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# Application of Virtual Reality in Architectural Education Case of Northern Cyprus

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***Abstract:***

The use of technology in architecture education has become essential in the current digital age. VR is a technology that has the potential to completely transform not only how we communicate and have fun, but also how we learn about space, design, and architecture. The immersive, participatory nature of virtual reality offers architectural students a special chance to transform the imaginational thinking into visual images. This study tries to find the problem in applying the VR in the classes of Architecture and its slow interaction to be a main element of the Architectural classes. For the purpose of examining this problem Research have been taken in Cyprus's use of virtual reality (VR) in architectural education. The study investigates the impact of VR on student performance and comprehension before its practical application using a quantitative research method, along with a targeted survey among architectural students at Cyprus International University. According to preliminary findings, of the 28 respondents, 74% were familiar with virtual reality, and 50% thought it had applications in architectural design. Only 23% of respondents had actual experience with VR outside of architectural contexts, though. This study examines the pedagogical intricacies of VR, going beyond simple technology integration to highlight the educators' duties in maximizing its potential and the students' expectations regarding its influence on their educational journey. This article explicitly considers the future of VR in architecture education, identifying crucial stages in the design process where VR can have the biggest influence. VR has numerous uses in many other sectors. The study gives insights into the potential roles and benefits of VR in shaping the future trajectory of architectural education in Cyprus after a thorough data analysis and contextual assessment.

**Keywords:** Architecture Education, Architectural Design, Virtual Reality, Northern Cyprus.

**الملخص:**

أصبح استخدام التكنولوجيا في التعليم المعماري أمرًا ضروريًا في العصر الرقمي الحالي. الواقع الافتراضي عبارة عن تقنية لديها القدرة على إحداث تحول كامل ليس فقط في تقديم العجائب والبهجة، ولكنها أيضًا تبسط كيفية تصورنا لفهم الفضاء والتصميم والهندسة المعمارية. طبيعة هذه التقنية تمنح طلاب الهندسة المعمارية فرصة فريدة لتحويل التفكير التخيلي إلى صور مرئية. تحاول هذه الدراسة استكشاف مشاكل تطبيق الواقع الافتراضي في فصول الهندسة المعمارية، ما الذي يمنع هذه التكنولوجيا من أن تصبح عنصرا رئيسيا في فصول الهندسة المعمارية. ولغرض دراسة هذه المشكلة تم دراسة استخدام (VR) من قبل جامعة قبرص في قسم الهندسة المعمارية. تبحث الدراسة في آثار الواقع الافتراضي على أداء الطلاب باستخدام التطبيقات العملية، مع مسح مستهدف لطلاب الهندسة المعمارية في جامعة قبرص الدولية. ووفقاً للنتائج الأولية، من بين 28 مشاركاً، كان 74% على دراية بالتكنولوجيا، ويعتقد 50% أن لها تطبيقات في التصميم المعماري. ومع ذلك، فإن 23% فقط من المشاركين لديهم خبرة فعلية مع الواقع الافتراضي خارج

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السياق المعماري. تبحث هذه البحث في التفاصيل التربوية للواقع الافتراضي، لتسليط الضوء على وظائف المعلمين في زيادة تحصيل الطلاب. تتناول هذه المقالة بوضوح مستقبل الواقع الافتراضي في التعليم المعماري، وتحدد المراحل الحاسمة في عملية التصميم حيث يمكن أن يكون للواقع الافتراضي أكبر الأثر. للواقع الافتراضي العديد من التطبيقات في العديد من القطاعات الأخرى. توفر الدراسة نظرة أعمق على الدور والفوائد المحتملة للواقع الافتراضي في تشكيل المسار المستقبلي للتعليم المعماري في قبرص بعد تحليل شامل للبيانات وتقييم السياق.

**الكلمات المفتاحية:** التعليم المعماري، التصميم المعماري، الواقع الافتراضي، شمال قبرص.

**پوخته:**

بەکارهێنانی تەکنەلۆژیا لە پەروەردەی تەلارسازیدا لە سەردەمی دیجیتاڵی ئێستادا بووەتە شتێکی بنەڕەتی. VR تەکنەلۆژیایەکە کە توانای گۆڕینی تەواوەتی هەیە نەک تەنها لە گەیاندنی سەرسوڕمان و خۆشی، بەڵکو چۆنێتی خەیاڵکردنمان ئاساندەکات بۆ تێگەشتن لە بۆشایی و دیزاین و تەلارسازی. سروشتی ئەم تەکنەلۆجیایە دەرفەتێکی تایبەت دەدات بە خوێندکارانی تەلارسازی بۆ گۆڕینی بیرکردنەوەی خەیاڵی بۆ وێنەی بینراو. ئەم توێژینەوەیە هەوڵدەدات کێشەی جێبەجێکردنی VR لە پۆلەکانی تەلارسازیدا بدۆزێتەوە، ئایا چی ڕێگرە کە ئەم تەکنەلۆجیایە ببێتە توخمێکی سەرەکی لە پۆلەکانی تەلارسازیدا. بۆ مەبەستی پشکنینی ئەم کێشەیە لێکۆڵینەوە لە بەکارهێنانی (VR) لەلایەن زانکۆی قوبرس کراوە لە بەشی ئەندازیاری تەلارسازی. توێژینەوەکە لێکۆڵینەوە لە کاریگەرییەکانی VR لەسەر ئەدای خوێندکاران دەکات بە بەکارهێنانی پراکتیکی، لەگەڵ ڕاپرسییەکی ئامانجدارو لە نێوان خوێندکارانی تەلارسازی لە زانکۆی نێودەوڵەتی قوبرس. بەپێی دۆزینەوە سەرەتاییەکان، لە کۆی ٢٨ بەشداربووەکە، ٧٤%یان ئاشنای ئەم تەکنەلۆجیایە بوون، ٥٠%یان پێیانوابوو کە بەکارهێنانی لە دیزاینی تەلارسازیدا هەیە. هەرچەندە تەنها 23%ی بەشداربووان ئەزموونی ڕاستەقینەیان لەگەڵ VR هەبووە لە دەرەوەی چوارچێوەی تەلارسازی. ئەم توێژینەوەیە لە وردەکارییە پێداگۆژییەکانی VR دەکۆڵێتەوە، بۆ تیشک خستنە سەر ئەرکەکانی پەروەردەکاران لە زیادکردنی توانای خوێندکاران. ئەم بابەتە بە ڕوونی داهاتووی VR لە پەروەردەی تەلارسازیدا لەبەرچاو دەگرێت، قۆناغە گرنگەکانی پرۆسەی دیزاین دیاری دەکات کە VR دەتوانێت گەورەترین کاریگەری هەبێت. VR لە زۆرێک لە کەرتەکانی تردا چەندین بەکارهێنانی هەیە. توێژینەوەکە تێڕوانینێکی قووڵتر دەدات بە ڕۆڵ و سوودە ئەگەرییەکانی VR لە دارشتنی ڕێڕەوی داهاتووی پەروەردەی تەلارسازی لە قوبرس دوای شیکارییەکی وردی داتا و هەڵسەنگاندنی کۆنتێکست.

**کلیلە وشە:** پەروەردەی تەلارسازی، دیزاینی تەلارسازی، واقیعی مەجازی، قوبرسی باکوور.

## 1. Introduction

Like many sciences, the field of architectural education is always changing in response to societal demands, technology developments, and pedagogical breakthroughs (Psotka, 2013). The introduction of technology into the educational process has been one of the most significant changes in recent decades. The line separating the real and virtual worlds is blending more and more as the digital age goes on, presenting both opportunities and difficulties for both educators and students (Bower, Lee, & Dalgarno, 2017).

Cyprus, which is renowned for its extensive architectural legacy, follows this pattern. Its architectural institutions have long understood the importance of keeping up with developments around the world, ensuring that their curricula are current and progressive (Seduikyte, Grazuleviciute-Vileniske, Kvasova, & Strasinskaite, 2018). The incorporation of these tools into the curriculum, however, necessitates a delicate balancing act between originality, viability, and pedagogical efficacy due to the rapid speed of technological change.

VR is a technology that has the potential to completely transform not only how we communicate and have fun, but also how we learn about space, design, and architecture. The immersive,


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participatory nature of virtual reality offers architectural students a special chance (Maghool, Moeini, & Arefazar, 2018). They can experience their designs firsthand in virtual spaces (Obla & Ukabi, 2021), gain a real-time understanding of spatial relationships, and make iterative modifications as a result.

The research problem which emerged from this paper is to investigate the obstacles and the limitations of inserting this technology into university classes despite the technological improvements in the Architectural field. Any new technology adoption, especially one as revolutionary as VR, is not without its difficulties. The questions are numerous for educators in Cyprus and around the world: What are the best ways to effectively incorporate VR into current curricula? What effects might such an integration have on education? What do our students stand to gain or lose from this transformation, and how prepared are our institutions for this seismic shift? This study delves into the condition of VR's integration into Cyprus's architecture education system today to provide answers to these crucial concerns. We want to plan a road for the future—a future where technology and education intersect to redefine architectural learning—by recognizing its potential benefits, limitations, and aspirations for both educators and students.

## 2. Literature Review

### 2.1 Evolution of Virtual Reality (VR)

Despite looking modern, the concept of virtual reality has historical roots. Morton Heilig unveiled the Sensorama in the early 1960s, a gadget that could mimic multi-sensory experiences like riding a bike through a metropolis (Ryan, 2015). Even though it lacked the interaction of today's VR, this early version of VR was a revolutionary approach to immersive experience.

Ivan Sutherland's 1968 release of the first head-mounted display, the "Sword of Damocles," was a crucial turning point in the evolution of VR towards a more interactive form. While simple by today's standards, it was ground-breaking at the time and demonstrated the promise of a computerized 3D environment (Foxman, 2018). By the 1980s and 1990s, VR had attracted a lot of interest. VR was first described by Jaron Lanier, who established VPL Research in 1985 and created the Data Glove and EyePhone HMD, two key pieces of VR technology. Consumer-oriented VR products like Nintendo's Virtual Boy were also developed in the 1990s (Sherman & Craig, 2018). These initiatives, albeit not hugely successful, showed how people are becoming more interested in virtual reality. Significant technological progress was made in the 2000s, including developments in computing, graphics, and sensing technologies (Roy, Stark, Tracht, Takata, & Mori, 2016). It was innovations like Google's Street View that paved the path for the current VR environment by offering panoramic if not fully immersive, experiences (Shih & Leonard, 2014).

The 2010s were a truly transformational decade for VR. The current era of VR was ushered in with the Oculus Rift Kickstarter campaign in 2012, which was followed by major industry investments (Hillmann, 2021). VR applications have spread beyond gaming, affecting industries like education and healthcare, thanks to the development of systems like Sony's PlayStation VR and HTC Vive. The trajectory of VR now indicates increasingly nuanced experiences as we negotiate the complexities of the 21st century (Miah, 2017). The distinction between the virtual and the real is becoming increasingly hazy because of advancements in AI, augmented reality, and more reasonably priced

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gear. This development points to a future in which VR will become more effortlessly integrated into daily life, revolutionizing several industries, including architectural education (Greene & Groenendyk, 2017).

### 2.2 VR in Global Architectural Education

VR integration into architectural education has been a game-changing endeavor, providing new paradigms for design and visualization. Institutions all over the world have acknowledged the enormous implications of virtual reality because it provides an experienced approach to building that goes beyond conventional 2D representations (Burdick, Drucker, Lunenfeld, Presner, & Schnapp, 2016).

VR in architectural education has long been regarded as a powerful technique for building immersive environments (Wang, Wu, Wang, Chi, & Wang, 2018). In order to evaluate the spatial features, lighting effects, and even the tactile experience of materials, students may virtually "walk" through the spaces they built. Beyond static drawings and scale models, the students' ability to make design decisions has been greatly aided by this all-encompassing sensory immersion (Tang, 2018).

Previous studies have been conducted on VR and its application in construction courses at the Architectural Department of a university in Jordan. In the study of the university researcher, he applied a software designed to use VR for the purpose of creating and visualizing 3D Models for a building's construction phases with clear illustration of the critical phases. The aim of the research was to transmit the studying approach and create an enjoyable lecture environment by changing the teacher-centered approach to a student-centered approach (Bryson, C & Hand, L, 2007).

The collaboration opportunities provided by VR have also expanded the boundaries of international architecture pedagogy. As students from many regions may collaborate to design, criticize, and improve work in shared virtual spaces, geographic borders have lessened (Pak & Verbeke, 2015). This international cooperation not only encourages design innovation but also creates a greater comprehension of many cultures and their subtle differences in architectural style. The interactivity of VR has also transformed feedback systems. Tutors can lead students through virtual designs while highlighting potential improvement areas and offering on-the-fly changes. The learning curve is sped up by this dynamic feedback method, which also encourages iterative design thinking.

It is important to realize the difficulties, though. While VR provides unmatched spatial insights, there is a risk of over-relying on the technology and neglecting basic design principles. In many universities, the topic of balancing technology and conventional design techniques is still quite important. However, as VR technology improves in usability and accessibility, its incorporation into architectural curricula around the world seems inevitable. Institutions are putting more money into VR training, software, and labs, which points to a positive future for the integration of VR and architectural education. This widespread adoption highlights VR's ability to shape the architects of the future, giving them cutting-edge tools and a deep grasp of spatial design.


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### 2.3 Benefits and Challenges of VR in Architectural Education

By providing immersive, lifelike experiences, VR has significantly changed architectural education (Rauf, Shareef, & Othman, 2021). The benefits of utilizing VR are numerous. In the beginning, it gives students a physical feeling of scale and space that 2D drawings or even 3D models can't adequately convey (Gómez-Tone, Martin-Gutierrez, Bustamante-Escapa, & Bustamante-Escapa, 2021). Students can better comprehend how their creations will function and feel in the real world by immersing themselves in a virtual setting (Trabelsi-Zoghlami & Touzani, 2019). Beyond visualization, VR has also demonstrated its value for teamwork. Regardless of distance restrictions, students can collaborate, share ideas, and alter designs in real-time in a virtual environment. The design process is enriched by this real-time collaboration, which encourages creativity, quick revisions, and cross-cultural interactions.

The prompt feedback method is another outstanding advantage. Tutors can lead students through their digital creations, offering timely feedback and making suggestions for changes. This dynamic method highlights the value of iterative design while quickening the learning process (Schulman, Moritz, Levine, Jordan, & Abbeel, 2015). Additionally, VR can imitate different environmental conditions, enabling pupils to comprehend how light, shadow, and materials interact. They can go through many seasons, times of the day, and even particular weather conditions, giving them insights into how their architectural choices affect the general atmosphere of a space.

The incorporation of VR in architecture education is not without difficulties, though. The overreliance on technology, which may keep students from learning the fundamentals of design, is a serious worry (Richards & Dignum, 2019). While VR enhances the sensory experience, there's a chance that students will place more importance on aesthetics than important factors like practicality and sustainability. Another issue is the cost. Because it can be costly to set up VR labs with top-tier hardware and software licenses, it is a less practical tool for colleges with low funding (Ratcliffe, Gatersleben, Sowden, & Korpela, 2022). Additionally, although VR provides an immersive experience, prolonged use can cause physical discomfort, with users reporting symptoms including drowsiness, nausea, and eye strain, which are known as VR sickness. Finally, any new technology comes with a learning curve. The complexity of VR technologies must be understood by both students and educators; this might take time and may take attention away from fundamental architectural topics. In conclusion, while VR has the potential to revolutionize architectural education, careful and nuanced integration is essential (Jerald, 2015). The trick is to use VR's capabilities without sacrificing the fundamental principles of architectural design.

### 2.4 VR in Architectural Education in Northern Cyprus

The architectural education system in Cyprus, an island renowned for its historical and architectural heritage, is increasingly utilizing cutting-edge technologies like virtual reality. This change shows Cyprus's efforts to establish itself at the forefront of cutting-edge architectural pedagogy and goes beyond simple technological adoption.

Because Cyprus' architectural landscape and history are so closely related, virtual reality has given students an unmatched instrument to explore the past (Iyendo & Halil, 2015). Students have had the opportunity to virtually explore historic Cypriot buildings through immersive experiences, learning

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about their design, cultural value, and construction methods. Students now have a thorough understanding of how architectural architecture in the area has evolved because of this fusion of the antiquated and modern. Academic institutions in Cyprus have taken the initiative to incorporate VR into their curricula. Leading institutions have established specialized VR labs with cutting-edge tools so that students may work on complex design projects (Mulà et al., 2017). These labs have developed into centers for creativity where students not only see their concepts but also participate in

However, the process of incorporating VR into Cyprus' architecture education has yielded many insights. An obstacle was the initial reluctance from educators, which was mostly caused by a lack of knowledge of the technology. In order for instructors to properly lead students in this new digital environment, workshops and training sessions become crucial in closing this knowledge gap. The emphasis on sustainability in the Cypriot setting has been another distinctive feature. Students are now able to comprehend and create structures that are in harmony with Cyprus's distinctive Mediterranean climate thanks to the use of VR to mimic various environmental circumstances. These digital simulations give students the information they need to choose building materials, layouts, and architectural features that support sustainable practices.

Students in Cyprus have generally had favorable things to say. Many claim that VR has democratized the design process by giving everyone access to tools that were previously exclusively available to big architectural firms. The learning process has been greatly improved by the ability to rapidly visualize changes, experiment with designs, and get real-time feedback. Nevertheless, difficulties continue. It takes ongoing work to strike a balance between this new digital tool and conventional architectural precepts. While virtual reality has many advantages, it is essential to make sure that it enhances rather than eliminates fundamental architectural lessons.

In essence, the use of VR in architecture education in Cyprus is a symbol of the nation's goals more generally. Cyprus is creating a distinctive architectural pedagogy that honors its past while ardently looking to the future by fusing traditional lessons with contemporary technology.

**3. Methodology**

To find the main reason behind the research problem, it is necessary to collect direct feedback inside Cyprus University’s classes from the students themselves because they are the main users of the university’s daily lectures. Through the process of questioning the students directly and the data collection process, afterwards analyzing these answers, valuable insights will be obtained which will create imaginations of the existing research problem and therefore to generate specific solutions for the universities to enhance the architectural departmen’s educational quality.

A robust methodology was chosen that was built around a questionnaire-based approach to gain thorough insights into the use of VR in architecture education, particularly in the Cypriot setting.

Data was primarily gathered via printed questionnaire questionnaires. These 45 forms were routinely provided to students participating in architectural design studios as well as those frequenting the department's building's private courtyards. This made sure that a varied cross-section of students was reached, all of whom were at different points in their academic careers. Of the 45 forms that were initially sent, 38 responses were fully completed. 7 forms, however, had to be eliminated due to


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factors including tiredness from the demands of the semester and overlap with other questionnaire-based research taking place at the same time. The latter, while creating a little obstacle for our data-gathering process, is a sign of a vibrant research climate within the school. The study team remained present at all times during the distribution and collection of the questionnaires. This not only guaranteed the validity of the responses but also gave the students a direct line of communication for any questions about the claims made on the form. The well-informed and accurate responses were made possible in large part due to this proactive strategy.

Post-collection, all hand-completed forms were meticulously organized and prepped for analysis. Out of the forms distributed, the response rate stood at an impressive 84.24%, calculated as (38/45) x 100%. Grounding this methodology in recognized research norms, we anchored our findings with a 5% error level and a commendable 95% reliability level, as indicated by relevant sources (Cohen, Cohen, West, & Aiken, 2013).

The research was thorough and statistically significant because of this methodological technique, which was simple but crucial in obtaining subtle thoughts on the issue.

## 4. Findings:

Our study delves deeply into the use of VR in architecture education within the Cypriot setting, and it is supported by a questionnaire-based methodology. The results offer a comprehensive view of students' experiences with and viewpoints on VR integration when combined with an advanced data analysis performed by IBM SPSS (Statistical Package for Social Sciences) (Meyers, Gamst, & Guarino, 2013).

### 4.1 Quantitative Analysis

The responses were subjected to a thorough quantitative analysis using cutting-edge software like IBM SPSS. This not only deepened the findings but also gave an organized way to understand the descriptive and demographic components. The data was presented in aesthetically appealing charts and tables that reflected the percentage distributions and the main objectives of the questionnaire to ensure clarity and ease of interpretation.

### 4.2 Demographics and Participant Profile

Analyzing the study's demographics revealed that a varied group of students participated in it. 25 of the 38 participants were men and 13 were women, giving the results a balanced gender perspective.

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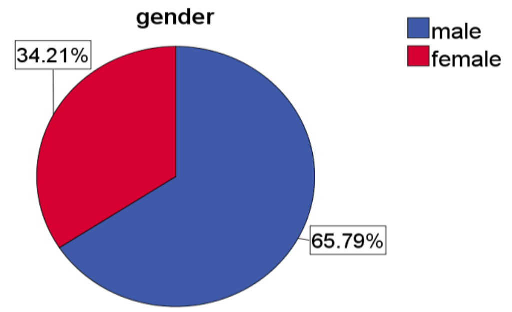


Regarding educational background, a sizable 63.2 % were fourth-year bachelor students, while 36.8 % were pursuing master's degrees. This distribution was deliberate since, according to the department's curriculum, bachelor students take design classes more frequently, typically once a week. A distribution like this guarantees that the results are both representative and pertinent to the study's goals.

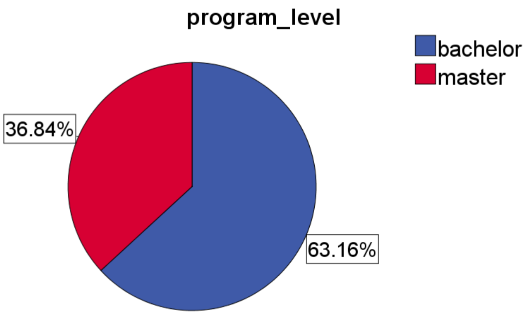


Figure SEQ Figure * ARABIC 2. Shows the percentage of the

A reliability test has been conducted for the results as shown in Table 1.

Table 1. The reliability test

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .901 | 25 |

The Cronbach's Alpha is quite high with a value of.901. Cronbach's Alpha values range from 0 to 1, and generally speaking, a value greater than 0.7 is regarded as appropriate for the majority of research objectives. Higher reliability is indicated by a number that is nearer 1.

There are 25 items on the scale or test. Because of the strong Cronbach's Alpha, it may be concluded that the 25 items effectively assess the target construct. It's also important to keep in mind that Cronbach's Alpha can rise as the number of objects does. A commendable Alpha of .901 for 25 items, however, indicates that the reliability of the scale might not necessarily be severely impacted by adding or eliminating things.


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A Cronbach's Alpha of.901 suggests that the scale/test with 25 items is very dependable in terms of internal consistency. The consistency of the scale may be relied upon by researchers and practitioners, indicating that the scale is well-made for its intended use. However, when assessing the overall quality and usefulness of a scale or test in research or practical applications, it's also critical to take other factors of validity into account.

After that, a correlation test has been done as shown in the Table. 2 (***see the appendix***)

We can glean several observations from the presented correlation table. The correlations are examined here:

***Gender and VR Awareness:*** The gender and awareness of VR have a -0.394 correlation coefficient, which is statistically significant at the 0.05 level (p = 0.014). This implies that there is a moderately adverse relationship between gender and VR technology awareness.

***Awareness and Experience with VR:*** Knowing about VR technology (Q1) and having used it in the past (Q8) have a statistically significant (p = 0.003) correlation of 0.464. This suggests that those who are familiar with VR are more likely to have first-hand experience with it.

***Awareness of VR in Architecture:*** VR awareness (Q1) and its use in architectural design (Q7) have a statistically significant (p = 0.015) correlation of 0.390. This demonstrates a strong link between comprehending virtual reality and being aware of its use in architectural design.

***VR Usage in Architecture:*** The thought that VR technology could be helpful throughout the project design stage (Q10), awareness of VR in architectural design (Q7) (r = 0.719, p = 0.000), and use of VR in design studio (Q11) (r = 0.710, p = 0.000) all have strong and significant correlations.

***VR Benefits in Architectural Design:*** There are strong and significant correlations between the advantages of using VR in architectural design lectures (Q13), from the first stage for imagination and space (Q14), in the third and fourth stages (Q15), in master's courses (Q16), in 3D modeling (Q17), in visualization and observation (Q18), and for understanding architectural details (Q19). This is especially true when it comes to the general awareness of VR and its applications in architectural design.

***VR in Visualization and Observation:*** A very strong and substantial association (p = 0.000) exists between the value of VR for visualization and observation (Q18) and the value of VR for comprehending architectural and constructional aspects (Q19). This demonstrates how useful VR can be for studying and understanding architecture.

***Inferences on Gender:*** It seems that there are some statistically significant correlations between gender and particular VR-related concerns. For instance, the gender and use of VR in design studios (Q11) have a significant (p = 0.004) correlation of 0.453. This shows that the familiarity with or use of VR in design studios may vary by gender.

***VR's Application in Different Design Stages:*** Strong correlation exists between project design stages (Q10) and 3D modeling (Q17) knowledge, indicating that people who appreciate the value of VR in the design process also see its advantages in 3D modeling (r = 0.813, p = 0.000).

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Therefore, the data suggests that the respondents had a solid awareness of and respect for VR's potential uses in architectural design. The strong positive relationships between VR awareness, experience, and perceived benefits at various stages of architectural design emphasize the significance of the technology. There are more underlying issues, such as gender, that may affect how VR is perceived and used in the industry. It's important to keep in mind that correlation does not imply causation in correlation analyses, and further study may be required to delve further into the underlying causes of these interactions.

## 5. Discussion

The table demonstrates the relation between many factors that are relevant to the knowledge of and use of VR in architectural design and design education. The conclusions from this table can be categorized into numerous categories:

***Awareness of VR in Architectural Design***

There may be a gender gap in the respondents' awareness of virtual reality as a technology (Q1), which shows a strong negative correlation between gender and awareness (-.394*).
Additionally, there is a significant positive correlation between comprehending VR's potential and being aware of it (Q10 with a correlation of .560**), suggesting that those who are aware of VR are also aware of its implications for design processes.

***Exposure to VR in the Department***

The fact that respondents are aware of VR in their department (Q2) did not significantly correlate with the majority of the other questions. However, there is a significant link with Q11 (.397*), which suggests that people who are aware of VR being discussed in their department may also be aware of its actual use in their design studios.

***Practical Experience with VR***

Knowing about VR (Q1) and having used it (Q8 with .464**) have a strong positive correlation, indicating that many people who are aware of VR have also used it.

However, having experience with VR does not necessarily mean that one has a great grasp of how it may be used in architectural design (Q9), suggesting that there may be a difference between the practical application of VR in architectural contexts and other uses.

***The potential of VR in Design Education***

A sizeable portion of respondents think they would benefit from VR in lectures on architectural design (Q13), and this is significantly connected with the idea that VR is valuable during the design process (Q10 with.491**).

The perception of VR's usefulness in particular design stages (Q14, Q15, and Q16) and its usefulness in 3D modeling (Q17) and visualization (Q18) are perceived to be consistently highly correlated, indicating that respondents see VR as a tool that can be integrated across different design and modeling process stages.


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### *General VR Benefits in Architectural Design*

According to the correlation values, people who perceive VR's potential in the early phases of design (Q14) also see its significance in the latter stages (Q15 with .656**) and master's courses focusing on architectural design (Q16 with .696**). This suggests that the potential of VR has been widely acknowledged across the design education process.

### *Broader Implications of VR*

Visualization and observation (Q18), comprehending architectural features (Q19), and knowing 3D modeling (Q17) all exhibit exceptionally strong correlations with one another. This supports the notion that VR can be a comprehensive tool spanning a variety of architectural design aspects, from inception through in-depth design assessments.

The correlations imply that the potential of virtual reality in architectural design and teaching has been widely acknowledged. While there are differences in awareness depending on characteristics like gender, once people are introduced to VR, they tend to understand its many advantages throughout the design process. The need for more thorough VR integration in architecture education and practice is highlighted by the apparent gap between this awareness and practical applications.

VR integration in architectural education has sparked a variety of ideas, both cautious and hopeful, particularly in the Cypriot setting. This section, which draws on the significant findings, aims to go deeper into the subtleties of these implications by providing a thorough examination of the function, difficulties, and potential future of VR in architectural education.

### *Understanding the Paradigm Shift*

We are in the midst of a technological paradigm shift in education, as evidenced by the high response rate and the noticeable interest displayed by students. Instead of simply switching from traditional to digital, immersive technologies are being used to reconstruct, redesign, and redefine the educational space. The potential of virtual reality is enormous in the field of architecture, which is firmly founded on spatial and experiential understanding.

### *The Gendered Lens*

A crucial topic for debate is the gendered experience of virtual reality in education, which is made possible by the study's balanced participation of male and female students. Despite the fact that both sexes participated in the study, it is crucial to continuously assess whether male and female students have equal access to VR technology and feel equally empowered to use it.

### *Traditional vs. Modern Pedagogy*

Most fourth-year bachelor's students demonstrated a grasp of and acceptance of VR. But when you contrast this with the sporadic comments on the difficulties of VR adaption, a noteworthy dialogue between the old and the new arises. Traditional architectural methods continue to have an inestimable worth, even as modern improvements promise increased realism and immersion. The key is finding a balance.

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***Institutional Role – A Catalyst***

The study highlighted the beneficial contributions made by institutional resources, including VR labs and research assistance throughout the study. This implies that institutions must take an active part in technology integrations like VR in order for them to be successful, acting not just as facilitators but also as enablers and catalysts.

***Addressing the Challenges***

Even while the inclusion of VR in the architecture curriculum is unquestionably revolutionary, there are still difficulties to overcome. The feedback regarding demands in the classroom and the parallel adaptation to VR emphasize the necessity for a gradual integration that enhances rather than confounds the learning process.

***Future Forward***

The publicity surrounding VR is evident. The ability to use and be comfortable with tools like VR might be crucial when architectural students choose their future careers. To ensure that students are not just technologically competent but also critically aware, instructional practices should advance together with technology.

## 6. Conclusion:

The incorporation of VR represents a paradigm shift in the evolving field of architectural education, particularly in the context of Cyprus. This study trip has illuminated several perspectives, difficulties, and goals regarding the function of VR, demonstrating not only its potential but also a futuristic vision. The students' eager participation highlights a definite desire for technology-driven education. However, there have been obstacles for its application in classes, some of the problems are lack of VR awareness of the students, others are the Teachers awareness of its usability and application, also there are Gender differences in the knowledge of using VR.

It's crucial to realize that these instruments' strength lies in more than just their technical prowess, though. Their real worth comes from encouraging profound understanding, igniting creativity, and promoting critical thought. Leading this wave of change, educational institutions need to create an environment where students may develop their judgment, flexibility, and creative abilities in addition to their familiarity with cutting-edge instruments.

Therefore, gradually inserting VR to be a main element of the Architecture Department is a necessary step for the 21st century's educational development, despite the challenges and difficulties involved in integrating VR into architectural education, the possibilities it provides are vast and motivational. The current task is to follow this route with caution, adaptability, and an unwavering commitment to excellence, shaping not only buildings but also the forward-thinking architects of the future.


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## Appendix

Table 1. The correlation test

Correlations

| | | 1 | 2 | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 | Q21 | Q22 | Q23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| gender | Pearson Correlation | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | N | 38 | | | | | | | | | | | | | | | | | | | | | | | | |
| program_level | Pearson Correlation | 0.024 | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.885 | | | | | | | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | | | | | | | | | | | | | | | | | | | | | | | |
| Q1.I'm aware of this technology which is virtual reality. | Pearson Correlation | -.394* | 0.026 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.014 | 0.876 | | | | | | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | | | | | | | | | | | | | | | | | | | | | | |
| Q2.I got information about VR in my department . | Pearson Correlation | 0.228 | -0.116 | 0.023 | 1 | | | | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.168 | 0.488 | 0.890 | | | | | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | | | | | | | |
| Q3.New technologies in architectural design is a topic of discussion in my department. | Pearson Correlation | 0.028 | 0.109 | 0.240 | 0.171 | 1 | | | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.869 | 0.516 | 0.147 | 0.306 | | | | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | | | | | | |
| Q4.I didn't have any knowledge about this technology before this survey | Pearson Correlation | .323* | -0.132 | -.483** | 0.072 | 0.151 | 1 | | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.048 | 0.430 | 0.002 | 0.669 | 0.365 | | | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | | | | | |
| Q5.I have already heard about this application but don't understand it. | Pearson Correlation | -0.025 | -0.150 | -0.109 | 0.118 | 0.186 | 0.144 | 1 | | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.880 | 0.370 | 0.514 | 0.479 | 0.263 | 0.389 | | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | | | | |
| Q6.I have some information that virtual reality is used in many fields | Pearson Correlation | -.365* | 0.047 | .463** | 0.070 | -0.141 | -.465** | -.392* | 1 | | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.024 | 0.780 | 0.003 | 0.677 | 0.397 | 0.003 | 0.015 | | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | | | |
| Q7.I'm aware of using VR in the architectural design process. | Pearson Correlation | -0.139 | -0.283 | .390* | 0.174 | 0.034 | -.424** | -0.155 | .588** | 1 | | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.405 | 0.085 | 0.015 | 0.297 | 0.841 | 0.008 | 0.351 | 0.000 | | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | | |
| Q8.I know virtual reality and I have already worked with it. | Pearson Correlation | -0.153 | 0.260 | .464** | -0.170 | -0.004 | -.408* | -0.138 | 0.244 | 0.270 | 1 | | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.358 | 0.115 | 0.003 | 0.308 | 0.980 | 0.011 | 0.407 | 0.141 | 0.101 | | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | | |
| Q9.I worked with virtual reality but I have no idea about its using in the architectural design process. | Pearson Correlation | -0.121 | -0.011 | 0.070 | 0.065 | 0.149 | -0.010 | 0.047 | 0.085 | 0.109 | 0.265 | 1 | | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.470 | 0.947 | 0.678 | 0.698 | 0.371 | 0.951 | 0.781 | 0.614 | 0.514 | 0.109 | | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q10.I have a clear idea of how VR technology will be useful in my project design stages. | Pearson Correlation | -0.173 | -0.138 | .560** | 0.145 | -0.006 | -.384* | -0.193 | .637** | .719** | 0.221 | 0.078 | 1 | | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.298 | 0.407 | 0.000 | 0.384 | 0.970 | 0.017 | 0.245 | 0.000 | 0.000 | 0.182 | 0.643 | | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | | |
| Q11.We already use virtual reality in our design studio of the department. | Pearson Correlation | .453** | -0.201 | -.365* | .397* | -0.108 | 0.196 | 0.056 | -0.007 | 0.029 | -0.092 | 0.017 | 0.011 | 1 | | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.004 | 0.227 | 0.024 | 0.014 | 0.520 | 0.238 | 0.738 | 0.967 | 0.862 | 0.583 | 0.917 | 0.946 | | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | | |
| Q12.My critical stage during designing my project is imagination and observing space of my project. | Pearson Correlation | -0.031 | 0.086 | .409* | -0.236 | 0.033 | -0.219 | 0.166 | 0.031 | 0.089 | .390* | -0.181 | 0.203 | -0.314 | 1 | | | | | | | | | | | |
| | Sig. (2-tailed) | 0.851 | 0.607 | 0.011 | 0.153 | 0.844 | 0.186 | 0.318 | 0.854 | 0.593 | 0.016 | 0.276 | 0.222 | 0.055 | | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | | |
| Q13.I will get benefit from using VR in the architectural design lectures if the department allows using it. | Pearson Correlation | -0.234 | -0.143 | .608** | 0.025 | 0.025 | -.555** | -0.128 | 0.262 | .406* | 0.254 | 0.189 | .491** | -0.167 | 0.173 | 1 | | | | | | | | | | |
| | Sig. (2-tailed) | 0.158 | 0.392 | 0.000 | 0.881 | 0.883 | 0.000 | 0.443 | 0.112 | 0.011 | 0.123 | 0.256 | 0.002 | 0.315 | 0.298 | | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | | |
| Q14.I prefer using VR from the 1st stage to have more imagination and sense of space. | Pearson Correlation | -0.158 | -0.115 | .573** | 0.106 | -0.128 | -.421** | -0.156 | 0.273 | .357* | 0.253 | 0.039 | .369* | -0.152 | 0.131 | .705** | 1 | | | | | | | | | |
| | Sig. (2-tailed) | 0.344 | 0.491 | 0.000 | 0.526 | 0.444 | 0.009 | 0.350 | 0.098 | 0.028 | 0.125 | 0.814 | 0.023 | 0.363 | 0.434 | 0.000 | | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | | |
| Q15.VR will be very useful if the department allow using it in 3rd,4th,stage. | Pearson Correlation | -0.212 | -0.008 | .768** | 0.192 | 0.133 | -.495** | -0.182 | .581** | .555** | 0.276 | 0.096 | .710** | -0.097 | 0.242 | .712** | .656** | 1 | | | | | | | | |
| | Sig. (2-tailed) | 0.202 | 0.962 | 0.000 | 0.249 | 0.425 | 0.002 | 0.275 | 0.000 | 0.000 | 0.094 | 0.568 | 0.000 | 0.562 | 0.143 | 0.000 | 0.000 | | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | | |
| Q16.I prefer using VR in master courses that related to the architectural design. | Pearson Correlation | -0.257 | 0.052 | .669** | 0.281 | 0.139 | -.428** | -0.129 | .472** | .340* | 0.284 | 0.197 | .458** | -0.156 | 0.048 | .647** | .696** | .726** | 1 | | | | | | | |
| | Sig. (2-tailed) | 0.119 | 0.756 | 0.000 | 0.088 | 0.404 | 0.007 | 0.439 | 0.003 | 0.037 | 0.084 | 0.237 | 0.004 | 0.350 | 0.775 | 0.000 | 0.000 | 0.000 | | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | | |
| Q17.I will get benefit from using VR in 3d modeling. | Pearson Correlation | -0.193 | -0.081 | .678** | 0.166 | 0.093 | -.416** | -0.231 | .414** | .471** | 0.272 | 0.091 | .610** | -0.121 | 0.151 | .821** | .773** | .813** | .725** | 1 | | | | | | |
| | Sig. (2-tailed) | 0.247 | 0.629 | 0.000 | 0.320 | 0.580 | 0.009 | 0.164 | 0.010 | 0.003 | 0.098 | 0.586 | 0.000 | 0.468 | 0.366 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | | |
| Q18.The using VR will be very useful in visualization and observation. | Pearson Correlation | -0.184 | 0.109 | .752** | 0.141 | 0.204 | -.525** | -0.156 | .496** | .465** | .405* | 0.112 | .609** | -0.115 | 0.253 | .746** | .599** | .912** | .692** | .848** | 1 | | | | | |
| | Sig. (2-tailed) | 0.269 | 0.516 | 0.000 | 0.400 | 0.219 | 0.001 | 0.349 | 0.002 | 0.003 | 0.012 | 0.504 | 0.000 | 0.490 | 0.125 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | | |
| Q19.Using VR will help us for better understanding of architectural and constructional details. | Pearson Correlation | -0.171 | 0.005 | .699** | 0.067 | 0.049 | -.548** | -0.156 | .451** | .495** | 0.295 | 0.099 | .611** | -0.117 | 0.203 | .852** | .724** | .872** | .716** | .926** | .918** | 1 | | | | |
| | Sig. (2-tailed) | 0.305 | 0.976 | 0.000 | 0.689 | 0.769 | 0.000 | 0.349 | 0.004 | 0.002 | 0.072 | 0.552 | 0.000 | 0.486 | 0.223 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | | |
| Q20.In case we couldn't reach the site of our project we will use VR to feel the space of the site . | Pearson Correlation | -0.282 | -0.244 | .645** | 0.018 | -0.028 | -.494** | -0.156 | .463** | .432** | .424** | 0.304 | .555** | -0.067 | 0.213 | .785** | .647** | .694** | .650** | .759** | .680** | .738** | 1 | | | |
| | Sig. (2-tailed) | 0.087 | 0.140 | 0.000 | 0.913 | 0.866 | 0.002 | 0.348 | 0.003 | 0.007 | 0.008 | 0.064 | 0.000 | 0.687 | 0.199 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | | |
| Q21This technology will harm the learning process in the 1st and 2nd stage. | Pearson Correlation | -0.025 | 0.102 | .528** | -0.030 | 0.152 | -.488** | 0.044 | 0.142 | 0.150 | .382* | 0.005 | 0.224 | -0.206 | .353* | .360* | .345* | .538** | .343* | .367* | .550** | .478** | .381* | 1 | | |
| | Sig. (2-tailed) | 0.881 | 0.540 | 0.001 | 0.859 | 0.363 | 0.002 | 0.791 | 0.395 | 0.368 | 0.018 | 0.975 | 0.176 | 0.214 | 0.030 | 0.027 | 0.034 | 0.000 | 0.035 | 0.023 | 0.000 | 0.002 | 0.018 | | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | | |
| Q22.VR will clear my vision about the future architectural design process . | Pearson Correlation | -0.251 | -0.119 | .708** | 0.159 | -0.081 | -.485** | -0.169 | .633** | .504** | 0.235 | 0.086 | .620** | -0.045 | 0.167 | .761** | .678** | .863** | .748** | .823** | .834** | .889** | .797** | .342* | 1 | |
| | Sig. (2-tailed) | 0.129 | 0.475 | 0.000 | 0.341 | 0.630 | 0.002 | 0.310 | 0.000 | 0.001 | 0.156 | 0.610 | 0.000 | 0.791 | 0.316 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.036 | | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | |
| Q23.Students will lack their architectural sense by using VR in their project. | Pearson Correlation | 0.109 | -0.117 | .408* | 0.245 | 0.127 | -0.256 | 0.241 | 0.052 | 0.243 | 0.162 | 0.195 | 0.277 | 0.061 | 0.199 | .460** | .446** | .515** | .519** | .478** | .510** | .553** | .403* | .668** | .440** | 1 |
| | Sig. (2-tailed) | 0.514 | 0.484 | 0.011 | 0.138 | 0.446 | 0.121 | 0.145 | 0.757 | 0.141 | 0.330 | 0.241 | 0.092 | 0.715 | 0.230 | 0.004 | 0.005 | 0.001 | 0.001 | 0.002 | 0.001 | 0.000 | 0.012 | 0.000 | 0.006 | |
| | N | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

1= Gender 2=Program level


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