the ability of the performance to draw attention to scientific topics and to communicate antimicrobial resistance appropriately (little was said on research with children; see below). Both theatre critics supported this position, at least in connection with the accompanying information leaflet.

However, both artistic and scientific stakeholders qualified their positive views. Theatre staff, critics, and scientists understood that target group differences (e.g. different age groups) could influence the successful delivery of the drama’s messages. Scientists and critics also acknowledged that the target group might require a pre-existing understanding of the topic. The theatre critics further suggested that familiarity with non-verbal performances would be helpful for understanding Fishy Clouds, and that complementary information (e.g. “an education package that goes with [the play] for different age groups;” critic) would help the audience to grasp the scientific messages of the play more effectively.

In addition, the theatre team highlighted differences in effectiveness of communication depending on whether the show is performed in open or closed spaces. B-Floor Theatre also acknowledged the requirement to discuss the content during and after the show in order to make the performance effective. This discussion was envisaged to take place especially between children and their parents, noting that the performance had initially been designed with families in mind (“family and children orientated;” theatre staff); the target group only later expanded. Recognising this original focus, one of the published reviews of the play also considered that Fishy Clouds appears to speak to “younger audiences” in particular (Mahasarinand, 2016:10B).

More critical perspectives existed as well, primarily among the critics and scientists. Some questions related to whether the medium is indeed the most suitable to convey a complex scientific topic, and one scientist felt that the imagery used in the play was generally unsuitable for this purpose (“too abstract and too subtle;” subject specialist). Moreover, as the two thematic areas of AMR and research with children were difficult to reconcile artistically, the non-artistic stakeholders also saw the
combination of the two different themes as “somewhat coerced” (MORU team), and research with children was perceived to be subordinate to the theme of antimicrobial resistance, which corresponds to audience responses. Overall, the positive impressions of appropriateness appear to outweigh these doubts, but most stakeholders maintain the pragmatic position that the play is unlikely to suit all audiences who were ultimately included. The varying ability of the audiences to relate the play to their culture (Table 3 in Section 3.1.2.1) reinforces this conclusion.

3.2 Overall Assessment of Evaluation Criteria

We summarise in this section the findings of the evaluation and relate them to the overarching evaluation criteria of effectiveness, relevance, efficiency, impact, and sustainability. Owing to the novelty of creative-expression-based public engagement evaluations, we rely on a qualitative appraisal and acknowledge especially the limitations in assessing long-term impact of Fishy Clouds. However, our consideration of these overarching evaluation criteria provides an opportunity to build the knowledge base of benchmark indicators for future public engagement evaluations.

According to our assessment, we conclude that Fishy Clouds was implemented efficiently and it was partly successful in meeting its objectives. The play also addressed topical issues which have, however, mixed relevance for its diverse target groups. Final judgements on the cost-effectiveness, impact, and sustainability of the public engagement activity require further benchmark information and longer-term evaluations.

3.2.1 Effectiveness

The criterion of effectiveness assesses whether and to what extent the project objectives have been achieved (OECD Development Assistance Committee, 2010). We will examine each objective separately in detail below, but the overall conclusion from the discussion is that the awareness-raising objectives have been partially achieved, whereas the artistic objective has been achieved on the whole.
We supplement our qualitative evaluation of effectiveness with an achievement score from 0 (not achieved) to 10 (fully achieved).

**Objective 1 – To raise awareness of antimicrobial overuse and misuse: Partially achieved (6 of 10).**

The available evidence suggests that *Fishy Clouds* raised awareness about antimicrobial misuse and overuse among a part of the target audience, but it also yielded interpretations that are potentially at odds with its intended message. Awareness about antimicrobial over- and misuse, specifically in relation to antibiotics, was raised primarily among target group members with pre-existing understanding and awareness, but who do not consider themselves experts in the topic. This pertained especially to comparatively highly educated Bangkok metropolitan theatre goers. The play was able to inspire specialist audiences including scientists and healthcare workers with new ideas as well, but these audiences also indicated that they were already aware of the subject. Uninformed audiences including school children and migrant workers linked the play to broader themes of health, illness, and medicine use. Interpretations of the “medicine use” theme thereby led audience members to consider the appropriate use of medicine but also scared some and—occasionally—led others to conclude that they have to use more medicine than they currently do. Overall, *Fishy Clouds* appeared successful in reinforcing existing awareness about antimicrobials, but less successful in generating it without a prior basis.

**Objective 2 – To raise awareness of the importance of research with children: Partially achieved (4 of 10).**

Compared to antimicrobial use, *Fishy Clouds* was less successful in raising awareness about “research with children,” the importance of which was less widely recognised among the target audiences. The various interpretations of this theme included research with children but also medical research more generally and the importance of correct medicine dosing, but none that we could consider problematic.
It appeared that *Fishy Clouds* was most successful in raising awareness about research with children among healthcare workers in Thai-Myanmar border zones and with Bangkok theatre goers, but the theme itself was subordinated to antimicrobial misuse both in the play’s production and in the audience’s reception.

**Objective 3 – To produce a science-themed performance of entertainment value and high artistic quality: Achieved (9 of 10).**

The validation of the artistic expression was widespread among the target audiences and among theatre critics, complimenting in particular the puppetry, acting, and the live music support. However, critics also considered the storyline of the play to be obscure and the performance inhibited by a mismatch between a politically oriented theatre company and a science-themed play. Despite the disagreements in the artistic value, the entertainment value was considered high both within the qualitative and quantitative evaluation instruments and among all audience and stakeholder groups. An unintended positive outcome contributing to this objective was the promotion of the (performing) arts among the target audiences more generally.

From a process perspective, the collaboration between B-Floor Theatre and MORU was successful in generating an organisational sense of success and in reinforcing existing and developing new relationships between the project stakeholders—notwithstanding the impression that both groups see MORU as the initiator of the present and potential future collaborations. The project also entailed processes of personal and organisational learning, inspiring the artistic stakeholders with scientific themes, and leading the scientific stakeholders to reflect on the opportunities of creative expression and other forms public engagement. Merely the outcome of locally appropriate content was not fully realised, considering the absence of a Thai focal contact among the MORU team, the implicit targeting of metropolitan theatre-going families for *Fishy Clouds*, and the difficult combination of two scientific
themes. Overall, the project was implemented successfully and it represents an organisational success, though the performance itself appeared to address too broad an audience with too many themes.

3.2.2 Relevance

Relevance considers whether the objectives of the project correspond to target group requirements, but also to national and global priorities as well as partner’s and donors’ policies (OECD Development Assistance Committee, 2010). Antimicrobial resistance is a global and regional health priority, while research with children is a salient topic in the clinical research of MORU. Public engagement more generally is gaining increasing recognition in academic practice and is promoted by funders as well as academic institutions such as MORU. This suggests global, national, and partner relevance of the activity, but it does not automatically imply relevance of the project for all identified target groups.

Antimicrobial over- and misuse is a problem recognised for Thailand (Lim et al., 2016) and directly connected to people’s healthcare experiences and healthcare-seeking behaviour (from both a demand and a supply perspective). The theme can also be relevant beyond the identified target groups for limitedly trained formal and informal healthcare providers. However, while the general public may not be aware of the importance of the problem, a “lack of awareness” about antibiotic misuse might not be a priority issue for scientists and healthcare workers attending tropical medicine conferences and specific events for antimicrobial resistance (these groups may already be aware about global health priorities). Conversely, research with children is arguably relevant for scientists and healthcare workers who are involved in clinical research with MORU and research more generally, but this specific theme (rather than research more generally) appeared too remote for the general public (school children, theatre goers, migrant workers).

The criterion of relevance further considers whether the project proposed a plausible mechanism to achieve the intended objectives with the proposed activities, and whether the project aligned with other, related activities (e.g. to raise awareness about health and research, to increase the appreciation
of science among the general population, and to promote the arts). The activity intended to extend beyond metropolitan theatre goers through non-verbal communication and as a touring production, which is a suitable design to be accessible to broader groups. However, the assumed mechanism did not take account of complementary knowledge and educational activities to enable awareness among the least aware target groups like children and migrant workers. As a sole instrument, *Fishy Clouds* might be insufficient to raise awareness among these high-priority groups. In terms of alignment, the theatre play was integrated into AMR and research-related activities in Bangkok (AMR week, JITMM) but a lack of alignment with existing health education mechanisms for non-academic and non-medical target groups left *Fishy Clouds* short of its awareness-raising potential.

In summary, the project addressed important subject areas but the target group relevance was diminished by the heterogeneity of the groups spanning lay audiences as well as experts, and by the lacking integration with complementary health education activities to reinforce the non-verbal messages.

### 3.2.3 Efficiency

The criterion of efficiency considers the operational efficiency of production but also cost-effectiveness and allocative efficiency of the project (OECD Development Assistance Committee, 2010). Considering the yet limited knowledge base of public engagement evaluations and the associated absence of reference values, we limit ourselves to a brief discussion rather than a comparative assessment.

In terms of production efficiency, the project complied with its production timeline, only being subjected to an external event (the passing of the King of Thailand) that prevented and delayed the first performances of *Fishy Clouds*. The show had otherwise been implemented according to plan, having reached 1,440 audience members, which corresponds to 180% of the initial estimates. The overall project costs of GBP 32,000 correspond to GBP 22 per audience member reached. It is possible
that *Fishy Clouds* performances continue in the future, or that video recordings of the show are being shown instead, both of which would spread the fixed costs of production and reduce the costs per audience member thus.

Cost-effectiveness would have to be assessed not merely in terms of output (audience numbers) but in terms of awareness (or enjoyment and artistic appreciation) created (O'Brien, 2010). We do not attempt to develop such a measure but point to the target group differences in awareness raising, which suggests that not all 1,440 audience members have become more aware about the problem of antimicrobial over- and misuse and about the importance of research with children. An optimistic estimate from the evaluation forms (which, as we argued above, are overestimates) would suggest that 71% (600 out of 848 valid responses) of the audience experienced increased interest both in medicine use and in research with children, which would correspond to GBP 31 per “more aware” audience member. Considering the arguable overstatement in the quantitative data (owing to the wide range of interpretations), the actual costs per aware audience member are presumably higher. A conclusive statement would also have to account for more tacit forms of awareness over the longer term that are less readily measured through an evaluation form or through interviews. Lastly, the target group differences indicate that some groups may be reached more effectively through this medium than others. For example, Bangkok theatre goers responded positively to the performance, school children might require complementary activities to increase the cost-effectiveness of the performance, and the cost-effectiveness of addressing scientists might be comparatively low.

Owing to the lack of benchmark indicators, we cannot provide a concluding assessment of the project’s efficiency, but we reiterate the efficient implementation of the project alongside the mixed cost-effectiveness across different target group members.
3.2.4 Impact and Sustainability

Impact is a criterion that assesses the positive and negative, intended and unintended long-term implications of the project (OECD Development Assistance Committee, 2010). Because this evaluation was designed as a process evaluation to understand the nature of context, mechanisms, and outcomes related to public engagement using creative forms of expression, we are not in a position to appraise long-term impact, which also relates to the criterion of sustainability (Kilroy et al., 2007). In both cases (impact and sustainability), we can only provide hypotheses and outline the sustainability risks, which we hope are useful for future evaluations of public engagement activities.

The theme of retention has indicated that the explicit messages of the play wane (not surprisingly) especially for topic areas to which individuals cannot relate personally. If not embedded into a set of complementary activities that establish and reinforce a basic understanding of the problem areas (e.g. health education) and that relate the audience to the artistic forms of expression (e.g. drama classes), the performance as a one-off event may be unable to yield sustainable impacts among the target groups (Munier & Etherton, 2006). Such impact may take the form of increased acknowledgement of and discussions about the scientific themes and the arts in public discourse; changes in health behaviour and research interests; active contributions to and participation in artistic activity; and more general understanding and ongoing reflection about the drama’s topics (Calzia et al., 2005; Dalrymple, 2006; Etherton & Prentki, 2006; Gallagher et al., 2010; Kilroy et al., 2007; Mitchell et al., 2011; Thomson et al., 2013a). Beyond the target groups, the project itself promises to establish sustainable cooperative relationships between the project stakeholders, aided by mutual processes of personal reflection and organisational learning. However, it is yet too early, and public engagement evaluation toolkits are yet too limited, to articulate an assessment of impact and sustainability.

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7 Note that a single project like *Fishy Clouds* will be unable to demonstrate impact on higher-order development outcomes like antimicrobial resistance or mortality on a national level and cannot be judged by such a standard.
4 Discussion

This evaluation was conducted with the explicit purpose of informing future evaluations of public engagement with science using creative forms of expression. In this section, we highlight the shortcomings and advantages of the mixed-methods approach, and reflect on and develop the evaluation framework.

With respect to the evaluation methodology, we combined quantitative and qualitative instruments to assess the project’s achievement of awareness-related and artistic objective. Our evaluation design has four main limitations. First, the cross-sectional design is unable ascertain causal relationships between the Fishy Clouds play and its outcomes rigorously. The insufficient knowledge base on how to assess the various interpretations of the non-verbal performance together with a largely self-selected audience and the absence of a counterfactual rendered an experimental design infeasible (Etherton & Prentki, 2006; Guetzkow, 2002); and logistical constrains and possible priming effects also prevented a quantitative before-and-after comparison. We therefore analysed a cross-section of self-reported project outcomes from evaluation forms and complemented the interpretation of these data through interviews and focus group discussions. This provides us with a better understanding of the underlying mechanisms and the likely direction of causality (Galloway, 2009), but longer-term and rigorous quantitative studies would be necessary to establish our claims more firmly (see e.g. Dalrymple, 2006).

Second, our quantitative evaluation was bound by the need for a simple, easy-to-administer evaluation form that suited different lay and specialist audiences at once (note that the evaluation forms were not owned by the evaluation team but by the theatre company). The reported interest in and positive reception of the scientific messages reflects established patterns in the literature (Durant et al., 1989),

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8 The self-selection of the audiences became apparent in our quantitative and qualitative data collection (based on contact information form the evaluation forms). Rather than a cross-section of target groups like “Bangkok school children” or “Bangkok metropolitan theatre goers,” Fishy Clouds appeared to be more likely to attract individuals who are involved in drama studies. Considering their experience with medium of non-verbal drama, especially their responses relating to the artistic value of the show were notably different from the remaining audiences. However, due to the small sample and variable information on “occupation” in the evaluation form, we refrained from a quantitative comparative analysis between groups with different level of involvement with the arts.
but our qualitative work indicated a tendency of acquiescence and a wide range of interpretations associated with the answers in the evaluation forms (note that unforeseen interpretations are an intrinsic feature of creative expression and not necessarily problematic). A limitation of the analysis is thereby the temporal mismatch between the self-completion evaluation forms (administered immediately after the performance) and the qualitative data collection (carried out between 2-4 weeks after the performances). Considering the broad answer categories, the limited recall, and the potential response biases, we therefore concluded that the positive responses in the quantitative part of the evaluation are probably an overestimate of the actual project outcomes, which are still positive rather than negative. While the “true” outcomes of the project are difficult to detect with certainty (requiring additional representative quantitative data collection at different points after the performances), the complementary qualitative study helped to interpret the otherwise crude quantitative evaluation instrument (Calzia et al., 2005). Response biases in future quantitative studies of this kind could be mitigated by varying the answer categories (alternating “yes” and “no” answers on different versions of the evaluation forms), and by having target-group specific evaluation forms based on prior qualitative research to establish an understanding of interpretive categories (e.g. simpler questions for children and more specific questions for scientists and healthcare workers).

Third, this project has developed a set of outcome categories and underlying mechanisms for the evaluation of science-themed public engagement using creative forms of expression. Considering the yet limited knowledge base of this kind of evaluation in global health, we caution against the uncritical application of our evaluation categories to other projects (Thomson et al., 2013a). Repeated process-based realist evaluation approaches will still be required in order to broaden our understanding of outcomes and mechanisms, and to develop a range of benchmark indicators in order to articulate evaluation targets in future public engagement projects. Complementary evaluation designs (e.g. long-term impact and ex-post evaluation of engagement programmes rather than individual project) can then help to ascertain the evolution of understanding, attitudes, and behaviours associated with public
engagement activities, which is a limitation of our realist evaluation approach. Our evaluation case study is therefore only one among the first steps towards established evaluation practice in theatre-based public engagement activities.

Lastly, a methodological limitation of the evaluation was that junior members of the evaluation team were also part of the department that commissioned and coordinated Fishy Clouds. In order to maintain independence of the evaluation (OECD Development Assistance Committee, 1991:5; World Bank Independent Evaluation Group, 2015:29), the evaluation process has been overseen closely by an external evaluator who was not involved in the production and operation of Fishy Clouds, and who carried out the data analysis and the reporting of this evaluation.

Our evaluation framework was informed by the limited yet evolving literature on evaluating the arts and public engagement in particularly, including Calzia et al. (2005); Galloway (2009); Jackson (1998); Jackson et al. (2003); Lafrenière and Cox (2013); Thomson et al. (2013a); Thomson et al. (2013b). Our exploratory research approach has helped to inform and specify our initial categories, reiterating themes observed in the existing literature and combining them into a harmonised framework. Our data suggested that important and inter-related elements within active thought processes to raise awareness include recognising the topic area within the creative expression, relating the story and its elements to existing knowledge and personal concepts and experiences, interpreting the both verbal and non-verbal messages provided by the performance, discussing and sharing messages from the performance with peers, and retaining the interpretation and messages over time (Lafrenière & Cox, 2013). These elements of the thought process interact with characteristics of the audience, including their pre-existing awareness and understanding of the subjects, their cultural background, their education and experience with creative forms of expression, the nature of the performance venue (influencing audience member focus and interaction between audience and actors), and the informational environment providing complementary information and reinforcing messages to support the play. The awareness-related outcomes of interest, desire to learn, and reflection were
informative though difficult to measure and disentangle, and we noted the presence of potentially problematic unforeseen interpretations of both verbal and non-verbal messages.

The mechanisms underlying the artistic outcomes included the active appreciation of the play, which, according to our qualitative research, included audience members’ conceptualisation of art and health education (which can but need not be opposites), the presence of artistic attractors to increase attention and appreciation, and inspiration following from exposure to the performance (Jackson, 1998; Jackson et al., 2003; Thomson et al., 2013a). We identified the promotion of the arts as an emerging outcome aside from the validation of the play as art and a sense of enjoyment gained from attending *Fishy Clouds*. Theatre experience is arguably an important (though not decisive) characteristic of the audience to influence these outcomes.

We also considered the organisational process dimension of the artistic production in a collaborative process, of which the (power) balance and frictions between the different stakeholders and processes of mutual reflection and learning were important elements underlying the realisation of the pre-formulated outcomes of appropriate content, sustainable relationships, and an organisational sense of success (Haddon, 2006; Jackson, 1998; Jackson et al., 2003; O'Connor et al., 2006). We see organisational learning not only a process in itself but also a desirable outcome of the collaboration between the sciences and the arts (Haddon, 2006).

We summarise the lessons for the evaluation framework in Figure 5. We caution against using this framework as a template for future public engagement evaluations, but it can serve as a basis to consider possible pathways and outcomes in other evaluation projects.
Figure 5. Augmented Evaluation Framework

Source: Authors, based on Calzia et al. (2005); Galloway (2009); Jackson (1998); Jackson et al. (2003); Lafrenière and Cox (2013); Thomson et al. (2013a).

Note. Grey-shaded fields are additions to the initial framework.

5 Conclusions

In the context of increasing research funder and academic interest in public engagement, we carried out an evaluation of the science-themed puppet theatre *Fishy Clouds* as a case study to inform evaluation practice. The engagement activity intended to raise awareness about two scientific themes (antimicrobial over-/misuse, research with children) and to create an artistic product with high entertainment value. We followed a six-step evaluation process, used a realist evaluation approach, and employed qualitative and quantitative research methods. Target group heterogeneity and imbalanced scientific themes meant that the achievement of the awareness-raising objectives was mixed, but the achievement of the artistic objective was successful from an organisational as well as audience perspective.
The evaluation has shown that public engagement activities can engage certain groups of the public with scientific themes while promoting the arts and fostering interdisciplinary cooperation. Methodologically, this case study provided an evaluation process description, a framework example, and indicative benchmark values for outcome indicators and evaluation criteria. The yet limited understanding of context, mechanisms, and outcomes of public engagement using creative forms of expression also highlights the need for broader qualitative and quantitative research studies about the ability of different activities to inform and engage the public with scientific themes effectively, and the role of age and education in shaping the range of interpretations resulting from creative forms of expression.

Our case study also offers modest lessons for science-themed drama. According to our analysis, future public engagement projects should consider limiting the specificity of scientific themes, responding to and working with target groups’ background knowledge, existing conceptions, and understanding. Such activities should be focused on justified priority target groups (e.g. in terms of awareness-raising need, potential for inspiration, ability to act on awareness) in order to be cost effective. Effectiveness in general and cost effectiveness in particular could also be enhanced by:

- using simple, clear, and target-group specific messages to accompany a non-verbal performance (e.g. simple messages in accompanying leaflets, live narration, colourful picture books for children),
- expanding the audience through video screenings of the performance (whose effectiveness would need to be evaluated separately),
- offering a long-term series of activities rather than isolated, one-off events,
- embedding the engagement activity within a broader educational programme like school curricula, information campaigns, and participatory pre- and post-performance workshops (Chinyowa, 2011; Kilroy et al., 2007; Skinner et al., 1991), and/or
aligning various public engagement consistently for priority target groups.

Evaluations should then focus on programmatic action rather than isolated engagement activities, evaluating overall effectiveness, efficiency, relevance, internal consistency of the various activities, and long-term impacts (Thomson et al., 2013a). Where a collaborative relationship puts the sciences and the arts on an equal level, it is also important that the goals of the project reflect the intentions of the participating stakeholders. Lastly, we recommend that future public engagement projects explore and articulate the mechanisms leading to the expected outcomes, recognise potentially detrimental outcomes, and, ideally, formulate an evaluation strategy and agree on qualitative and quantitative indicators of success at the design stage of the project (Dalrymple, 2006; Galloway, 2009; Lafrenière & Cox, 2013; O'Connor et al., 2006; Thomson et al., 2013a). An ongoing challenge in this context will be to balance the needs for evaluating effectiveness, artistic freedom and experimentation, and scientific rigor and awareness raising within one project (Thomson et al., 2013a).

In conclusion, artistic means of expression can offer a vehicle to engage the public with the sciences, but the interpretation of artistic expressions can create a tension with scientific awareness-raising objectives. Ambiguous and unintended interpretations do not necessarily mean that a project is necessarily unsuccessful, and a recent workshop by the Wellcome Trust argues that “funders should be sufficiently flexible and understand the unpredictable nature of these [artistic] projects to allow them to flourish” (Austen, 2016:44). However, open-endedness and unpredictability does not relieve arts-science collaborations of the need to be relevant, effective, efficient, and sustainable. Our process description and realist approach can inform future evaluations for this type of public engagement in global health and beyond. This would not only help researchers to respond to funder requirements, but more widespread evaluation would also help to build a knowledge base of cost-effective, target group specific, and locally appropriate public engagement activities.
References


Gallagher, K., Freeman, B., & Wessells, A. (2010). ‘It could have been so much better’: the aesthetic and social work of theatre. Research in Drama Education: The Journal of Applied Theatre and Performance, 15(1), 5-27. doi: 10.1080/13569780903480971


Pongpipat, K. (2016, 24 November). When the medicine is the problem, not the cure, *Bangkok Post*, p. 11.


StataCorp. (2013). *Stata Statistical Software: Release 13*. College Station, TX: StataCorp LP.


### Appendix 1: Coding Frame

<table>
<thead>
<tr>
<th>Theme</th>
<th>M1 Process - Active Thought</th>
<th>M1O1 Interest in AMR</th>
<th>M1O2 Interest in RWC</th>
<th>M1O3 Desire to learn AMR</th>
<th>M1O4 Desire to learn RWC</th>
<th>M1O5 Reflect on AMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Awareness about AMR and research with children</td>
<td></td>
<td>Already interested</td>
<td>No interest</td>
<td></td>
<td></td>
<td>AMR</td>
</tr>
<tr>
<td>M1O1 Interest in AMR</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td>AMR in Agriculture and food</td>
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<td></td>
<td>Antibiotic Discovery</td>
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<td></td>
<td></td>
<td>Effect of AMR in agriculture on human</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Relationship between rain and AMR</td>
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<td></td>
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<td></td>
<td></td>
<td>Resistance</td>
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<td></td>
<td></td>
<td>Taking medicines</td>
</tr>
<tr>
<td>M1O2 Interest in RWC</td>
<td></td>
<td>No interest</td>
<td>Prescribing different dose for children</td>
<td>Yes research, not with Children</td>
<td></td>
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<td>Antibiotic Discovery</td>
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<td>Conflicts with thoughts, wish for changes</td>
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<td>Experiments should happen</td>
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<td>Experiments to cure sickness</td>
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<td></td>
<td>Importance of research</td>
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<tr>
<td></td>
<td></td>
<td>Yes research, yes children</td>
<td></td>
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<td>AMR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Existence</td>
<td></td>
<td></td>
<td>AMR in Agriculture and food</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Frequently mentioned subject</td>
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<td>Antibiotic Discovery</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Out of expectation</td>
<td></td>
<td></td>
<td>Effect of AMR in agriculture on human</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Participation of children in experiments</td>
<td></td>
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<td>Relationship between rain and AMR</td>
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<tr>
<td>M1O3 Desire to learn AMR</td>
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<td>No desire to learn</td>
<td>Yes</td>
<td></td>
<td></td>
<td>AMR</td>
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<td>Revision</td>
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<td>AMR in Agriculture and food</td>
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<td>Antibiotic Discovery</td>
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<td>AMR in Agriculture and food</td>
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<td>Antibiotic Discovery</td>
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<td>AMR in Agriculture and food</td>
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<td></td>
<td>Antibiotics aren't always bad</td>
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<td></td>
<td></td>
<td>Antibiotics in general</td>
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<td></td>
<td></td>
<td>Mouthwash</td>
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<td></td>
<td>Needs prescriptions or doctor</td>
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<td></td>
<td></td>
<td>Resistance</td>
</tr>
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<td>Virus VS Bacteria</td>
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<td>Medicines</td>
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<td></td>
<td></td>
<td></td>
<td>Changing medicine behaviours</td>
</tr>
</tbody>
</table>
Correct medicine for symptoms
Take more medicines
Use when necessary
No reflection
Reflecting on prior knowledge, experience
Reflecting on the show
Created question for show
Metaphor and symbols
Unexpected subject
Unrelated to AMR
Cold weather
Germ causing sickness
Medicines' appearances and ingredients
Sickness in general
Taking care of health
M1O6 Reflect on RWC
No reflection
Reflection only after question
Unrelated to research or children
Being scared of treatments
Money Issue
Scientific experiment
Yes
Guardian allowing treatment
Linking research with AMR
Questioning existence
To cure the patient, unnecessarily children
To find children's dose
To find treatments for other people
To produce custom-made medicines
Other outcomes
Audience wanting more
Aware already and not learning more
Disagreeing with message
General desire to learn
General interest
General reflection
Interpretation of message
AMR
AB or medicines in agriculture
ABs aren't bad when use wisely
AB's cycle in all lives
Resistance, antibiotic
Resistance, drugs in general
Seriousness of AMR problem
Health
Being exposed to diseases via swimming in hot water
Following doc's instructions
Germ
Germs spread easily
Protection from germs, diseases
Watch out for germs
Health Awareness
Injections
Not getting enough sleep damages brain and increases virus
Not working too hard
Reading too much makes eyes weak
Take care of health, medical treatment
TB
Treating illness before going to doctor
Using medicines
Being stubborn and not taking medicines will make you more ill
Different medicines fit different people
Meds have both good and bad sides
Not buying medicines or antibiotic on their own
Not taking expired med
Not taking meds at all isn't right
Reading medicines labels
Take correct medicines for illness and body weight
Take medicines correctly when you buy it
Take meds only when necessary, reduce
Take meds rather than not
Take more or various medicines to cover every symptoms
Wash hands, eat good food

Other agriculture topics
Agriculture being the origin of diseases
Diseases begins in agriculture ends at human or doctor
Fish or plant spreading diseases

Other topics
Hat cures illnesses
Hat is immunity
Performance reflecting real life, society
Puppets have different illnesses
Toxins' many origins
Toxins produced by human are the cause of all illnesses

RWC
Consent is needed before treatment
Doctors figuring out ways to make guardians comply
Experiments with child participants
General public’s cooperation in researches
Guardian giving consent for experiment
Guardian giving consent for treatment
Guardian should get enough info about treatment
Research to help the kid
Research with drugs
Researches to find new medicines
Researches to find right medicine for a person

Process
(impression of) clarity
Abstract
already interested in topic
Attention because artistic
Awareness about topic
Complementary activities
Difficulty in understanding, confusion
Experience with theatre
General understanding and communication
Interactive performance
Lack of specific information
Local categories of thought
Metaphors
Non-verbal communication
Prior knowledge
Reflection through evaluation
Relating to oneself
Retention
Sharing and discussing
Target-group specific
Unforeseen interpretations

2. Artistic product
M2 Process - Active appreciation
M201-1 Audience validation
Art
Abstract, metaphors, interpretation
Beautiful
Creative
Music and sound
Puppetry and performance
<table>
<thead>
<tr>
<th><strong>M2O1-1 Stakeholder validation</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Partially positive or negative</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Improvements</strong></td>
<td></td>
</tr>
<tr>
<td>Longer</td>
<td></td>
</tr>
<tr>
<td>Storyline</td>
<td></td>
</tr>
<tr>
<td>Too abstract</td>
<td></td>
</tr>
<tr>
<td>More health than art</td>
<td></td>
</tr>
<tr>
<td>Narrative challenging</td>
<td></td>
</tr>
<tr>
<td>Partial success</td>
<td></td>
</tr>
<tr>
<td>Too much framing, too constrained</td>
<td></td>
</tr>
<tr>
<td><strong>Positive</strong></td>
<td></td>
</tr>
<tr>
<td>Abstract, space for interpretation</td>
<td></td>
</tr>
<tr>
<td>Creative</td>
<td></td>
</tr>
<tr>
<td>Good artists</td>
<td></td>
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<tr>
<td>It communicates ideas</td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Naturally understood as art</td>
<td></td>
</tr>
<tr>
<td>Promoting discussion</td>
<td></td>
</tr>
<tr>
<td>Puppet and actor performance</td>
<td></td>
</tr>
<tr>
<td>Visual expression</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>M2O2-1 Audience enjoyment</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Negative</strong></td>
<td></td>
</tr>
<tr>
<td>Not interesting</td>
<td></td>
</tr>
<tr>
<td>Too short</td>
<td></td>
</tr>
<tr>
<td><strong>Positive</strong></td>
<td></td>
</tr>
<tr>
<td>Exciting</td>
<td></td>
</tr>
<tr>
<td>Funny</td>
<td></td>
</tr>
<tr>
<td>Generally positive</td>
<td></td>
</tr>
<tr>
<td>Interesting content and presentation</td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Puppet performance and props</td>
<td></td>
</tr>
<tr>
<td>Stimulating imagination</td>
<td></td>
</tr>
<tr>
<td><strong>Storyline</strong></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>M2O2-2 Stakeholder view on enjoyment</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engaging for children</td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>Not engaging</td>
<td></td>
</tr>
<tr>
<td><strong>Positive entertainment value</strong></td>
<td></td>
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<tr>
<td><strong>Other outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>Promoting the arts</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Process</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Attractors</strong></td>
<td></td>
</tr>
<tr>
<td>B-Floor reputation</td>
<td></td>
</tr>
<tr>
<td>Interesting subject</td>
<td></td>
</tr>
<tr>
<td>Show happening</td>
<td></td>
</tr>
<tr>
<td>Unaware of show, competing priorities</td>
<td></td>
</tr>
<tr>
<td><strong>First time theatre experience</strong></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>M3 Process - Collaboration</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M3O3 Appropriate content</strong></td>
<td></td>
</tr>
<tr>
<td><strong>M3O0 Stakeholder view on appropriateness</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Negative</strong></td>
<td></td>
</tr>
<tr>
<td>Abstract</td>
<td></td>
</tr>
<tr>
<td>Difficulty in understanding</td>
<td></td>
</tr>
<tr>
<td>Ineffective medium</td>
<td></td>
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<tr>
<td>Ineffective message</td>
<td></td>
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<tr>
<td>Ineffective metaphors</td>
<td></td>
</tr>
<tr>
<td>RWC forced</td>
<td></td>
</tr>
<tr>
<td><strong>Positive</strong></td>
<td></td>
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<tr>
<td>Appropriate AMR</td>
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</tr>
<tr>
<td>Appropriate medium</td>
<td></td>
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<tr>
<td>Appropriate RCW</td>
<td></td>
</tr>
<tr>
<td>Clear message</td>
<td></td>
</tr>
</tbody>
</table>
**Generally appropriate**
- Generating attention
- Logistically appropriate
- Non-verbal appropriateness
- Not too abstract
- Universal topic that people can relate to

**Qualifiers**
- Complementary info and activities
- Complexity of message
- Discussion
- Familiarity with medium
- General target group differences
- General understanding and communication
- Local inputs for appropriate content
- Non-verbal challenges
- Prior knowledge and sophistication

**Space, open versus closed**

**M3O4 Lasting relationships**
- Continuation of collaboration
- Depends on MORU, MORU as scientific driver
- Expecting it to last
- If both want to
- Importance of arts-science collaboration
- Positive relationship
- Stakeholders wanting more
- Still a new kind of relationship

**M3O5 Sense of organisational success**
- Broken new ground, new world
- Excitement
- Limitedly keen on science
- Outreach
- Pride
- Satisfaction
- Successful
- Supportive
- Unclear (cost) effectiveness, curiosity
- Useful

**Process**
- B-Floor-MORU working together
- Balancing demands, force-fitting themes
- B-Floor’s style, method
- Dealing with frictions, challenges, solving problems
- Interactions
- Language, translation, mutual inputs
- MORU initiated
- Collaborative
- Experimental

**Internal and outside processes**
- Stakeholders reflecting, learning, and changing views
Appendix 2: Stata Code

//adjust variable labels for readability
label var Q1 "1. How do you feel about the drama?"
lable var Q2 "2. Do you think this is art?"
lable var Q3 "3. Did you find any element of this drama related to your culture?"
lable var Q4 "4. Before watching the drama, were you interested in the correct use of medicines?"
lable var Q5 "5. Did the drama increase your interest in the correct use of medicines?"
lable var Q6 "6. Do you want to learn more about the correct use of medicines?"
lable var Q7 "7. Did the drama give you new ideas regarding the correct use of medicines?"
lable var Q8 "8. Before watching the drama, were you interested in the participation of children in research?"
lable var Q9 "9. Did the drama increase your interest in the participation of children in research?"
lable var Q10 "10. Do you want to learn more about the participation of children in research?"
lable var Q11 "11. Did the drama give you new ideas regarding the participation of children in research?"

//assign venue labels
label define lsites 1 "BKK school"
lable define lsites 2 "BKK muslim comm.", add
label define lsites 3 "AMR day", add
label define lsites 4 "Thammasat", add
label define lsites 5 "Democrazy", add
label define lsites 6 "JITMM", add
label define lsites 7 "Mae Sot Wattana Resort", add
label define lsites 8 "Mae Sot Wang Pa clinic", add
label define lsites 9 "Mae Sot Mawker Thai clinic", add

gen site_new = .
replace site_new = 1 if Site == "th048"
replace site_new = 2 if Site == "th042"
replace site_new = 3 if Site == "th043"
replace site_new = 4 if Site == "th044"
replace site_new = 5 if Site == "th045"
replace site_new = 6 if Site == "th046"
replace site_new = 7 if Site == "th047"
replace site_new = 8 if Site == "th013"
replace site_new = 9 if Site == "th014"
label values site_new lsites

//recode ethnic background
gen str25 ethn = ""
lable var ethn "Nationality/ethnic background"
replace ethn = "ROW" if NATION == "AUSTRALIAN"
replace ethn = "ROW" if NATION == "BRITISH"
replace ethn = "" if NATION == "BUDDHA"
replace ethn = "Burm & ethnic groups" if NATION == "BURMESE"
replace ethn = "Burm & ethnic groups" if NATION == "BURMESE-KAREN"
replace ethn = "ROW" if NATION == "CANADA"
replace ethn = "ROW" if NATION == "CANADIAN"
replace ethn = "other Asia" if NATION == "CHINESE"
replace ethn = "ROW" if NATION == "DUTCH"
replace ethn = "other Asia" if NATION == "FILIPINO"
replace ethn = "ROW" if NATION == "FINLAND"
replace ethn = "ROW" if NATION == "FRENCH"
replace ethn = "ROW" if NATION == "GERMAN"
replace ethn = "ROW" if NATION == "GERMANY"
replace ethn = "ROW" if NATION == "HUNGARIAN"
replace ethn = "other Asia" if NATION == "INDIA"
replace ethn = "other Asia" if NATION == "INDIAN"
replace ethn = "other Asia" if NATION == "INDONESIA"
replace ethn = "" if NATION == "ISLAM"
replace ethn = "ROW" if NATION == "ITALIAN"
replace ethn = "other Asia" if NATION == "JAPAN"
replace ethn = "Burma & ethnic groups" if NATION == "KAREN"
replace ethn = "Thai" if NATION == "KRABI"
replace ethn = "other Asia" if NATION == "LAOS"
replace ethn = "Burma & ethnic groups" if NATION == "MON"
replace ethn = "Burma & ethnic groups" if NATION == "MYANMAR"
replace ethn = "Burma & ethnic groups" if NATION == "MYANMR"
replace ethn = "Burma & ethnic groups" if NATION == "MYO"
replace ethn = "Burma & ethnic groups" if NATION == "PA-0"
replace ethn = "" if NATION == "NA"
replace ethn = "Burma & ethnic groups" if NATION == "POE KAREN"
replace ethn = "Burma & ethnic groups" if NATION == "POE-KAREN"
replace ethn = "ROW" if NATION == "POLISH"
replace ethn = "Burma & ethnic groups" if NATION == "RAKHINE"
replace ethn = "Burma & ethnic groups" if NATION == "SAWAW KAREN"
replace ethn = "Burma & ethnic groups" if NATION == "SHAN"
replace ethn = "ROW" if NATION == "SWEDISH"
replace ethn = "other Asia" if NATION == "THAI"
//note that "THAT" was initially labelled "THAI" in test database, so this is certainly THAI rather than "unknown"
replace ethn = "Thai" if NATION == "THAT"
replace ethn = "Burma & ethnic groups" if NATION == "TONGSU"
replace ethn = "ROW" if NATION == "UK"
replace ethn = "ROW" if NATION == "USA"
replace ethn = "ROW" if NATION == "WORLD"

//code target groups
//note: some locations contain exclusively one group (school), others contain none (Wattana)
//selection based on age, location, occupation
"migrant workers" not including school children but out-of-school school-aged children
label define ltarget 1 "BKK school children"
label define ltarget 2 "BKK theatre goers", add
label define ltarget 3 "AMR scientists etc", add
label define ltarget 4 "Mae Sot migrant workers", add
label define ltarget 5 "Mae Sot healthcare workers", add
gen str25 job_new = ""
label var job_new "job recode"
replace job_new = "BKK school child" if site_new == 1
replace job_new = "BKK school child" if site_new == 2 & (JOB == "STUDENT") & AGE <= 18
replace job_new = "BKK school child" if site_new == 4 & (JOB == "SCHOOL STUDENT" | JOB == "STUDENT" & JOB == "STUDENTS") & AGE <= 18
replace job_new = "BKK school child" if site_new == 5 & (JOB == "SCHOOL STUDENT" | JOB == "STUDY DRAMA ART") & AGE <= 18
//note: MS HCW does not include the one Karen HCW who participated at the Wattana Resort show - unsure of double-counting and actual work location
replace job_new = "MS HCW" if site_new == 8 & (JOB == "HEALTH WORKER" | JOB == "NURSE")
replace job_new = "MS HCW" if site_new == 9 & (JOB == "HEALTH WORKER"
replace job_new = "MS migrant" if site_new == 8 & ((JOB != "HEALTH WORKER" & JOB != "NURSE" & JOB != "SMRU STAFF" & JOB != "SMRU" & JOB != "SMRU" & JOB != "")) & ((JOB == "STUDENT" | JOB == "") & AGE >= 18)
replace job_new = "MS migrant" if site_new == 9 & ((JOB != "HEALTH WORKER" & JOB != "STUDENT" & JOB != "")) & ((JOB == "STUDENT" | JOB == "") & AGE >= 18))
gen int target = .
label var target "Target Group Category"
label values target ltarget

//anyone who is defined as student
replace target = 1 if site_new == 1 | (site_new == 2 & job_new == "BKK school child") | (site_new == 4 & job_new == "BKK school child") | (site_new == 5 & job_new == "BKK school child")
// anyone not a student, or students >= 18 years
replace target = 2 if site_new == 2 & AGE >= 18
replace target = 2 if site_new == 3 & ((JOB != "STUDENT" & JOB != "ACADEMIC" & JOB != "POST DOC" & JOB != "RESEARCHER" & JOB != "SCIENTIST" & JOB != "")) | AGE >= 18
replace target = 2 if site_new == 4 & AGE >= 18
replace target = 2 if site_new == 5 & ((JOB != "SCHOOL STUDENT" | JOB != "STUDENT" | JOB != "STUDY DRAMA ART") | AGE >= 18)

// scientists or (research) students above 18
replace target = 3 if site_new == 3 & ((JOB == "STUDENT" | JOB == "ACADEMIC" | JOB == "POST DOC" | JOB == "RESEARCHER" | JOB == "SCIENTIST") & AGE >= 18)
replace target = 3 if site_new == 6 & ((JOB != "PROGRAMMER" & JOB != "") & AGE >= 18)

// anyone who is not defined as a school child (not included for Mae Sot!) and not a healthcare worker in Mae Sot clinics
replace target = 4 if job_new == "MS migrant"
replace target = 5 if job_new == "MS HCW"

// define age groups
label define lage 1 "<12"
lable define lage 2 "12 - <18", add
label define lage 3 "18 - <30", add
label define lage 4 "30 - <50", add
label define lage 5 "50+", add
gen int age_group = .
label var age_group "Age Group Category"
label values age_group lage
replace age_group = 1 if AGE < 12
replace age_group = 2 if AGE >= 12 & AGE < 18
replace age_group = 3 if AGE >= 18 & AGE < 30
replace age_group = 4 if AGE >= 30 & AGE < 50
replace age_group = 5 if AGE >= 50

// recode education
label define ledu 1 "None"
labe define ledu 2 "Primary", add
label define ledu 3 "Secondary", add
label define ledu 4 "Undergraduate", add
label define ledu 5 "Graduate & above", add
gen int edu = .
label var edu "Education Group Category"
label values edu ledu
replace edu = 1 if GRADE == 0
replace edu = 2 if GRADE >= 1 & GRADE <= 6
replace edu = 3 if GRADE >= 7 & GRADE <= 12
replace edu = 4 if GRADE == 13
replace edu = 5 if GRADE == 14 | GRADE == 15

// Recode questions to only show yes vs. no/dk
label define lq 0 "No / don't know"
label define lq 1 "Yes", add
foreach var in Q* {
  recode `var' (2 = 0) (8 = 0)
  label values `var' lq
}
save "$analysis\working-file.dta", replace
// Now generating outputs

// descriptive statistics
tab target
tab SEX
tab ethn
tab site_new
tab age_group
tab edu

// Results
// overall
su Q*

// awareness
tabstat Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11, by(target) stat(mean n)
tabstat Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11, by(edu) stat(mean n)
tabstat Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11, by(site_new) stat(mean n)

// artistic dimension
tabstat Q1 Q2 Q3, by(target) stat(mean n)
tabstat Q1 Q2 Q3, by(edu) stat(mean n)
tabstat Q1 Q2 Q3, by(site_new) stat(mean n)

// effectiveness of awareness raising (% increased interest) - overall and target groups
tab Q5 Q9, ce
tab Q5 Q9 if target >= 1 & target <= 5, ce