

## Evaluation of User Interface (UI) and User Experience (UX) in A Web-Based Entrepreneurial Student Application

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### Abstract

Measurement of entrepreneurial orientation remains limited and is predominantly conducted using manual methods. To address this gap, this study aims to develop a web-based application for measuring entrepreneurial orientation-which has not previously been developed-and to examine its reliability, user interface (UI), and user experience (UX). The instrument used is an adaptation of the entrepreneurial orientation scale, which was converted into a website-based format and complemented with recommendation features and user constraint identification. Data were collected through a focus group discussion (FGD) involving junior and senior high school teachers and students (N = 5), as well as a survey of junior and senior high school students (N = 60) following a trial of the web-based "Entrepreneurial Student" application. The results indicate that this web-based instrument demonstrates high reliability, with Cronbach's alpha ranging from 0.806 to 0.845, and adequate validity, with Corrected Item-Total Correlation (CITC) values ranging from 0.404 to 0.630. After revisions based on user feedback, UI scores were in the "Very Good" category (range 495-554), and UX scores were also in the "Very Good" category (range 258-274). The Entrepreneurial Student application demonstrates promising potential for measuring entrepreneurial orientation among secondary school students. With further testing involving larger samples, the application may be implemented more broadly within the adolescent population.

**Keywords:** entrepreneurial orientation, user experience, user interface, quality education

### INTRODUCTION

For the successful implementation of Indonesia's Vision for 2045, it will be necessary to increase the number of entrepreneurs in the nation from 3.47% to 12%. To achieve this goal, it is essential that entrepreneurship education be offered to high school students. Adolescence is a critical period when individuals develop long-term attitudes, values, and beliefs, and career aspirations. At this point, they have begun to develop their identity and value sys-

tems, which will shape their perspectives on the workplace and future opportunities. Therefore, by introducing entrepreneurial awareness and thought to high school students, they will be able to develop mental models that support an entrepreneurial mindset, which can become a reality when they enter the workforce.

Uncertainty is part of entrepreneurship; so too are finding opportunities and taking risks thoughtfully. EO (entrepreneurial orientation) encompasses three behavioral aspects of entre-

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preneurship: innovation, initiative (making things happen), and risk-taking (Lumpkin & Dess, 1996; Covin & Slevin, 1989). The psychological aspects of EO are not something we are born with; they come to us through repeated learning and exposure to new things. Students who develop their innovative, proactive, and risk-taking attitudes during their adolescent years (a time of high neuroplasticity) will have less fear of the unexpected and will learn to test the water and learn from their mistakes. Therefore, developing EO prior to graduation is the best way to reduce students' risk aversion and foster a more proactive approach to finding new opportunities, providing a sound rationale for why secondary education is the best intervention point for Indonesia to reach its long-term economic objectives. An easy-to-access measurement tool will support this effort. therefore, this project will develop and pilot a web-based Entrepreneurial Student application to measure EO in secondary school students.

For more than 70 years, researchers have told us that adolescence is a developmental stage when you have much more creativity, curiosity, and exploration than at any other period in your life - key components of being an entrepreneur. In an environment that encourages entrepreneurship education, children will develop the ability to creatively solve problems, develop innovative processes, and find opportunities (Gibb, 2003). At the secondary school level, entrepreneurship education appears to develop important psychological characteristics, such as self-efficacy, independence, and initiative, that will help shape future entrepreneurial behavior (Fayolle & Gailly, 2013). In the context of Indonesia, developing an EO at this level will help cultivate productive, innovative generations of students who will create employment opportunities for their communities and

their country, aligning with the longer-term vision of providing quality human resources for Indonesia's Golden Age 2045.

Research conducted over time in the United States has found that high school students' entrepreneurial orientation significantly influences their decision to pursue entrepreneurship as a career ten years later. An increase in entrepreneurship rate could depend on the development of a large-scale (i.e., thousands of students) means of quantitatively measuring entrepreneurial orientation with an online tool (web-based tool). The benefit of using a digital measurement method is that it provides greater convenience and flexibility to both the assessor(s) administering the measurement and the student(s) who are responding, as well as providing a greater number of students with the opportunity to participate, while also reducing the amount of time required to administer and score the assessment, as well as facilitate the scoring and categorising process more accurately. Therefore, creating a web-based assessment tool to measure entrepreneurial orientation among high school students is critical to ensuring large-scale implementations are effective (Nurchahyo & Valentina, 2021). Furthermore, using an online measurement tool will enable evidence-based interventions and improve the scalability and accessibility of entrepreneurship programs (Marcu et al., 2022).

Assessing EO among students using web-based methods is critical because digital assessments allow teachers to administer tools effectively, collect data automatically, and make it easier for students to respond. In addition, technology-based assessment systems will make evaluation processes more effective and improve data management in educational research (Gikandi et al., 2011). Although there are many advantages to using technology-based assessment systems, no studies in the literature have

developed such a system for the demographic of interest identified in previous studies. In fact, only two prior studies have systematically measured EO of non-vocational secondary students (Kurniawan et al., 2019; Kurniawan, Sanjaya, & Virlia, 2021). Both studies identified three characteristics of EO among secondary school students: innovativeness, proactivity and risk-taking, and competitiveness. The EO scale, developed for non-vocational secondary school students, along with its categories, will facilitate the development of a web-based system to measure EO. However, previous studies measured EO manually, without a web-based approach, and did not provide recommendations based on the measurement results (Kurniawan et al., 2019; Kurniawan, Sanjaya, & Virlia, 2021).

This study aims to address this gap by developing a digital tool tailored to the Indonesian context, where entrepreneurship still faces significant challenges compared to other Asian economies. Data from the Central Statistics Agency (BPS) shows that Indonesia's entrepreneurship ratio is approximately 3.37%, which remains lower than neighboring countries such as Singapore (approx. 8.7%) and Malaysia (above 4.5%) (OECD, 2018; Fathurkhman & Burhanuddin, 2023). This disparity indicates that Indonesia must urgently increase both the quantity and quality of its entrepreneurs to strengthen regional economic competitiveness. Consequently, a scalable, web-based tool is necessary to effectively identify and nurture entrepreneurial potential at the secondary level. To illustrate this point, Indonesia is ranked 75th out of 137 countries in the Global Entrepreneurship Index (GEI), highlighting a significant need to develop an entrepreneurial system in Indonesia (Acs et al., 2018).

Other Asian countries, like Singapore, however, possess well-developed entrepreneurial systems with strong supportive components, such as high-quality education systems and advanced innovation infrastructure, as well as access to venture capital. Because of these supportive components, Singapore continues to be one of the most innovative countries in Asia and has a much stronger startup ecosystem than many developing countries in the region (Startup Genome & Global Entrepreneurship Network, 2021). Therefore, strengthening entrepreneurship capacity in Indonesia through early entrepreneurship education and enhancing the EO of younger generations is vital for Indonesia's future growth. Research has shown that encouraging EO dimensions (innovativeness, proactiveness, and risk-taking) contributes to the development of entrepreneurial behavior and future business activity (Lumpkin & Dess, 1996; Bolton & Lane, 2012). Nonetheless, little empirical research has examined EO among secondary school-age students in Indonesia, indicating a significant research gap.

To achieve these results, a web-based app called "Entrepreneurial Student," which assesses students' EO, produces automated outputs and advice. Assessment tool offers timely feedback now to students - following guidelines published by APA (APA, 2020), students can see whether they are in "Very High" "Very Low" category(s), etc. The instrument will return a score for each EO factor (using the current scores out of 100), along with tailored recommendations to improve any EO factor for students in the moderate (green), low (yellowish), or very low (red) scoring categories. Recommendations for improving the dimension of innovation were based on the identified antecedent factors of innovative work behavior (Asurakody & Shin, 2018; Nisula & Kianto, 2016;

Kurniawan, 2024). Recommendations for developing proactive risk-taking will be based upon the identified antecedents of proactive work behavior. Finally, for competitiveness (which is similar to achievement motivation and self-actualization; Kurniawan et al., 2019; Kurniawan, Sanjaya, & Virlia, 2021), recommendations will be made based upon the well-established driver(s) of achievement motivation and self-actualization (Kurniawan, 2024; Jaitner et al., 2019; Lewis et al., 2022).

As more entrepreneurship education programs are offered at younger ages, it is important to ensure that young people develop entrepreneurial mindsets and competencies early in life. Since the potential end users of the Entrepreneurial Student application are secondary school students, the interface design of the digital instrument must account for the characteristics and preferences of adolescent users. Adolescents are very familiar with technology and online tools, making web-based tools particularly accessible for both data collection and facilitating learning activities (see Prensky, 2001; OECD, 2019). In addition to issues related to the website's design for end users, the Entrepreneurial Student application will also need to be tested for reliability from the end user's perspective, along with an evaluation of both UI and UX.

The field of Human-Computer Interaction (HCI) provides a well-established theoretical foundation for the study of the usability of digital systems. HCI incorporates perspectives from three fields - engineering, design, and psychology - to create an integrated understanding of the interaction between people and technology (Ke, 2026). HCI defines the interaction between people and technology not just as a function of the technology, but as a dynamic interaction between the system's technical de-

sign and human cognitive and emotional factors. As such, it emphasizes the importance of designing interfaces that are not only functional but also aligned with users' capabilities, expectations, and mental models. Evaluating these elements ensures that the measurement tool is effective, engaging, and suitable for the cognitive development of secondary school students.

HCI examines how the design of an interface can affect a user's ability to work with that system. During a usability evaluation, Nielsen's heuristics are used to assess whether the system's design helps or hinders the user's ability to use it. Poor usability can result in confusion, errors during interaction, and increased cognitive load, while a good interface creates a seamless navigation flow and helps the user make fewer errors. HCI also considers UX, which refers to a user's internal reaction to using a system (Kheder, 2023). This study uses Punchoojit & Hongwarittorn's (2017) approach to three-dimensional assessment of UX to quantify the user's feelings, perceptions, and thoughts when interacting with the system. By examining a user's emotional reaction to using the system, their interpretation of the information presented to them, and the cognitive processes they use, the three dimensions provide insight into the user's satisfaction with the system and their deeper feelings about it.

The Entrepreneurial Student App (ESA) leverages UI and UX principles to deliver an easy-to-use, engaging, and accessible platform for students/young people. UI relates to how the app looks, how you navigate through it, and how clearly information is presented, while UX relates to how enjoyable it is to interact with the app. A young person needs to have a good digital experience when accessing this app since they cannot accurately measure their entrepreneurial orientation if they are stressed or tired from using an

app that does not function properly; this is why the UI and UX of this app must be assessed to ensure that the ESA is a valid psychometric measurement tool and provides a suitable vehicle for accurately measuring the entrepreneurial potential of youth. By incorporating valid measurement and a user-friendly and fun digital interface, the ESA will collect entrepreneurial orientation data from students in a manner consistent with younger generations' digital technology habits. Validity testing is important because results from digital measurements are likely to differ from those from traditional analog measurements (Abend et al., 2014). Therefore, it is critical to assess the UI and UX of the ESA to maximize the comfort and effectiveness of HCI in the developed app.

The UI is a part of a system that lets users work directly with computers. It is designed to be user-friendly, easy to learn, and enjoyable to work with (Nielsen, 1993). A good UI occurs when the application successfully connects the user to information providers (Nielsen, 1993). Also, a well-designed visual interface and user interface make it easier for users to understand and use a system (Indrayani et al., 2020). Since the visual appearance of an application can affect how a user views the interface, the quality of the design can significantly influence a user's desire to continue using the system (Indrayani et al., 2020).

To evaluate how good a UI design is, Nielsen developed the heuristic evaluation method (see Appendix 1), which uses ten principles to determine whether an application meets usability standards (Nielsen, 2005). Heuristic evaluation is an important method used by usability engineers to find and fix usability issues within UI designs (Nielsen and Molich, 1990). After identifying usability problems, designers can create new design iterations to eliminate them. Heuristic evaluations are conducted

by small groups of evaluators who review a UI and determine whether it follows usability guidelines. Their feedback is subsequently categorized according to Nielsen's Ten Heuristic Principles, providing a structured pathway for system optimization (Nielsen, 2005).

UX refers to the overall user perception of an experience (both good and bad). This includes a user's feelings, thoughts, and sensory experiences (both physical and psychological), both before and throughout their use of a product or service. According to Punchoojit & Hongwarittorn (2017), UX is characterized by the experience created across multiple uses, from the user's first contact with a product. UX focuses primarily on the user's perspective. Comparatively, UI, which is very focused on the technical side of a system and is usually assessed quantitatively, focuses on how users think, feel, and form an emotional relationship with a product (Kim, 2015). According to ISO 9241-210, UX focuses on a person's perceptions and responses after using a website. UX is an assessment of how comfortable and satisfied a person is after using a product.

As a result, a further examination will be needed to measure entrepreneurial orientation through web applications among secondary school students, evaluating all aspects using a variety of metrics, thereby making the application of the evaluations to secondary school students much more extensive. The absence of prior studies that test and implement, in a structured manner, a computer-based application model for measuring entrepreneurial orientation among secondary school students—including the scale, conclusions, and recommendations—constitutes the novelty of this study. This study aims to examine the reliability of a web-based measurement of entrepreneurial orientation, as well as its UI and UX.

## METHOD

This study adopts a pragmatic research paradigm, combining quantitative and qualitative approaches to analyze the web-based application “Entrepreneurial Student” currently under development (Pretorius, 2024). Furthermore, the research is conducted using an agile approach, as described by Osega, Quinones, & Rojas (2025), which involves developing a web-based application followed by iterative development and testing. This agile method emphasizes people and results, openness to change, collaboration, and consistency in the objectives of application development. The first stage of the research involved creating the Entrepreneurial Student website, a computerized program for analyzing the level of entrepreneurial orientation in high school students, optimizing the survey created by Kurniawan and others (Kurniawan et al., 2019; Kurniawan, Sanjaya, & Virilia, 2021) with the use of the Laravel framework, as well as wireframe models for designing an engaging and user-friendly interface.

The survey contained seven items measuring innovative behavior (innovative dimension; CITC = 0.438–0.610; reliability  $\alpha$  = 0.806), nine items measuring proactive behavior (proactive risk-taking dimension; CITC = 0.437–0.628; reliability  $\alpha$  = 0.845), and eight items measuring competitiveness (competitiveness dimension; CITC = 0.404–0.630; reliability  $\alpha$  = 0.817), with all items being positively oriented. These dimensions of entrepreneurial orientation were incorporated into the Entrepreneurial Student website application along with categorical descriptions from prior research. In addition, the Entrepreneurial Student website offered recommendations based on the measurement results, grouped into moderate, low, and very low categories for each of the three dimen-

sions studied. Recommendations for each dimension came from multiple antecedents related to innovative working behavior, proactive working behavior, and risk-taking behavior, along with achievement motivation and self-actualization (Asurakkody & Shin, 2018; Nisula & Kianto, 2016; Kurniawan, 2024; Crant, 2000; Polas et al., 2022; Jaitner et al., 2019; Lewis et al., 2022).

The phase-two portion of the study included an FGD with teacher representatives (3 teachers) and student representatives (1 junior high student and 1 senior high student) from both junior high school and senior high school. The criteria for selecting participants were as follows: teachers who deliver entrepreneurship as a subject and students who are completing an existing entrepreneurship project (ongoing). Participants were asked to provide preliminary impressions and a critique of the developed Entrepreneurial Student website (prototype). The critiques included the measurement scale, the degree of the conclusion(s), and recommendations based on the use of the application. Based on FGD results (participant feedback), the Entrepreneurial Student website model was developed and subsequently tested with a large group of respondents (sample). The FGD results and post-FGD measurement results provided data for improvement. The above legwork, combined with the collected data, indicates data triangulation occurred (Morgan, 2024).

The phase-three portion of the study consisted of piloting the Entrepreneurial Student website model with 60 students, including 30 junior high students and 30 senior high students from partner schools. All respondents completed an informed consent (permission) form and voluntarily participated in the pilot. The trial was conducted to test the reliability of the measurement

scale implemented in the Entrepreneurial Student web-based application and to evaluate its UI and UX. Two types of analysis were employed in this study: a priori coding for the FGD data and descriptive statistical analysis for the trial data. A priori coding involved identifying meaningful keywords based on the theoretical framework used, specifically Nielsen’s user interface theory. Meanwhile, data on UX were analyzed using the concepts proposed by Punchoojit & Hongwarittorn (2017). Descriptive statistical analysis was conducted by creating categories based on the normative distribution, using the hypothetical maximum and minimum scores, the mean (M), and the standard deviation (SD). Respondents’ scores (X) were then classified into five categories: very low ( $X < M - 1.5 SD$ ), low ( $M - 1.5 SD \leq X < M - 0.5 SD$ ), moderate ( $M - 0.5 SD \leq X < M + 0.5 SD$ ), high ( $M + 0.5 SD \leq X < M + 1.5 SD$ ), and very high ( $X \geq M + 1.5 SD$ ) (Azwar, 2012).

## RESULTS

### Participant Demographics

This study was conducted at a private school located in the Surabaya City that offers various

levels of education. The criteria for selecting the school included its ability to provide ongoing entrepreneurial education across all levels of education, from primary through higher education. In addition, students participate in numerous hands-on entrepreneurial activities, which makes the school an appropriate location to test the measurement instrument. Prior to the large-scale study, an FGD was conducted with representatives from both teachers and students to gather post-application feedback. The demographics of the five participants in the FGD include four females and one male. There were three individuals from junior high school (two teachers, including one teacher; one student) and two individuals from senior high school (one teacher and one student). Across grade levels, each grade was represented by one individual (Table 1). After the application had been modified based on this qualitative feedback, data were collected from a total of 60 students.

The gender ratio is nearly 50% male and 50% female (or vice versa). There were equal proportions of junior and senior high school students participating in the research; therefore, they represented equal numbers within each grade level and provided a wide range of

Table 1 Demographic Characteristics of Participants

Demographic Variable	N	Frequency
<b>Gender</b>		
Male	31	48,33%
Female	29	51,67%
<b>Educational Level</b>		
SMP (Junior High School)	30	50%
SMA (Senior High School)	30	50%
<b>Grade</b>		
7	9	15%
8	11	18.33%
9	10	16.67%
10	6	10%
11	14	23.33%
12	10	16.67%

developmental stages for students in Grades 7–12. The qualitative data collected from the FGD consisted of specific suggestions/feedback from the participants and served as the basis for developing improvement options for the application (Entrepreneurial Student). The FGD

took place in the afternoon and lasted about 1.5–2 hours. The FGD participants were provided with instructions on completing and reviewing the web version of the FGD application prior to providing feedback and were given the opportunity to complete it on their devices (two

**Table 2 User Feedback and Improvement Solutions Related to the User Interface (UI)**

Dimension (a)	Problem / Evaluation (b)	Solution / Improvement (c)
Visibility of system status	Users experienced confusion regarding how to complete the questionnaire, specifically whether it should be filled out by dimension or as a whole. Additionally, users suggested that score descriptions and criteria should be provided to help them better understand their results and current standing.	The researchers added dimension-by-dimension instructions and displayed the final score along with its criteria (low, moderate, high), accompanied by simple visualizations to make it easier for users to understand.
Match between system and the real world	Users suggested using more familiar wording, as certain terms—such as "tips" and "construction"—were considered difficult for them to understand.	The researchers used more familiar terms, such as “tips” or “how to,” and replaced the term “construction” with “entrepreneurial orientation” to make it more relevant and easier for users to understand.
User control and freedom	Users were not aware that they had the freedom to edit their responses.	The researchers added clear labels and an edit icon so that users would know they could modify their responses before submission.
Consistency and standards	Users who accessed the system via smartphones and laptops experienced differences in the display. They also suggested the need for consistency in terminology and recommended using the more familiar form of address "you" to better suit junior and senior high school users.	The researchers improved the interface to be responsive across devices and standardized the use of terminology and the form of address “you” to ensure consistency and a closer connection with adolescent users.
Error prevention	Users experienced the loss of their input due to accidental button presses.	The researchers added a confirmation feature before deleting or exiting, as well as an undo button, to prevent the loss of input due to accidental button presses.
Recognition rather than recall	Users did not receive notifications indicating whether any items had been missed. They suggested that the system should provide notifications or include clearer explanations in the guidelines or instructions. In addition, users experienced confusion regarding how to proceed with the items, particularly whether they needed to click the arrow icon or the “Submit” button to continue.	The researchers provided automatic notifications for unanswered items and added clear guidelines and button labels so that users could better understand the flow and how to proceed with the questionnaire.

<p>Flexibility and efficiency of use</p>	<p>Users experienced confusion when completing each item on the website because the system automatically returned to the home page instead of directly displaying the next item. This required users to scroll manually to read the next item, which was considered disruptive and impractical.</p> <p>Users also reported that the recommendation section was too long and required excessive scrolling, especially when accessed via smartphones. They suggested several improvements, including presenting the recommendations in bullet points for better readability, adding a “Next...” or "Read More" button to display additional information, and including images or other visual elements to make the interface more engaging and less rigid.</p>	<p>The researchers improved the navigation so that items are displayed sequentially without returning to the home page. They also restructured the recommendations into bullet points and summaries, and added a “Next...” button alongside visual elements to enhance readability and user comfort, especially for smartphone users.</p>
<p>Aesthetic and minimalist design</p>	<p>Users suggested that, where possible, the Conclusion and Recommendation sections should be accompanied by images or visual illustrations to make the interface more engaging and to facilitate understanding. In addition, they proposed that the Results section should be presented in a layout that can be read within a single full screen—without excessive scrolling—to encourage users to read the entire content.</p>	<p>The researchers added visual illustrations to the Conclusion and Recommendation sections to clarify the content, and optimized the Results display so that it can be read on a single full screen without excessive scrolling.</p>
<p>Help users recognize, diagnose, and recover from errors</p>	<p>Users suggested that the website should provide examples of correct personal data entry, along with examples of common mistakes, to minimize errors. Furthermore, they recommended that the system provide immediate warnings when errors occur in the responses so that users can promptly recognize and correct them.</p>	<p>The researchers provided examples of correct and incorrect personal data entry at the beginning of the interface and added an automatic validation system that provides immediate warnings when input errors occur.</p>
<p>Help and documentation</p>	<p>Users were not aware of the existence of the help button.</p>	<p>The researchers made the help button more prominent by using a familiar icon and positioning it strategically so that it can be easily found by users.</p>
<p>Other</p>	<p>Users found typos or typographical errors in the recommendation section. Based on observations, users generally did not read the scenario but directly proceeded to complete the statements on the website.</p>	<p>The researchers corrected the typos in the recommendations for the innovativeness dimension and presented the scenario and instructions in a concise, engaging manner at the beginning of the questionnaire to ensure they were more noticeable to participants.</p>

different devices allowed for cross-device comparison). Each participant was interviewed individually during the FGD so that all their comments and concerns could be properly recorded.

Table 2 shows that feedback was collected for each UI dimension in line with Nielsen's principles. Each piece of user feedback was followed up by the researchers (see Table 2, column c). Subsequently, the improved web-based Entrepreneurial Student application was tested on 60 junior and senior high school students.

## DISCUSSION

To analyze the collected data, a human-computer interaction framework comprising two perspectives was used: design engineering and psychology. The design engineering perspective focuses on the iterative development of the web-based entrepreneurial student application and uses Nielsen's 10 dimensions of UI as an operational definition. The psychological perspective uses Punchoojit & Hongwarittorn's UX framework to operationalize three dimensions (think, perceive, and feel). After reviewing the feedback presented in Table 2 and Appendix 2, several changes were implemented. In doing so, the importance of remaining objective in interpreting the changes was recognized. Therefore, I have described the improvements in terms of the UI and UX theoretical frameworks. User feedback received during the initial evaluation of the prototype of the Entrepreneurial Student web-based application focused on three major areas: ease of use, clarity of results, and comfort while completing the application. This feedback was used to inform decisions on improving both the UI and UX.

A key finding in this study was that there were no categories to explain the final score after the user had finished completing the assessment. This lack of category may confuse users about how to interpret their final scores numerically and be a usability issue related to the system status visible and matches between the system and the real world, in that the system presents information to the user in an understandable and meaningful manner (Nielsen, 1993; Nielsen, 2005). Thus, there is no way for users to connect their scores to any categories, so they cannot contextualize them; therefore, the amount of useful information or feedback provided to the user by the system will decrease. Therefore, in order to improve the system's ability to provide clear and effective feedback, categorical descriptions of "very low", "low", "moderate", or "high" were created based on pre-defined score ranges, and these categorical descriptions assist users in contextualizing their scores within the entrepreneurial spectrum, providing the user with a greater sense of self-awareness of their competency, as shown in Appendix 3. This enhancement will also support the positive perception of the clarity of results generated by the user in the UX evaluation (Appendix 6).

Follow-up feedback indicated that there were also noticeable issues with the design of the completion flow, which was perceived as less intuitive in the placement of the submit button. Users expressed concerns that locating this button at the top of the page could disrupt the logical ordering of data entry and create uncertainty about whether a task had been completed (Appendix 6). Theoretically, this way of thinking is supported by Nielsen's usability principle of 'User Control & Freedom' and suggests that an interaction system should sup-

port an intended and predictable flow of information as users complete their desired actions (Nielsen, 2005). Additionally, this finding conforms to Garret's discussion of interaction design principles, which state that the user must complete previous steps before being presented with subsequent steps (Garrett, 2011). Based on subsequent feedback (Appendix 4), the submit button was moved from the top of the page to the bottom to create a more logical, sequential interaction flow, eliminating premature submissions and improving overall task completion efficiency. This positive change is supported by high usability scores received by the new UI across all dimensions (Appendix 6). Thus, the new design better supports established usability principles.

To enhance users' comfort, both cognitive and emotional, while completing a form, improvements were made to the visual design and textual aspects of the interface; these changes were based on user feedback from the FGD, particularly regarding visual appeal and reading ease. The new interface design (e.g., a more uniform color palette, attractive images, and easy-to-read fonts) can be explained by aesthetic and minimalist design principles, which suggest that a well-designed, clearly displayed interface reduces cognitive load and improves focus (Nielsen, 2005). Further research supports this assertion; the attractiveness of images is a significant determinant of users' emotional responses during interaction (Punchoojit & Hongwarittorn, 2017).

Additionally, by expanding response boxes and adding sample reflective sentences with each response item, the Response conformed to the principle of recognition vs recall: providing users with cues and support for responding rather than relying on their memories (Nielsen,

2005). This approach allows users to convey their response in a more organized and meaningful manner, thus providing greater opportunity for cognitive engagement. These improvements are illustrated in Appendix 5 and are supported by the positive results in both UI and UX evaluations (see Appendix 6 and 7), particularly in terms of user comfort and ease of use. Overall, all enhancements were guided by user-centered design principles and aimed to create a more intuitive, reflective, and meaningful UX (Garrett, 2011).

The two classes held on the site for trial testing and to complete the online questionnaire to evaluate the UX/UI followed the same structure. First, the senior high school had 30 students, and the junior high school had 30 as well. This allowed for a more structured testing process and ensured a true representation of user participants from both types of schools (Table 1). Therefore, the researchers were able to observe each session in each class, provide guidance on completing the form, conduct direct observations, and anticipate potential technical problems. The researchers' presence was important in ensuring the process was conducted consistently and that participants understood and completed the tasks. This is consistent with established usability testing practices, which use direct observation to identify areas of difficulty and users' interaction patterns as they use the item (Nielsen, 1993).

Referring to Appendix 6, UI scores on all ten Jakob Nielsen heuristic dimensions all ranked as "very good", as demonstrated by the aggregate scores for junior and senior high students, which fell between 495 and 554. Thus, improvements based on user feedback gathered during the FGD were favorably received by both junior and senior high users. These results

support the theoretical perspective that this application meets the key usability principles identified by Nielsen: visibility of system status, consistency, error prevention, and flexibility in use (Nielsen, 1993, 2005). Furthermore, high scores across all ten dimensions suggest that the system is functional and meets established usability standards; therefore, it will support effective human-computer interactions. Additionally, high scores across user groups indicate that the interface design is both versatile and usable for users with varying cognitive abilities and technological experience; therefore, user-centered design ultimately contributes to greater usability and acceptance across user groups (Garrett, 2011).

Based on the collected data, the UX scores ranged from 258 to 274, all of which fell within the “very good” category (Appendix 7). These results indicate that users experienced positive feelings during the completion process, perceived alignment between the scores and their personal characteristics, and found the completion process easy to perform. From a theoretical perspective, these findings can be interpreted using the UX dimensions of “feel,” “perceive,” and “think,” which reflect users’ emotional, cognitive, and evaluative responses to system interaction (Punchoojit & Hongwarittorn, 2017). The “feel” dimension is reflected in participants’ statements such as, “I felt quite confident while completing the assessment,” and “I felt calm because the UI design is simple and user-friendly.” These responses indicate positive emotional engagement, which is an important component of UX, as users’ feelings during interaction influence overall satisfaction and continued use (Kim, 2015). The high score in this dimension suggests that the interface design successfully created a comfortable and supportive interaction environment.

In addition to feeling confident and calm, several participants provided statements reflecting the “perceive” dimension, such as, “I was surprised to find that my entrepreneurial score was high,” and “In my opinion, the results are highly consistent with who I am.” These responses indicate that users perceived the system output as meaningful and relevant to their personal characteristics. From a theoretical standpoint, this reflects perceived validity, in which users accept and trust the system’s results (Garrett, 2011). The relatively high score in this dimension (see Appendix 7) suggests that the application effectively communicates results in a way that aligns with users’ self-perceptions.

However, the third dimension reveals a different pattern. As indicated by the statement, “I experienced some difficulty when completing the tips section...,” participants tended to focus more on technical difficulties than on deeper reflection when formulating recommendations and identifying constraints. This is also reflected in the relatively lower score of the think dimension compared to the other UX dimensions. From a theoretical perspective, this suggests that although the system supports usability and emotional engagement, it has not yet fully facilitated higher-order cognitive processes, such as reflection and critical thinking, which are essential components of a meaningful UX (Punchoojit & Hongwarittorn, 2017).

The results also suggest that prior to taking the assessment, many students were not aware of their entrepreneurial orientation. The application serves a dual purpose as a measure and as a tool to enhance users’ self-awareness. Research suggests that the use of effective feedback can improve users’ understanding of their competencies and aid in their future efforts (Garrett, 2011). Given the information col-

lected, the UI and UX of the Entrepreneurial Student web application, along with modifications made, received ratings of “very good” from junior and senior high school students. However, given an ongoing commitment to continual improvement, the application has potential for additional refinement. Specifically, the UI related to the help and documentation features may be further enhanced and the UX improve to more fully support the reflective and cognitive engagement of users.

## CONCLUSION

This research developed and assessed the online Entrepreneur Student app, with findings indicating that it provides a simple, easy-to-use

interface that offers a good experience for secondary students. The evaluations using Nielsen’s evaluation criteria, all obtained a “very good” rating, and therefore, the app provides an excellent tool for human-computer interaction in an educational setting. The respondents rated their confidence (self-assessment of results) and clarity (how clear they were about what the app produced) very highly, but improvements can be made in the “Help and Documentation” and “Thinking” evaluation dimensions to facilitate further reflection on what was accomplished. Given the research context’s specific focus on education and the homogeneous sample used in this study, it is prudent for future research to include diverse populations to validate the app’s usability and UX across multiple stages of development.

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APPENDIX

Appendix 1 Nielsen’s Ten Usability Heuristics for UI Design

Heuristic Principle	Description
Visibility of System Status	The system should continuously inform users about ongoing processes by providing appropriate feedback within a reasonable timeframe.
Match Between System and the Real World	The system should use language that is easily understood by users, employing words, phrases, and concepts familiar to them rather than system-oriented or technical jargon. Information should be organized according to real-world conventions so that it appears natural and logically structured.
User Control and Freedom	Because users may accidentally choose the wrong function, the system should provide a clearly marked "emergency exit" to allow them to leave an unwanted state without navigating a complicated process. Support for undo and redo actions should also be provided.
Consistency and Standards	The system should avoid using different terms, contexts, or actions that may confuse users when they mean the same thing. It is essential to follow platform conventions and industry standards consistently.
Error Prevention	It is better to prevent errors from occurring than to rely solely on high-quality error messages. The system should be carefully designed to minimize the likelihood of errors, either by eliminating error-prone conditions or by requesting user confirmation before critical actions are performed.
Recognition Rather Than Recall	To reduce the user's cognitive load, the system should make objects, actions, and options visible. Users should not be required to remember information from one part of the interface to another. Instructions for using the system should be visible or easily accessible whenever needed.
Flexibility and Efficiency of Use	Accelerators—features that may go unnoticed by novice users—can speed up interaction for experienced users. This ensures the system can be used efficiently by individuals with different levels of experience. Additionally, users should be allowed to customize frequent actions.
Aesthetic and Minimalist Design	Dialogues should not contain information that is irrelevant or rarely needed. Every extra unit of information competes with relevant units and diminishes their overall visibility.
Help Users Recognize, Diagnose, and Recover from Errors	Error messages should be expressed in plain language (not technical codes), precisely indicate the problem, and constructively suggest a solution.
Help and Documentation	While the system should ideally be usable without documentation, it may still be necessary to provide help resources. Such information should be easy to locate, focused on the user’s specific tasks, list concrete steps to be carried out, and remain concise.

**Appendix 2 User Feedback and Improvement Solutions Related to User Experience (UX)**

Dimension (a)	Problem / Evaluation (b)	Solution / Improvement (c)
Emotional Experience While Using the <i>Entrepreneurial Student Website</i>	No feedback was provided by the users.	The researchers did not make any additions, as no issues were identified regarding users' feelings during the process of completing the website.
Clarity When Reading the Results (Scores and Categories) on the <i>Entrepreneurial Student Website</i>	Users suggested adding category labels for the final score results, namely low, moderate, and high.	The researchers added category labels for the final score results (low, moderate, high) so that users could more easily understand their level of achievement. This information is clearly displayed in the final results section after completion.
Ease of Completing the Recommendations or Reporting Constraints for Each Score on the <i>Entrepreneurial Student Website</i>	Users suggested that the Submit button be placed at the end of the form to facilitate a smoother completion flow. In addition, they recommended including Save and Edit features to allow them to temporarily store and revise their responses. Users also noted that the process requires significant time and deep reflection; therefore, they suggested making the text more engaging and including guiding sentences (placeholder text) within response fields to create a more comfortable and enjoyable experience.	<ol style="list-style-type: none"> <li>1. Relocating the submit button to the end of the form to facilitate a smoother completion flow.</li> <li>2. Adding save and edit features to allow users to temporarily store their responses and make revisions as needed.</li> <li>3. Redesigning the interface to improve visual appeal and readability, ensuring a more engaging experience.</li> <li>4. Providing example guiding sentences within the response fields to support users' reflective answering process and reduce cognitive load.</li> </ol>

Appendix 3 Addition of the Normative Table

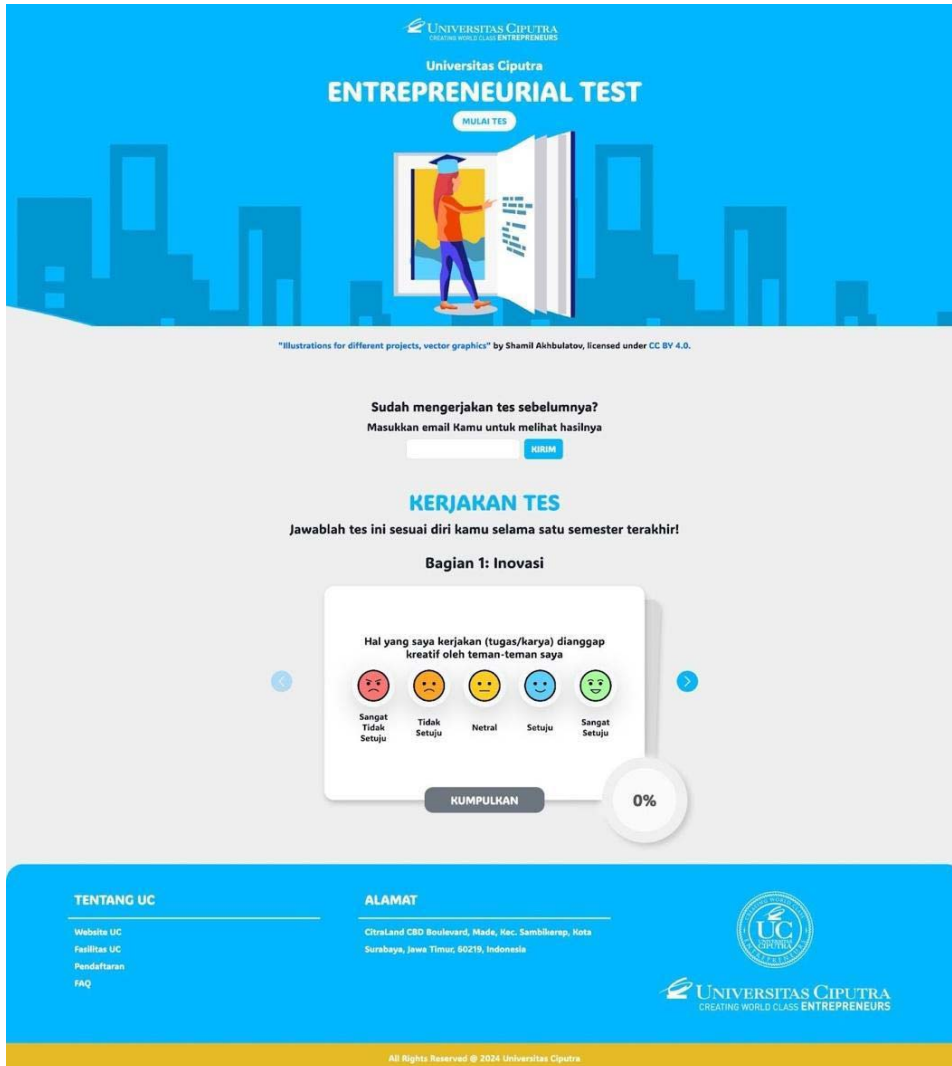
### Tabel Norma SISWA/SISWI SMP

ORIENTASI	SANGAT RENDAH	RENDAH	CUKUP	TINGGI	SANGAT TINGGI
INOVASI	≤ 14.60	14.61 - 19.20	19.21 - 23.80	23.81 - 28.40	≥ 28.41
PROAKTIF BERISIKO	≥ 28.41	18.21 - 24.40	24.41 - 30.60	30.61 - 36.80	≥ 36.81
KOMPETITIF	≤ 21.25	21.26 - 25.94	25.95 - 30.63	30.64 - 35.31	≥ 35.32
ENTREPRENEURIAL	≤ 21.25	57.26 - 70.19	70.20 - 83.13	83.14 - 96.06	≥ 96.07

### Tabel Norma SISWA/SISWI SMA

ORIENTASI	SANGAT RENDAH	RENDAH	MENENGAH	TINGGI	SANGAT TINGGI
INOVASI	≤ 16.25	16.26 - 20.94	20.95 - 25.63	25.64 - 30.31	≥ 30.32
PROAKTIF BERISIKO	≤ 19.40	19.41 - 25.80	25.81 - 32.20	32.21 - 38.60	≥ 38.61
KOMPETITIF	≤ 18.40	18.41 - 23.80	23.81 - 29.20	29.21 - 34.60	≥ 34.61
ENTREPRENEURIAL	≤ 56.80	56.81 - 75.10	75.11 - 93.40	93.41 - 111.70	≥ 111.71

### Appendix 4 Improvement of the Submit Button Position



### Appendix 5 Improvements in Color Scheme and Illustrations

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Nilai Entrepreneurial Kamu  
**57**  
RENDAH  
KEMBALI SELENGKAPNYA

"Illustrations for different projects, vector graphics" by Shamil Akbulatov, licensed under CC BY 4.0.

### Orientasi Kewirausahaan

RENDAH 20pt. Inovasi	SANGAT RENDAH 18pt. Proaktif Berisiko	RENDAH 19pt. Kompetitif
----------------------------	---	-------------------------------

Lihat Norma

#### KOMPETITIF Rendah

Skor Kompetitif Kamu tergolong Rendah.  
Artinya Kamu belum ingin berkembang dan mencapai hasil yang lebih baik. Kamu agak mudah menyerah ketika menghadapi kegagalan, belum dapat belajar dari kesalahan untuk mencapai target yang lebih tinggi. Kamu juga belum berusaha memanfaatkan waktu sebaik mungkin untuk meningkatkan kemampuan Kamu.

- Kembangkan gambar diri Kamu
  - Kenali Kekuatan dan Kelemahan Kamu: Sadarilah apa yang Kamu kuasai dan apa yang perlu Kamu tingkatkan, agar Kamu bisa fokus mengembangkan diri.
  - Cinta Diri Kamu Apa Adanya? Kamu tidak perlu sempurna untuk bahagia dan sukses. Terima diri Kamu dengan segala kelebihan dan kekurangannya.
  - Bergaul dengan Orang-Orang Positif: Lingkungan sekitar sangat berpengaruh pada cara pikamung Kamu terhadap diri sendiri, jadi beresialah dengan orang yang positif.
- Miliki motivasi dari diri Kamu sendiri
  - Pilihlah dan tekuni bidang yang ingin Kamu kembangkan sesuai bakat dan minat Kamu, bukan karena paksaan.
  - Sadari apa manfaat Kamu mempelajari dan menekuni bidang tersebut, baik manfaat untuk diri Kamu sendiri maupun orang lain.
- Tetapkan tujuan hidup yang SMART
  - Specific: Tentukan dengan rinci, apa yang ingin Kamu capai.
  - Measurable: Tentukan bagaimana Kamu bisa mengukur kemajuan Kamu.
  - Achievable: Pastikan tujuan Kamu realistik dan bisa dicapai.
  - Relevant: Pastikan tujuan Kamu sesuai dengan nilai-nilai hidup Kamu.
  - Time-bound: Tentukan batas waktu untuk mencapai tujuan Kamu.

Sumber:  
Galmaras, P. et al. (2024). Positive Self-Image: Overcoming Taboos and Self-Esteem Inspired by Napoleon Hill's Thoughts. Digital World Publishing.  
Watts, R. H., Jr., Cashwell, C. S., & Schweiger, W. K. (2004). Fostering intrinsic motivation in children: A humanistic counseling process. Journal of Humanistic Counseling, Education and Development, 43, 19-24.  
Chahal, R.S. (2024). Mastering SMART Goals: Your Ultimate Guide to Achieving Success. UK: Rana Books.

SHOW LESS

Apa kendala Kamu sehingga kompetitif Kamu hanya tergolong rendah?

SIMPAN

TENTANG UC  
Website UC  
Fasilitas UC  
Pendaftaran  
FAQ

ALAMAT  
Citraland BSD Boulevard, Madi, Mac, Sambikemp, Kota  
Surabaya, Jawa Timur, 60219, Indonesia

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**Appendix 6 UI Usability Heuristic Evaluation of the “Entrepreneurial Student” Web-Based Application**

Aspects	Score
Visibility of system status	542
Match between system and the real world	548
User control and freedom	541
Consistency and standards	542
Error prevention	517
Recognition rather than recall	523
Flexibility and efficiency of use	554
Aesthetic and minimalist design	551
Help users recognize, diagnose, and recover from errors	515
Help and documentation	495

**Appendix 7 Results of the UX Measurement**

Dimension	Item	Score
Feel	Feelings While Completing the <i>Entrepreneurial Student</i> Website	274
Perceive	Perceived Appropriateness of Interpreting Results (Scores and Categories) on the <i>Entrepreneurial Student</i> Website	261
Think	Ease of Providing Recommendations or Reporting Constraints Based on Each Score on the <i>Entrepreneurial Student</i> Website	258