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20TH AUGUST 2025

TRANSFORMING EDUCATION, DRIVING INNOVATION AND
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DESIGN THEORY EXPLORER (DTE_{exp}.V1.0): VISUAL-INTERACTIVE INNOVATION FOR BASIC DESIGN PRINCIPLES IN INTERIOR DESIGN EDUCATION

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ABSTRACT

The effective teaching of design theory – particularly the identification and application of the basic design principles – remains a pedagogical challenge in interior design curricula. This paper introduces Design Theory Explorer Version 1.0 (DTE_{exp} V1.0), an innovative, image-based learning tool designed to enhance students' understanding of basic design principles through visual engagement, active learning, and reflective practice. The innovation exists in two formats: a mobile application prototype developed using RMAD (Rapid Mobile Application Development), and a manual PowerPoint slide version adaptable for both digital and offline classrooms. DTE_{exp} V1.0 allows undergraduate students to interact with curated visual content by analysing real-world design examples and selecting applicable basic design theory principles, e.g., emphasis, contrast, repetition and etc. Key components include gamified image identification tasks, portfolio-based reflection and challenge-based learning modules, together enabling hands-on design theory application. The activity aligns with constructivist learning theory and Models of Visuospatial Cognition, supporting deep engagement with basic design principles. Preliminary classroom implementations suggest increased student motivation, improved retention of theoretical concepts, and strengthened visual literacy. The DTE_{exp} V1.0 represents a scalable, accessible, and pedagogically robust approach to bridging the gap between design theory and practical observation, with potential for cross-disciplinary application in interior design, architecture, art, and visual communication programs.

Keywords: Basic Design Principles, Design Theory, Interior Design Education, visual-interactive, RAMD.

INTRODUCTION

The instruction of design theory in interior design education often confronts challenges related to abstraction, limited visualisation, and student disengagement (Badenduck, 2024; Lin & Liang, 2014; Triatmaja, 2020). The ‘Basic of Design Theory in Interior Education’ syllabus consist of the introduction of many fundamental theories in design, including the Basic Design Principles. The Basic Design Principles—such as emphasis, balance, contrast, rhythm, unity and etc.—are foundational, yet their application in real-world settings is often poorly understood by students. Traditional pedagogical approaches that rely heavily on lecture-based delivery and textual materials fail to address the inherently visual and experiential nature of design learning (Wagiri & Hasudungan Irianto Sitindjak, 2024; Wang et al., 2024).

Responding to this educational need, the Design Theory Explorer Version 1.0 (DTExp. V1.0) was developed as a visual-interactive learning tool. It seeks to help students build a deeper understanding of basic design principles and apply them in meaningful ways - using visual prompts, interactive gamified activities, and reflection-based tasks. The approach is grounded in constructivist learning theory, which emphasises learning through active exploration and personal experience (Gurses et al., 2015; Kocadere & Ozgen, 2012) and Models of Visuospatial Cognition, which help students understand how people think about space, objects, shapes, and movement (De Vega & Marschark, 1996). DTExp V1.0 enable students to actively explore, identify, and reflect on design principles embedded in interior spaces in any project types and professional examples.

METHODS

The goal of developing DTExp V1.0 was to improve the way students learn by adding a visual interactive tool. There are two versions of the tool: a) Manual Version (PowerPoint Slides): This version can be used in both digital and print-based classrooms, so educators can be flexible with how they teach, no matter what technology they have; and b) Mobile App Prototype: This version is best for learning on the go with smartphones and tablets. It was developed using Rapid Mobile Application Development (RMAD) for fast prototyping and deployment. RMAD uses visual interfaces and pre-built components, and it is a low-code/no-code method for quickly creating web, native, and hybrid mobile applications that can be used by both developers and non-technical users. The DTExp.V1 prototype application's visual components were all carefully selected from a variety of internet resources, including royalty-free websites like Pexels, Canva, and Freepik. Pinterest-sourced images were only used when their original sources permitted unrestricted or licensed educational use.

To ensure the tool aligned with effective learning strategies, its development was guided by established educational theories that support both active engagement and multimodal learning. The pedagogical framework was informed by constructivist theory, which emphasises learning as an active, contextualised process, and dual coding theory, which supports the integration of visual and verbal information. The tool was made up of three main parts:

Visual Identification Tasks: Students look at carefully chosen images and decide which design principles apply to them.

Challenge-Based Activities: Students use what they've learned in the classroom to solve real-life design problems.

Portfolio Reflections: Students write down and think about how their analytical process and understanding have changed over time.

RESULT AND DISCUSSION

Innovation Description

The DTExp.V1.0 is a new way of learning that combines visual interaction, gamification, and reflective learning to help people understand basic design principles better. In an image-based interface, students look at real-world visual examples and are asked to identify design principles that apply, such as balance, proportion & scale, repetition, emphasis, contrast, repetition, and unity. The tool has two different ways to deliver: a) a manual slide-based version that can be used in class or offline; and b) a prototype of a mobile app that can be used for self-paced or remote learning. The innovation is based on getting students involved, which encourages them to explore, analyse, and build portfolios, turning what they learn in theory into what they see and understand in real life. The DTExp.V1.0 step-by-step game play is shown in Figure 1 for the offline version and Figure 2 for the online version.

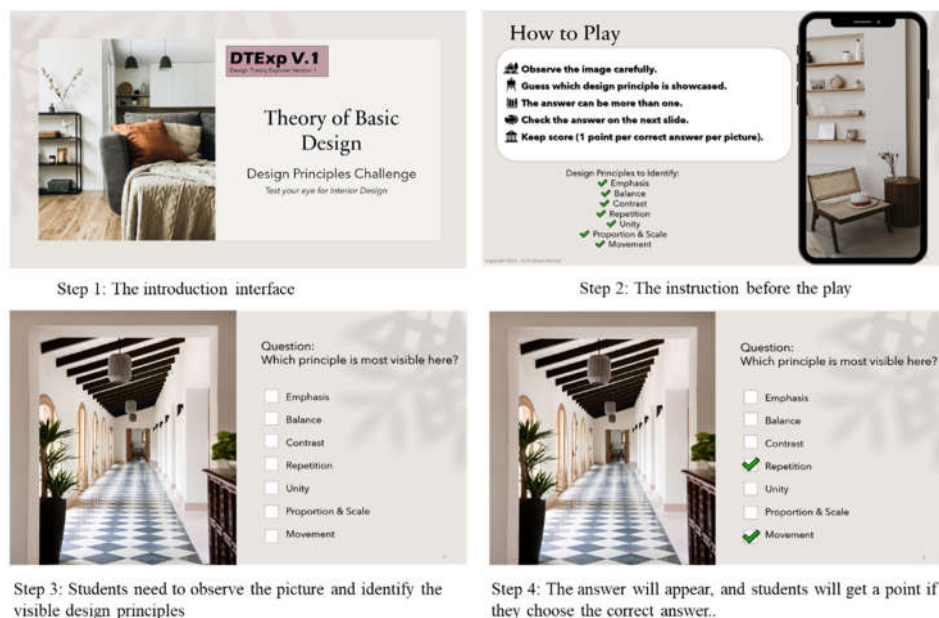
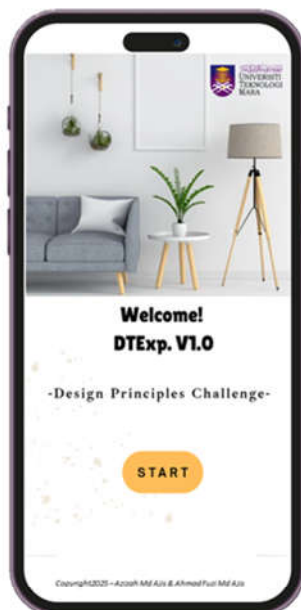
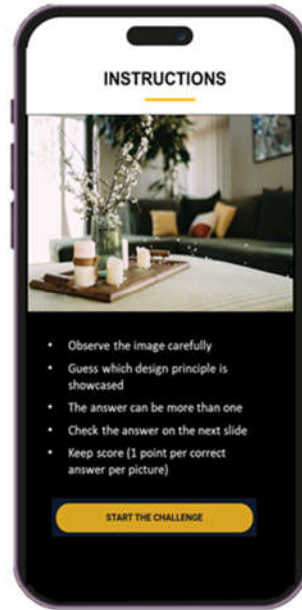


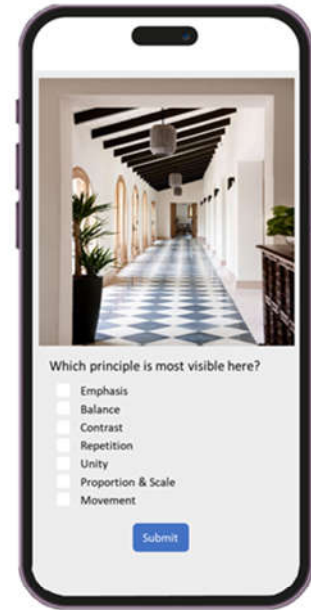
Figure 1.: The Offline PowerPoint Slide Version of DTExp. V1.0



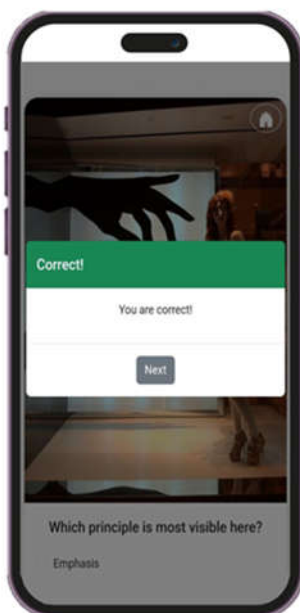
Step 1: The introduction interface



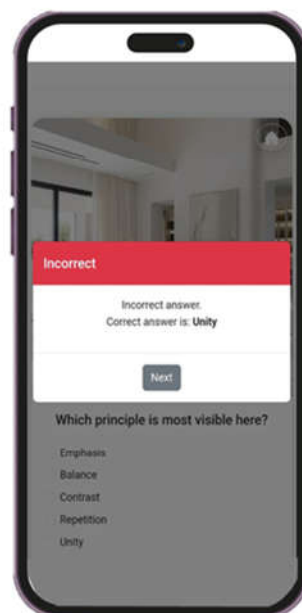
Step 2: The instructions of the play



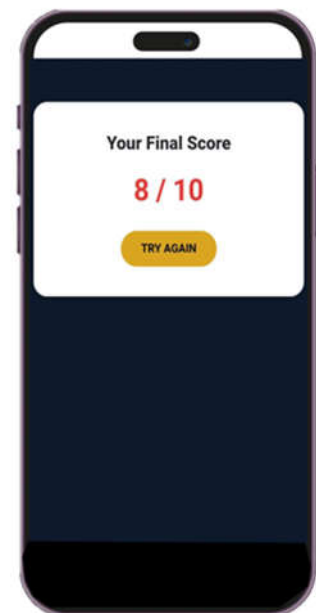
Step 3: Students need to observe the picture and identify the visible design principle



Step 4: Students receive a point when they select the correct answer, which is then shown on the screen



Step 5: The correct answer is displayed when an incorrect response is given



Step 6: The total score is displayed at the end of the activity

Figure 2.: The Online Mobile Apps Version of DTExp.V1.0

The DTExp.V1.0 makes learning more fun for interior design students by encouraging them to be active through interactive visuals, helps to understand design principles by applying the principles in the real world through interior design visuals, and letting educators keep track of students' progress through

reflective portfolio tasks and challenges. Giving a structured but flexible framework that works in both digital and traditional classrooms. The core novelty about the DTEp.V1.0 is that it combines image-based gamification with reflective pedagogy in the context of design theory. DTEp.V1.0 changes passive learning into an active, student-centred process, which is different from traditional design theory instruction that often uses abstract verbal explanations. It also fills a need in the market by providing a dual-format tool (mobile + manual) that is specifically designed for interior design education.

COMMERCIALISATION AND BENEFIT TO SOCIETY

Beyond its instructional value, DTEp V1.0 also demonstrates strong potential for market application in the educational technology sector. DTEp V1.0 has high potential for commercialisation within the design education technology market, particularly in higher education institutions offering programs in interior design, architecture, as well as art and design. The mobile application can be further developed into a paid learning platform or licensed for institutional use. The manual version can be turned into a teacher's toolkit that can be used in workshops, short courses, and modules that aren't online. Opportunities for commercialisation include a) Academic licensing for universities and colleges; b) Freemium app model for students with premium add-ons; c) Customizable versions for different disciplines and learning levels; and d) Collaborations with educational publishers or EdTech platforms could also facilitate broader distribution.

In addition to its market potential, DTEp V1.0 offers meaningful societal contributions through its impact on design education and student development. It contributes to society by improving design literacy among students, who are future professionals shaping built environments. It also makes design education more accessible to everyone by making high-quality teaching tools available even in classrooms with few resources through its offline version. Further, it is expected to support creative and critical thinking in young designers, which will lead to more thoughtful, people-centred design solutions in the real world. In line with the digital transformation era, it could encourage the use of technology for meaningful learning, which is in line with global trends in education toward digital transformation (Zou et al., 2025). In the long term, DTEp V1.0 can improve the quality of design education, turning out more skilled graduates who can make their communities better by creating sustainable, culturally sensitive, and visually appealing interior spaces.

CONCLUSION

The development of Design Theory Explorer (DTExp Version 1.0) represents a significant step forward in enhancing the teaching and learning of basic design principles within interior design education. By integrating visual interactivity, gamified learning, and reflective portfolio activities, DTExp transforms abstract theoretical content into an engaging, student-centred learning experience. The tool is available in two formats: a mobile app and a manual. This makes it easy to use in a variety of teaching settings, such as digital, hybrid, and offline. Its design is grounded in sound pedagogical theories, namely constructivist learning theory and Models of Visuospatial Cognition, supporting further conceptual understanding and improved visual literacy among students. With its potential for broader application in related design disciplines, as well as opportunities for commercialisation and societal benefit, DTExp.V1.0 is a scalable and innovative way to connect design theory with real-world observation.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to the Team DTR101 Basic of Design Theory at UiTM Perak, Seri Iskandar Campus, for their invaluable support, collaboration, and feedback throughout the development and implementation of Design Theory Explorer Version 1.0 (DTExp.V1.0). Their dedication to innovative teaching practices and commitment to enhancing student learning experiences have been instrumental in bringing this project to life.

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