Virtual Inclusion
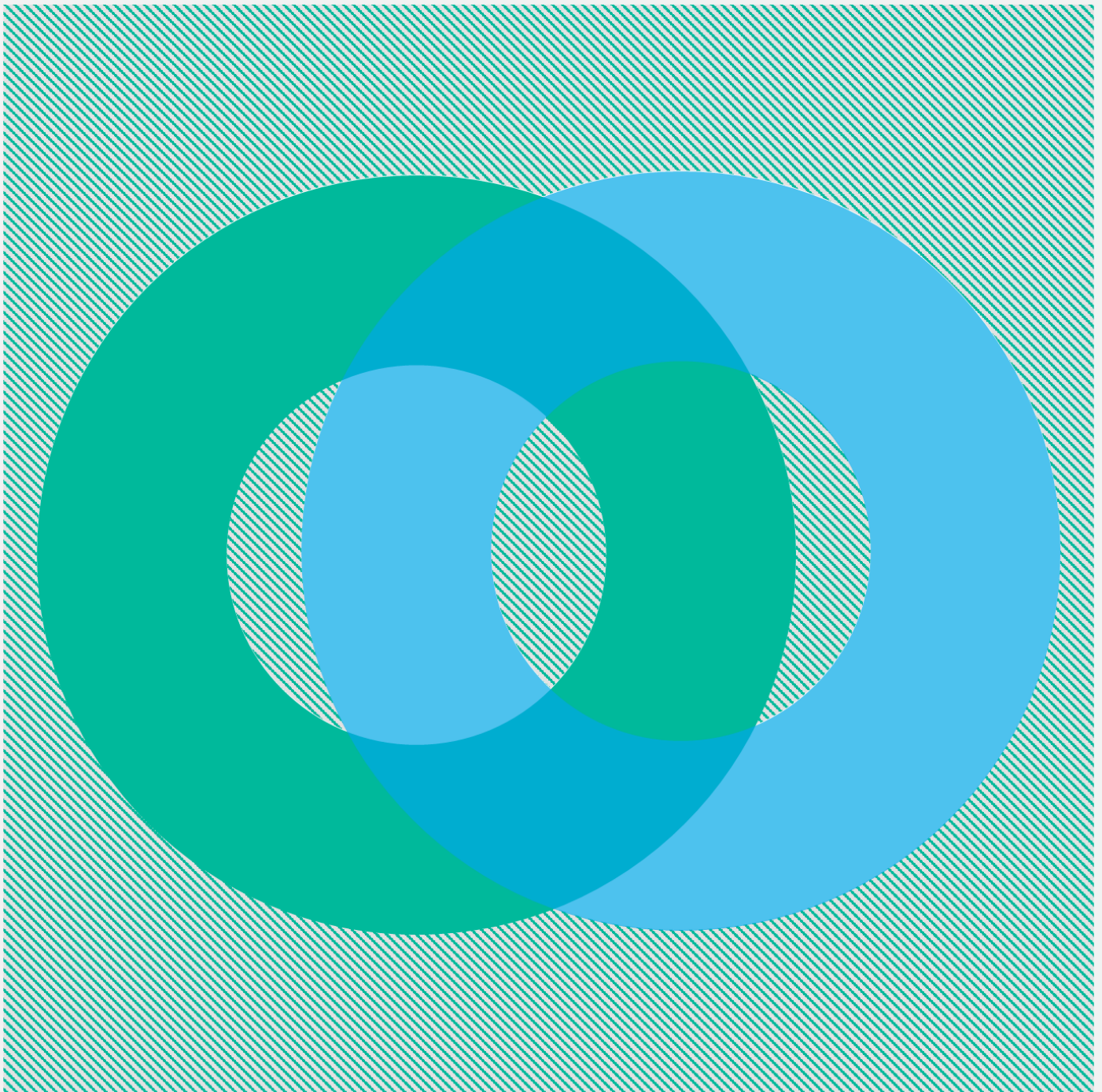
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Summary

Virtual reality has emerged as a powerful new technology aimed at immersing its users in an environment or in experiences that would otherwise be inaccessible to them.

Demos and the Open University piloted three virtual reality workshops in UK schools to test the use of this technology in building empathy and resilience among young people. The workshops were designed to allow a young person to experience 'life in someone else's shoes'. The workshops were attended by ninety young people over three months in 2018. To evaluate the pilot, surveys were completed by the young people after the experience. Feedback from young people underlined their enjoyment of the experiences, and hinted at future behavioural change.

- Scenarios covered exclusion by language, in culture and by race.
- 54 percent of the participants reflected positively on the role played by VR in immersing them in someone else's experiences.
- High proportions of participants reported learning new skills (80 percent) and knowledge (88 percent).

Encouragingly, teachers and students involved in the work expressed an interest in extending their participation in the pilot. The project showed the possibility of creating socially impactful technology developed with young people, drawing on the views and ideas of British students from diverse.

We believe this kind of immersive technology will grow in importance in media consumption in the coming decade, and it is of central importance that we are aware of its use and committed to exploring its utility in education.

Introduction

Virtual (VR) and Augmented Reality (AR) technologies are moving into the mainstream. Brought together, these immersive technologies are forecast to grow into a market worth hundreds of billions of dollars, with enterprise and public sector applications in healthcare, in the military, in engineering and education. For consumers, the technology promises new, immersive ways to experience news and live events and entertainment.

There is evidence that VR may provide a powerful vector through which empathy and understanding in its users can be built up, and a number of pioneering media and news agencies have begun to explore this application as part of their reporting. This report explores the ways in which educators and civil society might use this power for good, in building up tolerance and resilience, and in capturing and then exploring the experiences of those from contrasting to walks of life.

This short paper illustrates the *Virtual Inclusion* project, led by Peter Bloom at the Open University, of which Demos was a partner. Over a period of ten months, the project team designed and delivered a series of school workshops using virtual reality technology, aimed at allowing a participant to walk in the shoes of someone from a minority or disadvantaged background.

Our research began with a review of the existing literature, though the review is presented towards the end of this report. The review explored the extent to which VR can be shown to build empathy and resilience and examples of previous applications.

The report begins with a description of the project: the process by which the project team developed a platform through which young people were able to access VR scenarios focusing on resilience-building and its piloting at three British schools.

The report concludes with a short evaluation based on survey-data taken from the pilot workshops and feedback from participants and teachers, and some concluding thoughts on the likely future applications of this and similar technology.

Workshop Design

The aim of the project was to build virtual scenarios through aimed at combating extremism through building empathy and tolerance in participants able to experience discrimination and exclusion using new technology.

Planning

The project team worked with the education community, with law enforcement, with the academic community and with our funders, the ISD, to identify aspects of young peoples' experiences that would be best leveraged as part of the virtual inclusion workshops. The project team also consulted on the technological requirements, eventually settling on video 360 as the best suited for the purposes of the pilot.

Eight development workshops took place during the project with students, parents, teachers, Prevent coordinators, councillors and law enforcement. Workshops took place in Milton Keynes, Harrogate and High Wycombe between June and July.

Workshops aimed to:

1. Discuss ideas for scenarios.
2. Better understand the resilience needs of young people.
3. Establish the suitability of scene and use of drama school students as actors.
4. Discuss the experience of shooting the scenarios and how they could be used effectively in classrooms.

Key findings from speaking to teachers and students included:

- The need to capture the everyday experiences of young people in 2018 specifically to ensure the scenarios felt relevant and up to date.
- The importance of 'low-key' unpleasant experiences faced by vulnerable young people growing up, such as having their mother-tongue mocked, or complaining of ethnic or national differences in group situations. This aligned closely with parental and governor requirements around student conduct when taking part in the workshops.
- The importance of language and comprehension as central to experiences of exclusion.
- The conflicted position of cultural artifacts in the eyes of young people facing everyday exclusion: some interviewees dismissed concerns that, for instance, a

headscarf increased their vulnerability to exclusion and discrimination, while others listed evidence that their peers had been targeted in this way.

- The need to include a balance of genders, and the unique circumstances associated with exclusionary behaviour by gender.
- The need for the project team to build trust with the young people taking part in the workshop, and how that trust was central to delivering the project once released to the public.
- The importance of focusing on inclusion as a core tenet of the project, rather than straying into broader 'anti-bullying' messaging.
- The surprisingly limited use of technology by this age group: they are too young to all be carrying mobile phones, and this should be reflected in the scenario construction.

Key findings from speaking to law enforcement and Prevent coordinators included:

- The contemporary challenges facing Muslim children in schools and their increased risk of discrimination and exclusion.
- Further emphasis on the problem of tacit discrimination

Working with young actors and filming in 360 video, the team produced three virtual scenarios or "field trips". Each scenario presented the experiences of a young person who was either socially isolated or vulnerable to exclusion as a result of being different. The project aimed to create videos that were revealing of both the positive parts of their culture and the daily struggles they might face due to discrimination and the demands of fitting into British society. Each scenario ended with a choice that could be made by the participant as to how to resolve a challenging situation.

The three scenarios filmed were named after the lead character.

1. Kasia

This scenario explored the experience of a young girl whose first language wasn't English, and who was joining the school for the first time, and their experience of feeling isolated from games and conversations of other students and the sense of belonging experienced in the special class designed for them to improve their English skills. It included scenes showing them trying to speak to a student who comes from their background but does not speak their language fluently.

2. Rashid

This scenario followed a day at school of a student of Arab ethnicity whose friends are playing a "terrorist" themed video game. It revealed the sense of inclusion he feels when students make an effort to talk about his existing interests and the fact that other students who are not of his culture also feel excluded due to not having access to social technology (either because of their class or similarly strict parents).

3. Darrell

This scene followed an Afro-Caribbean student who is being bullied at school. It highlights for students the subtle discrimination that non-white young people may face in their everyday life. It also shows how having friends who understand and support them can enhance their feelings of inclusion when facing these subtle and not so subtle challenges.

Scenarios were shown to a group of six students at a school in Milton Keynes. Feedback was very strong, with all students agreeing positively on measures of 'effective', 'realistic', and 'immersive', and that they were content to recommend the work for use in the classroom. The team noted that social pressure likely impacted the unanimity of the feedback, but were nevertheless pleased with the results. A number of students noted that scenes like those captured in the workshops "happened all the time", and that these were useful tools through which to discuss how and why they take place and possible responses.

Each virtual experiences was followed up by activities asking young people to critically reflect on their own prejudices and experiences, the extent to which they can sympathize or understand, and how they could help people who are excluded in their communities. Workshops were delivered in the schools between August and September.

Distribution

A key requirement for the pilot was to estimate the accessibility of the project to educators. At the time of writing, virtual reality technologies are relatively new, and can come with significant costs attached. The project sought to minimise these costs by:

1. Making the videos accessible and functional both through VR-enabled headsets and traditional media technologies. Each video could be shown on a monitor or projector in the classroom, and participants could recreate the experience of moving the camera without the need for a headset. This means that teachers can employ the workshop outputs in the classroom without access to VR hardware.
2. Ensuring the videos would function on the most basic VR hardware. Each video is compatible with 'low-tech' solutions, such as Google's Cardboard viewer. The Cardboard software development kit is available for the Android and iOS operating systems, and allows developers to embed VR content on the web as well as in their mobile apps.
3. Ensuring the videos were accessible on a range of different platforms, such as mobile apps and a web version in 3D and 2D). This allows the resources to reach the broadest population possible
4. Using the Open University's OpenLearn platform to distribute the video and related teaching accessories and materials.
5. Uploading the content to YouTube.

To support the use of the technology in the classroom, the project is releasing a digital toolkit that will be freely available to educators across the UK and internationally. This toolkit outlines lessons and lesson plans and explains the technological requirements for using the material in the classroom. The material can be used in a variety of ways in the class, from the large touch screen allowing an entire assembly or class to watch and discuss it, to a tablet where small groups can watch it independently fostering collaborative discussions, to the VR headsets that makes students feel fully immersed in the scenario.

Outcomes

100 young people aged 9-11 participated in the virtual inclusion workshop. Of these, 90 feedback surveys were collected. Ten surveys were either illegible, or were unable to be linked to a participant. Surveys collected basic demographic information prior to the workshop, and asked the young people for feedback on the workshop. No attempt was made to compare 'resilience' prior to the workshop and after.

In addition to the surveys, further feedback was received from focus group discussions with participants, as well as informal feedback from teachers once the workshops had concluded.

Of the 90 young people surveyed, 49 identified as female and 41 as male. No students identified as 'other'. 73 participants were aged 10 (81 percent), and 76 were British citizens (85%). Of the remaining young people, the largest national group were Romanian, with four citizens completing a survey. Similarly, the majority of survey respondents were English speakers, shown in the table below.[1]

Table 1: # Participants by Language

Language	# Participants
English	77
Bengali	4
Romanian	4
Urdu	3
Chinese	2
Italian	2
Other	8

This relative lack of diversity made comparative analysis of the population challenging, and the lack of parallel prior- and post-survey questioning made an overall measure of change in resilience impossible. The extent to which a young person self-reports future behavioural change is also a poor evaluator of resilience, particularly when promised behavioural change is subject to likely social acceptability bias.

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[1] In some cases, students reported speaking multiple languages, reflected in table x.

Feedback from the students was collated, painting a picture of a successfully-delivered and enjoyable workshop. Evidence from comments made by students and teachers as part of focus groups indicated the workshop successfully in presented a challenging topic in an engaging way, and hinted at the role of VR in bringing to life the experiences of the video subjects.

Participants had a positive experience. When asked whether they had enjoyed the workshop, 83 of the 90 respondents responded that they had either liked it or liked it a lot (92 percent).

Chart 1: Did you enjoy the workshop? (N=90)

Did you enjoy the workshop?

Several participants provided additional detail, praising the use of the technology in bringing a challenging subject to life. Where there were complaints, they tended to revolve around the levels of noise in the classroom during the workshops, and when they had not had a chance to try on the headsets, using a television instead. Further comments are shown below.

very cool, never done before

publish this so other people get to experience it too

I didn't get the headset but was quite good in 2D

Participants also reported acquiring new skills and knowledge from the workshop. When asked whether they felt the workshop had helped them gain new knowledge, 80 percent of participants responded positively. This rose to 88 percent when asked about new skills, shown in charts x and x below.

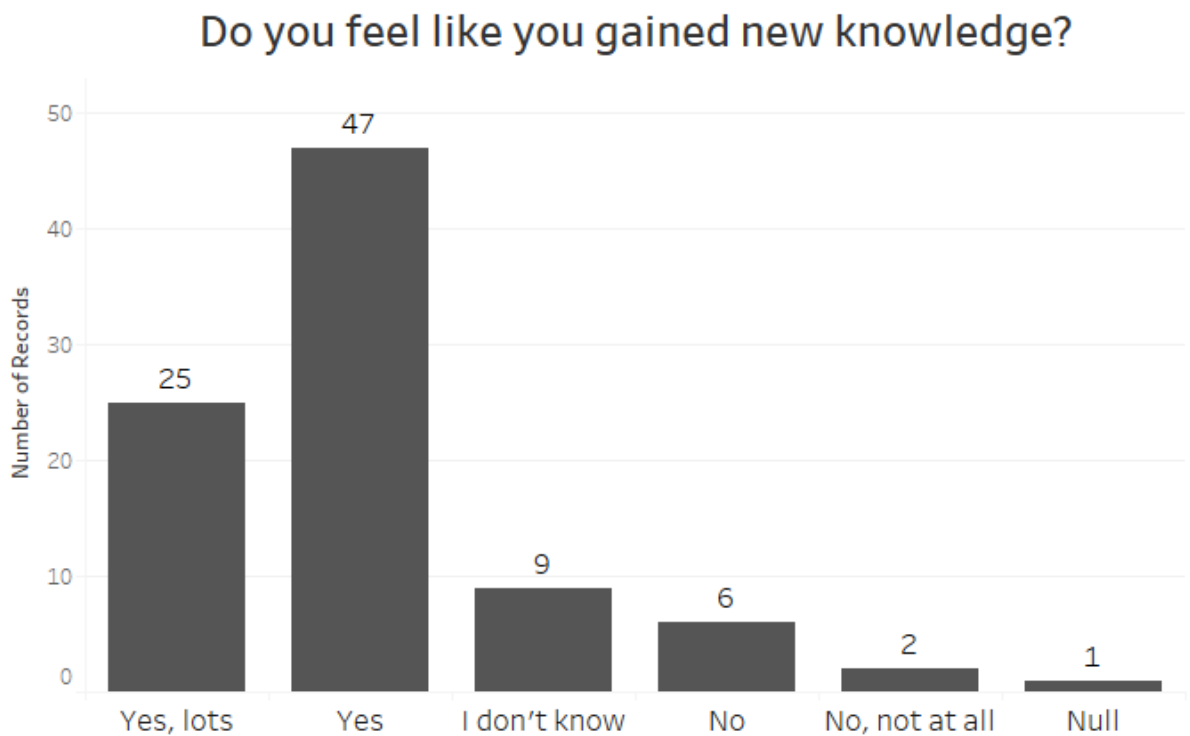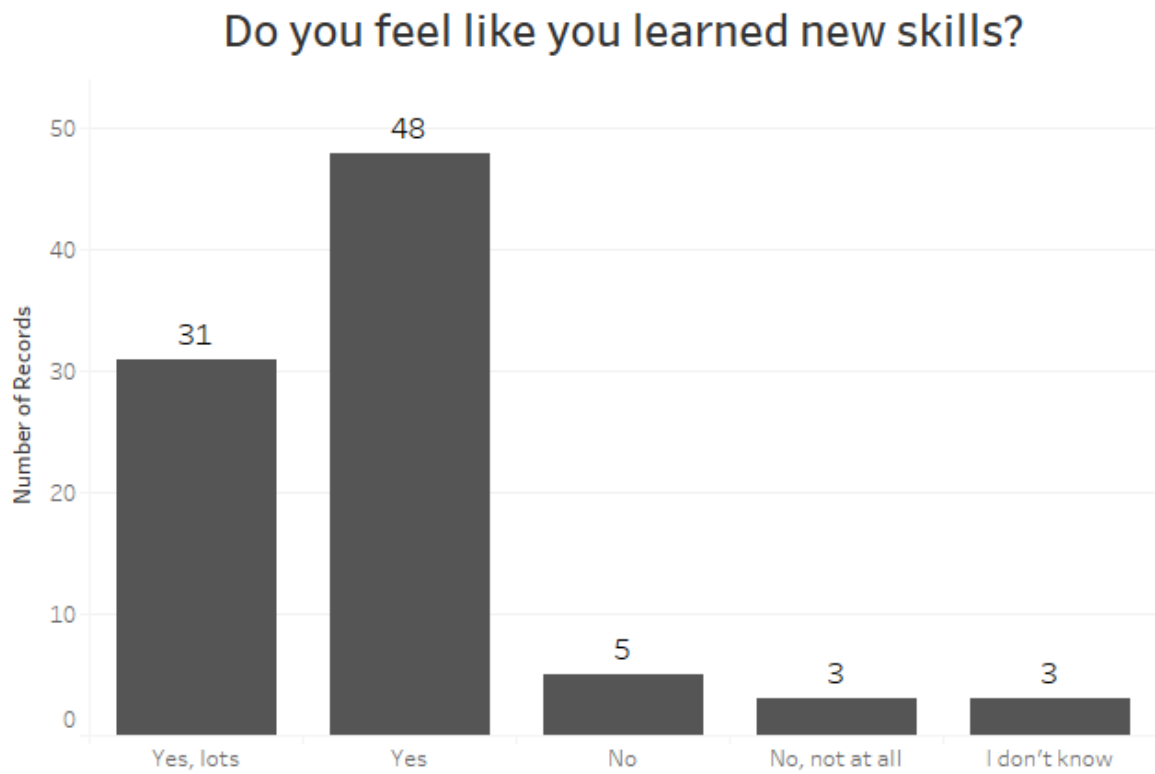*Chart 2: Do you feel like you gained new knowledge? (N=90)*

Do you feel like you gained new knowledge?

Chart 3: Do you feel like you learned new skills? (N=90)

Do you feel like you learned new skills?

Participants were asked how far they felt they understood the subject matter of the workshop: again, the majority (85 percent) felt they understood at least some of the subject matter. 59 percent reported understanding everything in the workshop, shown in chart x below.

Finally, participants were asked to estimate whether their behaviour would change to those who were being excluded on the grounds presented in the workshop. Participants reported a high proclivity to behavioural change (89 percent) towards others being excluded.

Chart 4: Do you feel like you understood the subject matter by the end of the workshop? (N=90)
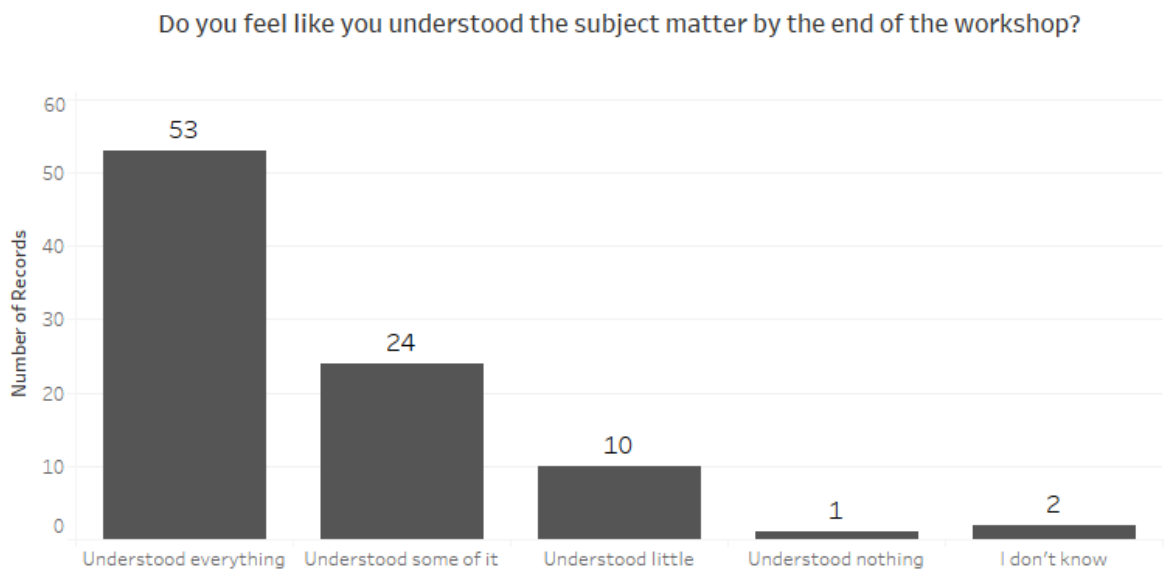
Do you feel like you understood the subject matter by the end of the workshop?

Number of Records

Understood everything	Understood some of it	Understood little	Understood nothing	I don't know
53	24	10	1	2

Chart 5: Do you think that you'll behave differently toward others being excluded? (N=90)

Do you think that you'll behave differently toward others being excluded?

Number of Records

Yes, lots	Yes	No	No, not at all	I don't know	Null
37	38	5	1	8	1
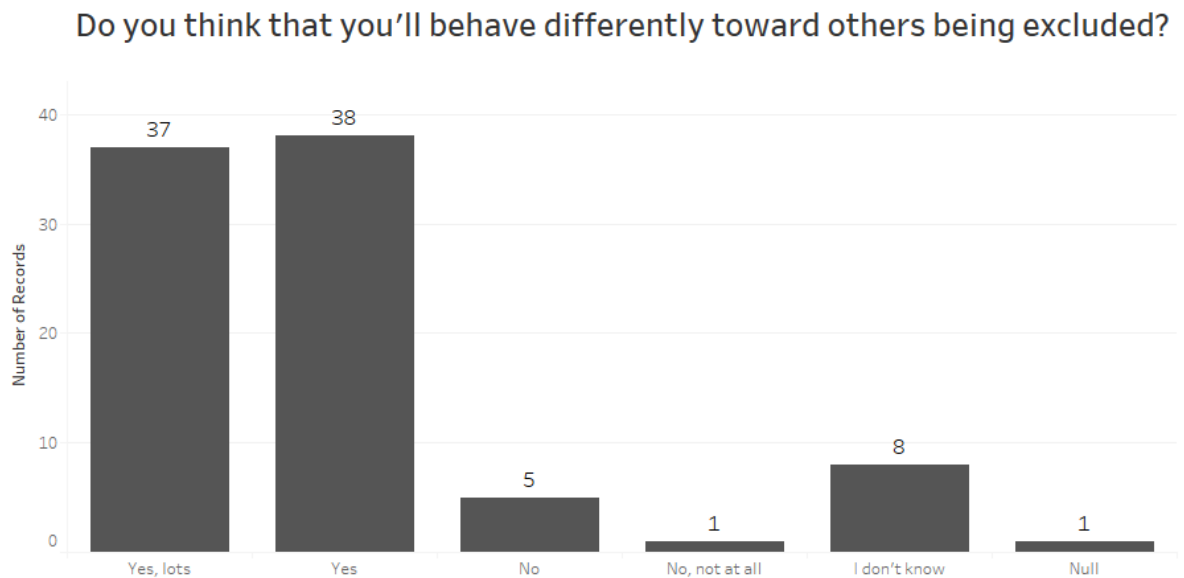
The team was pleased to note that participants had enjoyed their time in the workshops, and that participants reported new learning and a willingness to change future behaviours. Both these impressions were underlined in additional comments noted by participants.

I liked it a lot and it has really helped to stand up for myself and when these situations come I know how to solve them. Thank you virtual reality

It made me learn much more about why you shouldn't be mean to others, as it was like real life

some of the scenes made me sad yet angry because some scenes made me understand that people are racist and it makes me sad

In addition to the survey responses, the project team carried out group discussions with the young people taking part in the workshop in which the young people were asked to reflect on both the contents of the workshop and the technology itself.

Participants were asked to list 2-3 ways in which VR helped them understand the life and challenges facing the subject of each exercise. The majority of reflections from young people focused on the challenges themselves. Of the 78 responses, 16 explicitly discussed the role of VR in the workshop. A common theme here was the 'realism' the technology provided: "it was like you were really there", wrote one participant. The ways the video allowed young people to make a choice was also noted as a positive application of this technology.

Other responses did not explicitly mention the role of VR in the workshop, instead exploring the lessons of each video. It was encouraging to note that approximately half of the students (43 of 79 responses) reflected on the challenges facing the young person in the video and how that might lead to their exclusion or failure to integrate. Given this was a central message of the project, this was a positive finding. Nevertheless, the preponderance of responses dealt with bullying in general: this is by no means a bad thing, but future iterations should focus narrowly on questions of inclusion, particularly given the aims stated at the outset.

Participants also reported the collaborative aspect of the workshops. Experiencing it together rather than just individually, showed that it could be a space for students from different backgrounds to share experiences and shape each other's views.

Participants were also asked to list 2-3 ways they could help young people being excluded. Responses tended to fall into any of three broad categories: victim support, confronting bullies and reporting to an adult.

Table 2: Name up to three ways you could help young people who are being excluded (responses by theme), N=74

	Victim Support	Confronting Bullies	Reporting to Adults
# Responses	53	35	26
% Responses	72%	43%	35%

Table 3: Name up to three ways you could help young people who are being excluded (most frequently occurring language by response), N=74

Word	Frequency	Word	Frequency
tell	35	*friend*	7
help	19	*themselves*	7
teacher	19	*confront*	6
stand	18	*nice*	6
ask	13	*someone*	6
bullies	10	*are*	5
play	10	*bully*	5
friends	9	*feel*	5
people	9	*kind*	5
stop	9	*confident*	4

The team also received feedback from teachers who had helped lead the workshops. Teachers noted an increase in the level of engagement and interest as young people interact with new technology – in particular the phenomenon of watching a video in 3D. Teachers also felt the technology increased the impact of the message: "the new style of 3D video was very engaging for them and helped to make the points more powerfully to them".

Teachers also noted that the technology felt inclusive. The heavy emphasis on the visual aspects of the workshop improved participant comprehension, particularly useful when English was not a first language. Teachers did note that the opportunity to add further interaction to the workshop should be explored. This could include further branches and decision-points on the path, or simply an opportunity to reflect on the possible choices as a group.

Overall, however, the feedback from staff was overwhelmingly positive.

Outcome Conclusions

In summary, we feel the project was well received by those piloting it, both as teachers and students. The results of the survey reflected workshops that were engaging and exciting, and there was clearly a positive outcome in terms of the discussions of bullying and exclusion that took place during and after each workshop.

The data collected offers a tantalising glimpse into how VR enabled the young people to imagine themselves in the shoes of someone from a different and more vulnerable background. As noted above, 54 percent of the participants reflected on this idea in the discussions sessions after the workshops. High proportions of participants reported learning new skills (80 percent) and knowledge (88 percent), though how those skills and that knowledge relate to the core aims of improving integration cannot be shown.

Measuring the effectiveness of the workshop overall, we feel the data and interviews show the project to have been an enjoyable experience for its participants and an effective space in which to discuss complex issues around integration. In future workshops, we will hone in on measuring the impact on attitudes towards inclusion through identical prior- and post-workshop attitudinal surveys.

Conclusions

This project piloted the use of virtual technologies as an educational resource in improving resilience and empathy among young people. The evidence presented in the review of existing literature, in feedback from workshops and in the surveys of young people who had taken part in the workshop underline how the use of this kind of technology can offer powerful new ways to connect with young people and allow them to experience challenging and thought-provoking situations.

Survey results and qualitative feedback in particular underlined two major strengths of this technology. First, the immersive and realistic nature of VR and 360 video was reported to add a new dimension of realism to the experiences. The sensation of 'walking in someone else's shoes' was frequently cited as a positive feature of the work. Leveraging this in the fields of anti-extremism and citizenship is a major opportunity which this project set out to prove.

Secondly, the technology was itself engaging for young people. Feedback from students showed that lessons supported by VR and 360 Video technology were fun and interesting for the participants.

Further development should focus on two areas: first, the technology should be improved to place decision-making at the centre of the workshops. Young people and teachers both identified the points in the workshops where decisions could be made as the most useful and interesting moments. Second, further evidence should be gathered to allow analysts to compare levels of resilience and empathy prior to the workshop and after its completion. We anticipate this to begin with simple survey work, but could also be expanded into collecting the results of decisions made within the scenarios as data points.

The pilot showed that virtual technology can be successfully applied in the classroom. This has ramifications for its use in the wider curriculum, particularly on subjects best explored through experiencing decisions and outcomes, such as those explored in the PSHE curriculum.

Virtual reality as an educational resource remains underexplored, and we hope this pilot acts as both evidence for its potential impact and as encouragement for other teams looking to make use of this technology.

Literature Review

Building Empathy through Virtual Technologies

Despite some conflict, there is a broad consensus among scholars that experiencing virtual environments can build empathy in subjects (Bloom, 2017).

A number of international organisations have been experimenting with the use of virtual technologies as a means to build empathy. The UN released 360 degrees videos to raise awareness for the condition of Syrian refugees (Gürerk and Kasulke, 2017). According to the UN, the goal of the 'Virtual Reality series is to bring the world's pressing issues home to decision makers and global citizens around the world, pushing the bounds of empathy' (UN, no date). Immersive journalism like this is described as 'the ideal empathy machine (Gürerk and Kasulke, 2017). In the lab, scholars at the Virtual Human Interaction Lab at Stanford University are testing whether Virtual Reality can be used to build empathy (Stanford University, 2015) – and are testing this hypothesis in long-term longitudinal studies.

Although VR represents true lived experiences, it is important to remember that the represented subject and context are artifacts represented through situated knowledge of the VR designer, so users empathise directly with the designer's representation of their subject (Fisher, 2017).

Nevertheless, representation of the subject and context can be very precise to achieve an ' Almost Real Live' (Fisher, 2017, p.243) which has evidenced a lead change in behaviour. For instance, Irom (2018) analysed three communication texts that engaged with Syrian refugees of which two were produced using immersive technology (*Clouds over Sidra and My Son*), and one was made using traditional documentary (*Another Kind of Girl*). For both *Clouds over Sidra* and *Another Kind of Girl*, the leading characters are

Syrian girls living in Zaatari refugee(Bivins and Newton, 2003) camp in Jordan who both display a strong sense of female agency. From this analysis, Irom (2018) concludes that the three texts exhibit complex and varied representation of Syrian refugees and argues that VR introduces new mechanisms of experiential closeness to the implementation of 'humanitarian communication' (Irom, 2018, p.4287) that also utilises meaning-making codes in the representation of other people and their spaces (Irom, 2018).

Therefore VR technology can play a positive, impactful role when: it makes an ethical effort to portray an accurate representation of the subject and their space; and is transparent about the links with the subject's larger cultural, philosophical and market forces (Irom, 2018).

Although VR has been described as an empathy stimulating medium, researchers investigating empathy have struggled to find regulated methods assessing empathy constructs in VR. In response, various research studies have used VR to elicit empathy using various measures. The literature below will discuss some studies that have used VR to stimulate empathy and how it has been measured.

A study assessing empathetic response to short journalistic films presented in 360-degree video format on 180 participants used a set of related questions to measure affective and cognitive empathy as well the immersion level. Participants' were shown a 5-minute video either entailing a 360-degree video or photo/text article. Their responses were then analysed against demographic features such as gender, race, familiarity with technology and news consumption to see whether similarities in demographics between the viewer and story subject triggered a higher empathetic response. Findings from this study indicated that presentation in VR formats prompted a higher empathetic response compared to static photo/text articles. Participants who experienced VR format experience reported a higher level of immersion and were more

likely to change their behaviour towards the subject of the story and instead take action (Archer and Finger, 2018).

A second study conducted in the US to destigmatise mental health in the black community interviewed 12 African-American participants with diverse mental health conditions. The study found that a group of people who made an initial appointment to be helped were unwilling to continue with treatment as they were uninformed of the results (Sneed, Sawhney and Watkins, 2016). To tackle this problem, the study used VR. The VR experience entailed the use of 3D video, 3D audio and haptic feedback to instigate a personal narrative of someone with anxiety to the user and educates them on the benefits of therapy while encouraging the user to continue seeking help. Thereafter the user is guided through a breathing exercise for them to better understand what to expect from therapy. Then they are shown a map of African-American therapists to choose from, and contact as interviewees in this study indicated that having to find therapists by themselves was tedious. Users were also given the option of joining an online community to prevent loneliness (Sneed, Sawhney and Watkins, 2016). This approach was in line with the virtual reality technology method organisations such as Virtually Better, and CleVR are using to treat various anxiety and impulse control disorders (Virtually Better, 2014; CleVR, no date).

Another study examined the use of virtual bodies in immersive virtual reality to increase self-compassion in 15 patients diagnosed with depression developed eight-minute scenarios where patients practiced conveying compassion in one virtual body and experienced receiving it in another. After three repetitions of these eight-minute scenarios, the results indicated an evidence of a noteworthy reduction in depression severity and self-criticism and an increase in self-compassion within a four week follow-up period in particular four patients exhibited clinically proven improvement (Falconer et al., 2016). Compassion is a multi-faceted process of empathy, distress tolerance, sympathy, perspective-taking, motivation, courage, wisdom and actions of kindness

both towards self and others (Gilbert, 2015). Results from this study concluded that interventions entailing immersive virtual reality has clinical potential of helping patients with various physical and psychological ailments. Further developments in immersive virtual reality promise an alternative that could eliminate face-to-face therapist time. Additionally, they have the potential of offering an alternative to those going through social exclusion similar to such conditions (Falconer *et al.*, 2016). In another study, a team of researchers at Lincoln University utilised 360 VR video to highlight using clinical expertise and judgement, communication and professional values in clinical scenarios. The experiment involved mounting a 360 VR camera over the pre-frontal cortex area of a mannequin to stimulate the 360 views the patient would have had they been situated in a hospital ward scenario. This technique has constantly been used in real-life practice; however technology is rarely used therefore using 360 VR video is a unique perspective to stimulating empathy in clinical scenarios (Beggan, Morton and Simpson, 2017).

Researchers have struggled to find standardised methods evaluating empathy in VR, in response, Carey *et al.* (2017) developed a lightweight approach to standardise assessing empathy in VR experiences, building upon existing research on empathy measures in VR (Ahn, Le and Bailenson, 2013; 2014; Gehlbach *et al.*, 2015; Oh *et al.*, 2016). They play-tested eight VR experiences that entailed 360-degree documentary video, 3D scenario reconstruction and interactive fictional narrative. These eight experiences utilised in play-testing were: Accounting; I Expect You to Die; Kiya; Notes on Blindness; Project Syria; Soundself; The Assembly; and We Wait. Members of the research team who had never played the VR experience being tested were assigned to be the player while other researchers collected audio and video data took observational notes and conducted interviews. Rotating the player role amongst research team members enabled them to take into account both subjective and experiential facets of empathy-related data collection in VR and the usefulness of the data collected to the researchers. After each session, the team debriefed about their observations and

experiences, revised the data collected and made recommendations to improve the procedure. To standardise responses across players, researchers used a wheel of emotions that encouraged players to identify specific moments of play they associate the feeling with (Carey *et al.*, 2017). This wheel has an extensive list of emotions and made the data collected consistent (Plutchik, 1982) and enabled them to understand emotional empathy through watching the indicated emotional moment with the player. This allowed the player and researcher have a shared language about the VR experience (Carey *et al.*, 2017). The VR-adapted Other in the Self Scale (Aron, Aron and Smollan, 1992) was employed as a second instrument to understand cognitive empathy and enable players to communicate how they related with the character they inhabited and others they met while playing (Carey *et al.*, 2017). This enabled the researcher to understand the player's perspective while maintaining a distinctive sense of self (Boltz, Henriksen and Mishra, 2014). However, Notley, Gregory and Lowenthal (2017) argue that there are serious issues associated with standardised measures evaluating impact as organisations and activists work in complex contexts and therefore a one size fits all approach is not feasible. Instead, they propose a holistic approach called '*Video for Change*' that not only focuses on the outcome but considers various processes and actions within the project duration. It involves engaging with communities activists are working with and involving them in the full production of the video including planning, capacity building, the filming itself, filming distribution and evaluation (Notley, Gregory and Lowenthal, 2017). This can be applied to 360-degree video projects to encourage the subjects of the story to take ownership as they were involved in the process of creating the video.

Measuring Impact of Virtual Reality on Young People

Research with adults (Ahn, Le and Bailenson, 2013; Archer and Finger, 2018; Gregory, 2016 among others) indicates that immersive VR experiences strongly affect their thoughts, behaviour and perceptions. However little exists with regards to how it affects children's behaviour and perceptions (Bailey and Bailenson, 2017).

The research that exists regarding children's interaction with VR is linked to medical environments to: evaluate ADHD and Autism Spectrum Disorder (Bellani *et al.*, 2011); manage pain (Shahrbanian *et al.*, 2012); and educational environment to teach hearing-impaired children essential skills (Vogel *et al.*, 2004). Bailey and Bailenson (2017) suggest that embodiment (the state of inhabiting an avatar) of children in immersive VR environments could help to stimulate empathy by enabling children and youth to inhabit an avatar of a different race, gender, social background or nationality for a day. Evidence from research with adults indicates that VR can minimise inherent racial bias after users embody an avatar of a different race (Peck *et al.*, 2013). A virtual embodiment could exist in a third person representation called virtual doppelgangers where children view a photorealistic version of themselves controlled by a computer system engaging in activities they have never done before (Blascovich and Bailenson, 2011).

A virtual doppelganger is different from an avatar as it is controlled by a computer in real-time (Bailey and Bailenson, 2017). Research on influences of virtual doppelgangers amongst young adults in real life behaviour indicates a change in the type of products they prefer (Ahn and Bailenson, 2011) and their eating habits and exercise routines (Fox and Bailenson, 2009; Fox, Bailenson and Binney, 2009). So far only one study exists on the impact of immersive VR virtual doppelgangers on children (Segovia and Bailenson, 2009). Findings from this study indicated that when elementary school children saw their virtual doppelgangers swimming with orca whales, they confused it to be occurring in real life. Previous research on young children (0-6 years) learn from screen

media established that children at the age of five can differentiate between fantasy and reality (Richert *et al.*, 2011) however, immersive VR seems to be challenging for children to differentiate between the two. As it creates the impression of being surrounded by the content and children feel like they are preoccupying the same physical space with virtual characters, it can blur children's perception of fiction from reality (Bailey and Bailenson, 2017). A meta-analysis study used 67 studies evaluating the relationship between desktop-based virtual reality instructions, effectiveness (including design structures like feedback, student collaboration and teacher access to guide students) and learning gains in K-12 and higher education. Results from this study found promising outcomes of virtual-reality based instruction especially game-based learning environments which were found to very effective as students could apply a concept that can be evaluated in a different context from the one they were instructed in. This study found the learning outcomes of virtual-reality based instruction to be greater when students were assessed immediately after instruction compared to when the evaluation was delayed (Merchant *et al.*, 2014).

Immersive VR experience has been used to tackle different situations. For example, a project conducted in a school environment in Sweden designed an anti-bullying different viewpoints mobile application where students immerse themselves in different characters to build empathy in the same setting using video 360 google cardboards and headphones (Berg *et al.*, 2016). While the initial aim of the project was to tackle bullying, researchers of this project learnt of the importance of not specifying the bully, bullied and bystander as these are not definite roles from a project leader of Friends, an anti-bullying organisation (Cox, 2015 in Berg *et al.*, 2016). Therefore, the focus was moved to ambiguous social situations to circumvent stigma of concepts and to create an opportunity for discussion and interpretation with other students in a classroom with a teacher as a facilitator which helped increase empathy in a school environment (Berg *et al.*, 2016). A systematic review of 23 studies entailing of controlled trials, cluster randomised controlled trials and controlled pre and post studies focusing

on the effectiveness of video innovations in destigmatising young people aged between 13-25 years found video interventions to be more effective compared to face-to-face educational sessions (Janoušková *et al.*, 2017). In particular, results from two studies (Reinke *et al.*, 2004; Corrigan *et al.*, 2007) suggest that social contact conveyed via video attained a similar destigmatisation impact to a face-to-face intervention (Janoušková *et al.*, 2017). This approach can be applied to Video 360 initiatives to minimize stigmatisation and understanding different perspectives. The advent of mobile VR based content has encouraged learner-created content and settings. Cochrane (2016) designed an interactive learner framework focusing on 'student-centered pedagogies' (Cochrane, 2016, p.47). Examples of interconnected student-focused pedagogies entail constructivism (Vygotsky, 1978), rhizomatic learning (Cormier, 2008) and connectivism (Siemens, 2004). This student-networked pedagogy focuses on collaboration throughout the learning process; self-motivation; investment of an individual during the networked learning process and the role of technology in mediating and creating collaboration (Dirckinck-Holmfeld, Hodgson and McConnell, 2012).

Measuring Resilience in Young People

Various strategies have been explored to nurture resilience in young people against hate and extremism. A study conducted by Johns, Grossman and Mcdonald (2014) in Melbourne, Australia aimed at developing community-based resilience through a 12month youth football mentoring programme with 60 young men aged 15-25 years of predominantly Lebanese descent from Newport Islamic Society. This programme was implemented by the Western Football Club in collaboration with government and community partners including the Police and leaders of Newport Islamic Society. A key finding from this research is that it broke down barriers and stereotypes between participants, government agencies, stakeholders and local communities. Another finding is that participants developed self-control through the sport-based activity which enabled them to apply this skill in other aspects of their life where conflict may arise (Johns, Grossman and Mcdonald, 2014). In our research, we therefore expect virtual reality to be used as the medium to build resilience among young people against

hate and extremism through cross-cultural VR-based activities that will nurture multicultural understanding, trust and knowledge sharing.

Research (Sonn and Fisher, 1998; Schanzer *et al.*, 2016) indicates that social affiliations both within ethnic/religious subgroups and between these individuals and others in the wider community of different faith and ethnicity is at the core of building resilient communities. Any efforts to increase community resilience must bind existing social connections and endeavour not to damage or weaken them (Ellis and Abdi, 2017). In our research VR can be used as a tool to create a bond within young people of diverse cultural and religious background. VR-based embodied encounters and emotions can help build more awareness and understanding of each other's cultures and values through knowledge sharing hence facilitating to build community resilience among young people.

Conclusion

The literature above has discussed how virtual reality is used to stimulate empathy and how empathy and social effect using virtual reality has been measured in various projects. It has also discussed the impact of virtual reality on young people and how this has been measured. It further discussed how resilience in young people can be nurtured and ways of measuring and further harnessing it using virtual reality. Finally, it has discussed various ways of nurturing resilience in young people against hate and extremism; one of which is using similar intense embodied encounters and emotions via virtual reality embodied encounters and emotions. Another way is by building and nurturing social connections both within ethnic/religious groups and in a multicultural setting where young people can build understanding of each other's culture and values through knowledge sharing therefore building social resilience among young people. Virtual reality environments can be used to facilitate this.