

# Designing Blended Experiences

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## ABSTRACT

The increasing ubiquity of interactions as a mix between digital content and physical objects and spaces, brings about new challenges for designers. There is a need to embed digital systems in physical places, whether those are existing physical structures or existing digital platforms. Traditional approaches to product design, interaction design and user experience design do not often take this new context into account. They do not consider how designers produce new digital and physical experiences that work harmoniously to provide new forms of engagement. To address this, we illustrate the constructs of blended experiences and how they can be used in the context of bridging green spaces between different countries. We propose the idea of blended experiences and offer a framework of constructs and techniques that can help designers work in this emerging area of design.

### Authors Keywords

Blended Experiences; Digital & Physical Spaces; Augmented Reality; Storytelling; Presence; Trajectories; Horticulture; User Experience

### CSS Concepts

- Human-centered computing~Augmented reality

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Figure 1, David pottering around his back garden

<sup>1</sup> In memory: 31.10.2018



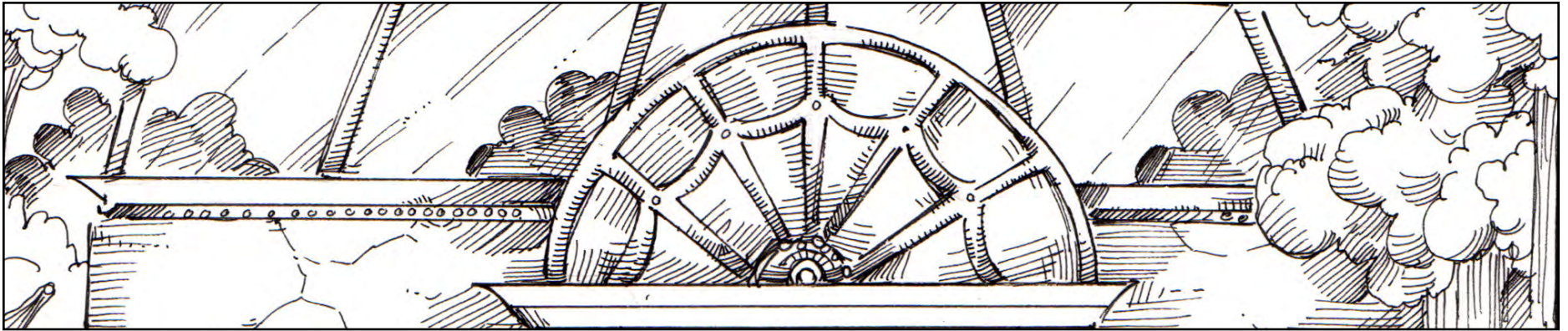


Figure 2, Conservatory Garden, Central Park, New York City

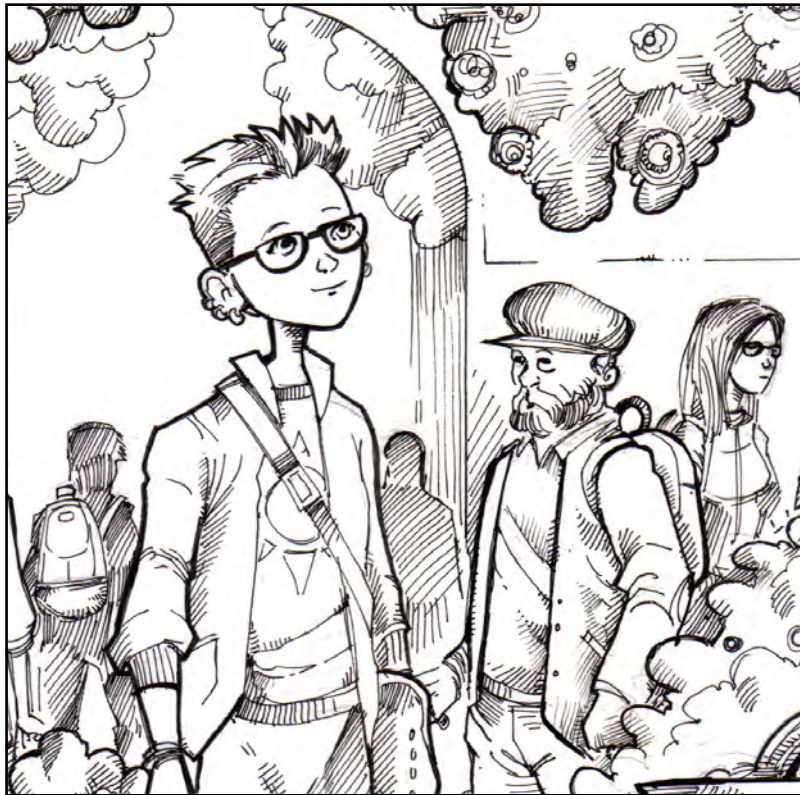


Figure 3, Holly is meandering through the gardens

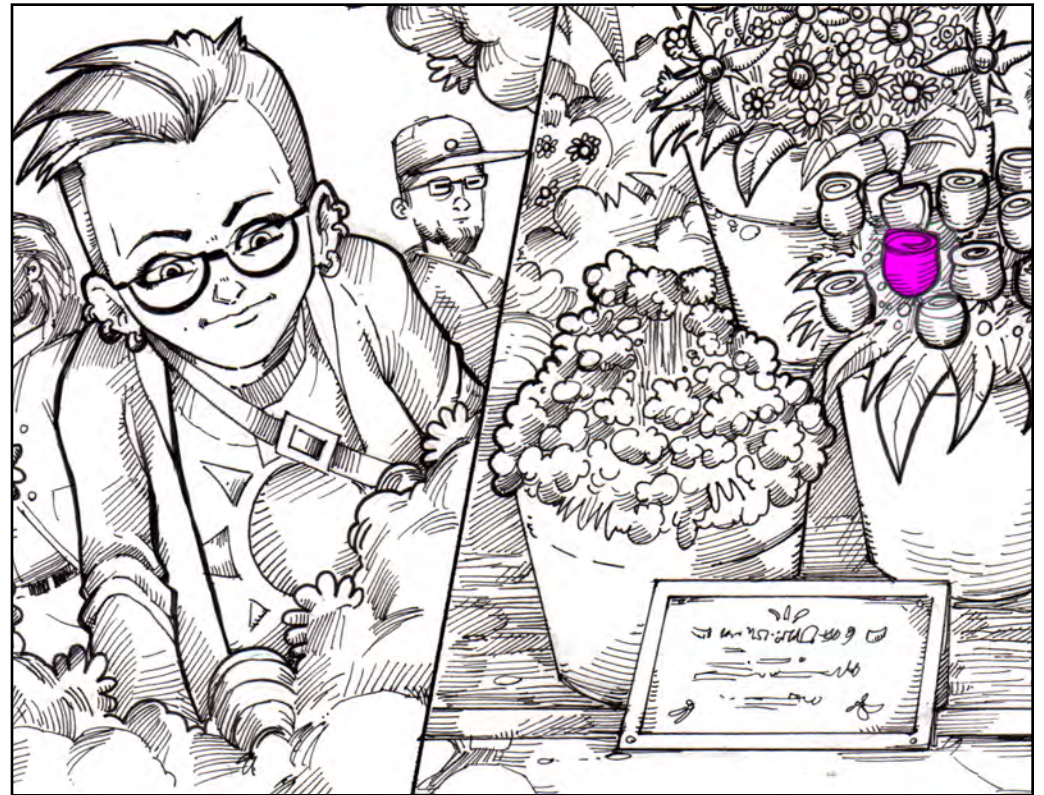


Figure 4, Holly spots a unique purple rose tucked away



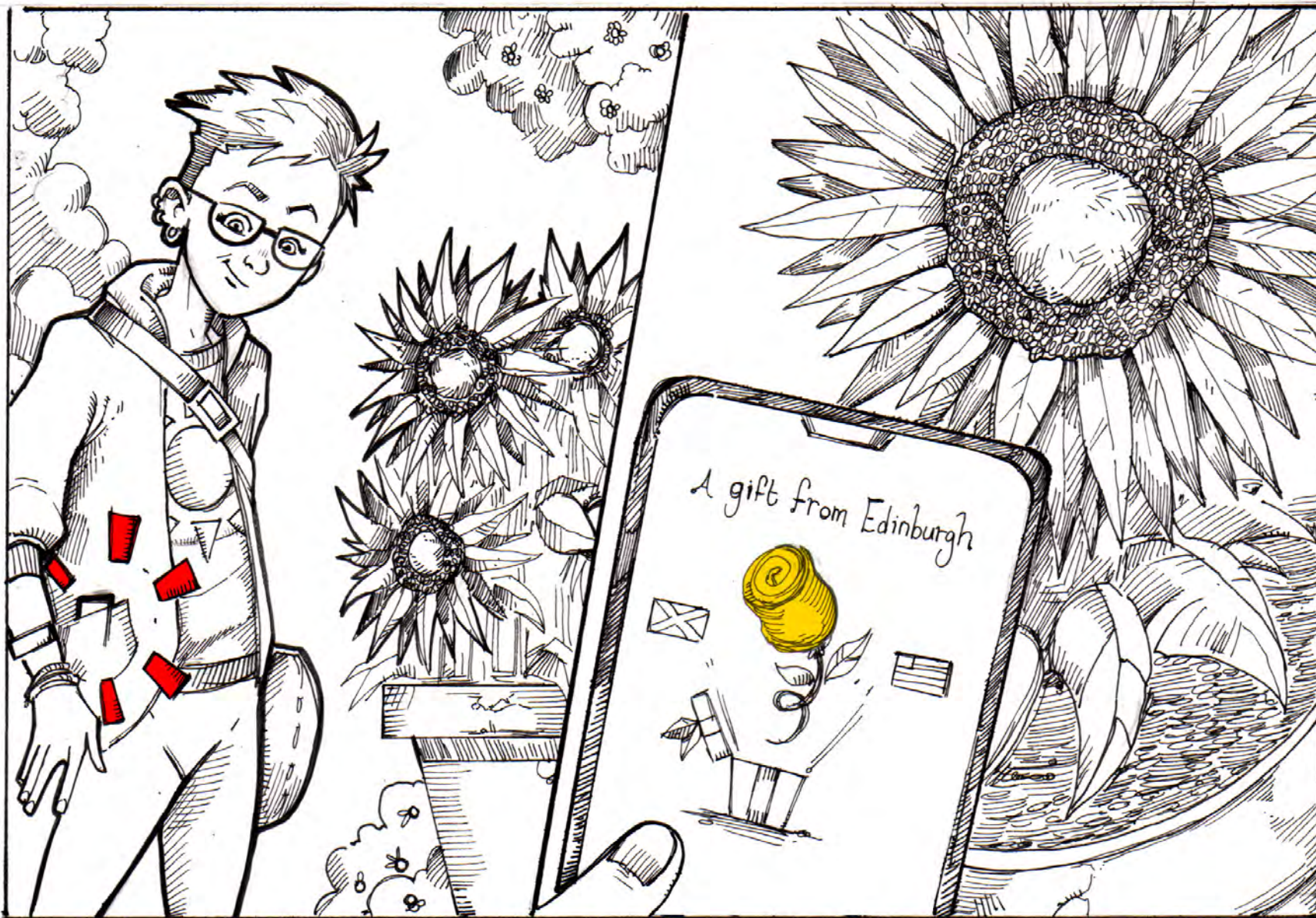


Figure 4, Upon nearing the purple rose, Holly receives a special notification in her pocket (Left). Holly opens a yellow friendship rose from Scotland, UK (Right).

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Figure 5, Meanwhile in Edinburgh, Scotland, David is simply caring for his yellow roses.

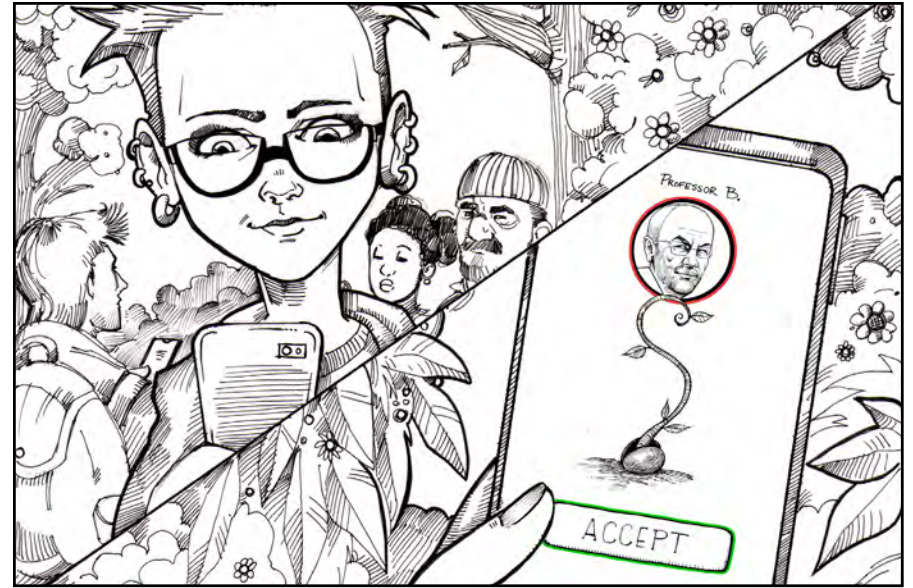


Figure 6, When Holly accepts the yellow rose seed, David receives a special notification.

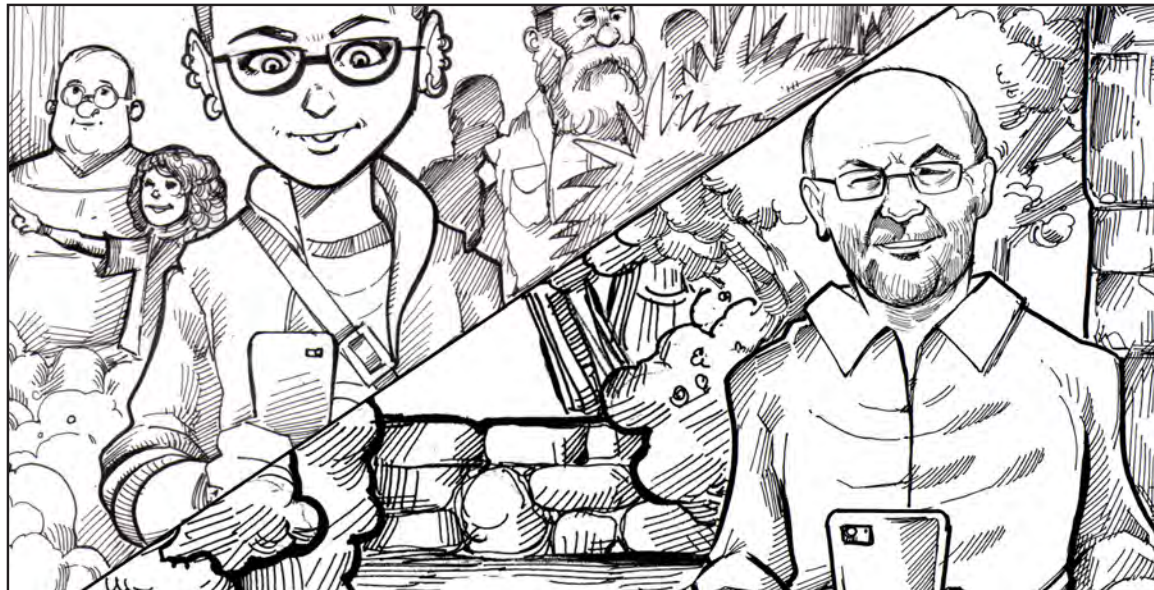


Figure 7, Holly and David chat about rose care and other garden design tips.



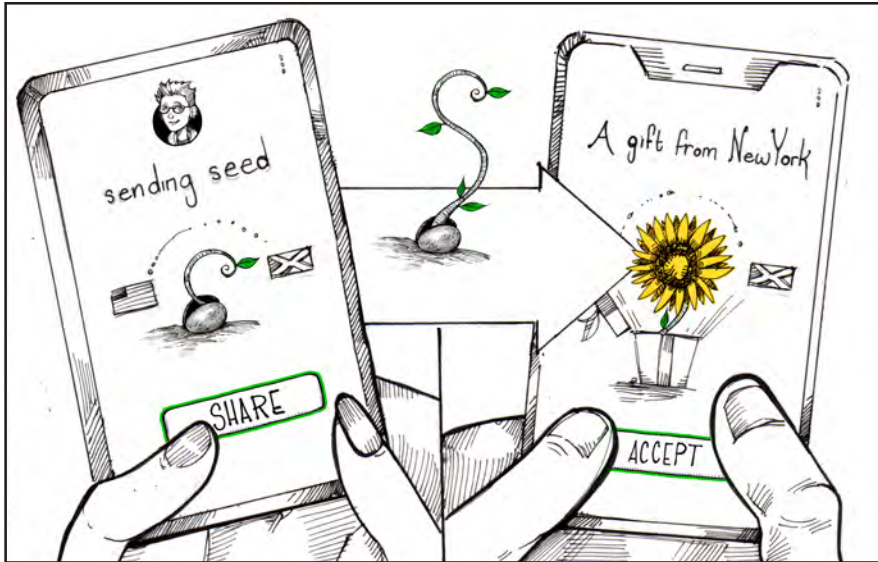


Figure 8, Holly sees a physical yellow sunflower, and shares the digital seed to David.

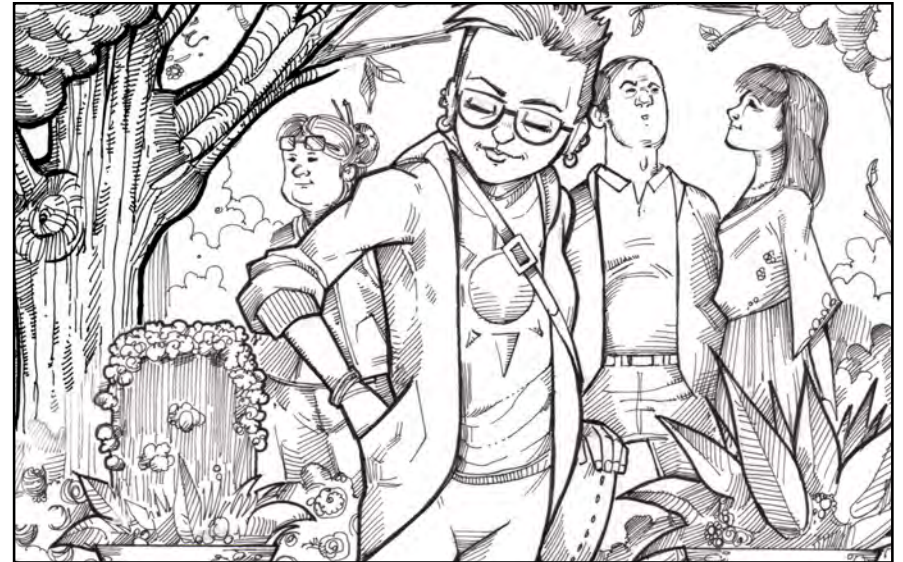


Figure 9, Holly returns her device to her pocket and continues to meander.

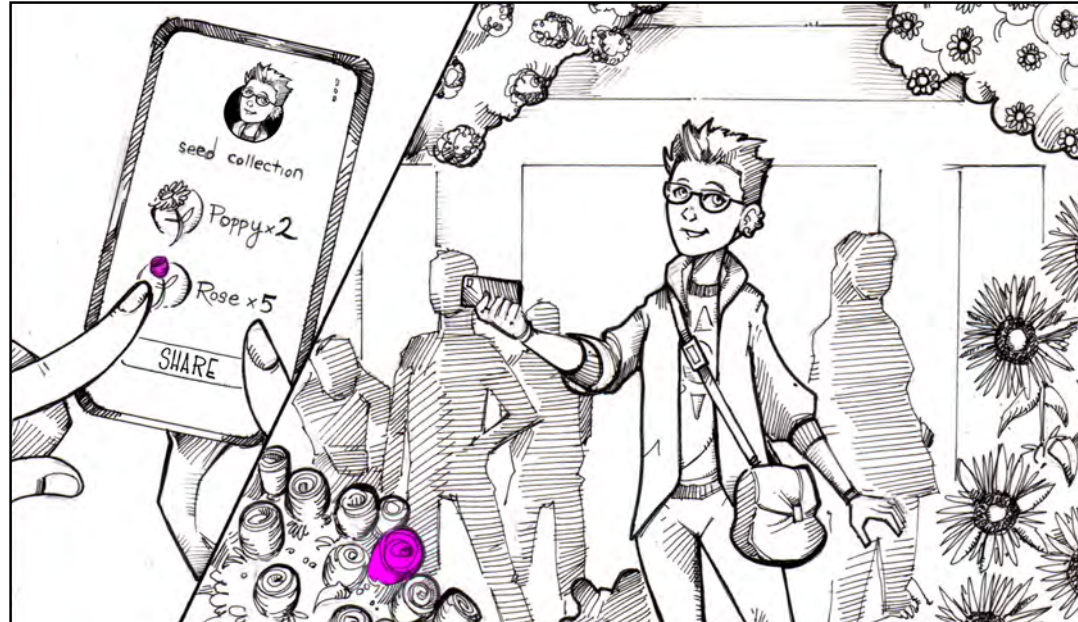


Figure 10, During her garden visit, Holly collects various digital seeds to share with other PlantPals.



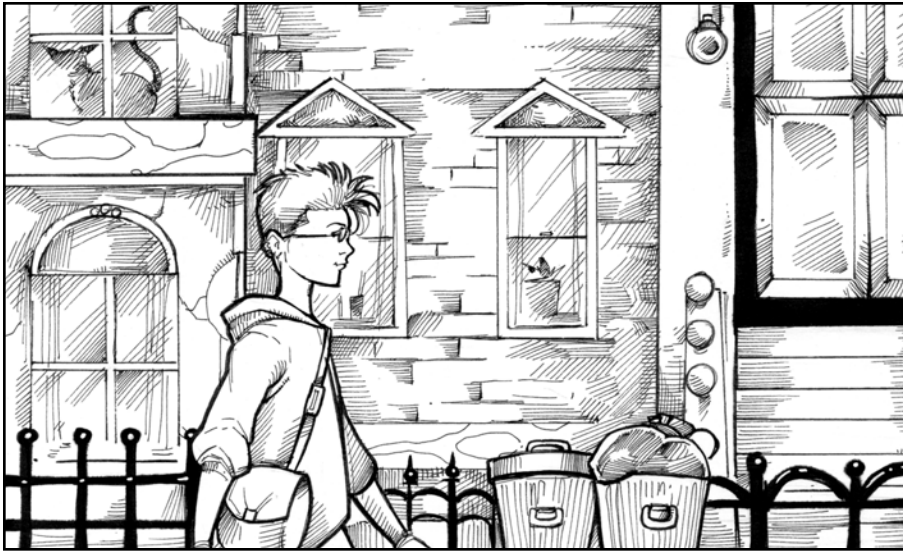


Figure 11, Holly returns to her busy life in Brooklyn.



Figure 12, Holly receives a friendly message that her rose seed from David is growing.

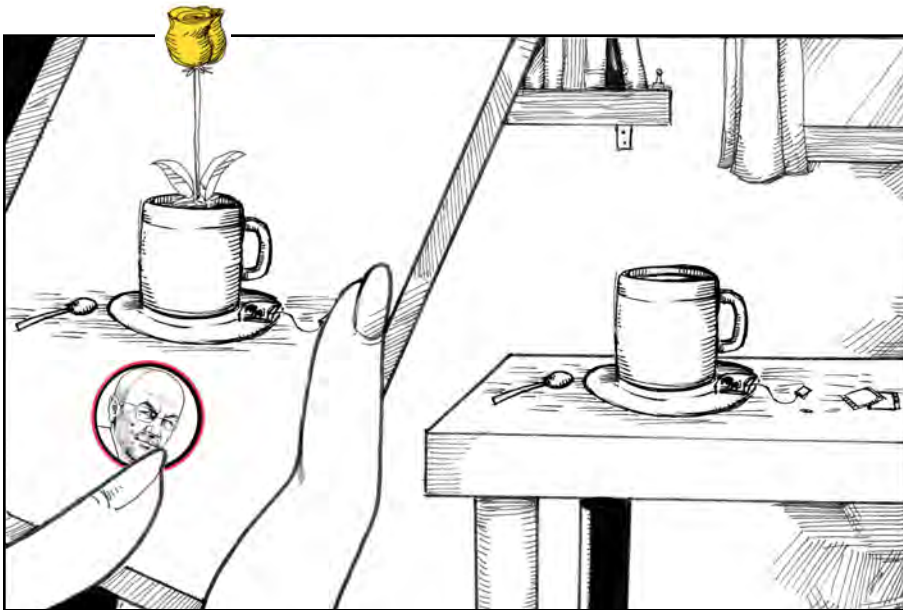


Figure 13, Using Augmented Reality, David's rose can grow out of any cylindrical object.

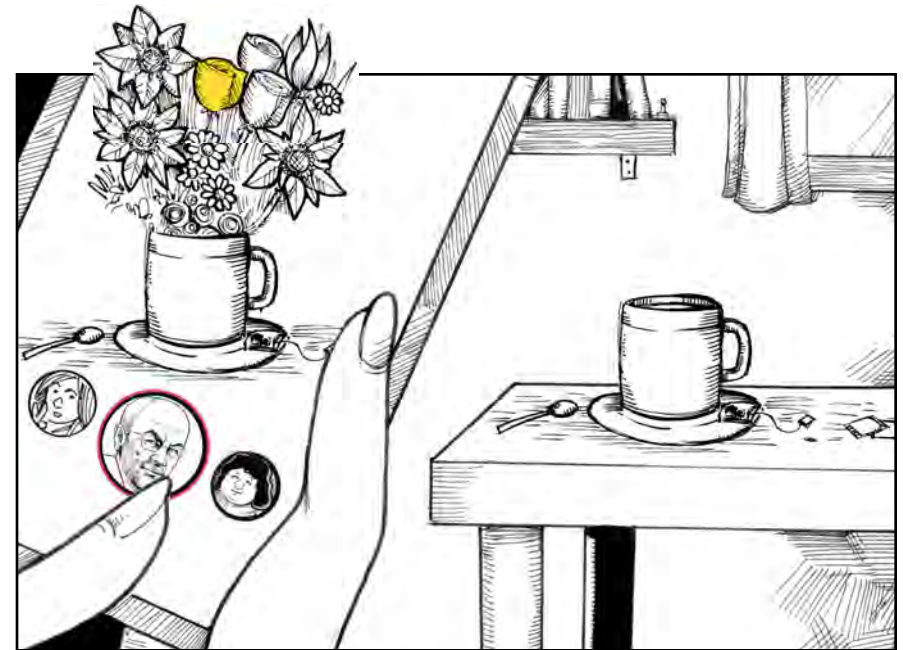


Figure 14, Holly can also view all the flowers she had collected from her PlantPals.

### PlantPals: Design Fiction

It's a beautiful day in New York, and Holly, a botanical enthusiast decides to take a trip to Conservatory Gardens in Central Park, New York City. With PlantPals, Holly follows plant influencers from around the world.

Holly is exploring and enjoying the flowers and plants in the botanic gardens while PlantPals is passively active in her pocket. Upon coming upon a beautiful purple rose, Holly receives an automated PlantPal notification from David. David lives in Edinburgh, Scotland and is also enjoying some time in his private garden. David is an avid garden designer and particularly enjoys sharing his knowledge about plant aesthetics, species and care.

David is one of many plant and flower enthusiasts that Holly has followed through PlantPals. She loves learning with plant enthusiasts from all over the globe and collecting digital flora that doesn't easily grow in her home town. Holly and David have been trading digital plant seeds for some time, and Holly aspires to have a lush, carefully designed garden of her own one day.

David has a rare yellow rose growing in his garden. Knowing that Holly collects all sorts of roses, David sends her a digital rose seed from his physical garden. This is a welcome addition to Holly's ever growing digital rose collection and instantly puts a smile on her face. They exchange watering advice for roses while the digital flower seed is shared. Looking around the lush gardens she's currently visiting, Holly sends David a sunflower seed she has been admiring. Holly adds the yellow rose to her PlantPals collection, and David adds the sunflower to his PlantPals collection. This pleases David because he has never been able to effectively grow a sunflower in Scotland. It's a welcome addition to his growing PlantPals collection.

Holly returns home to her apartment in Brooklyn. By the time she arrives home, her rose seed from David has begun to grow. Holly uses the PlantPals augmented reality view to view her flowers. PlantPals recognizes any cylindrical object as a vase. In this case, Holly's mug from her morning tea serves as a makeshift vase for her augmented reality yellow rose. Holly can easily view other Pals to create a collective digital bouquet to admire.

Holly is not home enough to care for as many plants as she'd like to have, but PlantPals allows her to express her love of gardening in a way that suits her busy lifestyle.

## INTRODUCTION

The continuing integration of physical and digital interactions has led us to look for new ways in which designers can approach design considerations when transitioning between digital and physical spaces. To do this, we propose the concept of *blended experiences* which focuses on the intricate transitions between physical and digital components, and integrate these to create a unified, holistic experience. Our storyboard, *PlantPals*, showcases the application of Fauconnier and Turner's conceptual blending, Benyon's Designing with Blends [7] and Benford's Trajectories Framework [1].

The work presented here is a manifestation of numerous workshops and exchange programs conducted annually since 2017. With a view to exploring and developing a method of practice for designers, we recruited faculty and dozens of design students from our respective institutions, Farmingdale State College, State University of New York, USA, Edinburgh Napier University, UK and Lancaster University, UK. Our objectives are to continue our research and develop tools to Design Blended Experiences [2, 3, 5, 7, 9, 10].

In this pictorial, we illustrate the careful and thoughtful transitions between digital and physical space (and vice-versa). These design considerations integrate physical objects and digital technologies for new and engaging experiences. We do this by reviewing theoretical constructs of blending by visualizing how these constructs can be integrated in design considerations and decision making. We discuss this by providing different perspectives on experience design.

PlantPals is a speculative blended experience [11, 12] that supports plant enthusiasts to connect through their particular love for certain plants. We created a detailed storyboard to illustrate this blended experience while exploring users' personal preference of specific flowers as material anchors [6] to meet like-minded people. Through these plants, users can "Share" their digital 'Seeds' with other people who might not have access to certain species of plants in other places of the world. After receiving and sharing seeds, users can create and display their own augmented plant arrangements. These digital gardens would need to be created and maintained by exploring physical gardens to digitally grow more seeds and meet new people. We created a detailed storyboard to illustrate PlantPals as a blended experience.

### Theoretical Background

We use blending theory [7] to bring about new experiences: a theory of cognition that relies on inputs from two conceptual spaces, sharing some correspondences which can be described in a more generic space. Partial projections from the input spaces are brought together into a *blend* that then demonstrates new properties that were not present in the input spaces.

Fauconnier and Turner discuss blends as conceptual packets that relate and integrate as blends within human cognition [4]. They discuss a number of blends, one of which is linguistic. This diagram of the input spaces and blend of the word "Frenemy" is an



example that we often use when discussing blends.

When first hearing the word “Frenemy” (Figure 15), most people do not need its meaning explained to them natively understanding the blend of the words friend and enemy. Fauconnier and Turner argue that we recognise blends because we form new neural pathways that make the blend seem natural.

- The **Generic Space** alluded to is that of a person you interact with.
- **Input 1** is Friend calling to mind affection and shared activity.
- **Input 2** is Enemy alluding to someone you don’t like and normally avoid.
- The **Blend** “Frenemy” is someone you dislike but with whom you are forced to share activities.

Fauconnier and Turner explain conceptual integration in terms of three processes. *Composition* establishes correspondences between the input spaces and brings them together into a blended space. In the blended space, new relations are established that build on the relationships between the input spaces. *Completion* is the process where people’s cultural and cognitive models are integrated into the blend. *Elaboration* is the process whereby the blend is manipulated as a whole resulting in new insights [8]. It is also important to have a material anchor in blending [6] – if one of the input spaces is grounded in a physical, embodied experience (as opposed to an abstract, conceptual experience) the power of the blend can be much greater. New inferences become automatic: things that are difficult to think about in the abstract become obvious if they are blended with an appropriate material anchor. For example, when an engineer carefully lays out the parts of an engine as they dismantle it, thereafter it makes reassembling the engine easier later on.

#### Blended Spaces Framework

The goal of the Blended Experiences Framework guides strategic design decision making so they can produce user experiences that effectively transition *between* areas of digital and physical spaces [2, 3, 7, 9, 10].

Benyon’s *Blended Spaces Framework* [2] applies the conceptual integration concept of blending [6, 8] to the design of mixed reality spaces. He identifies the key structure of the generic space shared by digital and physical spaces as *things (ontology)*, *relationships (topology)*, *people (agency)* and *change (volatility)* as key principles when designing systems, services and devices [9, 10]. Successful blending of spaces using these constructs results in a new blend, with its own social space, conceptual space and sense of place [2, 3].

To begin using the Blended Spaces Framework (top half of Figure 16), we identified a public garden in New York, USA and a specialist private garden in Edinburgh, UK. First we identified the generic space by documenting all of the *things (ontology)* in



Figure 15, Linguistic Blending: “Frenemy”

these gardens. Second we identified all the *relationships (topology)* between things and people within these two garden spaces. Third we considered how people (agency) could have similar and different relationships between these garden spaces. Exploring the contexts of generalized and nuanced interactions helped us to consider a variety of possible user interactions, behaviors, wants and aspirations. Fourth we looked at how things, relationships, people and change impacts these principles over time. Finally we uncovered that a blended space is not continuous and constant throughout a user’s journey. In contrast, blended spaces are revealed as smaller moments within a user’s journey. In our PlantPals example, our blended spaces materialized in the storyboard at 3 cells out of 14 cells, see page 12 for details.



### Blended Spaces Framework and Trajectories Framework

The final piece of the Blended Experiences Framework concerns how people move between areas of digital and physical space and how they transition from digital to physical and back again. Benford [1] discusses these ideas in some detail through his notion of a trajectory (bottom half of Figure 16). The Trajectories Framework encourages designers to consider a participant's actual experience as a traversal of interactions through time and space. Trajectories have several constituents and transitions between constructs, such as real-time versus time in a narrative, the different roles people adopt such as spectator or active participant and the different interfaces that are encountered. The framework encourages us to consider the canonical trajectory, that is the ideal designed traversal through the experience versus the participant trajectory; the path actually taken. Participant interaction creates divergence from the canonical and orchestration describes various interventions that drive the participant back to the canonical.

Although the actual path taken in our design fiction is speculative, the Blended Spaces Framework coupled with notions of transitions from Benford's Trajectory Framework guided our design decision making when moving from physical to digital spaces and back again (Figure 16).

Each step of the Trajectories Framework, *beginnings*, *role and interface transitions*, *physical traversals*, *physical resources*, *episodes*, *seams* and *endings*, were carefully considered when designing between physical and digital spaces. The design decision making processes that occur between the framework's transitional phases guided the production of our storyboard cells. For example, figure 18, describes the transitions moving from the physical space to digital space by examining the experience's *beginnings*, *role & interface transitions* and *physical-virtual traversal*. Figure 22 describes the transitions moving from the digital space to physical space by examining the experience's *physical resources*, *episodes* and *seams*. Lastly, Figure 25 describes the blended space by re-examining the *episodes* and *seams* to explore how meaningful moments are built by relationships e.g., people to people and/or people to place. While endings is an aggregation of all transitional interactions and relationships with the goal of creating a new social space, conceptual space and new sense of place [2, 3, 7]. The following discusses the design choices and considerations when transitioning from *Physical to Digital Transitions*, *Digital to Physical Transitions* and *Blended Spaces*.

This integration of Benford's Trajectories Framework [1] and Benyon's Blended Spaces Framework [2] produces a third tool, Designing Blended Experiences. Building on our practice when designing blended experiences [2, 3, 5, 7, 9, 10] we have begun to identify a wider set of nuances and challenges that often confront designers when designing across physical to digital spaces and back again. This challenge led us to identify that blended experiences are moments within a larger context of intertwined things, relationships, people, and change.

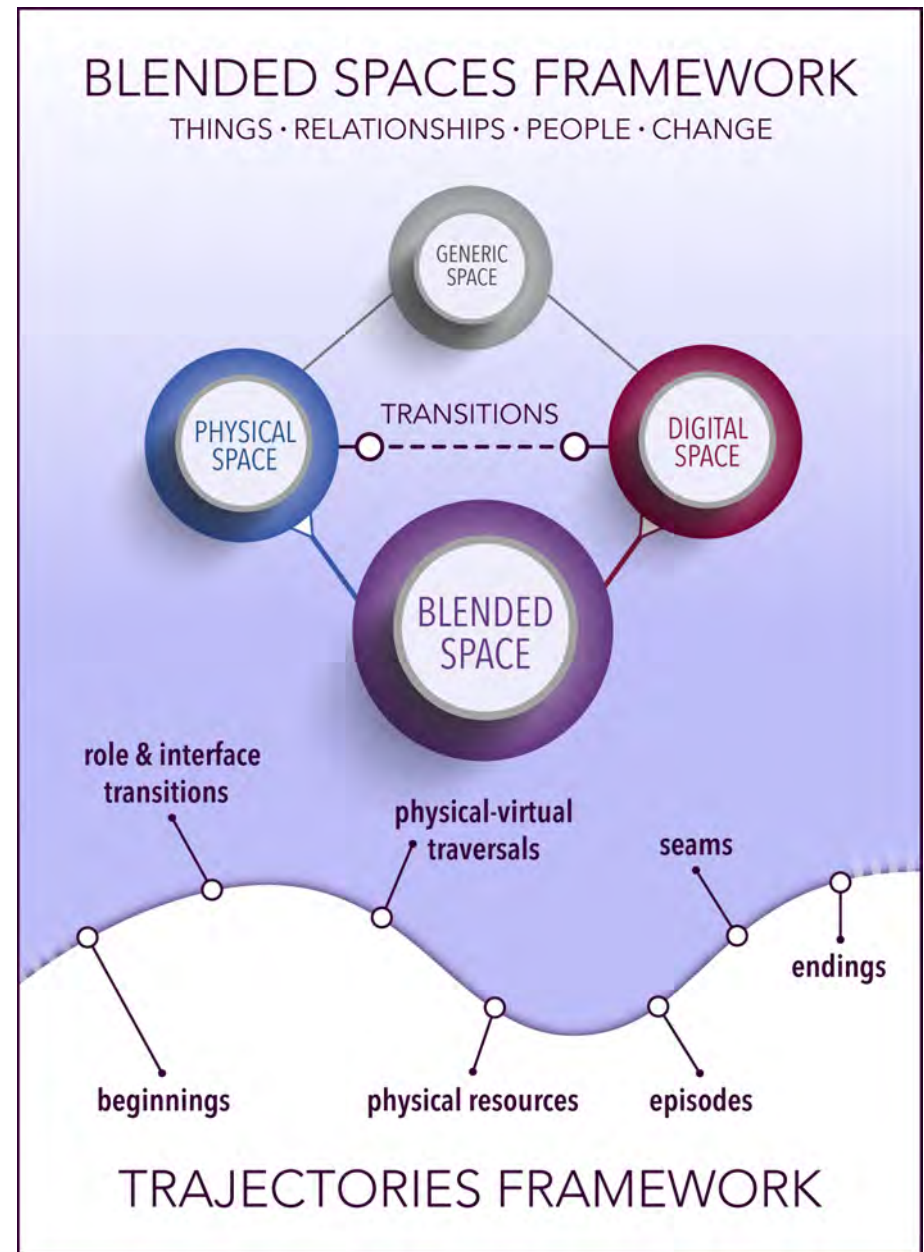


Figure 16, Benyon's Blended Spaces Framework [2] & Benford's Trajectories Framework [1]



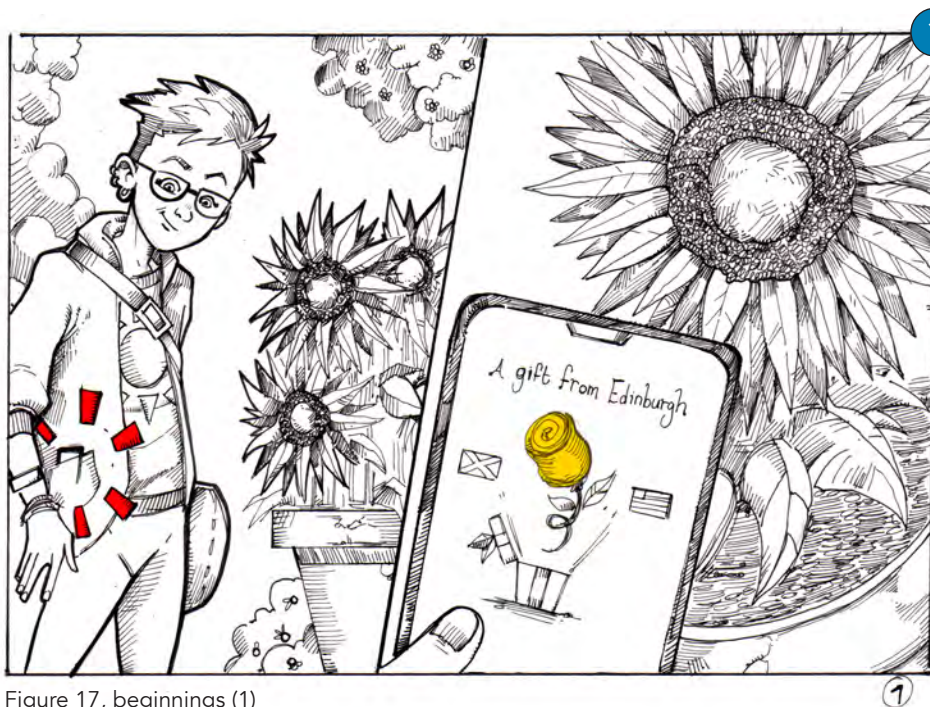


Figure 17, beginnings (1)

## TRANSITIONS & TRAJECTORIES

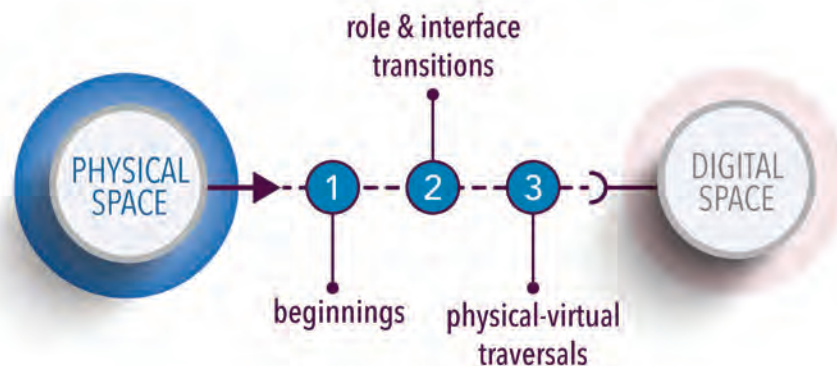


Figure 18, Physical Space : Transitions & Trajectories

### Physical to Digital Transitions

The cells highlighted on this page identify Holly's and David's transition from the physical garden space to a digital garden space while figure 18 describes the specific trajectory moving from the physical space into the digital space. The storyboard begins by illustrating the physical space of Central Park gardens. Holly spends time meandering through the gardens and enjoys her day away from the city.

The main cell on the left (Figure 17) identifies the "*beginnings*" of the transition; where Holly receives a small vibration in her coat pocket. This little vibration marks the beginning of the transition from the physical space to a digital space. The transition is relatively quick and is designed to alert Holly while remaining unobtrusive to her and other people nearby. Holly pulls out her mobile device and receives a digital gift from a garden designer named David, who lives in Scotland.

The cell on the bottom left (Figure 19) represents the "*role & interface*" transition from physical space to digital space. It is at this point that we employ the trajectories framework to carefully guide the transition in order that it feels natural and unobtrusive. The transition begins with an unobtrusive notification. After Holly sees that she received a gift from David, she is curious to see what happens next. Holly taps "ACCEPT" and receives her first rose seed from David. In this instance, Holly's focus of attention is transitioning closer to the digital space than the physical space. This is the midpoint of the physical/digital traversal.

The cell on the bottom right (Figure 20) represents a "physical-virtual traversal" guided by two people's love for roses. Although Holly and David are engaged with digital devices and systems, these interactions are rooted in their similar personal interests. In this instance, PlantPals allows Holly's experience to be mediated through digital technology. Holly has now transitioned her focus to the digital space and her interactions are mediated through technology. It is at this point that physical space may seem peripheral although the overall blended experience remains at the centre of Holly's interaction.

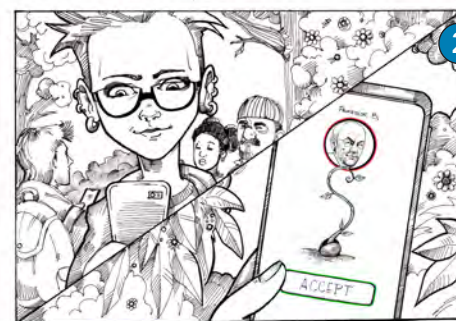


Figure 19, role & interface transitions (2)



Figure 20, physical-virtual traversal (3)



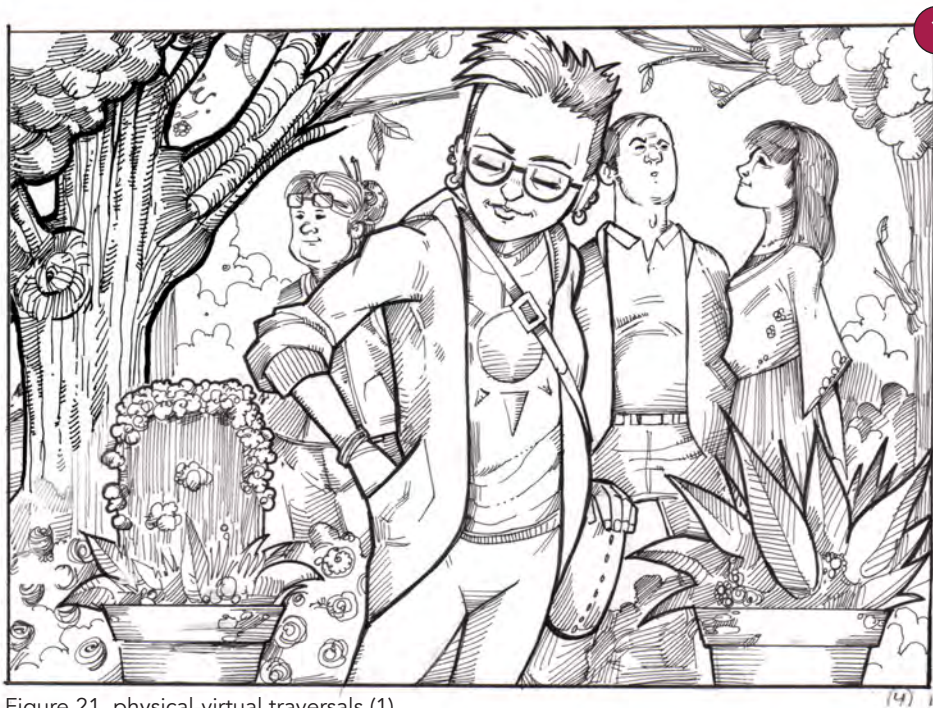


Figure 21, physical-virtual traversals (1)

## TRANSITIONS & TRAJECTORIES

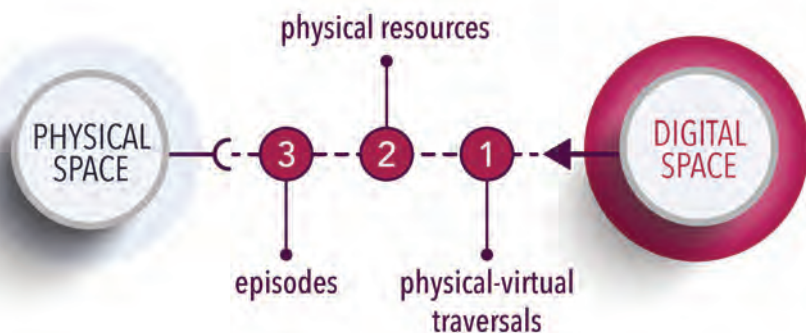


Figure 22, Digital Space: Transitions & Trajectories

### Digital to Physical Transitions

The following cells identify how Holly and David transition from the digital garden space to physical garden space while Figure 22 describes the specific transition from the digital space back into the physical space.

The main cell on the left (Figure 21) identifies how Holly and David “physical-virtual” transition from a digital garden space to their respective physical garden spaces. The cell on the left underscores a general principle when Designing with Blends [7]. Rather than simply bolting technology onto an experience, it should be helpful and supportive while it is put away [10]. In the case of PlantPals Holly has been using her mobile device, collecting seeds and receiving gifts from a variety of new botanical friends. Now it is time to return her mobile device back to her pocket. This cell highlights an important moment in the digital space as Holly’s focus is primarily on the physical world, the people and garden surrounding her.

At first glance, the cells on the bottom left (Figure 22) may appear to be examples of the physical space. However, these moments in time mark the “*physical resource*” highlighting an important transition from the digital space to the physical space. Working behind the scenes (in the digital space), PlantPals begins to personalize the botanical profile, interests and preferences of both Holly and David. The system searches and analyzes key data points and finds a match. In this scenario, both our pals love particular rose species. With this digital information, PlantPals is able to proactively share David’s digital yellow rose seed by as a personalized digital gift to Holly, as described in Figure 17.

The cell on the bottom right (Figure 23) represents an episode. These episodes are moments where the Blended Spaces begins to form. In Figure 23, David is simply caring for his yellow roses, and unknowingly marks a material anchor for a like minded Plant enthusiasts such as Holly.



Figure 22, physical resources (2)



Figure 23, episodes (3)





Figure 24, episodes (1)

## TRANSITIONS & TRAJECTORIES

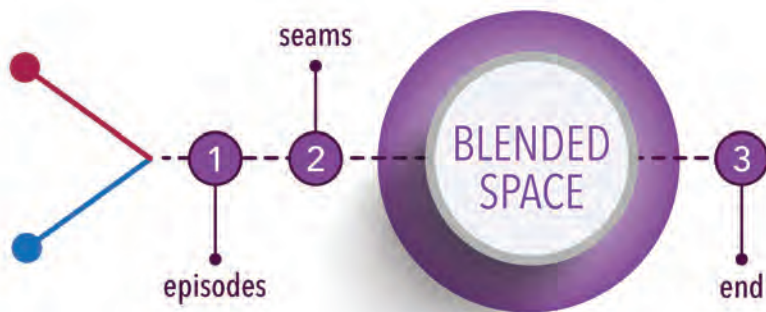


Figure 25, Blended Space: Transitions & Trajectories

### Blended Spaces

The following design fiction cells identify how transitioning between the physical to the digital space can result in a blended experience, while, Figure 25 describes the specific transition, merging digital and physical spaces. Through smooth transitions between physical and digital spaces, the following storyboard cells results in a new blend, with its own social space, conceptual space and sense of place [2] (Figures, 24, 26, 27).

In the main cell on the left (Figure 24) identifies the penultimate “episode” in Holly’s experience. Holly is inside a physical garden whilst enjoying interactions with people physically in other spaces. The seamless merging of physical and digital interactions generates a blended experience, in other words, a way for Holly to feel present in a new social space. This experience produces an unobtrusive interface, where other botanical enthusiasts can exchange and share their favorite plants with people around the world.

In the final cells (Figures 26 & 27) Holly is able to watch her plants grow and display them anywhere using augmented reality. Though this may at first glance appear to be a straight forward augmented reality application, it lacks meaning without the interaction with and through PlantPals. PlantPals recognizes any cylindrical object and turns them into vases for the virtual plant display. Holly can fill the empty cup on her desk with a variety of flowers from past and present friends. The blended experience creates a personal connected experience shared across a single Plant Pal or across many PlantPals.

The cell on the bottom left (Figure 26), represents the single rose given by David. This creates a personal memory that ties back to the physical space of the garden. The cell on the bottom right (Figure 27), represents multiple flowers given by numerous people as represented in Figure 24. This creates a community memory tied to the botanical enthusiasts she interacted with during her day in the physical garden. This interaction is a fun way to “end” the blended experience.

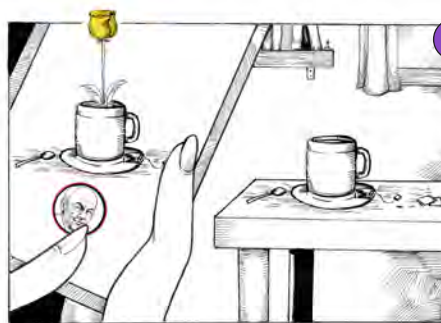


Figure 26, seams (2)

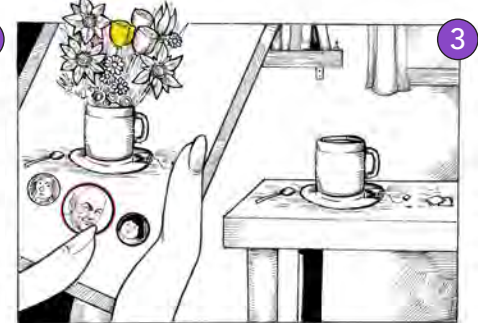


Figure 27, end (3)



## CONCLUSION

Three principal results come from this work. The first contribution is how we integrated Benford's Trajectories Framework [1] into Benyon's Blended Spaces Framework [2]. This merger guided us in the creation of a third tool, Designing Blended Experiences. This tool provides specific considerations in how to smoothly transition between digital and physical spaces. Building on our practice when designing blended experiences [2, 3, 5, 7, 9, 10] we have begun to identify a wider set of challenges that often confront designers, such as the transitional nuances when moving from physical to digital spaces and back again.

The second contribution is our use of speculative storyboards and how we designed and reflected on our design concepts [11, 12]. This process challenged us to reconsider that a blended experience is not an all-encompassing experience nor does a specific sequence of storyboard cells create a single blended experience. We were able to step back and consider that a blended experience reveals itself within small moments throughout phenomenological experience. This approach helped us identify blended experiences as a series of individual moments. These blended moments reside within a much larger experience and context that can span across multiple locations (topology), people (agency) and time zones (volatility).

The third contribution is to reconsider what seems to be obvious, digital things produce digital spaces and physical spaces produce physical places. We grappled with these concepts and uncovered that the inverse is more accurate. For example, some interactions in the physical garden had a lot more to do with digital spaces and vice versa. As David was watering his roses, PlantPals was analyzing data in the background so that it could align David's and Holly's botanical interests. In contrast, some interactions on the digital device had a lot more to do with physical spaces than digital interactions. As PlantPals augments flowers within cylindrical objects, Holly is thinking about real people and the

potential relationships that may have formed.

Our contribution provides an accessible and well-grounded approach to interaction design. Designing Blended Experiences guides us in the design of seamless user experiences that bring digital and physical spaces together and how we transition between them. Through this approach we design experiences in a thoughtful and harmonized way, rather than bolting-on digital content to a physical space [9, 10]. In blended spaces, people should feel present in the blended space whilst maintaining their sense of presence through smooth transitions between digital and physical spaces [3].

## ACKNOWLEDGMENTS

We dedicate this paper to the memory of our colleague, our mentor and our friend Professor David Benyon (figure 7). The initial concept of Designing Blended Experiences was conceived during DIS 2017 in David's back garden (figure 1). We are delighted that this paper affords us the opportunity to thank him and honour his memory. Our ongoing pedagogical strategy is to make Designing Blended Experiences more accessible for the next generation of UX designers and researchers. David will forever remain our guide in our expedition through the nature of blends.

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