

## IBC 2021 Accelerators: RT-3D Interactive Content Creation for Multi-Platform Distribution.

### A Real-time 3D Interactive Content Creation User Study with Novice Users

Gareth W. Young  
V-SENSE  
Trinity College Dublin  
Dublin, Ireland  
YoungGa@TCD.ie

Grace Dinan  
RTÉ  
Donnybrook  
Dublin, Ireland  
Grace.Dinan@RTE.ie

Aljosa Smolic  
V-SENSE  
Trinity College Dublin  
Dublin, Ireland  
SmolicA@TCD.ie

**Abstract:** The modern classroom employs various novel technologies to educate and inform the industry leaders of tomorrow. With the recent reinvigoration of extended-reality (XR), including augmented and virtual reality (AR/VR), the potential of this technology to influence the next generation of users is vast. In higher education, in particular, industry partnerships are fundamental for creating a pipeline of suitably skilled operators for future studio productions. In the presented study, we explore the opinions of a cohort of novice student users towards the use of new XR technology, record their previous experiences and knowledge of 3D technology, gather information about their current needs and requirements, and report on the potential future of XR from an educational perspective. It is expected that this user-type focused study will be used to inform the design of new educational software for novice users.

#### Methodology

This study aimed to explore novice-user experiences when undertaking tasks with 3D animation and modeling software. This process involved engaging with students using new 3D tools in the classroom and understanding their experiences in a learning context. Thus, an experiment is presented that exposed students to a 3D animation and modeling task in VR. This data will provide VR application creators and XR developers with an understanding of how students will use this technology in the future classroom.

#### Participants, Apparatus, and Materials

Recruitment took place in the Republic of Ireland during the latter half of 2021. A general call for participation was made through a prestigious institute of technology. Volunteers were sought from a 3D modeling and animation cohort. Participants were asked to report demographic information via an online questionnaire. This data included age, gender, and education level. The participants were asked to identify on 5-point Likert scales their competencies with digital technologies (1 = Unskilled to 5 = Excellent); their familiarity of 3D modeling and animation (1 = Unfamiliar to 5 = Extremely Familiar); and their expertise using 3D modeling and animation technologies (1 = Novice to 5 = Expert). Participants were then scaled as "Novices," "End-users," and "Advanced Users," as described by Nielsen (1994).

In total, 12 participants attend the VR tutorial, identifying as 7 Males, 3 Females, and two Non-binary users with an average age of 21.08 (SD = 1.83). According to the Irish National Framework of Qualifications (NFQ), the education profile of the cohort consisted of levels 6 (n = 6) and 5 (n = 6).

The cohort was invited to experience 3D modeling and animation in the classroom. Each session was scheduled for one hour and implemented COVID-19 social distancing and hygiene protocols. Participants were given 3D modeling and animation tasks to complete that were delivered via video tutorials. The

course lecturer was present to provide additional support. The students were asked to model a 3D apple in Masterpiece studio and animate the apple falling down stairs in Tвори.

*Masterpiece Studio (www.masterpiecestudio.com)*: Masterpiece Studio Pro is a fully immersive 3D creation pipeline. It provides a suite of professional, intuitive, and easy-to-use immersive tools. Users can create high-fidelity 3D models and animations using easy-to-use and intuitive tools. The application allows users to create 3D concepts within VR, sculpt 3D assets, and prepare meshes for many different professional workflows.

*Tвори (www.tvori.co/tvori)*: Tтвори is an animation and prototyping software for VR and AR that can be used for previsualizations, animatics, or VR films. The application makes designing for both AR and VR simple. This software package can be used collaboratively to prototype interfaces, products, and experiences for XR. It is easy to learn, provides animations for design transitions and user interactions, and can be used collaboratively by teams and clients remotely.

After the class, the students were asked to complete an online questionnaire. Quantitative data was recorded to highlight usability issues, and qualitative data was recorded to add depth of knowledge. The following questionnaires operationalized these topics; the UMUX-Lite was used to identify usability issues; the following questions were used to expand upon these answers: "What previous knowledge or experiences have you had with the 3D modeling technologies you have experienced today?"; "What benefits or problems do you see arising from using VR technology for 3D modeling in the classroom?"; "What do you think you would need from future VR technology for 3D modeling like this in the classroom?".

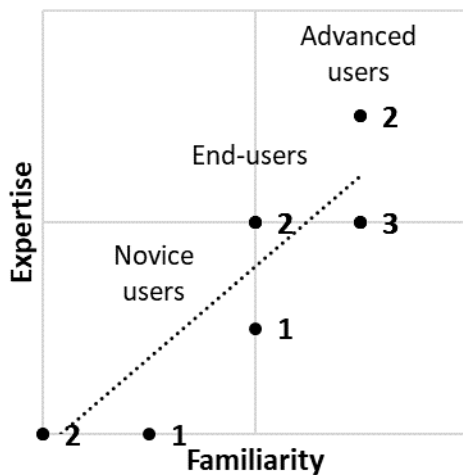


Figure 1: User-cube representing user types (the dotted line represents the linear average).

## Results

Empirical data was collected and analyzed. Quantitative data was used descriptively to report on the cohort demographic. Qualitative data were coded and used to enrich and add depth of knowledge to our aims and objectives. The analyses of open-ended questions took a thematic approach guided by the frequency and fundamentality of the issues raised by the participants (Adams et al., 2008; Nowel et al., 2017).

## Population Variables

Data relating to the cohorts' ability to use digital technology (M = 3.92; SD = 0.79), their familiarity or knowledge of 3D animation and modeling (M = 3.00; SD = 1.13), and their expertise or experience in using 3D animation and modeling technologies (M = 2.58; SD = 1.08) were captured to identify specific user-types (Nielsen, 1994). All participants were self-reported as having a "Good" ability to use digital technology. The distribution of user types was weighted towards Novice users (n = 7), with three End-users and two Advanced users (see Figure 1).

## Usability

First, students described their usability experiences of 3D modeling and animation in the classroom. As such, the cohort reported a mean usability score of 78.47 (SD = 21.75). The UMUX-Lite result was then converted to a raw System Usability Score (SUS) to help benchmark the collected data (M = 73.91; SD = 14.14). The percentile rank for the raw SUS score was calculated as 60%, or "above average," where a percentile above 50% is, by definition, above average (Sauro & Lewis, 2016).

## Time on Task (ToT)

All students completed the task. From ToT data, the average task completion time for 3D modeling and animation tasks was calculated as M = 29 minutes (SD = 10.92).

Table 1: Visual presentation of themes

What are novices' opinions on using 3D animation and modeling technology in the classroom?			
	Previous Knowledge & Experience	Advantages & Disadvantages	Future Requirements
Themes	<ul style="list-style-type: none"> <li>• Mostly none</li> <li>• Blender, Mudbox, Solidworks, 3DsMax, Auto CAD, Procreate, and Dragon Frame</li> <li>• Experiences in the 3rd Year with 3D Design, Model-Making, and Digital Art</li> </ul>	<ul style="list-style-type: none"> <li>• Cybersickness</li> <li>• Usability</li> <li>• Fun</li> <li>• Novel</li> <li>• Industry-specific</li> <li>• Learnability</li> <li>• User experiences</li> </ul>	<ul style="list-style-type: none"> <li>• Ubiquity</li> <li>• Accessibility</li> <li>• Existing technology integration</li> <li>• Learning materials</li> <li>• Improved usability</li> <li>• Scalable UIs</li> </ul>
Examples	<p><i>"I have had no previous experiences like this."</i></p> <p><i>"No VR knowledge. I've used Mudbox, Solidworks, 3DsMax before."</i></p> <p><i>"Animating in Procreate and Dragon Frame."</i></p>	<p><i>"Some students may get headaches or feel unwell after using VR."</i></p> <p><i>"It's a lot of fun, and you get details you wouldn't be able to translate easily on regular digital modeling."</i></p> <p><i>"The industry is very much digital heavy."</i></p>	<p><i>"More VR headsets and a designated VR area."</i></p> <p><i>"ZBrush, Screen Tablets should be supplied..."</i></p> <p><i>"It should have a simpler interface."</i></p> <p><i>"Better layout structure and button configurations."</i></p>

## **Previous Knowledge and Experience**

Most students presented with little or no previous experience with 3D modeling software. None had previously used VR for these purposes either. Those students that had had some previous experience listed Blender, Mudbox, Solidworks, 3DsMax, Auto CAD, Procreate, and Dragon Frame on the PC and generally had a mix of 3rd Year, 3D Design, Model-Making & Digital Art level of expertise.

## **Benefits or Problems**

Students highlighted that some of the benefits of using VR in the classroom were that it was easy to use, a lot of fun, and could see additional details that would not translate easily on traditional PC modeling platforms. The ease of use that students experienced was thought to enhance the accessibility of the medium and could attract more people to the industry. Students recognized that the current industry climate was very digital-orientated and tech-heavy, so they needed to know how to use new software and hardware for future employment. Although a lot of time would be required to learn how to use the software efficiently, the visualization of 3D data was thought to be much more enhanced and showed a lot more detail on the final output. The additional use of projection mapping and internal lighting spotlights for the 3D modeling object was thought to be advantageous for learning as a "visual experience." Subjectively, this advantage allowed our novices to model and contextualize their work much quicker than via traditional PC software. Additionally, it was highlighted how physical modeling and animation project work could easily be damaged; therefore, a 3D digital model was more mobile and easier to transport. Ultimately, the student thought that VR for 3D modeling and animation was potentially a cost-efficient, fast, safe, and easy way to save progress when learning. While the students offered several advantageous scenarios for the use of XR in the classroom, it was also noted that there may be other disadvantages as well. As one student commented:

"It's easy to use and could allow for a wide range of people to get into it, but it could potentially lead to less student to student feedback and collaboration"

The problems listed by the students highlighted typical issues that novice users might face in the classroom. User-type specific issues included how some students might suffer from VR sickness and "get headaches or feel unwell" when using VR for the first time. The user interface or "layout of buttons" were also highlighted as problematic for ease of use for some students. Furthermore, the task was particularly challenging for those who were previously inexperienced with such programs. These issues were thought to be easily overcome with accessible tutorials and a teacher present to help students understand the task better. Interestingly, it was believed that this technology could potentially lead to reduced student-to-student feedback and collaboration.

## **Future Uses.**

For VR to be more prominent in future classrooms, our student users highlighted that more VR headsets would have to be made available for general use. This suggestion also included designated VR areas to be included in classroom spaces. Additional technology integration was also recommended, such as ZBrush and Screen Tablets. Some students highlighted usability problems and that future software would require enhanced "ease of use" features for novices, where the user interface would be scalable in difficulty for different user types. For example, a simple interface for beginners and a more complex one for advanced users — "There should be more straightforward layout selections, for example, cut

lines, extrude, etc." For more streamlined interactions with other classroom software, it was suggested that future iterations have a layout that matches other programs for cross-platform use and "hot-key" shortcuts for fluid switching between platforms. For example:

"Better layout structure that matches other software, that is nearly cross-platform in terms of use, and hotkey shortcuts to be more fluid when having to switch between modeling software."

Although, it was suggested that this could be avoided if there were a selection of software to choose from. It was also recommended that tutorials be delivered inside the HMD and made more straightforward and accessible for entry-level users. Although, this was contradicted as some students preferred to be made "aware of their surroundings" and alerted if someone was approaching them while wearing an HMD.

## References

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