Enhancing Statistical Physics Learning: Rhetoric and Emotion in Moodle for Physics Education

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Abstract

The Learning Management System in science education has become crucial in modern educational settings. However, there is a lack of comprehensive resources to guide the implementation of hedonic and pragmatic qualities in UX. This study aims to identify emotional design factors and adopt an innovative perspective with a rhetorical approach to enhance the user experience. This study adopts the Design-Based Research methodology using the UEQ questionnaire with 26 items, involving a total population of 122 students. Conducting research through a User Experience Questionnaire, rhetorical evaluation, and open-ended questions in three control groups, the physics learning experience through Moodle at the Sarjanawiyata Tamansiswa University was evaluated, specifically in the Physics Education study program. The research findings demonstrate that improving UX leads to higher user satisfaction. According to the results of the UEQ analysis, it is evident that attractiveness, clarity, and efficiency are rated above average. Meanwhile, aspects of dependability, stimulation, and novelty are assessed below average criteria. The study concludes that ethos, pathos, and logos are essential in embracing the pragmatic and hedonic aspects of UX.

Key words: emotional design, ethos, pathos, rhetorical perspective

INTRODUCTION

The use of Learning Management Systems (LMS), also known as virtual learning environments, is increasingly becoming an important part of Information and Communication Technology (ICT) resources in the teaching and learning process. The quality of the user experience (UX) in this type of system is very important for users, especially teachers and students. To improve the learning process, it is necessary to consider both the pragmatic and hedonic qualities of UX. So far, research on Learning Management Systems tends to focus on pragmatic aspects of user experience, which are mainly related to usability, as stated by Zaharias & Pappas (2016), and often ignore the hedonic aspects that affect interaction.

It is important to understand that statistical physics education in a university context requires a holistic learning approach that takes into account not only pragmatic aspects but also considers the hedonic aspects of user experience (UX). Pragmatic aspects in statistical physics education involve factors such as delivering easily understandable content, intuitive navigation within the learning platform, and efficiency in the interaction between students and learning materials. This means that content should be presented clearly, easily accessible, and well-structured so that students can quickly find the information they need. Additionally, navigation within the learning platform should be

straightforward and easy to understand to prevent students from getting lost while searching for materials. Furthermore, hedonic aspects in statistical physics education pertain to elements that create a positive learning experience, motivate students, and enhance their emotional engagement with the subject matter.

This may include the use of intriguing case studies, practical experiments, or involvement in stimulating critical discussions. Instructors should also create an environment that supports creativity and exploration in understanding statistical physics concepts. By combining these two aspects, universities can create a more effective and engaging statistical physics learning experience for students. By considering the pragmatic aspects, content can be delivered more efficiently, while incorporating hedonic elements can make students feel emotionally engaged, motivated, and more likely to achieve a deep understanding of the taught statistical physics concepts. In the context of statistical physics education, the integration of pragmatic and hedonic aspects is key to creating an inspiring and effective learning experience.

Emotional design aims to improve pragmatic and hedonic qualities with an emphasis on hedonic aspects. The implementation of emotional design has been carried out in Multimedia Learning, as can be seen in the research conducted by Plass, Heidig, Hayward, Homer & Um (2014); Mayer & Estrella (2014); Heidig, Müller, & Reichelt, (2015); Li, Luo, Zhang & Shadiev, (2020); Endres, Weyreter, Renkl & Eitel (2020); Chung & Cheon, (2020); Bülbül & Kuzu (2021); Wang, Zhou, Gong, Jia & Lei, (2022); Liew, Pang, Leow & Tan, (2022); In addition, the application of emotional design factors in the Learning Management System has been carried out by Mokhsin et al. (2017). In research conducted by Martín-Páez, Aguilera, Perales-Palacios, & Vílchez-González (2019), shows that a user satisfaction proposal is presented based on the ISO/IEC 25010 product quality model applicable to e-learning systems, considering three categories: utility, trustworthiness, and enjoyment.

While there is another category called comfort, this one doesn't count as it has more to do with physical comfort. Although user experience and emotional design have been implemented in various educational resources, there is a gap between UX evaluation and the implementation of emotional design, have presented some guidelines, but they admit that their proposal size has weaknesses. Therefore, this paper presents an overview of emotional design factors and applied rhetorical approaches that can help enhance the user experience in an LMS.

In the context of physics education, the use of Moodle LMS can enhance the learning experience through the integration of multimedia elements. Physics concepts are often complex and abstract, so students face difficulties in understanding them with only traditional teaching methods. By utilizing multimedia elements such as experimental videos, simulations of physical phenomena, and interactive modules that allow exploration of concepts, the Moodle LMS creates a more interesting and interactive learning environment.

This multimedia element helps students visualize and understand these abstract concepts, so that the learning process becomes more accessible and enjoyable. In addition, the Moodle LMS in physics learning also enables instructors to monitor student progress and engagement in using multimedia content, provide valuable insights into their learning journey, and provide personalized support and guidance. By leveraging the multimedia capabilities of Moodle's LMS, physics educators can create dynamic and immersive learning experiences that enhance students' understanding and retention of physics principles.

In the UST Physics Education Study Program, a redesign of the graphical user interface has been implemented in the Moodle LMS during physics lessons. In this process, several emotional design factors from a rhetorical perspective were considered. After that, the user experience (UX) using the User Experience Questionnaire and conduct a rhetorical evaluation were evaluated. Four open-ended questions to three control groups to elicit views from students were asked. This study aims to identify emotional design factors that

can be applied using a rhetorical approach in three modes of appeal, namely logo, ethos, and pathos.

With the development of Information and Communication Technology (ICT) technology, the education sector is one that is greatly influenced, and the Learning Management System (LMS) is one of the technologies that can provide benefits in the teaching and learning process. According to Kasim & Khalid (2016), Learning Management System is "a web-based software package designed for planning, executing, and evaluating learning, facilitating student interaction, providing performance feedback, and managing student activities". LMSs, which are also known as Virtual Learning Environments, are gaining importance in today's context, especially as the Covid-19 pandemic has abruptly transformed much of traditional education into a complete online learning experience.

Generally, there are two types of issues that can cause users to switch from one Learning Management System (LMS) to another. The first issue is "design issues that directly affect the user (aka customer) experience, such as poor usability, poor visual design, and less responsive design" (Zaharias & Pappas, 2016). The second problem is "management issues, such as reporting ability and adaptability to organizational needs". In this paper, the main focus is on the first aspect, which is the problem related to the graphical user interface. Martín-Páez, Aguilera, Perales-Palacios, & Vílchez-González (2019) commented that traditional user studies tend to focus on objective parameters that can be measured and verified related to aspects of interactive products. This ignores the hedonic component that is part of user satisfaction and is directly related to the level of engagement and motivation shown by a person when using an e-learning system.

Marc (2003)argues that user experience has two qualities, namely pragmatic quality which is mainly related to usability and ease of use, and hedonic quality which consists of stimulation, identification, and generation. Preece, Rogers & Sharpe (2019) noted that there are many aspects of the user experience to consider and pay attention to when designing interactive products.

Some of these aspects include usability, functionality, aesthetics, content, look and feel, as well as sensual and emotional appeal. Thus, emotional design aims to influence emotional appeal. Judge (2018) explains in his book that emotional experiences have a profound influence on our long-term memory, and that emotion and cognition are interrelated.

It should be noted that according to reports Muhammad and Ridwan (2017) that User Experience Design in Pedagogy is one of the major trends in education, along with measurement of user experience. The goal of this trend is to create meaningful learning experiences for all students. As stated by Suryaningrum, Astuti & Rusilowati (2021) that all the activities have cognitive and affective components. The cognitive component provides meaning, while the affective component provides value. Therefore, emotion and cognition cannot be separated. Work of De Lera, Almirall, Valverde & Gisbert (2013) provide insight into how to implement aspects of emotional design. They devised the 12 guidelines as a way of "incorporating students' emotional and psychological dimensions into the design of learning environments". The guidelines include personalization, identity, brand image, community, surprise, innovation, zen state, search, clarity, situation, aesthetics and recognition. In the context of this paper, it should be noted that identity and brand are replaced by brand image. Meanwhile, zen, clarity, situation, and aesthetics are primarily concerned with visual design involving composition and user interface elements.

Pinasthika (2020), reminds us that after achieving functionality, reliability, and usability, it's important to pursue pleasure. In the article, he concluded that animation can create surface enjoyment along with tactile transitions or gesture commands, use of humor and entertaining slang, and the ability to predict user questions in advance. In addition, high-resolution images and beautiful and relevant voice interactions can also enhance user enjoyment. Rudolph, Thoring, Remfert & Vogl (2017) also noted that in website design, several aspects that can be considered to

affect emotions are the use of colors, images, shapes, and photos.

Mayer & Estrella (2014) have applied several aspects of emotional design in multimedia materials, where they evaluated the effect of color and similar human faces. Plass et al. (2020) evaluate the influence of color and round face shape. Vanslambrouck, Zhu, Lombaerts, Philipsen & Tondeur (2018) conduct research related to the influence of color and animation. Endres et al. (2020) uses a design approach that involves the use of warm colors, animation with social cues, use of symbols and characters in sketch form, use of friendly language, and use of stories with social engagement. Where as Li et al. (2020) evaluated the effect of positive designs involving the use of color and anthropomorphism, compared to neutral designs using gray scale

Chung & Cheon, (2020) implement emotional designs using background images that have motivational cues. Bülbül & Kuzu, (2021) create different animations taking into account the use of color, rounded shapes, personification, character animation, and sound effects. Wang, Zhou, Gong, Jia & Lei (2021) implements the emotional design factor by emphasizing the use of color. Plass et al., (2020) apply emotional design factors in digital games to learning, including expression, color, shape, and dimensions of game characters.

The emotional design aspect in LMS is implemented in Mokhsin et al.'s research. (2017). They stated that "four main designs have been identified as potentially useful for these projects, namely display, logo, navigation, and login page". Finally, Badia, Martín & Gómez (2019) also presents some hedonic factors. Table 1 shows the main factors found in the literature review, and the factors proposed in this study. The login page plays an important role in every LMS, as it gives access to the system only to authorized users, and is generally the first page students see. In this context, the images displayed on the login page are changed dynamically using animated GIFs, according to different celebrations or events. The aim is to see if these dynamic changes can trigger reactions from students.

In response to special celebrations in Indonesia, such as Hari Raya Idul Fitri (Eid al-Fitr), Indonesian Independence Day (17 August), Kartini Day (21 April), and the celebration of Pancasila Day (1 June), animated GIFs were designed and placed five days before those dates and removed one day after. This emotional design includes elements that can evoke emotion and connect users with the celebration, such as the use of relevant colors, images related to the celebration, and design elements that reflect the spirit and meaning of the celebration.

Table 1. Emotional Design Factors

Authors	Factors
De Lera et al. (2013)	Personalization, identity, brand, community, surprise, innovation, zen, search, clarity, situation, aesthetics, recognition
Rudolph et al. (2017)	Color, images, shapes, photographs
Mayer & Estrella (2014)	Color and human-like faces
Plass et al. (2014)	Color and round face-like shapes
Fishmen (2015)	Translation, information symmetry and direction, color, individualism / collectivism, genre, contextualization or information architecture
Chen & Zhou (2016)	Positive design—color, anthropomorphism—vs neutral design—grayscale
Mokhsin et al. (2017)	Body (color and layout), navigation, logo (position), login page
Sosa Tzec (2017)	Color, typography, simplicity, persona, nature in design, seduction, graphics and multimedia, layout of screen elements

Authors	Factors
Nowakowski (2020)	Animations, tactile transitions or gestural commands, microcopy (i.e., injecting humor & slang, predicting users' questions in advance), beautiful, relevant high-resolution imagery and sound interactions
Endres et al. (2020)	Warm colors, animations with social cues, sketched symbols and characters, friendly everyday language, frame stories with a social agent
Plass et al. (2020)	Expression (happy, neutral, sad), color (warm, neutral), shape (rounded, square), dimensionality (2D, 3D, immersive 3D)
Wang et al. (2021)	Color and animation
Chung & Cheon (2020)	Background images with motivational cues
Bülbül & Kuzu (2021)	Color, rounded shapes, personification, character animations and sound effects
Wang et al. (2021)	color

In the context of emotional design and rhetoric in the user experience, design that takes this special celebration into account can create an emotional connection with users, increase their engagement in the LMS, and create a more engaging and meaningful learning experience. By incorporating celebration-appropriate design elements, such as colors, images, and other visual elements, emotional designs can influence users' perceptions of and reactions to the learning environment, creating a more positive and memorable experience. Thus, the emotional design in the LMS that is influenced by the special celebrations in Indonesia has an important role in creating a user experience that is more connected to local culture and traditions, increasing student motivation and engagement,

From a rhetorical perspective, the system is considered as a medium of communication. As explained by Mamun, Lawrie & Wright (2020) in his essay, design is a form of conversation between the designer and the user in which every object placement, selection of materials, etc., is for utility and communication. Designers deliberately place signs and signals on artifacts to communicate with users. In the context of rhetoric and human-computer interaction, Iswatun, Mosik & Subali (2017) presented a communication model for the design and evaluation process in which he proposed a model with three components, namely the system designer, the system itself, and the audience, namely the intended users and the actual users. At the production stage, designers create proposals taking the intended users into account, and then the designs are evaluated by actual users, as shown by Iswatun et al. (2017).

De Sousa also takes a semiotic approach. HCI semiotic theory is explained by combining in the same communicative context the three sources of interpretation and communication involved in the design of interactive computer artifacts, namely the designer, the user, and the computer system. In this perspective, each computer artifact introduces a new signature in the user's universe; therefore, computer artifacts are generated through the processes of reasoning, selection, and communication. Thus, a rhetorical perspective in design views systems as a means of communication in which designers and users interact through the signs, signals, and artifacts that are created. Conversation between designer and user occurs through intentional design to meet utility goals and achieve effective communication.

In the context of UX design, rhetoric has traditionally been seen as a means of persuasive technology that directs users to take certain actions to achieve predetermined goals, as expressed by Bintang, Lubis & Nasution (2021). From a rhetorical perspective, there are three main components involved, namely the designer, the user, and the system or application itself. In the design process, rhetorical foundations are used to

form an effective communication strategy. Rhetoric in UX involves using signs, symbols, and messages to influence user perception, understanding, and action.

The designer acts as a communication leader whose aim is to convey messages and influence users by considering context, user needs and design goals. Users, as audiences, interact with the system or application and respond to the messages conveyed by the designer. Systems or applications become a medium that connects designers and users, conveys messages and facilitates interaction. In the UX design process, rhetorical foundations help designers to understand their audience, convey messages clearly and persuasively, and achieve defined goals. Designers use rhetorical techniques to build trust, influence emotions, and provide users with relevant information. In addition, rhetorical principles can also be applied in the selection of design elements, navigation structure, word choice, and interaction strategy to create an effective and satisfying user experience. Thus, rhetoric in UX plays an important role in shaping the interaction between designer, user and system. The rhetorical foundation helps the designer to communicate messages effectively, influence users, and achieve predetermined design goals.

Lupton and Ehses (1996) outlines that the design process from a rhetorical perspective consists of five stages. The first stage is discovery, which involves finding plausible arguments and supporting material relevant to the situation. At this stage, the designer selects the elements that will be part of the interface or system to be designed. The second stage is disposition, where arguments, organization, layout, and planning are organized. The third stage is selection, in which the suitability of formal language with arguments is considered, including the use of rhetorical figures of speech and figurative language. The fourth stage is recall, which involves understanding the material, assertiveness of presentation, and clarity of communication. The final stage is delivery, where arguments are presented, executed, and the appropriate medium is selected to convey the message.

Oliinyk (2021) comment on this stage. According to him, the discovery stage includes intentions, ideas, and the formulation of hypotheses about future performance. The disposition is responsible for the stage of developing and conveying the main ideas that are formulated and realized in the inventory. In the elocutio stage, the message acquires linguistic figurative expression as a result of additional substantive, evaluative, emotional, and volitional effects that correspond to the way the design elements are presented (French & James, 2016).

Finally, the delivery or action stage involves the process of pronouncing text or rhetorical broadcasting. In this context, Table 2 provides an overview and details of these stages, and their relationship to design from a rhetorical perspective. These stages assist designers in organizing arguments, designing effective design elements, and conveying messages clearly and persuasively to users. Thus, the design process from a rhetorical perspective involves interrelated steps to develop and convey an effective message. These stages assist designers in selecting and designing the right design elements, considering the use of appropriate language, and conveying messages clearly and persuasively to users.

In rhetoric, there are three modes of appeal, namely logos, pathos and ethos (Lupton & Ehses, 1996). Logos aims to appeal to reason and teach, pathos aims to appeal to emotion and move, and ethos deals with ethical appeals. As commented by Wahyurini (2018), logos refers to a rational argument or message, pathos refers to the emotions of the audience, and ethos refers to character or credibility. In the context of interactive systems, Sosa Tzec (2017) explains that the logos dimension relates to the definition and structure of the information displayed in the interface and functionality of a system or website. The ethos dimension focuses on the design quality of interface components and relates to the appearance and user perception of the component's functionality. Meanwhile, the

designers are responsible for the execution of these dimensions.

Table 2. Phases of Rhetorical Production

Traditional phases of rhetorical production	
Inventio	Concept development, finding relevant ideas, understanding the characteristics of the problem, selection of elements.
Dispositio	Organization, structure according to a grid, layout, depending on the communicative intention.
Memory	Stylistic options, expressions, how the arguments are presented. Use of rhetorical figures to provide greater expressiveness, according to the desired intention.
Elocutio	Full revision of the design for the production.
Actio	Execution and reception of the graphic discourse.
Inventio	Full revision of the design for the production.
Dispositio	Execution and reception of the graphic discourse.

Finally, the pathos dimension relates to the user's emotional reactions based on the interface components. In the design of interactive systems, it is important for designers to consider all three dimensions of attractiveness. Logos helps convey information clearly and provides a strong argument. Pathos affects the user's emotions, creates an emotional connection, and motivates the user's action or response. The ethos reflects the character and credibility of the system, which can influence the user's perception of the quality and reliability of the system. By integrating these three dimensions of attractiveness in the design of interactive systems, designers can create effective user experiences that meet users' needs and goals. Users will be involved intellectually, emotionally, and ethically, increasing the satisfaction and effectiveness of using the system. Lupton & Ehses (1996) explained that the rhetorical figures used can influence three modes of appeal, namely ethical appeal (ethos),

emotional appeal (pathos), and logical appeal (logos). Each of these modes of appeal has a role to play in impacting audiences in different ways. Ethical appeals emphasize beliefs and convincing character, emotional appeals focus on driving emotions and feelings, whereas logical appeals rely on arguments and logic.

According to Tseronis (2021), numbers also have significant rhetorical relevance. Numbers can convey meanings that help frame messages for specific audiences and specific situations through the combination of images and text that form semiotic resources. The use of numbers in design can provide pragmatic appeal associated with system functionality and also provide aesthetic pleasure associated with hedonic qualities. In all, the three modes of appeal in rhetoric, along with the use of numbers in the design, contribute to the functional and fun aspects of a system. This mode of engagement helps influence user perception and response to the system, increasing user engagement and satisfaction. In system design, it is important to consider the pragmatic needs and hedonic desires of users.

In the context of interaction design, the main goal is to create a pleasant and satisfying experience for users of a product. Wahyurini (2020) explained that this can be achieved by adjusting visual elements, such as text, font type, and images. Interaction design has an important role in influencing user perceptions and emotions stated that this went beyond basic document design issues. Visual rhetoric includes the use of visual elements, whether in the form of text or graphics, to create a connection between the author, the message and the audience. Effective use of visual rhetoric can strengthen communication and influence the user's response to the message conveyed.

Sosa Tzec (2017) explained that in an interactive system there are two relevant qualities, namely the quality of composition and the quality of experience. Composition quality relates to how the system looks in one, two, or more modes at a given point in the user experience. This involves the effective arrangement of visual elements,

layout structures, and presentation of information. Meanwhile, the quality of experience relates to the result of associating certain meanings with these points, based on the user's individual judgment. The quality of the experience reflects how the user associates meaning with design elements, and the extent to which the experience meets the user's needs, preferences, and goals. In interaction design, it is important to consider the quality of visual composition and user experience. Designers must think carefully about how the visual elements are arranged and related to the message they want to convey to the user. Good design creates a strong connection between the product and the user, resulting in a satisfying experience and meeting user expectations.

In the context of emotional design, Jacob-Dazarola, Martínez Torán, & Esteve Sendra (2012) proposed the concept of three levels of design that can affect users, namely visceral, behavioral, and reflective. The visceral level relates to the user's first impression of the appearance, shape, and visual impact of a product. The behavioral level relates to the functionality and effectiveness of product use, thus including product interaction and performance. While the reflective level involves aspects of identity, interpretation, and meaning formed through the use of the system or product. The integration of these three levels provides a pleasant experience for the user. Judge (2018) also holds a similar view, suggesting that in the design of a system or product, it is important to fulfill four stages involving functionality, reliability, usability, and fun. The functional stage refers to the performance and features provided by the system.

The reliability stage focuses on the stability and robustness of the system. The usability stage involves ease of use and satisfaction in interacting with the system. And the fun stage covers the emotional, fun, and satisfying aspects of the user experience. In system or product design, it is important to consider all these aspects. Designers need to create experiences that involve users emotionally (visceral), fulfill needs and provide good performance (behavioral), and produce relevant meanings and identities for

users (reflective). By meeting the four design stages of being functional, reliable, usable, and fun, designers can create positive and satisfying user experiences.

During the process of designing interactive systems, it is important to consider not only functional or pragmatic aspects, but also the pursuit of pleasure as part of the user experience. The hedonic aspect of user experience includes the satisfaction and pleasure felt by users in interacting with a product or user interface. The ISO/IEC 25010 quality norm also recognizes the importance of such aspects in achieving user satisfaction. In the context of an e-learning platform, aspects of utility, trustworthiness and fun need to be considered to achieve adequate user satisfaction.

The hedonic component is an integral part of user satisfaction and has a direct relationship with the level of user engagement and motivation when using e-learning systems (Rudolph, Thoring, Remfert & Vogl 2017). By paying attention to hedonic aspects in the design of e-learning systems, users can be more involved and motivated in the learning process. In order to increase user satisfaction, it is important for interactive system designers to pay attention to functional, pragmatic, and hedonic aspects. Users should feel that the e-learning system adds value and is fun in their learning experience. By optimizing the qualities of utility, trust, and fun, designers can create learning environments that motivate, satisfy, and meet user expectations.

According to Rudolph et al. (2017), the utility in LMS in physics education relates to the pragmatic goal of achieving the learning process in a simple and efficient manner. The focus is on the ease of use of the system to quickly achieve the desired learning outcomes. User trust is positively influenced by the ease of navigation in an LMS in physics education environment. Good design with consistent visual appearance, clear interaction elements, intuitive navigation, and consistent terminology can increase user confidence in using the system. Pleasure relates to the extent to which the user feels pleasure and personal satisfaction from the experience of using the system. If the

system or interaction can meet the user's personal needs and create pleasant memories, then the user's enjoyment level can increase. In designing an LMS in physics education, it is important to consider all these aspects, i.e. utility, trustworthiness and enjoyment, to achieve adequate user satisfaction. By paying attention to these factors, designers can create effective, efficient and satisfying user experiences in the learning process.

From this perspective, it can be assumed that utility, trustworthiness, and enjoyment in ISO/IEC 25010 are correlated with three modes of appeal: logos, ethos, and pathos. The logos appeal mode deals with the utility and pragmatic aspects of the system, while ethos focuses on building trust through design elements, attributes, and layouts that foster user confidence. Lastly, pathos is related to the user's enjoyment and excitement, and the use of appropriate rhetorical techniques can trigger positive emotions.By triangulating the concepts from ISO/IEC 25010 as proposed by Rudolph et al. (2017) with the modes of rhetorical appeal, as seen in Table 3, it becomes apparent that there are shared perspectives on the importance of utility, trust, and emotional alignment in shaping the user experience. Through this comprehensive approach, designers can optimize their systems or products to achieve high levels of user satisfaction in terms of functionality, trustworthiness, and emotional.

Table 3. Triangulation among ISO/IEC 25010 and Modes of Appeal

ISO/IEC 25010	Modes of appeal	
Utilities	Logos	Aims to reason, pragmatic
Trusts	Ethos	Aims to trust, credibility
Pleasure	Pathos	Aims to emotion, hedonic

Sosa-Tzec (2017) notes that many interactive systems today use graphical user interfaces (GUIs) to enable interaction with users. Visual elements such as images, layouts, sounds, fonts, text, animations, avatars and videos can be used as means of persuasion in the interface. In this context, the proper use of the three modes of attraction can help achieve the communicative goals desired by designers and produce pleasant user experiences in interactive systems. This also contributes to better fulfillment of user satisfaction. Figure 1 shows the UST Physics Education LMS interface with the theme of using emotional design in the context of the interactive system.

Figure 1. UST Physics Education LMS

METHOD

This study adopted a Design-Based Research methodology. According to Thomas et al. (2019), the main goal of a design-based research approach is to strengthen the link between educational research and real-world problems. This methodology aims to generate practical solutions that can be applied in real contexts. Figure 2 describes the steps followed in the Design-Based Research methodology approach.
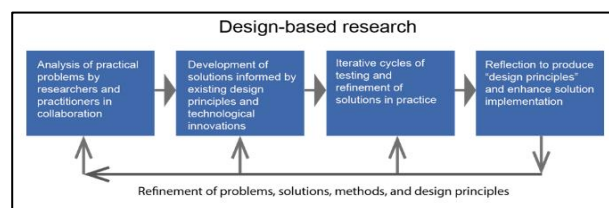

Figure 2. Design Based Research

In this study, analysis and solution development are carried out with reference to the literature review. Iterative test cycles are formed by getting feedback from experts. Based on the feedback, changes were made to the Moodle interface. Finally, an evaluation of the user experience is carried out using the User Experience Questionnaire (UEQ) (Table 3). UEQ has been used before in works like Santoso, Schrepp, Isal, Utomo & Priyogi (2016) and Sutadji et al., (2020). In works Salehudin et al., (2021), UEQ was used to evaluate visual media processing. Figure 3 shows the UEQ questionnaire.

The UEQ has two versions, a long version with 26 items that evaluate pragmatic qualities (clarity, efficiency, dependability) and hedonic qualities (stimulation, novelty). The short version has eight items evaluating overall pragmatic and hedonic qualities. In this study, an extended version of the UEQ is used which also evaluates attractiveness, i.e. the overall impression of the product. Data from UEQ were analyzed using Excel sheets. In the standard interpretation, a value above 0.8 indicates a positive rating, a value below -0.8 indicates a negative rating, and a value between 1.5 and 2 indicates very good quality (Santoso et al., 2016).

Figure 3. UEQ Questionnaire Items.
Source: https:www.ueq-online.org

The population of this study consisted of 122 students who used the Moodle LMS in physics education after November 1, 2021, after the intervention. The study sample consisted of 71 students aged between 18 and 25 years, including boys and girls, who answered the UEQ. To maintain confidentiality, no personal data is requested such as name or gender. This sample was selected with a 90% confidence level and a margin of error of 8.7%, according to equation 6.8.2 which is described in (Tekle-Haimanot et al., 2016).

To gain qualitative data that differs from the UEQ results and gain a deeper understanding of user reality, three open-ended questions were applied to Groups 1 and 2. The questions were: What do you think about the changes made to Moodle? Which changes did you like the most, or which did you dislike, and why? How do you feel about using Moodle? Two open-ended questions were also employed to Group 3, but here only the results of the second question presented, because the first has another purpose.

The question to ask is: In terms of the Moodle User Interface, what would you improve or what changes would you find more comfortable? Participant responses were observed to identify similar statements and themes, so that data triangulation can be carried out. Next, the Interactive System Rhetorical Evaluation (Azka, Purwandari & Sasono, 2017) was used to perform a rhetorical evaluation of the results of the data. Figure 4 shows the rhetorical evaluation process.

Table 4. Triangulation of UEQ Categories and ISO/IEC 25010

ISO/IEC 25010 as proposed by (Rudolph et al., 2017)	Modes of appeal (Lupton & Ehses, 1996)	UEQ categories
Utilities	Logos	Efficiency
Trusts	Ethos	Perspicuity dependability
Pleasure	Pathos	Stimulation novelty

RESULTS AND DISCUSSION

The main results of the UEQ, which include an assessment of each category resulting from the application of UEQ to students, can be seen in Table 5 and Table 6 which are presented.

According to the results of the UEQ analysis, it is evident that attractiveness, clarity, and efficiency are rated above average. Meanwhile, aspects of dependability, stimulation, and novelty are assessed below average criteria. This can be observed in the graph presented in Figure 5.
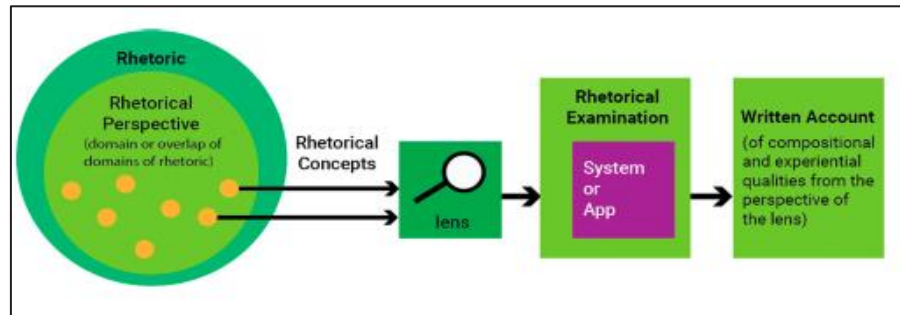
Figure 4. Rhetorical Evaluation of Interactive Systems
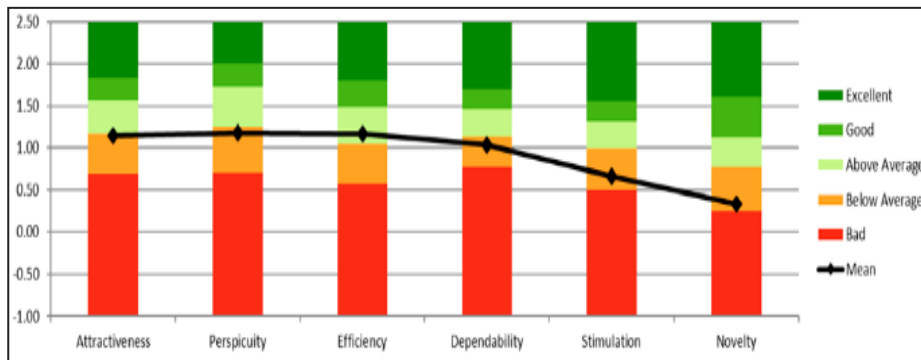
Figure 5. UEQ results

In the graph, the Y-axis represents variance, while the X-axis corresponds to the evaluated aspects. Regarding the measurement reliability, assessed through the Cronbach's Alpha coefficient, the values are as follows: 0.90 for the Attractiveness category, 0.78 for Clarity, 0.84 for Efficiency, 0.67 for Dependability, 0.75 for Stimulation, and 0.60 for Novelty. The majority of these scores indicate a reasonable level of consistency within the used scale.

Table 5. Results of UEQ

	All	Group 1	Group 2	Group 3
Attractiveness	1.15	1.30	1.30	1.65
Pragmatic quality	1.12	1.20	1.37	1.47
Hedonic quality	0.5	0.63	0.58	1.02

Table 6. Results of UEQ Categories and the Triangulation with ISO/IEC 25010

UEQ categories	ISO/IEC 25010	All	Group 1	Group 2	Group 3
Pragmatics					
Perspicuity	Trusts	1.16	1.40	1.25	1.45
Efficiency	Utilities	1.14	1.06	1.52	1.70
Dependability	Trusts	1.03	1.14	1.33	1.25
Perspicuity	Trusts	1.18	1.42	1.25	1.45
Hedonic					
Stimulation	Pleasure	0.66	0.81	0.57	1.18
Novelty	Pleasure	0.35	0.47	0.60	0.88

However, the Novelty category exhibits a lower coefficient, indicating potential issues with

the reliability of this aspect. It's important to note that Salehudin et al. (2021) and Santoso et al. (2016) have commented on the possible occurrence of misinterpretations in certain items within their research (Table 5 and 6).

In attractiveness mode, the login page's design is focused on enhancing system functionality, primarily achieved using logos. To establish a sense of trust, the login page incorporates institutional colors and logos, which contribute to building a reliable and credible atmosphere (ethos). Pathos, or emotional appeal, is conveyed on the login page through the thoughtful use of colors and images, creating an engaging and appealing experience. On the course page, the emotional appeal (pathos) is achieved by utilizing colors and course icons, aiming to evoke positive emotions and interest. This design choice adds a sense of excitement and enthusiasm to the learning experience, making the course content more appealing and engaging for the users (Table 7 and 8).

Table 7. Rhetorical Analysis of the Course Icon

Rhetorical stages	Analysis
Invention	The incorporation of a circular structure imbues the icon with the essence of pregnancy. The arrangement of four circles along the x and y axes signifies a closely interconnected group. Additionally, the inclusion of the play icon represents the virtual nature, implying interaction through a screen
Disposition	Circles are placed in an x and y axis; the play icon is centered.
Elocutio	Use of rhetorical
Memory	Image icon.
Actio	Redesign of the course icon

In appeal mode, the image structure situated at the top of the composition aims to grab attention through the logo and ethos which is revealed through organized language. It is assumed that the user has knowledge about one

of the most iconic festivals in Indonesia. The mode of pathos appeal is generated through the use of colors and elements related to the festival, as well as through the animations that are presented.

Table 8. Rhetorical Analysis of The Login Page

Rhetorical stages	Analysis
Invention	The use of institutional color and institutional logos of the UST, with the addition of an image on the login page, makes the login button more visible with a green color.
Disposition	The structure of the template was not changed. Logos on the top-left position. Image between the header and input fields (user and password).
Elocutio	Use of color, images, and institutional images (brand image).
Memory	CSS code and images, hosted on the server that has the Moodle LMS.
Actio	Redesign of the interface in the Moodle LMS.

According to the literature review contained in Table 1, there are various factors that can be used to implement emotional design, such as color, brand image, animation, image, personification, shape, layout, login page, sound, micro copying, cultural factors, genre, typography, and information architecture. It is important to understand that the use of these factors must be appropriate in the relevant context. In a rhetorical perspective, the findings show that a good understanding of the characteristics of the problem is very important. On the other hand, the evaluation results using the UEQ show that the pragmatic aspect is rated above the average, while the hedonic aspect is below average. These results are in accordance with student responses to open questions. For example, students agreed that the visual aspects had been improved, with some students describing it as more modern. They also mentioned that the experience of using

Moodle after the intervention was "pleasant" six times, and "comfortable" seven times.

In students' responses to open questions, several narrations indicated satisfaction with the changes made. Some examples are "I like the new one because it looks more modern", "The only change I noticed is that it looks nice", "The change in cover and layout of the front page makes it more pleasing to the eye", "Better order", and " The design and color palette used makes it feel more modern."

It is important to remember that the login page in a university LMS plays an important role as it is the entry point to the system and is often the main page. For Group 3, their responses to the open-ended questions indicated that in general they found the interface pleasant and intuitive. However, there were also students who expressed a desire to improve the design by making it more interesting and having usable didactic elements.

For the record, in Group 3, which got the highest score in hedonic quality, there was a professor as a respondent. This raises interesting questions for further research, namely the extent to which login images influence hedonic evaluation, and the extent to which instructional design influences the evaluation of user experience LMS in physics education. Thus, future research can dig deeper into these factors and gain a more specific understanding of the relationship between login images, instructional design, and evaluation of user experience LMS in physics education.

The results showed that the evaluation of the pragmatic aspects of user experience (UX) such as trust and utility tends to be better, while the evaluation of the hedonic aspects of UX is still below average. One factor that may have contributed to this is the Clean theme implemented in Moodle. The intervention takes place in the middle of the semester, and it is important to consider that changing the central Moodle theme that is already in use at that time can be confusing to users. Therefore, the intervention was carried out using the Clean theme which remained consistent with the existing theme.

Changes in themes in these interventions may not fully meet user expectations regarding hedonic aspects. Therefore, in future research, it may be necessary to make adjustments or improvements to design elements that contribute to the hedonic aspects of the user experience, such as colors, images, animations, and so on. Thus, it is hoped that the user experience in terms of fun and excitement can be further enhanced. It is important to understand that in interaction design, success depends not only on pragmatic aspects, but also on hedonic aspects that can increase user satisfaction and engagement. Therefore, it is necessary to carry out further research and experiments to improve and improve the design elements related to the hedonic aspects of UX in LMS in physics education,

The results of this study are consistent with some literature which suggests that there is a relationship between the visual appearance of a system and user satisfaction, trust, and enjoyment. Previous studies, such as Cyr (2013) and Rudolph et al. (2017), has also highlighted the importance of visual aesthetics in creating a more satisfying and enjoyable user experience. In this context, the use of a modern color palette and an orderly layout in the LMS in physics education is considered successful in increasing the user's perception of the impression of contemporariness and order. In addition, the use of a brand image that includes a campus image also provides a sense of community that is referred to by De Lera et al. (2013).

A logo position that is consistent with the traditional top left position also follows the findings Wrench & Paige (2019) which indicates that users are more likely to remember a logo placed in that position. These results indicate that well-considered visual design can have a positive impact on users' perception of the system and can enhance factors such as satisfaction, trust, and enjoyment. Therefore, it is important for designers to consider aesthetic aspects and appropriate layout in user interface design, so as to create a better and more satisfying user experience.

The results of the study show that the three modes of rhetorical appeal, namely logo,

ethos, and pathos, contribute to achieving functional, trust, and pleasure categories in user satisfaction described in ISO/IEC 25010 (Rudolph et al., 2017). Using a logo can help correct problems with poor visual design or a lack of functionality. Consistency of visual appearance and navigation also plays an important role in building user trust in the system. Overall, the Moodle user interface has elements and layouts that enable users to achieve their goals.

The use of rhetorical figures and emotional design factors can enhance the user's experience in terms of sadness or joy. As expressed by Wahyurini (2020), logos, ethos and pathos work together through images, layouts, fonts and animations in human-system interactions. The stages of rhetorical production, such as the selection of elements, structure and use of rhetorical figures, play an important role in achieving adequate user satisfaction. Sosa Tzec, (2017) states that rhetoric provides a framework for analyzing the relationship between composition, meaning, and emotion. It covers three categories of user satisfaction. The appeal mode and rhetorical production stages help improve the quality of the composition and the user experience.

In the context of physics education, these research findings provide a deep understanding of the importance of applying rhetorical concepts, namely logos, ethos, and pathos. Logos, which focuses on facts and logic, can be used by physics educators to provide clear and strong comprehension of complex physics concepts. Using logical arguments and strong evidence can assist students in understanding physics principles better. Furthermore, ethos, highlighting ethics and credibility, can be applied by educators by building their credibility as competent physics instructors.

This can establish trust among students in both the subject matter and the instructor, making them more receptive to the lessons. Lastly, pathos, involving emotions and appeal, can be utilized to make physics learning more engaging and motivating. Educators can create inspiring learning experiences, incorporating elements such as practical experiments, intriguing case studies, or even inspirational stories related to physics concepts. In practice, physics educators can implement these rhetorical concepts in curriculum design, content delivery, and instructional material development. This way, students will become more emotionally engaged in their learning process, enhancing their enjoyment in understanding and mastering physics. Through a thoughtful approach to these rhetorical concepts, physics education can become more effective and profound for all students.

The results of the study show that emotional design factors applied from a rhetorical perspective contribute to improving the quality of the user experience both from a pragmatic and hedonic perspective. In a literature review, factors such as color, images, animation, personification, and layout have proven to be very helpful in LMS in physics education design and emotional design implementation. In addition, the three modes of appeal, namely logos, ethos, and pathos, provide benefits in the design process.

From a rhetorical perspective, the results show that the emotional design factor has a positive influence on the quality of user experience in pragmatic and hedonic aspects. Literature studies show that design elements such as color, images, animation, personification, and layout play an important role in LMS in physics education design and emotional design implementation. In addition, the three modes of appeal, namely logo, ethos, and pathos, have a positive contribution to the design process. Evaluation using the User Experience Questionnaire (UEQ) helps in evaluating user satisfaction in the e-learning system according to ISO/IEC 25010 standards. It is important to remember that good user experience has a crucial role in the teaching-learning process.

CONCLUSION

The enhancement of the Moodle user interface for physics learning has a positive impact on the user experience, with support from qualitative approaches and rhetorical evaluation.

Emotional design involving ethos, pathos, and logos plays a crucial role in enhancing the pragmatic and hedonic qualities of the user experience. Applying a rhetorical perspective can guide the use of emotional design in learning management systems and other applications. Despite limitations, this research contributes to user satisfaction evaluation in LMSs and serves as a guide for designers to create effective and enjoyable interfaces for users.

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