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Research Article

Conducting an online STEAM-themed treasure hunt event during the COVID-19 pandemic

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Abstract. The in-person Malta-based STEAM Summer School intensive science communication course was transformed into the STEAM Digital School due to COVID-19 pandemic restrictions. Still retaining real world features, the course managed to incorporate individuals from three different continents to learn and work together simultaneously. Upon completion of the course, the students organised an online event during worldwide stay-at-home restrictions to stimulate excitement among youth about scientific topics; in this case, communication within nature. The organisers developed an online treasure hunt for teenagers, a novel format for online learning. The game involved solving puzzles with a science theme through an online platform. Through this medium, the participants were exposed to scientific ideas such as quantum waves, and how a microwave works, in order to increase their possible interest in the area. The organisers aimed to encourage the participants to develop an interest in science and research within society, against the backdrop of the COVID-19 pandemic. The event was evaluated to assess the impact on the participants and organisers, and the results indicated the event was generally enjoyed by the participants, though some puzzle difficulties were perhaps too high for those in the targeted age bracket of 16 - 19-year-olds. Further suggestions for the improvement of the online intensive course and this event format are discussed within the report. We found the event format to be an overall success, with all participants indicating an increased interest in science as a result.

Keywords: Online event; treasure hunt; STEM communication; Covid-19 impact; youth event; STEAM

1 Introduction

1.1 An innovative science communication course goes online

STEAM (science, technology, engineering, arts, and mathematics) Summer School was originally created in 2016 as a 10-day intensive face-to-face science communication course that brought together the resources of science communication academics and practitioners led by Dr Edward Duca from the University of Malta. The collaborators included Rhine-Waal University, Science View, University of Edinburgh, Haaga-Helia University and European Union of Science Journalists' Associations. Their approach was to cover diverse science communication and arts-related topics, focused on providing participants with the opportunity to engage public audiences during the course with science through artistic approaches that ranged from stand-up comedy to theatre.

The course was run as an experimental model supported by ERASMUS+ funding of the European Union. The funding allowed partners to test and evaluate variants of the course in Germany (2016), Greece (2017) and Malta (2018) to determine the courses' content, approach, pedagogic model, and financial sustainability. In 2019 the course was successfully turned into a social enterprise.

The school now takes a student-centred learning ap-

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proach, entirely focused on project-based learning with theoretical content shifted to a flipped classroom approach (Roche et al., 2021). Due to the COVID-19 pandemic the school was adapted to go purely online and renamed STEAM Digital School. Amanda Mathieson (BiOrbic, University College Dublin, Ireland) led the development of a multimedia online course that acts as a stand-alone science communication course and as a preparatory course undertaken by all intensive course participants. This online course covers science communication theory, presentation and writing skills, traditional and social media, branding and marketing, and event management and evaluation. The STEAM Digital School course was run over 5 days (18–22 January 2021) on Zoom, Slack and Google Drive, using online collaborative tools such as Mural. Over the 5 days, the course covered every part needed to develop an effective online science communication event using a STEAM approach. As a rough outline, the interactive workshops covered the many reasons to communicate science; these were then used to help the students develop their event's aims, followed by a target audience profile, then developing a tailored event for that audience with the appropriate branding and communications strategy. The participants of the STEAM Digital School also worked on their improv and theatrical performance skills, an evaluation plan, and started working on the chosen event's content. In the evening, online social events helped the participants socialise with the aim of more effective collaboration, and to expose them to innovative online science communication formats such as a STEM (Science, Technology, Engineering, Mathematics) Escape Room (Mathieson & Duca, 2021).

This preparation was then collated in the form of an outreach event which was scheduled to take place two weeks after the completion of the course, for all participants to gain experience in event creation and outreach. The students of the STEAM Digital School developed the event called "Swipe Right for Science Treasure Hunt" targeting 16 - 19-year-olds as a means to increase interest in STEM subjects during the COVID-19 pandemic. It was hypothesised that because of stay-at-home regulations in place in many countries, it was reasonable to believe that more students would be interested in joining such an online event from their homes. In addition, the students might also have an increased interest in the sciences in general due to the biological nature of the COVID-19 virus. The STEAM digital school students organised every part of the event themselves from the performances and the evaluation to the development of the puzzles based around science facts; specifically on the topic of communication within nature. This paper details the planning process, key learning points and insights of organising an online engagement event during the COVID-19 pandemic that we hope other science communication practitioners and educators will learn from when planning future online training courses and events.

1.2 Literature Review

Online learning has evolved dramatically from simple text and images on webpages, to innovative interactive games and more sociable webinars and lectures. The internet has been used across various educational institutes in the delivery of learning activities. Learning through online teaching offers benefits our ancestors would never have fathomed; free online courses help bridge the gap of social inequality access to third level education, enables flexible learning for those who perform day jobs or have dependents, and of course enables learning while still engaging in social distancing and stay-at-home policies during the COVID-19 pandemic (ION Professional eLearning Programs, 2022). Even prior to COVID-19, online learning has been utilised as an accessible method of education where students feel comfortable interacting and to increase social inclusion (Cobb, 2009; Notley, 2009). At university level, studies have shown that student engagement and interactivity were similar in both online and in-person learning (Coiado et al., 2020), or actually increased in online learning (Caton et al., 2021). It has also been identified as a preferred learning approach for millennials and working adults due to its flexibility and convenience (Amemado, 2020).

Nevertheless, online learning comes with challenges especially regarding access and inclusivity, which have been amplified during the course of the COVID-19 pandemic. These challenges include the technological, social, and psychological sphere (Ferri et al., 2020). Families from disadvantaged socioeconomic groups struggled with online learning mainly for the lack of resources, including appropriate physical space to carry out the learning, reliable internet connection, insufficient number of devices, and lack of support from parents who often do no have the necessary digital skills to help their children (Outhwaite, 2020). In addition, the persistent lack of in-person social interactions with the teachers and with other classmates, as well as physical and mental fatigue due to increased screen time, showed negative consequences on the mental wellbeing of the students as well as on the effectiveness of learning (Syahputri et al., 2020). Nonetheless, few other options were available during the pandemic.

Effects of online education in secondary schools can vary depending on the type of subject they are enrolled in (Zhang et al., 2021). With the COVID-19 pandemic, online learning became commonplace rather than an exception in the delivery of learning. Schools shifted from

face-to-face classes to synchronous and asynchronous classes, with over 1.6 billion children affected by school closures across the globe having to resort to alternate learning methods (UNESCO, 2020). This shift added to the challenge of making learning not only accessible but also of high quality and satisfaction (Amemado, 2020).

The decision of the organisers to target a younger age group with the online treasure hunt event stemmed from the aim of increasing interest in STEM subjects in the younger generation, particularly with science featuring so heavily in the news during the pandemic. Encouraging youth towards STEM (Science, Technology, Engineering, Mathematics) should start early as interest may wane with age (Talisayon et al., 2006; Wright, 2014). Science communication in a fun interactive format such as through theatre and art has previously been shown to be achievable through after-school science programs, interventions in pedagogical delivery of science and teaching science using a multicultural approach (Jones & Stapleton, 2017). Therefore, the event was developed as an online Treasure Hunt designed with the intention of including acting pieces of a humorous storyline to aid in maintaining interest and to introduce a "hook" or reason for completing the hunt as well as real time puzzles with a competitive element to increase the interactivity of the game.

Even prior to COVID-19, interactive learning had been shown to increase younger people's interest in STEM (Asheim & Parrilli, 2011; Rieber, 1996; Sirakaya & Alsancak Sirakaya, 2020). Goldee Jamwal of Utah State University evaluated the impact of using interactive learning modules against traditional methods of teaching in Logan High School in 2012 (Jamwal, 2012). The study asserted that improving the manner of teaching inside classrooms will increase student uptake for computer science careers. This goal of interactive learning was the basis of both the STEAM Digital School in science communication and also the event planned by the school's participants. To evaluate the effectiveness of more interactive learning modules, Jamwal used a series of surveys handed out to the students and in-class observations. The author's research demonstrated that more than half of the students participating preferred interactive learning and working in small groups, over more traditional learning methods. Similarly, the event reported here used evaluation methods of voluntary surveys to investigate the impact of the treasure hunt on the participants.

It is with these reasons in mind that this digital course and subsequent online event were planned using a STEAM approach: using the arts as a means of communication to a specific audience. Arts such as theatre are capable of incorporating informal learning methods very effectively (Kassing, 2007; Tomljenovic, 2015). Therefore, by utilising the arts as a communication method to design an online STEM themed event, it is possible to convey complex scientific ideas to non-scientific audiences such as teenagers. In the online Treasure Hunt developed science activities were embedded in a storytelling format, in which the organisers performed in first person as characters of the story. The next section describes in detail the development of the online Treasure Hunt format, from conceptualisation to the storytelling, logistic, content creation and finally the event hosting.

2 Methodology: The Online Treasure Hunt Format

The STEAM event was planned to take place in February 2021, in the middle of the COVID-19 Pandemic. In most countries, this meant citizens were cautioned against leaving their homes except for limited exercise within a couple of kilometres of their homes, and school and work activities shifted online. The virtual setting was thus the preferred option for running a STEAM event. The event was planned to target 16 - 19-year-olds with the aim to increase interest in STEM subjects during the COVID-19 pandemic. A virtual treasure hunt seemed the perfect balance between the event objectives (increase 16 - 19-year-olds' interest in STEM) and the logistic challenges of producing the final event (organisers working remotely from different locations around the world).

The treasure hunt format was conceived to allow participants to be the protagonists of the experience; they were at the centre of the action, interacting not only with the story but also with one another. The organisers elected to use the interactivity of Zoom platform as a tool to provide an active learning experience for all for the following reasons: it is free for participants to join an event on any main electronic device (mobile, tablet, computer); the targeted audience of teenagers has a high chance to be familiar with the platform already, since Zoom has been a popular platform chosen for online learning during the pandemic, with over 90,000 schools across 20 countries using Zoom during the first lockdown in March 2020 (Yuan et al., 2020). Zoom also supports flexible features such as break out rooms, texting boxes, sharing presentation mode, and a live annotation on screen mode that can be exploited for dynamic engagement online. It was decided to utilise the breakout room function to separate participants into teams and to introduce a competitive element to the game. Eventbrite was chosen as the means of registering participants and used to securely share the Zoom link needed for participants to join the event.

The event organisation team was split into different groups and each group was responsible for the production of one of following areas of the treasure hunt: story cre-

ation and script writing, content creation for the event, event communication and advertising, evaluation creation and execution. In the following paragraphs, we report how the work was organised and describe each part of the event.

2.1 Logistics of event creation

Much of the work to create an online treasure hunt would mainly involve autonomous tasks such as content creation, while certain group tasks could also be completed within smaller groups on Zoom to record the acting performances and design the script. Zoom was identified as a suitable platform for video meets, Google Drive was utilised for file sharing as everyone could have equal access to all necessary files. Slack was selected as a suitable messaging platform, due to its ease of access and some people's previous familiarity with the app. Doodle was used to set up polls to determine times of Zoom meetings, as all organisers were spread across different time zones.

2.2 Story and Script Writing

The treasure hunt event took place on Zoom as a live activity themed around superheroes and communication. During the idea generation stage of story development, the main ideas were decided as follows: the protagonists should be teenagers to increase relatability to the targeted audience of teenagers; humour should be a factor as it is proven to be attention-grabbing and entertaining (Dormann & Biddle, 2006); social media should play a part as this is one of the main methods of communication engaged in by teenagers (Villanti et al., 2017); a moral to the story should also be included, such as good social media practices or internet usage.

Combining these factors, the organisers came up with a story for the treasure hunt: the protagonists would be three teenagers with superpowers that had lost their powers through an online scam operated by a villain on social media platforms. The villain had encrypted the superpowers, so the audience needed to solve science puzzles to decode them. The scientific theme overarching the puzzles was chosen to be 'Communication in Nature with overall aim was to encourage interest in STEM subjects. The 60-minute time frame of the event was decided with the belief that the audience may begin to lose interest after this time point. The organisers of the treasure hunt game decided to incorporate theatre as an aspect of the event for entertainment and to provide a "story hook" to motivate participants to complete the game.

Once the story was decided upon, script development was then undertaken, taking into account principles of story-telling covered during the STEAM school: a hero, an obstacle, an objective, a journey to overcome obstacles, and a satisfying resolution (Champagnat et al., 2010; Deniston-Trochta, 2003).

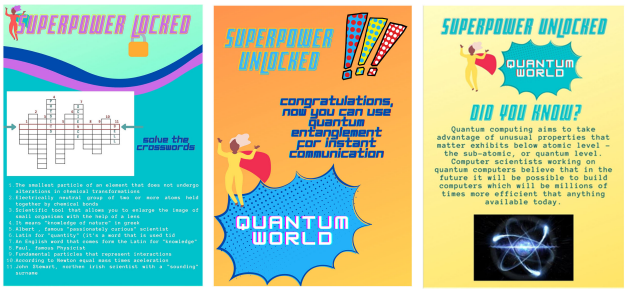

Figure 1: Example of a puzzle set from the event, created using Canva.

2.3 Content Creation

The short video performances for the story were recorded by using pre-existing software within Zoom. The feature of virtual backgrounds was used to give the villain a dark lair as a film set, while the speaker-view function within Zoom enabled the current speaking part to be put up front in the video recording. The full recording was then saved to the cloud and edited for better transitions and for sound effects by one of the performers with previous video editing experience. The Zoom format enabled the performance recording to seem more realistic, with each character in their own setting, interconnected in the plot by either a phone call or from a television screen, highlighting the topic of communication. These videos were then edited for effects and accessibility, with subtitles added to all speaking parts for accessibility.

For the creation of the puzzles, the organisers also carried out a brainstorming session using the scientific theme of the treasure hunt (communication in nature, specifically in terms of waves) to define different puzzle topics. The topics of each puzzle were decided as follows: x-rays, microwaves, the visible light spectrum, infrared, soundwaves, quantum waves, seismic waves, and genetics. The puzzle types were decided by what formats would carry effectively over an online format, including crosswords, hidden objects, morse code, pictograph math puzzles, and cryptography. For each puzzle solved, a brief scientific fact around the puzzle theme was provided, which was termed a "curiosity". Puzzles and curiosities were then standardised in a coherent visual theme using Canva in a slide format, which correlated to the overall treasure hunt theme. Figure 1 gives an example of a puzzle card used: the clue (left), the power unlocked (middle) and the scientific curiosity about the puzzle theme (right). The visual theme was decided upon by the marketing team, and was kept as a recurring visual theme throughout the

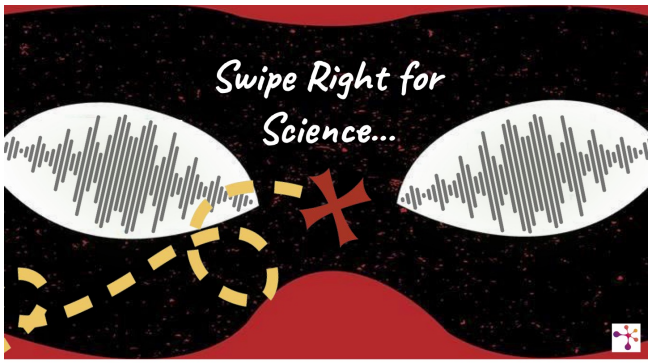

Figure 2: Poster for social media advertising.

event content.

2.4 Marketing

The marketing team created themed visuals which would link into the plot and created the event on the EventBrite platform. Figure 2 shows a banner for the event created to be shared on social media. This banner incorporated a superhero mask with some sound wave visuals and a treasure map to represent the various components of the event.

The title of the event was also decided upon: "Swipe Right for Science". This title was arrived at during the marketing team's creative brainstorming session where they discussed the target market's interests and the story arc. As the social media platform Tinder features within the story, "Swipe Right" was decided upon. This refers to a feature of Tinder whereby you decide to "like" a person's profile by swiping right on your mobile screen, hence the title of the event. The treasure hunt was then advertised on different social media platforms including Facebook, Instagram and Twitter one week before the event. These advertising platforms were chosen based on the event's target market of teenagers being hyper-represented on social media in general (Mas-Tur et al., 2016; Villanti et al., 2017).

2.5 Evaluation

Evaluation was performed to measure the effectiveness of the event and whether its objectives were met. The evaluation team for this event prepared three levels of evaluation: a questionnaire to be filled out after the beta-test with a limited number of test subjects, a questionnaire after the event itself sent to participants over a web-link, and an organiser-specific evaluation which took place after the event was competed and involved an informal discussion with recorded feedback points.

Before the event took place, a beta test was completed with five voluntary teenagers. Feedback from the beta test helped to improve the event before the final running in the following ways: the difficulty of some puzzles was reduced, the number of puzzles presented was shortened due to time limitations, and the running format was adjusted within the breakout rooms. From this beta-test, it was decided that the best way for engaging the participant in the puzzle solving was by remote screen sharing, using the annotation feature from the Zoom platform to allow the participants to interact with the puzzle simultaneously. A session leader guided each breakout room and the participants in that breakout room through the story and the puzzle solving, and a technical assistant was responsible for sharing the screen with the puzzles as well as for all the other technical needs for the session. This enabled the host of the individual breakout rooms to have the answers to the puzzles on screen themselves, in order to provide hints if the team was struggling with the puzzle.

2.6 The Online Treasure Hunt Event during 'Stay-at-Home' 2021

The event was hosted online in early February 2021, when many countries around the world were in a second 'Stay-at-Home' mandate (Mathieu et al., 2020). The day before the event, 16 people signed up over EventBrite. The live event had 9 people participate through Zoom. The event ran smoothly and within the time limit, bolstered by the feedback received from the beta test and a final rehearsal the same day of the event for the organisers to practice screen-sharing and other technical features. The evaluation team also prepared a Google form to be given to participants at the end of the event. Five participants responded to the form, the results of which are discussed in the Results and Discussion section. One more meeting was held the day after the event, for the organisers to formulate their thoughts and feedback for their own evaluations which were then recorded and will be reported similarly in the next section.

The actual event started on a Saturday, with the MC (master of ceremonies) welcoming everyone to the event. One technical assistant in the main room shared their screen with the first performance video to introduce the story's hook to the audience. After watching the video, all participants were split into groups in breakout rooms, with a host and technical assistant in each one. The MC remained in the main room and sent messages to each breakout room to generate a competitive atmosphere with messages like "Group 3 is on the second puzzle already!". Progress was reported to the MC through Slack, which was operated by each team's host in the background as they solved the puzzles.

3 Results and Discussion

The STEAM Digital School was held on 18th – 22nd January 2021 and the Swipe Right for Science Treasure Hunt was held at 12 noon GMT on Saturday, 6th February 2021 as a free virtual event on Zoom. A synthesis of results is presented below, along with the outcome of the event participants' and organisers' evaluations.

3.1 Event Participants

There were 9 participants in attendance at the main event, from a total registration of 16 participants on EventBrite. After welcoming participants in the main room, the main host introduced the treasure hunt and played the intro video introducing the plot hook: aiding our protagonists in retrieving their lost superpowers. Afterwards, the participants were randomly sent into two groups. Two team members were assigned to each group; one served as the host of the group while the other was responsible for technical assistance. Of the nine participants, five filled in the voluntary feedback form; the main results of which are reported below:

3.1.1 Survey results and participant feedback

The gender ratio of respondents was 80% male and 20% female, while the participant ratio was 90% male and 10% female. The nationalities of the responders were British, Egyptian and Maltese. One respondent was from the targeted age group of (16-19), while the other respondents were of older age groups (Fig 3). 80% of the respondents were from third-level education, with 20% from second level. 60% percent of the participants heard about the event through Facebook, 20% from the STEAM Digital School website, and 20% from word of mouth. Every respondent indicated they found the event entertaining, with some finding puzzles mid-level (5/10) in difficulty (40%) and others (60%) finding them slightly more difficult (7/10). Every respondent rated the event 8 out of 10 or over, in terms of quality. All indicated they felt more inspired by science after the event and would recommend the event to friends.

As seen in figure 3, team 1 found the puzzles more challenging and took a longer time to complete the game (using the full 50 mins assigned as opposed to team 2, who finished ten minutes early). This may have been due to the lower age distribution of team 1. One participant from team 2 reported they would have preferred some additional puzzles to complete since they finished early: "Perhaps a few extra puzzles, they were fun but we completed them all well ahead of time". Additional puzzles, which would require some twists to the storyline could have helped overcome this issue, though our intended target audience was of the 16 - 19-year-old group and they might have found the hunt more difficult if we did so. Therefore, we conclude that some optional additional puzzles may be a benefit in future events..

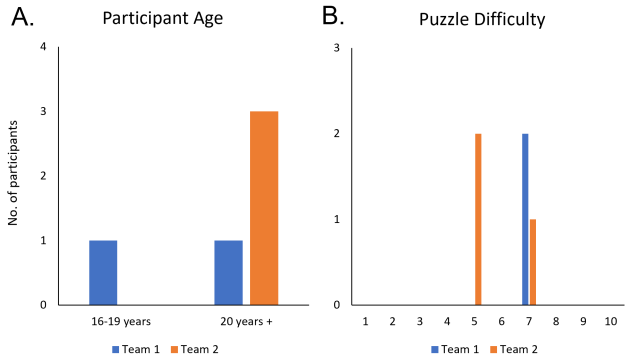

Figure 3: Participant distribution from survey responses. Five out of nine participants responded to the survey, two from team 1 and three from team 2. Panel A represents the age distribution, while panel B was a rating of how difficult participants found the puzzles, with 10 being most challenging and 1 being easy..

3.1.2 Accessibility

One participant was a special needs teenager, who struggled to interact at times with the group. They were non-verbal and could not write, therefore only communicated with gestures which were difficult to make out while sharing screen through zoom. Some consideration in this aspect could have been planned, such as having the puzzles on a smaller screen to show the participant's video more clearly.

3.1.3 Storyline

One participant remarked: "More videos showing the progression of the story - what happened to the people who lost their superpowers!". Further videos or additional graphics could have been shown between solving each puzzle to highlight participants' progression.

3.1.4 Puzzle Types

Some comments were also made about the content of the puzzles, such as "Memory recall puzzles are not very fun". This may not be a universal experience however, and a variety of different puzzle types are likely best utilised to ensure something will appeal to everyone in the game. Different genres of puzzles may be adopted for particular events either, where the puzzle type is known prior to commencing the game and perhaps ensuring a higher level of affinity with the intended audience. Further testing and evaluation would be needed to determine the content types that appeal to the widest target audience.

3.2 Event Organisers

The blended formats used within the course (presentations, improv role plays, live collaborative activities, etc.) gave a holistic experience that facilitated the practice of workshop sessions. Student feedback on the school itself was collected prior to the beginning of the course, and again upon completion of the course. The main points are reported as follows:

3.2.1 Organising a virtual online event vs. in-person event

Due to COVID-19 regulations, even the organising of this event had to be carried out through online meetings, which were interspersed with each organiser's usual workloads. After the five-day long course, two weeks were scheduled for individual and collaborative work towards the Treasure Hunt. Many participants of the school found it difficult to devote more time away from work or study, and to spend even longer times online in front of screens. Often this would take place at inconvenient hours in the day due to many organisers in different time zones. Considering the time investment required for preparation of the event, student team members generally agreed that the course could have been extended by two workdays. These days would have been devoted to finalising most event paraphernalia such as advert design, script writing, video recording, and development of the evaluation tools that were used during the Treasure Hunt. Completing tasks that required collaborative, large hands-on engagement could have been concluded before parting ways, leaving those tasks which were more autonomously dependent to be completed after this.

A noted benefit however from an online based organisation was that team members did not have the large cost associated with travelling to a predetermined destination and could do so from the comfort of their own homes. The organisers agreed that if most organisation activities had been concluded before the end of the workshop sessions with two extra days of active preparation, the whole experience of preparing an online event virtually could have been even less stressful than doing so in-person. The online event had the potential of attracting more participants, particularly if more time had been devoted to marketing the event after the course.

3.2.2 Communication

Most student team members hoped to be available for meetings and collaboration towards the Treasure Hunt during the intervening two weeks. However, not all could attend such meetings or contribute actively to executing event plans and communicating with these participants through online means proved difficult. Individuals within these teams were forced to take on larger workloads than originally expected as a result, and some took the lead in coordinating their respective team members towards presenting the necessary deliverables on schedule. The student feedback indicated that creating contingency plans for unavailability of team members could have made the plans move on more smoothly. An apt contingency plan could have been having some people work in more than one team. If the event organising took place in-person, this issue would not have arisen due to everyone being reachable at the same location in the school. Although overall communication was made much easier by the large variety of online platforms which were in frequent usage during the COVID-19 pandemic: for example Slack, WhatsApp, Google Docs, and Zoom.

3.2.3 Event Rehearsal

The Treasure Hunt was rehearsed by the organisers a day before the event. Due to time constraints, each team member was not able to completely test their assigned roles. This led to some technical difficulties on the day of the event, though these were fixed within short time frames. Having a full run through of the event would have aided in preparing substitutes to cover for others in case there was need. It would also have helped organisers to familiarise themselves with their assigned roles.

3.2.4 Target Audience

The treasure hunt targeted teenagers between the ages of 16–19 years old. This target audience was published in the fliers and the adverts. However, of the nine participants we had only seven were teenagers while others were older. Also, some organisers who had not seen the puzzles yet also joined in as participants, helping the other participants feel at ease with turning on their own videos and participating more vocally. The content and flow of the hunt was shown to be equally interesting for teenagers and for older participants based on these participants' feedback. The target market may have been narrowed too much by announcing that the hunt was primarily for teenagers. This factor may have limited participation. Specifying teens in the adverts excluded the possibility of families or adults without children joining in, when they may have enjoyed the event. Since the content of the event was relevant to wider demographics of participants, the decision to participate could have been left to the discretion of the prospective participant. Also, in a situation where participants have no prior interaction with one another, it is recommended that some sort of ice-breaker activity should be incorporated early into their separation into breakout rooms. This will facilitate collaboration, which will aid their progress through the treasure hunt and inspire an engaging environment from the beginning.

3.2.5 Technical Issues

Some participants (six teenagers sharing three devices) had technical difficulty joining the Treasure Hunt. Internet connection at their locations was bad almost throughout the event. Puzzles, clues, scientific curiosities, fun facts, and other items to be shared on-screen with participants at future events should be designed with mobile users in mind. They should be adapted to small screens, and participants should be able to easily annotate on them. This is especially important since as of January 2021, 59% of internet users access the internet from mobile devices: 55.68% on mobile phones and 2.87% on tablets (StatCounter GlobalStats, 2021).

While organisers agreed that Zoom was an innovative and user-friendly platform for use in an online event, there could have been technical backups such as live streaming on Facebook or YouTube, both of which require less bandwidth than a live event on Zoom. Live streaming on these platforms can also allow real time engagement. The links for accessing and downloading event resources should be shared on Zoom and on these platforms so that participants can download and enlarge them to suit their preferences. With these, individual participants could have been able to actively contribute to the event live, irrespective of the platform through which they joined. In addition, videos of the event flow could have been accessible to all afterwards. Notwithstanding, proper consideration should be taken for regulatory obligations such as those required under the General Data Protection Regulations (GDPR) and the Data Protection Act (DPA).

3.2.6 Videos

The intro and outro videos worked well with subtitles. It was agreed that including videos that showed the recovery and use of the different superpowers could have been a great way to keep participants' interest in the story, in-between the puzzles. It could have been more engaging if the story was not completely linear. We could have had videos that depicted other possibilities, for example, in a situation where a superpower was not successfully recovered or when the villain set out to use one of them because it was not recovered early. The short time span between the workshop and the event was the main limiting factor for video production, but with a longer time frame, this addition could have increased the quality of the event.

3.3 Conclusion

The purpose of events such as this is to engage with the audiences on topics within STEM in a fun and casual way. While the "Swipe Right for Science" Online Treasure Hunt was a small event, it serves as an example of what can be achieved through creative online learning approaches such as those employed by the STEAM Digital School. In pre-existing literature, there is no mention of an online STEM treasure hunt event in this format being completed before, as treasure hunts are traditionally seen as active, in-person events which may be difficult to move onto an online platform. Online events have some flaws, for example since signing up is free, as a result many people who sign up will not necessarily show up at the event itself. Even so, the benefits tend to out-weigh the disadvantages; the format of online events is accessible to people across the globe and can be made to be as user-friendly as possible with a wide range of software now available. COVID-19 pandemic restrictions have led to a revolution in how online learning is achieved; this generation is now the most tech savvy and internet proficient as a direct result of the struggle of pandemic living. COVID-19 regulations may have made online event planning an annoying necessity, but without these the online treasure hunt may have never been investigated as a medium for scientific communication. We conclude that fun, STEAM-themed online events like treasure hunts are both achievable and rewarding for organisers and participants.

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