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Chief Editors:
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Preface

Pioneering Educational Perspectives: Series 2025 is a collection of thought-provoking insights and research contributions exploring contemporary educational trends and practices. This eBook presents a diverse range of perspectives on innovative teaching methodologies, digital learning strategies, and transformative approaches in education. Designed to serve as a resource for educators, researchers, and practitioners, it aims to inspire meaningful discussions and advancements in the field. Through carefully curated chapters, this publication offers fresh ideas and practical solutions to enhance learning experiences in an ever-evolving educational landscape.

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Contents

e-FinLex (e-FINANCIAL LEXICON) 349

Umi Insyirah Pakasa[1], Joycelyne Anak Nyandang[2]*, Norazimah Mejri[3] & Azlan Yusof Punding[4] 349

PRESERVING AND PROMOTING *DONDANG SAYANG* THROUGH MUSIC TRANSCRIPTION AND EDUCATION 353

Md Jais Ismail[1*], Tee Yong Lai[2] & Vinisha Rajendran[3] 353

INNOVATIVE PROBLEM SOLVING AND VISUALIZATION LEARNING AIDS (PROVA) FOR EXTREMUM OF FUNCTIONS 358

Ng Set Foong[1*] & Foo Fong Yeng[2] 358

TIME TO ENGLISH (TTE): TYPES OF SENTENCE 362

Nur Fadzilah Muhamad Zamani[1]*, Ira Syaqira Sukimin[2], Norhafizah Amir[3], Shahira Adam[4] & Susanna Bithiah Varma[5] 362

EMPOWERING STUDENTS WITH THE 4P'S SOMA FRAMEWORK: A NEW APPROACH TO CRITICAL THINKING AND REFLECTIVE LEARNING 366

Arenawati Sehat Binti Omar[1]* & Zalina Binti Mohd. Desa[2] 366

INNOVATIVE ANDRAGOGY: LEVERAGING AI AND ONLINE PLATFORMS TO ENHANCE ADULT LEARNING OUTCOMES 372

Hamidah Md Yusop[1*] & Zoel-Fazlee Omar[2] 372

MOOC WAVES AND OPTICS 376

Mohd Zaki Mohd Yusoff[1]*, Muhammad Firdaus Othman[2], Suraya Ahmad Kamil[3], Siti Zafirah Zainal Abidin[4] & Zalina Zainal Abidin[5] 376

PADLET UNBOXED: THE DIGITAL ENGAGEMENT EXPERIENCE 379

Nur Shuhada Ya'acob[1*] 379

CTU EASY ACCESS CENTER 383

Syaimak Ismail[1]* & Azhar Abdul Rahman[2] 383

KAEDAH ORANG LIDI (PIK) DALAM PENULISAN KARANGAN BM SPM KSSM 387

Mohamad Jalil bin Mohamad Yunus[1*] & Norhayati binti Mat Ali[2] 387

UTILIZING MOOCS FOR HOLISTIC LEARNING IN HALAL CERTIFICATION STANDARDS AND QURANIC AND HADITH COURSES 392

Nurulaina Saidin[1]*, Mohd Ashrof Zaki Yaakob[2], Fadilah Abd Rahman[3] Mohd Asmadi Yakob[4] & Hanifah Musa Fathullah Harun[5] 392

DbAPedia – LEARNING PLATFORM FOR DATABASE ADMINISTRATION COURSE 396

Norshadila Ahmad Badela[1*] & Mohd Noor Halmy Ab Latif[2] 396

ENGINEERING DESIGN: A GUIDE TO FINAL YEAR PROJECT (FYP) 400

Matzaini Katon* & Norhanifah Abdul Rahman 400

ENHANCING HTML LEARNING THROUGH REAL-TIME OPEN-SOURCE TOOLS 404

e-ISBN: 978-967-0033-31-0

INNOVATIVE PROBLEM SOLVING AND VISUALIZATION LEARNING AIDS (PROVA) FOR EXTREMUM OF FUNCTIONS

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ABSTRACT

The Innovative Problem Solving and Visualization Learning Aids (ProVA) is designed to address the challenges students face in mastering the concept of extremum points (maxima and minima) in functions—a key topic in calculus and optimization. Traditional teaching methods often fail to provide an intuitive understanding of these complex mathematical concepts, leaving students struggling with problem-solving and visualization. ProVA offers a comprehensive solution by integrating three key components, i.e., virtual tutoring via YouTube, interactive 3D visualization using the Desmos 3D Graphing Calculator, and customizable problem-solving with Symbolab's Problem Solver. These platforms collectively enhance students' learning experiences by offering personalized, interactive, and engaging content that bridges the gap between theory and practice. ProVA's unique approach not only deepens comprehension but also adapts to individual learning styles, making complex concepts more accessible and enjoyable. The product has significant commercial potential in the growing digital education market, appealing to educational institutions, online learning platforms, and individual learners. Ultimately, ProVA seeks to improve mathematics learning by equipping students with the skills necessary to excel in advanced academics.

KEYWORDS: Innovation product, Extremum of functions, Virtual personalized online learning, Mathematics

PROBLEM AND OBJECTIVE

In modern education, the need for effective teaching and learning aids that enhance students' understanding of complex mathematical concepts is crucial (Susanti & Suripah, 2021). One such area is the study of extremum points (maxima and minima) of functions, which is a foundational concept in calculus and optimization (Yaroslav *et al.*, 2024). Traditional teaching methods often fall short in providing students with a deep, intuitive grasp of these concepts. Students often find difficulty in solving problems and visualizing the solutions in relation to the topics of extremum of functions. Moreover, students need to repetitively revise the lessons to deepen their understanding.

The objective of this innovation product, Innovative Problem Solving and Visualization Learning Aids (ProVA), is to address this gap by leveraging interactive digital platforms. This approach aims to deepen students' comprehension of extremum functions through a combination of 3D visualization, customizable mathematical functions, and virtual tutoring, offering a comprehensive and personalized learning experience.

DESIGN DESCRIPTION

The innovative learning ProVA product is built on three key components, each integrated into a seamless educational journey, i.e., Virtual Tutor Sessions, Interactive 3D Visualization with

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Dynamic Graphing, and Customizable Mathematical Functions with Guided Solutions. The targeted audience of this product is those mathematics, engineering, and computer science students who learn calculus and find difficulty in understanding the topic of extremum functions.

The ProVA product begins the learning process by visiting the recorded videos in YouTube. YouTube serves as a platform for virtual tutor sessions, providing video tutorials that delve into the theory and application of extremum analysis. These videos are created by authors which provide visual demonstrations. The content is designed to offer additional context and allows students to revisit and reinforce their knowledge as needed.

The next key component of the ProVA product is to utilize the Desmos 3D Graphing Calculator. This platform allows students to visualize and interact with three-dimensional graphs of functions. This tool provides an immersive environment where students can manipulate graphs by rotating and zooming in on 3D plots. Through dynamic graphing and interactive sliders, students explore how extremum points change with varying parameters, enhancing their understanding of multi-variable functions.

The third key component of the ProVA product is to employ the Symbolab's Problem Solver as a pivotal role by offering step-by-step solutions to mathematical problems, including the determination of extremum points. Students can generate different mathematical functions tailored to their learning syllabus, focusing on specific functions. Guided solutions, interactive tutorials, and instant feedback help reinforce the learning process, making complex concepts more accessible.

The selling point of the ProVA is its ability to offer a highly personalized, interactive, and comprehensive learning experience that effectively bridges the gap between theoretical mathematical concepts and practical understanding. Through the integration of virtual tutoring, 3D visualization, and customisable problem-solving into a unified teaching approach, students may grasp complicated topics such as extremum points in a comprehensive way that is not possible with traditional approaches. This approach not only enhances learning outcomes but also makes the process more engaging and adaptable to individual learning styles.

VISUALS

The approach integrates visually rich content through engaging video tutorials, step-by-step problem-solving interfaces, and interactive 3D graphs. YouTube tutorials combine animations and visual examples to solidify understanding (Figure 1). The Desmos 3D Graphing Calculator provides students with dynamic visualizations of functions in a three-dimensional space, allowing them to explore and manipulate graphs to understand the behavior of extremum points (Figure 2). Symbolab's interface presents clear, annotated solutions that guide students through the process of finding extrema (Figure 3).

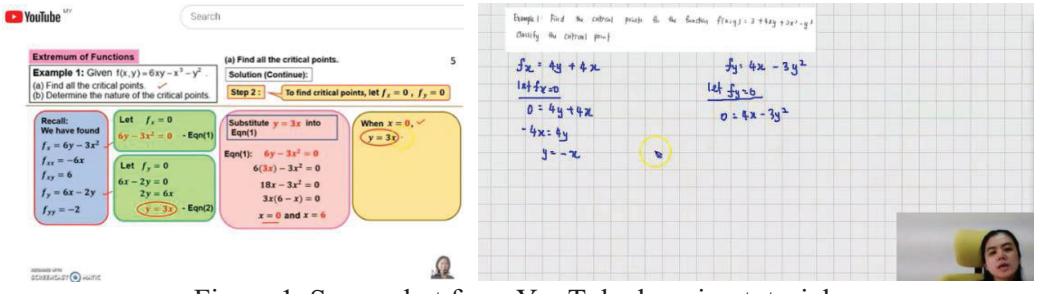


Figure 1. Screenshot from YouTube learning tutorials

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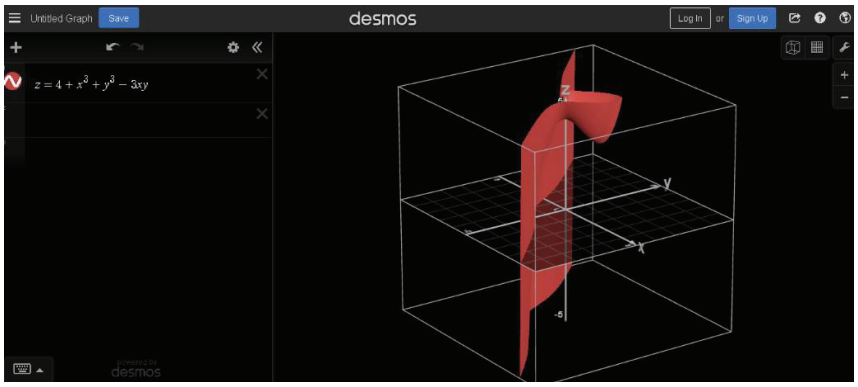


Figure 2. Three-dimensional visualizations of functions using Desmos 3D Graphing Calculator

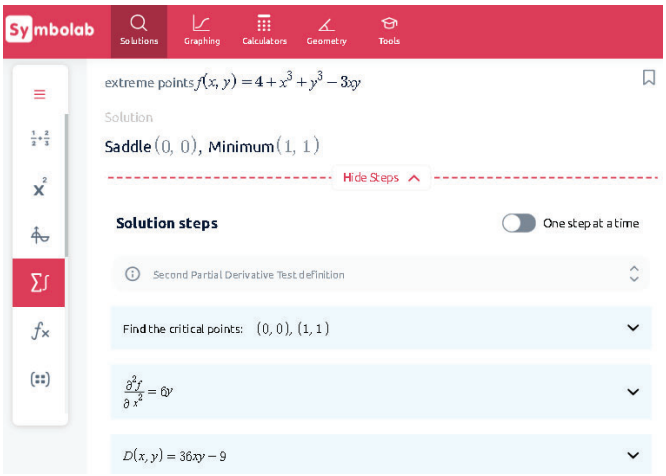


Figure 3. Customizable Learning Sets with Guided Solutions in the Symbolab's Problem Solver

NOVELTY AND UNIQUENESS

The uniqueness of this innovative ProVA product lies in its integration of multiple online platforms, each specializing in a different aspect of learning. By combining 3D visualization, customizable problem solving, and virtual tutoring, the approach offers a holistic learning experience that goes beyond traditional methods. The interactive and personalized nature of these tools allows students to engage with the material in ways that are tailored to their individual learning styles and paces, making the learning process both effective and enjoyable.

BENEFITS TO MANKIND

This innovative product has the potential to significantly enhance mathematical education, particularly in understanding complex concepts like extremum points. By providing students with the platforms to visualize, practice, and apply these concepts, the approach helps build a strong foundation in mathematics, which is essential for various fields including engineering and the sciences. The personalized and interactive nature of the learning experience helps students more effectively grasp the theoretical concepts of challenging mathematical topics, making the learning process more enjoyable.

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COMMERCIAL POTENTIAL

The commercial potential of this product is substantial, given the growing demand for online educational tools that offer interactive and personalized learning experiences. Educational institutions, online learning platforms, and tutoring services can adopt and integrate these tools to enhance their curriculum and offerings. Additionally, the approach can be marketed to individual learners and parents seeking effective educational resources, making it a valuable product in the digital education market.

CONCLUSION

The ProVA represents a significant advancement in mathematical education. By integrating interactive 3D visualization, customizable problem-solving tools, and virtual tutoring, this approach offers a comprehensive and personalized learning experience that deepens students' understanding of extremum points in functions. The novelty, benefits, and commercial potential of this approach make it a valuable contribution to the field of education, providing students with the skills and knowledge needed to excel in advanced mathematical challenges.

REFERENCES

Susanti, W. D., & Suripah, S. (2021). The effectiveness of website as a mathematics learning media during the online learning period. Edumatica: Jurnal Pendidikan Matematika, 11(01), 73-83.

Yaroslav, K., Oksana, T., Olena, K., & Olena, S. (2024). Studying the topic of the function extremum of two variables in the conditions of remote learning and application of digital technologies. *International Journal of Computer Science and Network Security*, 24(1), 1-8.