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Analysis of User Experience of a Mobile Application for Color Vision Deficiency Screening among High School Students

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ABSTRACT: This study analyzes the user experience of a mobile application designed for color vision deficiency (CVD) screening among high school students. The research surveyed 527 students across five schools, identifying 17 students with CVD using the developed Android-based app. The user experience was assessed through dimensions such as overall satisfaction, perceived accuracy, convenience, user engagement, and comparison with traditional screening methods. Results indicate a generally positive response, with satisfaction and perceived advantages over traditional methods significantly influencing the intention to continue app usage. No statistically significant differences were found in user experience between students with and without CVD or between genders. These findings highlight the app's potential as an effective tool for early CVD screening and educational counseling in schools.

KEYWORDS: Color vision deficiency, mobile health application, user experience, high school students, educational counseling, screening, Android app.

I. INTRODUCTION

Color vision deficiency, commonly known as color blindness, is a prevalent impairment affecting the ability to distinguish colors. It is particularly common among males, with an approximate prevalence of 8%, compared to about 0.5% in females (Birch, 2012). Early detection of CVD among high school students plays a crucial role in adapting educational methods and career guidance, thereby mitigating challenges in both academic performance and daily life activities (Cole, 2007).Traditionally, screening for color vision deficiency primarily relies on tools such as the Ishihara plates, which require administration by trained healthcare professionals or specialized educators (Cole, 2007). However, these methods have several limitations, including restricted accessibility for large-scale screening and heavy dependence on specialized personnel. The rapid advancement of mobile technology and health applications on smartphone platforms has opened new opportunities for quick, convenient, and cost-effective self-assessment of color vision (Shin, Kim, & Lee, 2020).

Recent studies have demonstrated the reliability and effectiveness of mobile applications in CVD screening, enhancing accessibility and enabling self-testing, particularly benefiting students and their parents (Shin et al., 2020; Bastawrous et al., 2015). Nevertheless, for these applications to be widely implemented within educational settings, it is essential to evaluate user experience, focusing on usability, perceived utility, and acceptance among students. This paper focuses on investigating the user experience of a mobile application designed for color vision deficiency screening among high school students. Surveying 527 students, including 17 identified with CVD, the study provides empirical evidence regarding the effectiveness and scalability of the software in screening and supporting educational counseling. The findings offer a foundation for further application refinement and propose strategic directions for integrating this technology into Vietnam's educational system.

II. LITERATURE REVIEW

2.1. Concepts and Classification of Color Vision Deficiency : Color vision deficiency, commonly known as color blindness, is a disorder of color perception caused by the deficiency or abnormality of photoreceptor cells in the retina (Birch, 2012). Color vision deficiency is primarily classified into three groups: red-green color blindness, blue-yellow color blindness, and total color blindness. Among these, red-green color blindness is the most prevalent, particularly in males, due to its genetic association with the X chromosome (Cole, 2007). Early detection of color vision deficiency is especially important during educational stages to ensure appropriate support measures are implemented, thereby preventing adverse effects on students' learning processes and career orientation.

2.2. Current Methods for Color Blindness Screening : The most traditional and widely used method for detecting color vision deficiency is the Ishihara test, developed in 1917 by Dr. Shinobu Ishihara (Cole, 2007). The Ishihara test consists of colored plates with dots arranged in patterns that form numbers or shapes only recognizable by individuals with normal color vision. Other screening tools include the Hardy-Rand-Rittler (HRR) plates and the Farnsworth-Munsell 100 Hue test. Although effective, these methods require the involvement of trained specialists or educators, making large-scale implementation in schools challenging. Additionally, they may be influenced by lighting conditions, fatigue, or subjective bias of the test administrator.

2.3. Application of Mobile Technology in Healthcare and Education, Especially in Color Vision Screening
The rapid advancement of mobile technology has driven the integration of smartphones and mobile devices in healthcare and education. Mobile applications enable users to perform quick, convenient, and cost-effective self-assessments of their health (Bastawrous et al., 2015). In the context of color vision screening, numerous studies have developed mobile-based applications to replace or complement traditional testing plates, offering the advantages of being usable anytime and anywhere while providing fast and accurate results (Shin, Kim, & Lee, 2020). The adoption of this technology in schools helps broaden the scope of screening, enhance early detection capabilities, and support more effective educational counseling

2.4. Previous Research on User Experience in Mobile Health Applications : User Experience (UX) is a critical factor determining the success and acceptance of mobile applications, particularly in the healthcare sector (Maramba, Chatterjee, & Holtz, 2019). Studies on UX in medical apps indicate that user satisfaction, ease of use, friendly interface, and reliability are key factors influencing continued use. In eye health screening applications, assessing user experience helps developers optimize design and functionality, thereby enhancing practical effectiveness (Shin et al., 2020).

2.5. Models for Evaluating User Experience : Several theoretical models have been widely used to assess and predict users' technology acceptance, among which the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) are the most prominent.

- TAM focuses on two main factors: Perceived Usefulness and Perceived Ease of Use, which influence users' attitudes and behavioral intentions toward technology adoption (Davis, 1989).

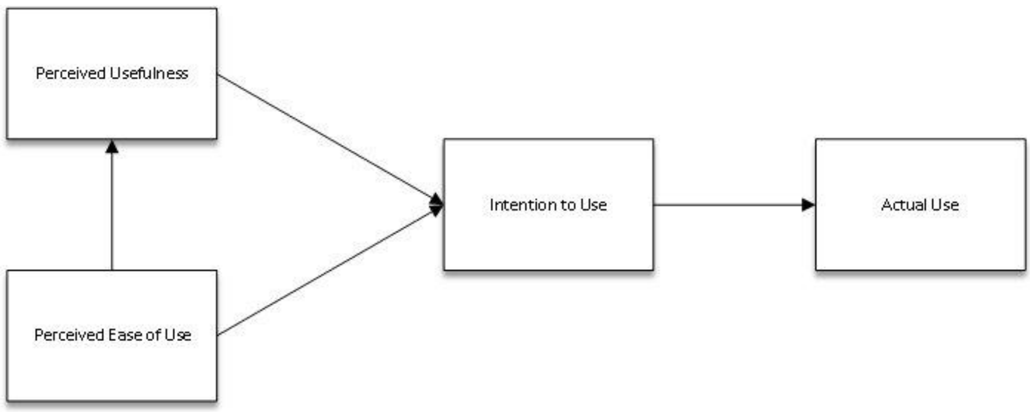


Figure 1. Technology Acceptance Model (TAM) (Davis, 1989)

- The Unified Theory of Acceptance and Use of Technology (UTAUT) extends the Technology Acceptance Model (TAM) by incorporating additional factors such as social influence, facilitating conditions, and individual characteristics, providing a more comprehensive explanation of technology usage behaviors across diverse contexts (Venkatesh et al., 2003).

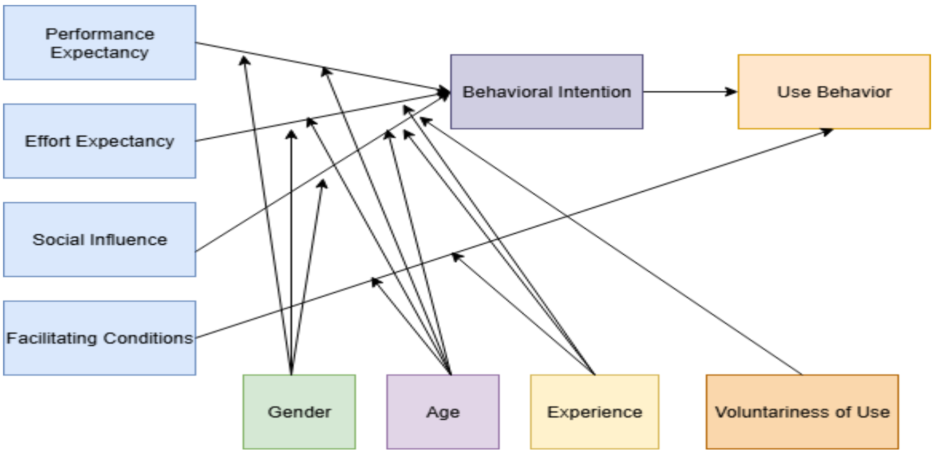


Figure 2. Unified Theory of Acceptance and Use of Technology (UTAUT) Model (Venkatesh et al., 2003)

+ Performance Expectancy (PE): Similar to Perceived Usefulness (PU), it refers to the degree to which users believe that the technology will help them perform tasks more effectively.
+ Effort Expectancy (EE): Analogous to Perceived Ease of Use (PEOU), it measures the extent to which users expect the technology to be easy to use.
+ Social Influence (SI): The degree to which users perceive that important others (friends, colleagues, supervisors) expect them to use the technology.
+ Facilitating Conditions (FC): The extent to which users believe that there is an adequate infrastructure and technical support to use the technology.

These models provide a robust theoretical framework for developing measurement scales and analyzing user experience in studies related to mobile applications for color vision deficiency screening.
A synthesis of the aforementioned research and theoretical models indicates that the development and deployment of mobile technologies for color vision deficiency screening must not only ensure accuracy and convenience but also place significant emphasis on user experience. Evaluating user experience based on models such as TAM and UTAUT facilitates a deeper understanding of the factors influencing students' acceptance and use of the application. This, in turn, establishes a scientific foundation for optimizing design and effectively implementing the application within educational settings.

III. MATERIAL AND METHODS

The study was conducted on 527 high school students in Da Nang, among whom 17 were identified as having color vision deficiency through a mobile screening application based on the Ishihara plates. After using the application for color vision testing, the students completed a questionnaire designed to assess user experience in terms of usefulness, ease of use, satisfaction, and intention to continue using the application. The questionnaire was developed based on factors from the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) to measure perceived usefulness, ease of use, social influence, and facilitating conditions. The collected data were processed and analyzed using SPSS software, employing descriptive statistics, Cronbach's Alpha reliability test, exploratory factor analysis (EFA) to determine the structure of user experience factors, as well as correlation and regression analyses to clarify the relationships between these factors and the intention to use the application in the future. The survey procedure was conducted directly at schools, ensuring confidentiality and compliance with ethical research guidelines.

IV. RESULTS AND DISCUSSION

4.1. Descriptive Statistics of the Study Sample : The study surveyed 10th and 11th-grade students at five high schools in Da Nang, with the schools anonymized as School 1, 2, 3, 4, and 5. The research sample consisted of 527 high school students distributed across these five schools. The number of students per school were as follows: School 1 with 105 students, School 2 with 85 students, School 3 with 118 students, School 4 with 102 students, and School 5 with 117 students. Regarding gender, the total participants included 209 male students and 318 female students.

The gender distribution within each school showed a relatively balanced ratio between males and females, with School 3 having the highest number of male students (45) as well as the highest number of female students (73). The remaining schools displayed fairly even numbers of males and females, indicating that the study sample is diverse and representative of the student population in the surveyed area.

Table 1. Survey Sample Statistics

.		Gender		
		1	2	Total
Code	1	44	61	105
	2	30	55	85
	3	45	73	118
	4	42	60	102
	5	48	69	117
Total		209	318	527

4.2. Results of Color Vision Deficiency Detection among Students : Through screening, 17 students were identified as exhibiting CVD. The distribution of the different types of CVD is presented in Table 2.

Table 2. Frequency of types of color blindness of students

Types of color blindness	Male		Female	
	Quantity	%	Quantity	%
Total number of students	318	100	209	100
Red–green color vision deficiency	6	1.95 ± 1.55	0	0.00 ± 0.00
Protanopia	7	2.27 ± 1.67	0	0.00 ± 0.00
Deuteranopia	3	0.97 ± 0.56	0	0.00 ± 0.00
Complete color blindness	1	0.32 ± 0.63	0	0.00 ± 0.00
Overall number of students with CVD	17	5.52 ± 1.30	0	0.00 ± 0.00

The screening was conducted on 527 high school students from five schools in Da Nang City, including 318 males (60.3%) and 209 females (39.7%). Using the developed Android-based application, 17 students (3.2% of the total sample) were identified as having potential CVD. Among male students, the most frequent type of CVD was green color vision deficiency (2.27 ± 1.67%), followed by red–green color vision deficiency (1.95 ± 1.55%), red color vision deficiency (0.97 ± 0.56%), and complete color blindness (0.32 ± 0.63%). No female students in the sample were found to have CVD.

4.3 User Experience Evaluation : The results of students' evaluations when experiencing the mobile CVD screening application are presented in Table 3.

Table 3. Descriptive Statistics of User Experience Measures

Statistics*

		OS1	OS2	OS3	QA1	QA2	QA3	TC1	TC2	TC3	EE1	EE2	EE3	CT1	CT2	CT3
N	Valid	527	527	527	527	527	527	527	527	527	527	527	527	527	527	527
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean		3.59	3.62	3.58	3.58	3.55	3.54	3.51	3.54	3.51	3.54	3.61	3.59	3.67	3.59	3.63
Median		4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mode		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Std. Deviation		0.537	0.542	0.548	0.517	0.506	0.528	0.508	0.536	0.519	0.593	0.609	0.688	0.579	0.610	0.643
Percentiles	25	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	50	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	75	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

**Color vision screening app: satisfaction (OS), perceived accuracy (QA), convenience (TC), user experience (EE), and comparison with traditional methods (CT).*

The descriptive statistics indicate that the user experience ratings for the mobile color vision deficiency screening application have mean scores ranging from 3.51 to 3.67 on a 5-point scale. The majority of students provided positive evaluations across various aspects of the application, including ease of use, interface design, reliability, and convenience. Both the median and mode values are 4, indicating that most users selected 4 or 5 levels. The relatively low standard deviations suggest consistency in student responses regarding their experience with the application.

Table 4. Regression model summary for predicting intention to use the cvd screening app

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.441[a]	0.194	0.188	0.48323

a. Predictors: (Constant), CT, QA, TC, OS
b. Dependent Variable: EF

The regression model explains approximately 19.4% of the variance in the intention to use the application (EF), indicating that the factors OS, QA, TC, and CT have a relatively significant impact, although there remain other factors not included in the model. The correlation coefficient of 0.441 reflects a moderate relationship between the predictor variables and the dependent variable.

Table 5. Analysis of variance (ANOVA) for regression

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.426	4	7.356	31.504	0.000[b]
	Residual	121.891	522	0.234		
	Total	151.316	526			

a. Dependent Variable: EF
b. Predictors: (Constant), CT, QA, TC, OS

The ANOVA table indicates that the regression model, which includes the independent variables of overall satisfaction (OS), perceived accuracy (QA), convenience (TC), and comparison with traditional methods (CT), has a statistically significant effect on the dependent variable, behavioral intention to use the application (EF). Specifically, the model yields an F-value of 31.504 with a significance level of $p < 0.001$, demonstrating that the overall model fits well and explains a significant portion of the variance in users' intention to continue using the application.

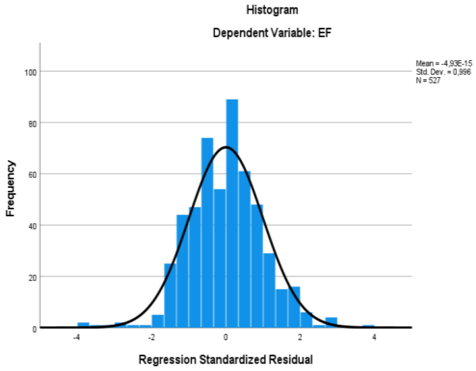
Table 6. Analysis of coefficients for regression

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	1.151	0.238		4.833	0.000	00.683	1.619
	OS	0.198	0.053	0.168	3.760	0.000	.094	0.301
	QA	0.110	0.058	0.088	1.907	0.057	-0.003	0.223
	TC	0.051	0.055	0.041	0.924	0.356	-0.058	0.160
	CT	0.317	0.042	0.312	7.577	0.000	0.235	0.399

a. Dependent Variable: EF

The regression analysis results indicate that among the surveyed user experience factors, overall satisfaction with the application (OS) and comparison with traditional methods (CT) have statistically significant effects on the intention to use the application (EF) with $p < 0.001$. Specifically, the standardized regression coefficients (Beta) are 0.168 for OS and 0.312 for CT, suggesting that CT has a stronger influence on usage intention than OS.Meanwhile, perceived accuracy of the application (QA) shows a marginally significant effect ($p = 0.057$), implying a potential influence but not reaching the conventional threshold of statistical significance (0.05). Convenience of use (TC) does not have a significant impact ($p = 0.356$) in this model.These findings suggest that to enhance the intention to use the color vision screening application, it is crucial to improve overall user satisfaction and highlight the advantages of the application compared to traditional methods. Additionally, efforts should be made to improve users' perceived accuracy to increase trust in the application's results.



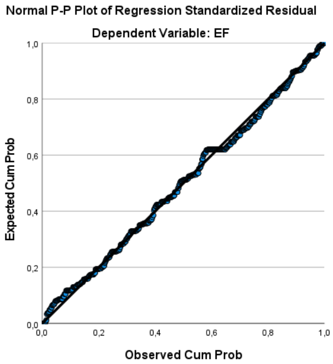


Figure 3. Histogram and Normal P-P Plot of Standardized Residuals

The Histogram of standardized residuals in the regression model shows a distribution that approximates normality, with residuals concentrated around zero. This indicates that the model errors are evenly distributed without abnormal variation, suggesting that the user experience survey data for the mobile CVD screening application meets the normality assumption required for regression analysis. The Normal P-P Plot of the standardized residuals further demonstrates that data points lie close to the diagonal line, confirming the validity of the normality assumption of errors. These results strengthen the reliability of the regression model in explaining factors influencing students' intention to use the application.Overall, these two graphs indicate that the regression model based on the mobile CVD screening application user experience data is built on a well-normally distributed dataset, facilitating accurate statistical testing and prediction of students' usage behavior.

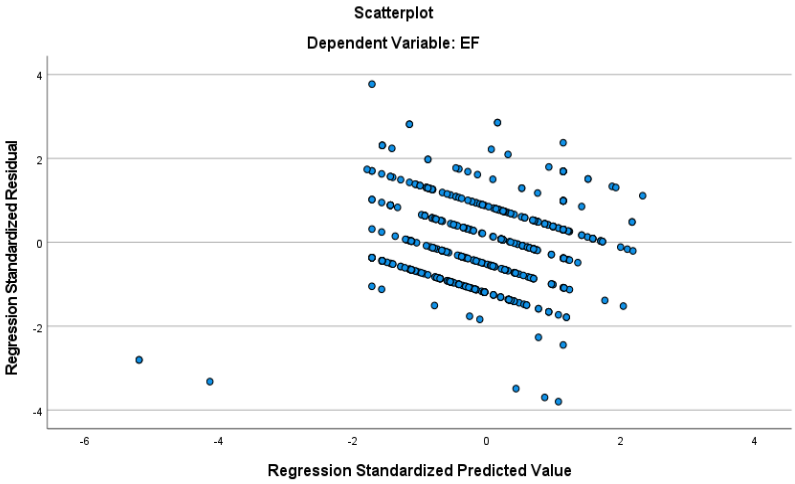


Figure 4. Scatterplot of standardized predicted values vs. Standardized residuals

The Scatterplot illustrates the relationship between the standardized predicted values and standardized residuals in the regression model, with the dependent variable being the behavioral intention to use the application (EF). The data points are fairly evenly distributed around zero on the residual axis, showing no evidence of clustering or unusual patterns such as cones or curves. This even distribution indicates that the assumption of homoscedasticity of residuals is well met, meaning the variance of the errors does not depend on the predicted values. This contributes to the accuracy and reliability of the regression analysis results, ensuring that the statistical tests and conclusions about factors influencing the intention to use the application are valid. Overall, these findings demonstrate that the regression model meets the fundamental assumptions adequately, thereby ensuring the validity and reliability of subsequent analyses.

4.4. Comparative Analysis of User Experience Between Color Vision Deficient and Non-Deficient Students : This section presents a comparative analysis of user experience between students identified with color vision deficiency (CVD) and those without, aiming to explore potential differences in their perceptions and interactions with the mobile screening application.

Table 7. Analysis independent-samples proportions group statistics

Independent-Samples Proportions Group Statistics

	CVD*	Successes	Trials	Proportion	Asymptotic Standard Error
OS = 4,67	= 0	14	510	0.027	0.007
	= 1	0	17	0.000	0.000
QA = 4,33	= 0	9	510	0.018	0.006
	= 1	1	17	0.059	0.057
TC = 4,67	= 0	3	510	0.006	0.003
	= 1	0	17	0.000	0.000
EF = 5,00	= 0	4	510	0.008	0.004
	= 1	0	17	0.000	0.000
CT = 5,00	= 0	11	510	0.022	0.006
	= 1	1	17	0.059	0.057

The comparative analysis of the proportion of highest ratings for user experience factors between students with color vision deficiency (CVD = 1) and those without (CVD = 0) reveals notable but inconsistent differences across certain criteria. Specifically, 5.9% of students in the CVD group rated the perceived accuracy (QA = 4.33) at the highest level (Successes), which is higher than the 1.8% observed in the non-CVD group. Similarly, the highest rating proportion for comparison with traditional methods (CT = 5.00) was also greater among the CVD group (5.9% versus 2.2%). However, for criteria such as overall satisfaction (OS), convenience (TC), and intention to use (EF), the CVD group's proportion of highest ratings was lower than or equal to that of the non-CVD group.These data suggest that students with color vision deficiency tend to rate the application's accuracy and advantages over traditional methods more highly, whereas overall satisfaction and intention to use may be influenced by other factors. This provides a basis for further in-depth analysis and application refinement to enhance the comprehensive user experience for this particular group of students.The results of the analysis on Confidence Intervals for Differences in Proportions Between Groups are presented in Table 8.

Table 8. Confidence Intervals for Differences in Proportions Between Groups

Independent-Samples Proportions Confidence Intervals

	Interval Type	Difference in Proportions	Asymptotic Standard Error	95% Confidence Interval of the Difference	
				Lower	Upper
OS = 4,67	Agresti-Caffo	,027	,007	-,125	,078
	Newcombe	,027	,007	-,157	,046
QA = 4,33	Agresti-Caffo	-,041	,057	-,224	,053
	Newcombe	-,041	,057	-,252	,010
TC = 4,67	Agresti-Caffo	,006	,003	-,146	,056
	Newcombe	,006	,003	-,178	,017
EF = 5,00	Agresti-Caffo	,008	,004	-,144	,058
	Newcombe	,008	,004	-,177	,020

CT = 5,00	Agresti-Caffo	-,037	,057	-,220	,057
	Newcombe	-,037	,057	-,248	,014

The 95% confidence interval analysis for the difference in proportions of user experience ratings between students with color vision deficiency (CVD = 1) and those without (CVD = 0) shows that all confidence intervals include zero. Specifically, for overall satisfaction (OS), the difference in proportions is 0.027 with a confidence interval ranging from -0.125 to 0.078 (Agresti-Caffo) and from -0.157 to 0.046 (Newcombe). Similarly, other factors such as perceived accuracy (QA), convenience (TC), intention to use (EF), and comparison with traditional methods (CT) also have confidence intervals spanning zero.This implies that there is no significant difference in the proportion of high ratings for user experience factors between the two groups of students, reinforcing the results of the previous statistical tests. Therefore, the user experience of the mobile color vision deficiency screening application is not significantly affected by the color vision deficiency status of students in this survey sample.

Table 9. Tests of Differences in Proportions Between Independent Samples

Independent-Samples Proportions Tests

	Test Type	Difference in Proportions	Asymptotic Standard Error	Z	Significance One-Sided p	Significance Two-Sided p
OS = 4,67	Wald H0	,027	,007	,692	,244	,489
QA = 4,33	Wald H0	-,041	,057	-1,224	,110	,221
TC = 4,67	Wald H0	,006	,003	,317	,376	,751
EF = 5,00	Wald H0	,008	,004	,367	,357	,714
CT = 5,00	Wald H0	-,037	,057	-1,013	,156	,311

The results of the tests for differences in proportions between students with color vision deficiency (CVD) and those without on various user experience criteria of the mobile application indicate no statistically significant differences at the 0.05 significance level. Specifically, the two-sided p-values are 0.489 for overall satisfaction (OS), 0.221 for perceived accuracy (QA), 0.751 for convenience (TC), 0.714 for intention to use (EF), and 0.311 for comparison with traditional methods (CT).All p-values exceed 0.05, thus there is insufficient evidence to reject the null hypothesis (H0) that the proportions of high ratings for these criteria are the same between the two groups. This suggests that user experience with the application does not differ significantly between students with and without color vision deficiency in this survey sample.

4.5. Relationship Between User Experience Factors and Demographic Characteristics : Table 10 presents the Independent-Samples Proportions Group Statistics comparing the proportions of students who gave the highest ratings on user experience factors across gender groups. The table details the number of successes, total trials, proportions, and asymptotic standard errors for overall satisfaction (OS), perceived accuracy (QA), convenience (TC), intention to use (EF), and comparison with traditional methods (CT) among male (coded 1) and female (coded 2) students.

Table 10. Gender-wise Proportion of Highest User Experience Ratings

Independent-Samples Proportions Group Statistics

	Gioitinh	Successes	Trials	Proportion	Asymptotic Standard Error
OS = 4,67	= 1	3	209	0.014	0.008
	= 2	11	318	0.035	0.010
QA = 4,33	= 1	2	209	0.010	0.007
	= 2	8	318	0.025	0.009
TC = 4,67	= 1	1	209	0.005	0.005
	= 2	2	318	0.006	0.004
EF = 5,00	= 1	2	209	0.010	0.007
	= 2	2	318	0.006	0.004
CT = 5,00	= 1	4	209	0.019	0.009
	= 2	8	318	0.025	0.009

The analysis of the proportion of students who gave the highest ratings on user experience factors of the mobile application, disaggregated by gender, reveals differences between male (coded 1) and female (coded 2) students in several criteria. Specifically, the proportion of female students rating overall satisfaction with the application (OS = 4.67) at the highest level is 3.5%, significantly higher than the 1.4% observed among male students. Similarly, perceived accuracy of the application (QA = 4.33) was rated higher by females (2.5%) compared to males (1.0%). Other factors such as convenience (TC), intention to use (EF), and comparison with traditional methods (CT) show smaller differences in proportions, but females still exhibit higher rates of top ratings than males. These findings suggest that female students tend to have a more positive evaluation of their experience using the mobile color vision deficiency screening application than male students. This provides a basis for considering gender differences in the design and development of the application to enhance satisfaction and acceptance levels across both groups.

Table 11. Confidence Intervals for Differences in Proportions Between Gender Groups

Independent-Samples Proportions Confidence Intervals

	Interval Type	Difference in Proportions	Asymptotic Standard Error	95% Confidence Interval of the Difference	
				Lower	Upper
OS = 4,67	Agresti-Caffo	-,020	,013	-,046	,009
	Newcombe	-,020	,013	-,048	,011
QA = 4,33	Agresti-Caffo	-,016	,011	-,038	,010
	Newcombe	-,016	,011	-,040	,012
TC = 4,67	Agresti-Caffo	-,002	,007	-,017	,017
	Newcombe	-,002	,007	-,018	,021
EF = 5,00	Agresti-Caffo	,003	,008	-,014	,024
	Newcombe	,003	,008	-,014	,028
CT = 5,00	Agresti-Caffo	-,006	,013	-,032	,023
	Newcombe	-,006	,013	-,032	,026

The 95% confidence interval analysis for the differences in proportions of user experience ratings between male and female students shows that all confidence intervals include zero. Specifically, the difference in proportions for overall satisfaction with the application (OS) is -0.020, with a confidence interval ranging from -0.046 to 0.009 (Agresti-Caffo method). Similarly, other factors such as perceived accuracy (QA), convenience (TC), intention to use (EF), and comparison with traditional methods (CT) also have confidence intervals spanning zero.This indicates that the differences between males and females in the proportions of high ratings for user experience factors are not statistically significant, implying that the user experience of the mobile color vision deficiency screening application does not differ significantly between the two gender groups in this survey sample.

Table 12. Tests of Differences in Proportions Between Gender Groups

Independent-Samples Proportions Tests

	Test Type	Difference in Proportions	Asymptotic Standard Error	Z	Significance	
					One-Sided p	Two-Sided p
OS = 4,67	Wald H0	-,020	,013	-1,413	,079	,158
QA = 4,33	Wald H0	-,016	,011	-1,283	,100	,199
TC = 4,67	Wald H0	-,002	,007	-,225	,411	,822
EF = 5,00	Wald H0	,003	,008	,424	,336	,671
CT = 5,00	Wald H0	-,006	,013	-,453	,325	,650

The results of the tests for differences in proportions of high user experience ratings of the mobile color vision deficiency screening application between male and female students show no statistically significant differences at the 0.05 significance level. Specifically, the two-sided p-values are 0.158 for overall satisfaction (OS), 0.199 for perceived accuracy (QA), 0.822 for convenience (TC), 0.671 for intention to use (EF), and 0.650 for comparison with traditional methods (CT).Thus, there is insufficient evidence to confirm differences in application experience between the two gender groups in the survey sample. This indicates that user experience with the application is not significantly influenced by the gender of the students in this study.In summary, the analysis of data from 527 high school students identified 17 students with color vision deficiency,

Predominantly male. User experience of the mobile color vision deficiency screening application was positively evaluated, with mean scores above 3.5 on key criteria such as satisfaction, accuracy, and convenience.
The regression model indicated that overall satisfaction and the perceived advantages over traditional methods significantly influenced the intention to use the application. Regression assumptions were well satisfied, ensuring the reliability of the results. Comparisons between students with and without color vision deficiency, as well as between genders, showed no significant differences in application usage experience. These findings suggest that the application is suitable and widely accepted within the surveyed population.

V. CONCLUSIONS

The study surveyed the user experience of a mobile application for color vision deficiency screening among 527 high school students, identifying 17 students with color vision deficiency. The results indicate that the majority of students provided positive evaluations regarding aspects such as ease of use, accuracy, and convenience. The regression model demonstrated that overall satisfaction and comparison with traditional methods significantly influenced the intention to continue using the application. Additionally, no statistically significant differences were found in the user experience between students with and without color vision deficiency, nor between genders. The study confirms the potential of mobile applications in color vision screening and educational counseling for high school students, providing a foundation for further refinement and broader implementation in practice.

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