

# Where are all the Curious Students? Fostering a Love for Learning Through a Curiology box Approach

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## Where are all the curious students? Fostering a Love for Learning through a Curiology Box Approach.

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**Abstract:** As British/UK Universities move towards more business oriented models of education, largely driven by financial goals, league tables and achievement metrics, students are increasingly relying on educators to hand-lead them through their assessments in Higher Education settings. This has been seen to be a particular issue since tuition fee increases, leading to a fee-entitlement approach to education exhibited by some students. This has also had a negative influence on how students approach their learning, leaning more towards a result driven focus with no room for development of discovery and exploration, a lack of curiosity-led learning motivation or an allowance for developing a love of learning. The authors therefore propose that there is a need to rekindle students love of learning in Higher Education by sparking their curiosity through playful methods. This paper explores the theory and background of the use of curiosity in education, presents 'Curiology' as an approach, and documents a playful example of how different types of curiosity can be developed through the theoretical 'making of' approach of an interactive '*Curiosity Box*' designed to foster curiosity-led learning around the subject of women's roles at Bletchley Park in World War Two. A discussion of the design, method and pilot feedback of (n = 12) participants undertaking the curiosity box experience is presented alongside next stage considerations of future work.

**Keywords:** Curiosity; Curiology; Playful Learning; Game-based learning; Higher Education

### 1. Introduction

Curiosity has often been a theme that has played a vital role in society, shaping behaviours and providing creative and literary works with inspiration. Berlyne (1954) first published on the subject of arousal and curiosity and examined the scientific qualities of curiosity. Berlyne described curiosity as the 'state' from being presented with an environmental situation that exhibited "complexity, incongruity, doubt and/or difficulty". These conditions were responsible he argued, for creating arousal of uncertainty. He linked the tension of uncertainty as the mechanism or behavioural shift which is used to drive exploration of a complex environment in order to ease anxiety of the unknown (Berlyne, 1960). Exploration then, as Day further observed in 1982, is the "behaviour elicited from uncertainty" which ultimately fuels the organisms "search for knowledge" (Day, 1982). Whilst uncertainty carries with it both positive and negative connotations (which is worth noting when considering uncertainty as a motivational drive), it is also linked to excitement and the focus of attention to a specific matter. Day (1982) observed, that exploration has several important characteristics; the act promotes interest, it serves to direct attention and that the act is self-rewarding. It is therefore then, somewhat easy to imagine that from these descriptors, how educators may be attracted to harnessing the use of curiosity, uncertainty and exploration for motivating their learners. A study carried out by Stumm et al., (2011) further discusses this concept as they reasoned, that intellectual curiosity should be considered, "the third pillar of academic performance", alongside intelligence and effort as core determinants. The study concluded that;

"the additive predictive effect of the personality traits of intellectual curiosity and effort, rival that (high level) influence of intelligence." (Stumm et al., 2011).

Although they acknowledge that the study was constrained in parts due to number of variable limitations, they believe that their results indicated that a "hungry mind" is "a core determinant of individual differences in academic achievement" and is an "important indicator of potential and ability" (Stumm et al., 2011).

Continuing the work into the study of curiosity (Hume, 1777; Berlyne, 1954), recognised that there were differing types of curiosity. Berlyne worked to explore these differences and in 1954, termed two variants. He posed that curiosity was either that of epistemic curiosity; the seeking out of intellectual information or the "drive to know", or, perceptual curiosity; sparked through visual, auditory and tactile experience or the "drive to experience and feel". In light of these differing examples of what triggers curiosity, we as educators, can begin to imagine rich

learning experiences that are not only driven by learner interest or the pursuit of knowledge itself, but by being wholly exposed to a range of sensory stimulants. Berlyne's examination of how curiosity can be roused through the exposure to multi-sensory stimulations & materials then, allows us to acknowledge that curiosity is a complex process that encompasses the need for exploration into its numerous triggers.

But is curiosity really an important factor to consider when looking to foster self-directed learning skills? Yes, is the short answer. Learning conducted outside of the traditional school/university educational setting, and undertaken through own methods, is mostly thought to come from a self-motivation and driven by intrinsic curiosity (Berlyne, 1966; Reeve and Deci, 1996; Ryan and Deci, 2000). Following this understanding, Kang et al., (2009) wanted to understand how intrinsic motivation led from curiosity can affect brain activity and the learning process. As a result of a behavioural experiment, Kang et al., (2009) found that after an 11-to-16 day retention period, participants could recall information more accurately if they had shown interest and curiosity about that particular question. Another study investigating the effect of intrinsic motivation on memory conducted by Gruber et al., (2014) revealed that

'in both immediate and one-day-delayed memory tests, participants showed improved memory for information that they were curious about and for incidental material learned during states of high curiosity.' (Gruber et al., 2014)

These findings from the study conducted by Gruber et al., (2014) suggest that there is a link between the '*mechanisms that support extrinsic reward motivation and intrinsic curiosity*' and that it '*highlights the importance of stimulating curiosity to create more effective learning experiences*'.

Understanding then, how different types of curiosity; particularly in the case of epistemic and perceptual, can be applied to teaching and learning practice is essential if we wish to inspire intrinsic motivation required for self-directed learning. Another factor that has been linked to fostering curiosity, as outlined in Costa & McCrae's (1992) *Five-Factor Model of Personality*, describes 'openness to experience' as a core driver to positioning the learner in a ready state of learning acceptance. The model has six key traits described as; Fantasy (vivid imagination), Aesthetic Sensitivity, Attentiveness to Inner Feelings, Actions (engagement in unfamiliar and novel activities), Ideas (intellectual curiosity), and Values (readiness to re-examine traditional social, religious, and political concepts) (Costa & McCrae, 1992). These traits, offer insight into explaining human motivation and personality, and help to further breakdown specific areas in which curiosity is aroused or can be triggered. This 'openness to experience' is perhaps then the first hurdle that Higher Education practitioners face when attempting to push students beyond their comfort zones.

As children, we are actively encouraged to be 'open to experiences', to be led by our curiosity and to learn through active play and engagement with the multitudes of stimuli around us. Engaging in the pull of perceptual curiosity to interact with stimulating environments, children take on an active interest and learn through the physical and emotional sensations that are offered up. It is here that perhaps we truly see the power of intrinsic motivation when children actively look to seek understanding, and engage with the world through play in both real and imagined capacities. This process, of dynamic coupling (Thompson and Varela, 2001), enables children both to adapt to the physical and social environment in order to construct meaning and value from these interactions. Although this way of playful learning is an accepted and even celebrated practice to be used in the education of young children, it is found that as we grow into adult learners we lose this sense of curiosity-led play. This is either through the idea that we must phase out 'childish' practices or that strict lesson plans, test-led teaching and attainment metrics are more robust methods of teaching and learning practice. However, somewhere along the way between child and young adult, we have lost this sense of curiosity-led learning altogether.

The importance of understanding what triggers the drives of curiosity in a learning environment seem therefore essential, particularly if we as educators are looking to utilise the behavioural motivation of exploration that accompanies it within our own teaching and learning practice. Indeed, an examination of the theoretical evidence leads the authors to suggest, that if we were to think about how curiosity is generated in an organism, particularly in the context of a learner, perhaps then multi-generated methods of curiosity is the optimal approach to adopt in an ever-changing educational landscape. This meaning being, that facilitators and educators should look not just to inspire the epistemic flow of curiosity but also utilise the draw of perceptual

curiosity to hook and provide the 'openness to experience' factor that could go some way to stimulating both body and mind, particularly in a Higher Education setting.

It is in this pursuit of developing curiosity that the authors have experimented with developing a pedagogical approach to developing and using 'Curiosity Boxes'. These types of games are trans-media based artefacts, that generally consist of props (real and imagined), digital files/ websites, a strong narrative and puzzles that the player must piece together in order to get an idea of the full and complete story.

## **2. Theoretical Design of 'Unsung: The World War 2 Curiosity Box.'**

The design and development approach of the curiosity box was adapted from version 1.2 (Figure 1) of the escapED framework (Clarke et al, 2017). Developed from the theoretical underpinnings of the Trans-Disciplinary Model of Serious Games Design (Arnab & Clarke, 2015), this model was chosen for its methodology in creating educational games for interactive experiences, that share design considerations such as puzzle and narrative design with the Mysterious Package Companies experiences. The escapED 1.2 framework was used to help map core development aspects such as a participant needs assessment, learning objectives, narrative design, learning objective to game objective mapping and considerations of implementation.

It was essential whilst developing the curiosity box that the process was to use a range of different stimuli so that multiple and various senses were stimulated at any one time. After consideration, this was found to be most easily achieved through the employment of different puzzles types (visual, physical, audio, mental etc.) and was used as an integral step of the process of developing perceptual curiosity-led engagement. As the development process was an experiment to look at both how easily and effectively these boxes could be built for education, but also how to focus on how to design for player experience and emotion, a simple flow for moving through the curiosity types and the concept of 'Curiology', was created to help structure the theoretical underpinning of how different curiosity types can be harnessed into a playful learning process.

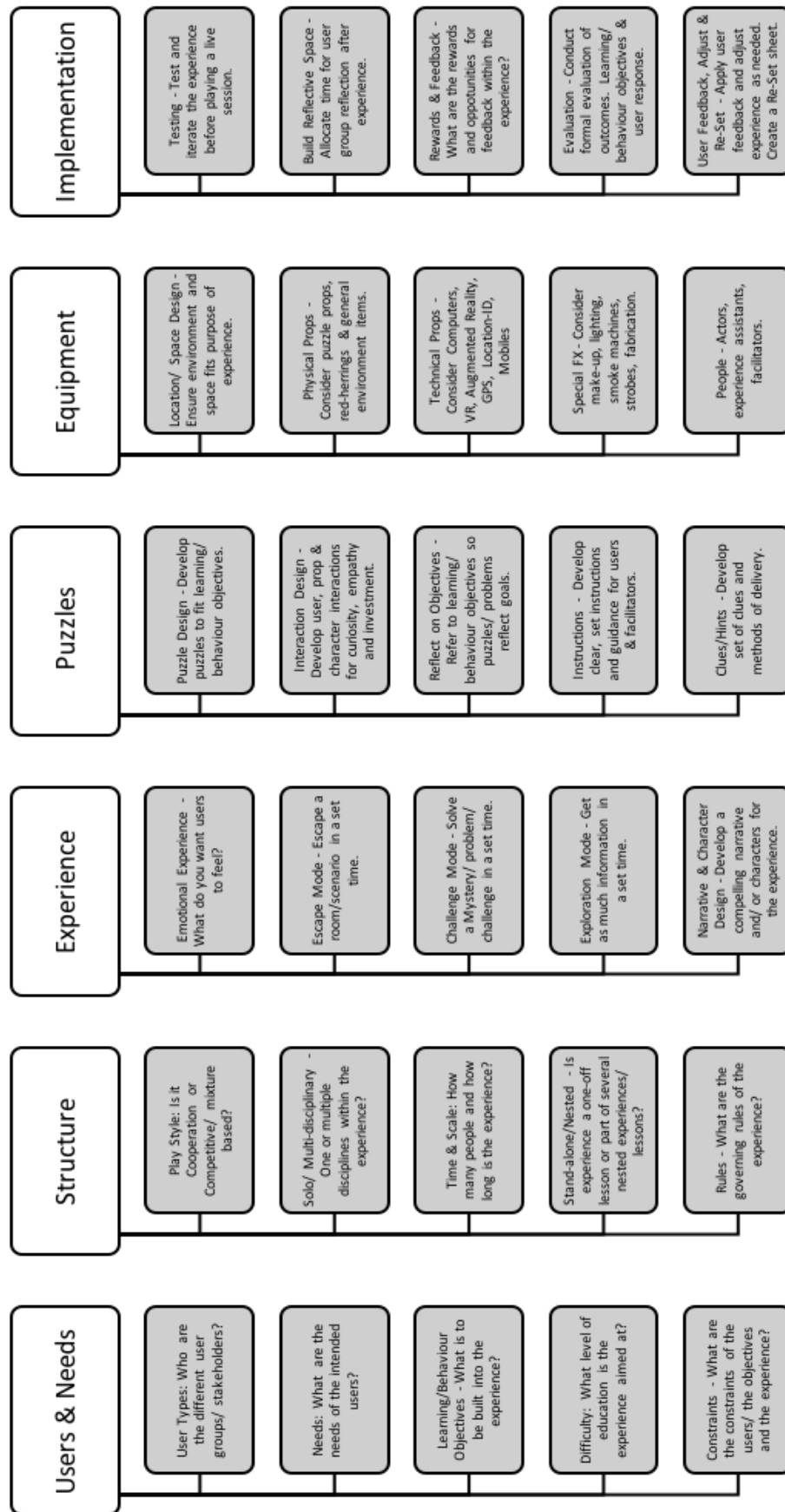


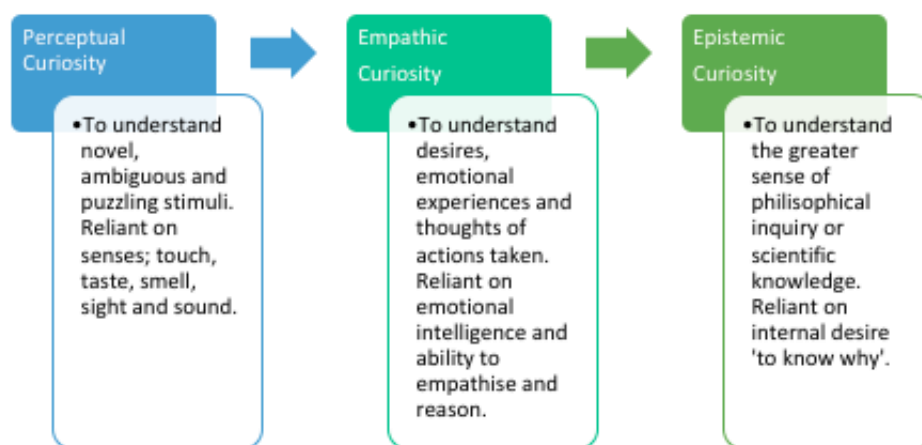
Figure 1: escapED Framework V1.2

## Curiology

Curiology is defined as a hybrid disciplinary approach of learning through play (LTP) and problem-based learning (PBL), in which a perceptual, empathic and epistemic curiosity flow is developed and utilised in a playful manner, through the use of puzzles and trans-media stimuli. This is done to engage learners in their experience of participating in/ solving/ or coming up with a resolution to an open-ended problem through a sensory and emotionally immersive experience. This is proposed as a 3-step approach:

- Step 1: in which a group of learners are engaged through the senses to achieve a state of Perceptual Curiosity.
- Step 2: in which the learners are emotionally invested in the content via in-play actions and interaction (characters, story etc.), to achieve a state of Empathic Curiosity (emotional curiosity).
- Step 3: in which the final goal of the state of Epistemic Curiosity is achieved by moving through step 1 & 2, and in which sufficient problems in the form of questions, puzzles, visual and open ended materials are provided for learners to engage with. This provides the foundation of the 'desire to know' within the learners.

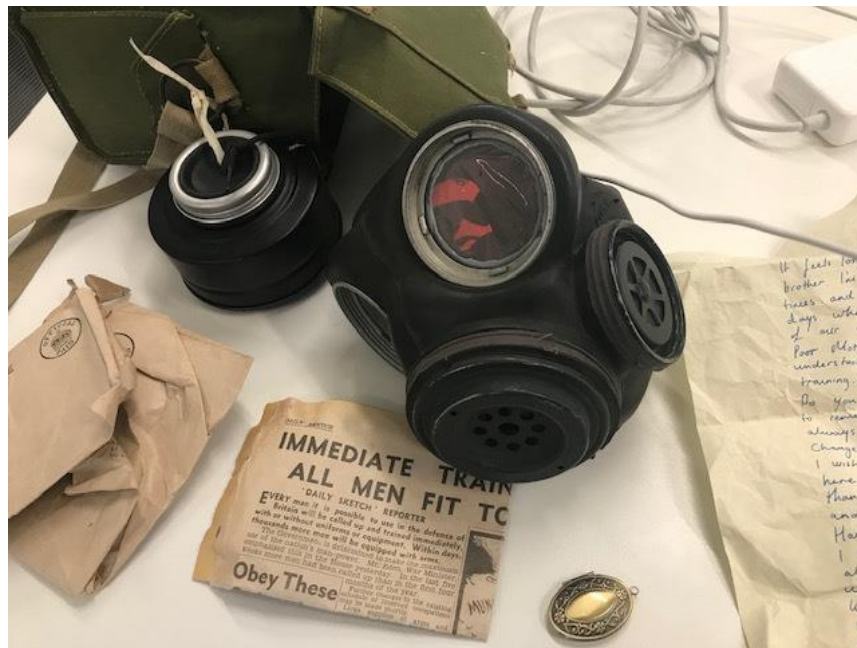
Each step, harnesses a different type of curiosity to engage players in the learning materials and build towards the ultimate goal of creating a 'true desire' to learn.



**Figure 2:** Curiology P. E. E. Flow Diagram

With the theoretical structure in place and the framework for the development of the curiosity box approach, World War 2 was chosen as a setting to discuss and raise awareness that women played a crucial role in contributing to the war efforts, particularly in STEM related fields. The box was developed to discuss women's roles at Bletchley Park, the home of the British codebreakers, and how they contributed to solving the ENIGMA code. It would focus specifically on a fictional correspondence between Margaret Rock, who was a prominent female decoder and her brother John Frank Rock, who was a Lieutenant in the Royal Engineers. The overall objectives for creating the experience was that it was to be an awareness building exercise in which understanding would be developed that women worked at Bletchley park to decode the German messages coming through, alongside their more known male colleagues such as Dilly Knox. This was also a way to potentially inspire young girls into a conversation that women have always worked in STEM fields throughout history. In part, the experience was designed so that players would have to look up additional information such as unknown words, names or places to understand the experience. In doing so, the player would be also building on their research skills. By piecing the story together, players were given permission to play the role of archaeologist selecting information they deemed as relevant in their process of discovery. It gave the players further license to branch off and research other areas that they found connected to the experience, feeding into the idea of curiosity-led learning.

The items that were developed into the design of the curiosity box were; an authentic WW2 gas mask, a locket, a torn picture of Bletchley Park, a newspaper from the time period, two handwritten letters inside envelopes and a note on field/waterproof paper.



**Figure 3:** Contents of Curiosity Box

Further discussion and a breakdown of how the puzzles and narrative were developed in detail can be found at Serious Games Life website (Credit Continue, 2019).

### 3. Pilot

After receiving ethics approval through the official procedure within Coventry University, a small pilot was conducted to assess how the curiosity box approach was received. There were several objectives of the pilot that was trialed with Coventry University teaching and learning practitioners.

1. To assess the acceptability, usability and perceived usefulness of the approach as a tool for educational purposes
2. To determine if and how curiosity factored into their experience of the play through.
3. To understand whether participants believed time as a game mechanic should or should not be used in this approach.

Members of teaching and academic staff were invited to play through the experience at their own convenience. It was up to the players whether they wished to go through the game in a team or on their own, however it was stipulated that team size was to be no bigger than four members. Four teams participated in playing through the experience, with a total of 12 players taking part in the pilot of the experience. As the pilot was run without a time limit, the teams all completed the play through at different times, ranging from an hour to a half a day to complete. Each team were given no formal instructions or introduction to what the experience was, or what they had to do. Instead they were given the gas mask bag with a tag on the outside that read: *'could someone please catalogue this item? No information immediately obvious, other than it is from World War 2. I need this off my desk ASAP!'* Participants were told that they could use the internet for research purposes as this was part of the process of discovery throughout the game. It was up to the players to sort through the items that made up the experience, and to work out the story from the puzzles and connecting materials that were provided. Each play through was observed by members of the research team at the Disruptive Media Learning Lab, however no external help was provided by any of the researchers or developers of the experience.

Each play through, the participants were observed to display high levels of engagement in relation to the physical items and written materials that made up the experience. Researchers also observed that in the play throughs that had more than one team member, players spent more time exhibiting excitable bursts of energy and hurried conversations, when they found a new object or new materials, which were then followed by moments of quiet contemplation whilst working together. In the play through that had only one player, it was observed that this player was quieter and exhibited less obvious physical excitement towards the items when they were found.

After the play through, players were asked a series of exploratory questions in a one to one semi-structured interview about their experience and perceptions of the curiosity box approach. Below follows a discussion on some of the themes that emerged from the findings.

### **3.1 Curious Impressions**

When asked to describe their impressions of the box, all participants described or mentioned in their interview the feeling of being 'curious', particularly towards uncovering what the package contained.

"I was really curious, I guess as to what the package contained."

Several participants also mentioned the word 'mystery' in their analysis and an 'excitement' from the element of not knowing what the experience was about.

"I assumed it was going to be some kind of game but there was an excitement in the mystery of the not knowing what was coming next."

"Discovery, I think. I think it was like a mystery."

This indicates that the concept of 'Curiology' as a process of engaging initial player attention through the use of perceptual curiosity as a first-step approach, has shown to have some success in this pilot study. As curiosity was cited as the initial reactions of the participants when presented with the curiosity box, we can conclude that unknown and non-threatening stimuli in an educational environment is an effective way to initially engage people to interact with desired materials and resources. Further emphasis was also indicated by some participants, as to the effects of certain items in the experience itself, in which they felt themselves drawn to those objects more than others. This was particularly interesting as the gas mask used was a real WW2 artifact that was used as part of the educational experience.

"Well, it was very interesting. Its inviting when you look at the mask and the old army bag, and it sort of entices you to look into it."

"The most intriguing thing was the gas mask, and it did make me want to investigate further."

"I was quite curious about the newspaper, tried to read it, tried to figure if it was only one clue or if the news reflected the problem and the mystery."

Other participants indicated that they believed time was also a factor in the reinforcement and build-up of curiosity as they played through the experience. Initially, the effect from perceptual curiosity was believed by the authors to have a faster player engagement drop off rate as time went on. However, some of the discussions from the participants indicate that perceptual curiosity may be a factor that engages people all the way through an experience, based on the unknown element of whether a player may discover something new/ something missed at any point in the experience.

"I think that the fact that you re unpacking something over a period of time adds to the curiosity. It's the discovery that keeps you curious, so at any time you could find something new that adds to the activity."



“Almost wanting to know afterwards whether something was part of it or was that just a coincidence. Was it your mind that found a connection. I remained curious how the game was put together after finishing it.”

From the participant feedback, confirmation can be gathered that the desired feeling of ‘curiosity’ was achieved, with further feedback indicating that some participants remained curious even after the experience had finished and wanted to continue exploring the materials and researching the content online. The continuation of intrigue regarding these materials, allow for the argument that the approach of using curiosity boxes at least during this pilot, has led to developing a further state of epistemic curiosity or the ‘want to know’ in some of the participants that took part in the pilot.

### **3.2 Item and Experience Authenticity**

Authenticity was another key theme that emerged from the discussions, in that participants linked authenticity with quality and their overall engagement with the experience.

“The authenticity if you know what I mean. The authenticity was, what's the word, captivating.”

“The quality was amazing which really added to the eagerness to take part, I think that’s a major factor of whether I wanted to do it or not.”

One of the development decisions that was undertaken was to use where possible real versions of the items in the curiosity box. As such, a real WW2 gas mask and holder was used. Whilst there is evidence to suggest that using high fidelity items adds to the overall participant experience, it should be noted that cost and replication could be factors to consider, depending on the subject matter that is being explored.

“I thought they were very well made and seemed very real, small pieces and hidden in little nooks. Very believable and very compelling.”

“I thought they were very realistic which added to the immersive nature of the experience. The quality was really high, and sometimes I would second guess that it was a game. The level of authenticity was exemplary. The tactile objects interested me more than the text based objects.”

Whilst cost and replication are factors to consider, based on the feedback from the participants it is suggested that the authenticity of the items factored into how engaged they were with the experience. This may also feed into how we approach the selection process of the stimuli to be used in the first-step of engagement through perceptual curiosity. This also opens up further questions as to our understanding of ‘immersive’ game experiences which will be carried over in further research.

### **3.3 Time**

Part of the pilot study was to explore further whether a time mechanic on the experience was felt to be needed or not by the participants. This question is an ongoing consideration that the researchers are curious about in terms of whether a time limit, such as employed in escape rooms/ timed live experiences hinders educational/ player enjoyment and development. We asked: ‘Would the experience be more enjoyable with or without a time limit?’

“Without, I don’t think you should put a time limit on it as people might not get to the end. The end point is rewarding.”

“I think it’s better without a time limit. Because it softens the frustration element if you can put it aside and do something else and come back later it might be easier. It’s like when you’re going through an attic looking at old things and you find a box you want to see who it belongs to, you don’t need to do it right away, you look at it and then come back to it.”

“Ok, a time limit is fine if all the answers are there so you have everything you need to solve it, but if it’s something like the Bletchley where you have to discover something online in detail then a time limit

would be annoying. It would really irritate me. Too much pressure to deliver. Time limits are great if you can solve it, but if you can't then there is a feeling of being inferior."

All of the participants interviewed fed back that they perceived the curiosity box approach was better without a time limit on the experience. One participant also linked the timer to how complex the experience was, indicating that if an experience was more in-depth in which additional research had to take place, then a timer would be too much pressure. This has opened up some further questions about how we time manage an experience of this type, and whether this is something we need to consider when developing its complexity. It also shows a need to conduct further experiments in which the same experience is run in scenarios with and without a time-limit.

### **3.4 Learning from the experience**

To understand whether the experience was effective as a learning tool, the researchers asked the participants whether they felt they did/ did not learn anything from the experience. All participants had positive responses to the experience as a learning approach, with some commenting on the awareness of women characters at Bletchley Park amongst other areas such as Cryptography and Code Breaking.

"It did bring women more to the forefront, than the story you usually hear about Bletchley park."

"Yes, I learned about the house that was used and the people that were involved in cracking the code. I knew the story but I did not know the characters."

"I definitely gained a deeper understanding of the history of cryptography that I wasn't aware of. I did understand more about the characters, and their impact on cryptography and the history of codebreaking in WW2. It actually made me want to read or learn more about it, which I would not have been so bothered about if I hadn't had gone through that. It opened up my intrigue."

Other participants recognised the value of the experience as a teaching tool for general research skills, understanding information and identifying information that is good or bad to take forward.

"I am a big proponent of having people to do things for themselves. This is teaching people how to research properly for themselves, internet research and reading skills."

The feedback in relation to what the participants learnt from playing through the curiosity box allows us to summarise that to an extent, the approach is useful as a teaching and learning method. Other participants fed back that they could see how this approach could be structured to release information slowly over the course of a module. This echoes a previous experiment that the researchers conducted with mystery packages that were delivered over a series of weeks to Masters level Sports Science students (Duncan et al., 2018).

## **4. Conclusions**

Concluding on the pilot of the 'Unsung' curiosity box, using Curiology as an approach to developing different curiosity types at different stages of the experience, the authors believe that from the behavior observed within the participating players throughout the experience, and from the semi-structured questionnaire feedback, that the approach is effective at creating perceptual curiosity and therefore engaging participants to explore the stimuli placed in front of them. Some participants also indicated that they felt curious to go and research other areas that were connected to the materials that they had experienced in the play through. This also allows us to consider that epistemic curiosity was observed in some students. One of the areas, that needs more observation is the drive of empathic curiosity. As this experience was designed to be a more passive experience where participants could not affect the outcome of the characters, emotional connection was not designed specifically for this experience. In future work, the authors will look to develop an experience where players are placed into different emotional states concerning character and story outcome to explore further the second-step of empathic curiosity. Concluding this pilot study, the feedback indicates that other teaching and learning practitioners not only learnt something from playing through the experience, but could also see how this approach could be used with students to encourage self-led learning, motivating them through the

application of different curiosity types to subject matter. Further work will look to continue this exploration into how Curiology can be applied, and how this approach can be simplified into an easy to adopt process.

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