Igniting the Engineering Educators and Learners through Heutagogy, a Transformative Learning

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***Abstract*—The paper proposes that engineering education should incorporate heutagogy, which emphasizes learner autonomy, self-direction, and real-world relevance, in order to improve critical thinking and practical application. Traditional pedagogical methods alone would not suffice for developing these skills. The authors suggest using the Empathy, Determined Learning Activities, and Assessment (EDLAA) model to promote heutagogical practices. They present two case studies in Applied Digital Logic Design and Computer Organisation (ADLDCO) and Principles of Programming with C (PPC), which demonstrate the efficacy of pedagogical techniques such as self-directed projects, design thinking, and collaborative activities. Jigsaw puzzles, peer-supported independent study (PSIS), open book/internet tests, virtual labs, and experiential learning are all cited as effective ways to increase student engagement, critical thinking, and practical application. Overall, pedagogical approaches foster deeper learning, practical skills, and better preparation for real-world challenges, proving effective in enhancing both academic performance and student engagement. Hence Heutagogy, a transformative learning is a function of factors like Learning objectives(LO) , Excitement(E), collaborative activities(CA) and technology(T) Time Management(TM) and critical thinking(CT). Assessment is the key factor in identifying the skills attained. Feedback from these case studies indicate improved student performance with joyful learning.**

***Keywords*—Andragogy; heutagogy; Jigsaw; Peer Supported Independent Study.**

***ICTIEE* Track*:* Pedagogy of teaching and learning**
ICTIEE Sub-Track: Inquiry-Based Learning in Fostering Curiosity and Critical Thinking among GenZ

I. INTRODUCTION

FACULTY face challenges in promoting active learning, balancing student engagement, critical and creative. Andragogy is geared towards adult learners, emphasizing learner-centered methods that build on prior experiences, promote self-direction, and adapt to individual needs for practical application. Heutagogy or self-determined learning, encourages learners to direct their own educational processes, fosters independence, and aligns learning with personal and real-world contexts. Each framework offers unique strategies for improving learning outcomes, with heutagogy being particularly well-suited to developing higher-order skills and real-world applications.

Colleen. (2015) Heutagogy, also known as self-determined learning, goes a step further by emphasizing greater learner autonomy. It encourages learners to set their own goals, select methods, and evaluate their progress, making it ideal for rapidly changing fields and lifelong learning. It goes beyond andragogy by emphasizing increased learner autonomy and self-direction, as well as self-regulation, adaptation, and the pursuit of personal learning objectives.

Engineering faculty frequently use traditional pedagogical methods out of familiarity, despite the fact that these techniques are better suited to younger learners. While pedagogy encourages class participation, it falls short of developing critical thinking skills and practical application of theories. Andragogy, which uses problem-based assessments, may be more effective for older learners, but it is rarely used.
Heutagogy, which emphasizes self-directed learning, provides a solution by empowering learners to plan and manage their own projects, apply theoretical knowledge practically, and conduct independent research. This approach promotes the development of higher-order thinking skills as well as practical application, thereby meeting industrial and research needs. Heutagogy encourages initiative, self-motivation, and resilience, while peer learning enriches the experience through

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collaboration and a variety of problem-solving approaches. Switching to heutagogical practices can better prepare engineering learners for real-world challenges and long-term success.

A. *Need for Heutagogy:*

Engineering learners, having passed rigorous entrance exams such as the JEE and COMEDK, expect to build on their foundational knowledge and advance their education. At this mature stage, heutagogical practices that emphasise self-directed learning are extremely beneficial. These learners perform better with facilitation and guidance than with traditional methods such as lectures and PowerPoint presentations. When given autonomy, learners frequently surpass their limitations and excel in their learning, as evidenced by my own experience of mastering a skill through independent practice. Self-directed learning approaches benefit Generation Z learners, who are technologically adept and quick to grasp new concepts. Connecting them with industry experts and involving them in research or consultancy projects improves their practical application while also providing valuable insights. Instructors play an important role in facilitating these connections, which fosters greater student autonomy and success.

B. *Need for leveraging technology*

Heutagogical teaching necessitates instructors serving as role models for critical thinking and problem solving. Educators must create an environment that promotes critical thinking and collaboration, guiding learners through complex problems, integrating diverse information sources, and encouraging creative solutions. Historically, during the Dwaapara and Threta yugas, people were able to excel in their passions with the help of effective Gurus. However, given today's exponential growth in population and learners, providing education to all is a challenge. Using technology is critical to meeting this demand. Both educators and learners must be familiar with digital tools and learning management systems. Teachers must embrace new technologies, explore social media, and implement active learning strategies such as problem-based learning, design thinking, and collaborative activities like Jigsaw puzzles, open book tests, and Peer Supported Independent Study. Self-reflection through daily learning journals enhances this process. Strong communication skills are required for effective teaching in order to engage learners, clarify complex ideas, stimulate critical thinking, and facilitate discussions. Teachers should foster a collaborative learning environment and encourage learners' curiosity while giving them autonomy in setting their own goals and selecting materials. Learners should practise active listening and comprehension by engaging with material other than presentations to improve their assimilation skills. The paper is organised as follows: Section II examines the literature on heutagogy, including its need, implementation, and challenges; Section III describes the design and implementation of heutagogical practices; Section IV presents findings and discussions; and Section V draws conclusions.

II. LITERATURE REVIEW

This section focuses on reviewing papers on how to adapt heutagogy, its implications, challenges and advantages.

Blaschke (2021) This study explores how heutagogy, or self-determined learning, integrates with modern technology to enhance lifelong learning. It reviews literature and offers practical advice on fostering student autonomy, but lacks empirical data and detailed analysis of specific technologies and challenges. It provides a useful framework for researchers and educators.

Wismaningrum et al (2023) The paper highlights the benefits of heutagogy in management education, emphasizing its value for both organizations and individuals. It reviews literature on heutagogy and learning theory, advocating its integration with traditional methods. The paper provides practical examples of its application across various educational and organizational settings.

Lock, J et al(2021) Investigate the use of heutagogical concepts in developing technology-enhanced experiences for lifelong learning. To facilitate continuous learning, the article provides a comprehensive framework for combining heutagogy (which emphasises learner autonomy and self- direction) with cutting-edge technology tools. The authors skilfully demonstrate how technology can support student engagement in a setting of lifelong learning and enable tailored learning pathways. The article, which demonstrates how heutagogical ideas can be implemented across a variety of technical platforms, is packed with useful examples and insights. Though the theoretical explanation is sound, the study could benefit from more case studies or empirical data to show how these tactics work in real-world situations. Overall, the paper contributes significantly to the field by integrating

Natalie Canning (2010) examines how heutagogical strategies can improve older learners' learning experiences by encouraging autonomy, self-direction, and reflective practices. Provides practical insights and case studies that demonstrate the efficacy of these strategies in supporting mature learners, adding valuable perspectives to discussions about innovative pedagogical approaches in higher education. The work is highly regarded for its thoughtful examination of heutagogy and its potential to address the specific needs of mature learners, making it an important contribution to the field of educational research.

Krishnazyber. (2024): The concept of heutagogy is explored with a focus on its relevance to modern learners known for their adaptability and self-direction. They explain heutagogy's theoretical foundations and distinguishing it from other learning paradigms such as pedagogy and andragogy. It demonstrates how heutagogy, which emphasises self-directed learning, can meet the needs of today's learners, who expect greater independence and adaptability from their education. The discussion is bolstered by insightful theoretical analysis and provides practical suggestions for implementing heutagogical techniques in a variety of educational contexts. However, to demonstrate how these tactics have been successfully used in

actual situations, the study would benefit from the addition of case studies.

Albers (2017) investigates the application of heutagogical principles and brain-based learning theories to improve transformative learning experiences. The paper investigates how heutagogy, which focuses on learner autonomy and self-directed learning, can be effectively combined with neuroscience insights to create more engaging and impactful educational environments. Albers claims that this synthesis promotes deeper learning and personal transformation by leveraging both the learner's intrinsic motivation and the brain's natural learning processes. The presentation is praised for its innovative approach and practical implications, providing educators with a compelling framework for applying modern educational theories to foster meaningful and transformative learning experiences.

Rhew1 et al.,(2018)According to the study, having a growth mindset—believing that one can improve oneself through hard work—helps learners' self-esteem and motivation to overcome obstacles. The study employs sound methodology, assessing the consequences via surveys and interventions. The findings provide instructors with valuable information for improving student performance and engagement. A larger sample size and a longer follow-up period would, however, improve the study's ability to assess the long-term effects of growth mindset therapies. Overall, the paper provides compelling evidence supporting the incorporation of growth mindset concepts into instructional strategies.

Ron Mhel Francis L. Blanco(2021) investigates the use of the Feynman Technique within a pedagogical framework for independent and remote learning environments. Discusses how combining this technique with heutagogical principles like learner autonomy and self-direction can improve the efficacy of self-directed and remote learning experiences. The paper argues that by utilizing the Feynman Technique, learners can improve their understanding of complex subjects while also increasing engagement and retention in remote learning contexts. This is presented as a practical way to support independent learners by encouraging active learning and critical thinking.

Stahl, (2002) discovered that solving problems independently releases neurotransmitters like adrenaline and dopamine in the brain, leading to feelings of excitement. Socrates was likely aware of the impact of asking relevant questions on learning, albeit intuitively rather than scientifically.

Sagarin et al. (2002) Tormala & Petty (2002), these researchers found that persuasion causes hormones to be released, leading to resistance.

According to the review, we need to look beyond pedagogy and andragogy as heutagogical approaches help develop critical thinking and grow holistically.

III. Design Model / and Implementation of Heutagogy in Practice

A model for practicing heutagogy is detailed in figure 1. To implement heutagogy, this model was followed (E*DL*AA) Empathy, Determined learning, Activities and Assessment.

1. Empathy phase: empathize with the learners to identify the learning styles and interest of the learners
2. Determine Learning.-. During this phase, the learners and teachers collaborate to determine the learning needs and desired outcomes.
3. Activity: Conduct collaborative activities
4. Assessment: Transparent assessment with effective rubrics.

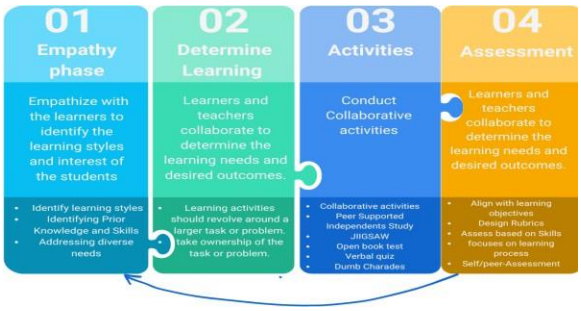

Fig. 1. Empathy, Determined learning, Activities and Assessment model (ED_LAA)

Fig 1 depicts the Empathy, Determined learning, Activities and Assessment model with a single loop which depicts that instructor can go back and reassess the procedure /techniques followed. The implication of this model was implemented as case studies inclined to the ED_LAA model.

A. *Case Studies*

Case study 1: For the batch of 2022-26, during the academic year 2023-24, an experimentation on activity based learning was conducted for the course Applied digital logic design and computer organization course (ADLDCO) of 3rd semester learners. Class strength was 60. After getting to know the learners and their interests, they were exposed to a few activities that provided them with a platform to demonstrate their potential as well as to be fully engaged in the learning process, allowing them to think from the perspectives of the teachers. To list a few Jigsaw, Peer supported independent study (PSIS), open internet/book test, Design thinking (DT). A brief description of each of the activities conducted are given below:

1) Collaborative activities

Collaboration Activities in Engineering Education are:

i) Jigsaw Activity: In this activity, learners were divided into six teams of ten people each, with the goal of understanding and teaching various topics in Binary Arithmetic, such as overflow and underflow, Booth's algorithm, and sequential binary multipliers. Each team selected a unique topic, researched it, and then creatively presented it to the class. This approach enabled comprehensive topic coverage and provided the instructor with insights into learners' learning processes while promoting student autonomy in the classroom.

ii) Peer Supported Independent Study (PSIS): This activity aimed to strengthen independent learning and accountability. Learners investigated topics related to Computer Organization, including the structure of computers and memory design, using resources such as YouTube videos and PowerPoint presentations available on the LMS. They could also seek additional resources based on their learning preferences. This method encouraged self-directed learning while providing a framework for structured study.

iii) Open internet/book test (in a team of two) to encourage thinking and collaborative learning. The Open Internet/Book Test, which was conducted in pairs, aimed to promote collaborative learning and critical thinking. Learners participated in discussions rather than browsing internet to answer higher-order thinking questions. They also helped with question preparation, which improved their understanding and encouraged active participation. Discussion with their peers gave them very good insights and ideas.

This activity involved investigating challenges in concepts from Applied Digital Logic Design and Computer Organisation. Learners followed the nonlinear steps of DT, which included empathy, problem definition, ideation, prototyping, and testing. They selected topics, investigated them, identified stakeholders, and created prototypes. DT helped learners gain a better understanding of problems and solutions by incorporating different perspectives and innovative ideas. Planning and Time management are two important factors, the timeline is depicted in fig 2.

The 3 months of the semester are divided into 6 segments of 2 weeks each as shown in the timeline in Figure 2 for practicing the heutagogy. The semester is kicked off with a brainstorming session with the learners to know them and their learning styles. Followed up with the JIGSAW activity concluding the first segment. In the 2nd segment, learners were introduced to DT and EL by the conduction of orientation sessions. During the course of the next several weeks learners can work on their projects which will be evaluated in the 6th segment. PSIS activity is conducted in the first week of the 4th segment and then the open book test in the 5th segment.In this paper, two case studies are discussed inclined towards the proposed EDLAA model. Timeline for case study1 is shown in figure2.

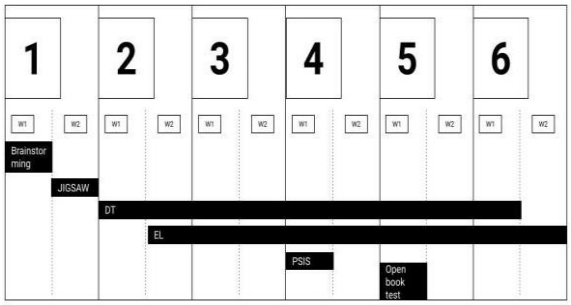

Fig. 2. Time line for Casestudy 2

Fig 2 depicts the timeline for Case study 2: For the batch of 2023-27 for the academic year 2023-24 In the second semester course on Principles of Programming Using C, a class of about 60 learners participated in a variety of activities designed to improve learning. At the beginning of the semester, brainstorming sessions were held with second-semester learners to determine their learning styles and needs. This collaborative effort resulted in the development of several engaging activities designed to improve learning outcomes.

1). Activities planned included:

- Dumb Charades are used to creatively demonstrate programming concepts.
- Analogy building aims to simplify complex ideas through relatable comparisons.
- Open Book Test: Encouraged the application of knowledge in a practical setting.
- Virtual Labs: Offers hands-on coding experience in a simulated environment.
- Verbal/online quizzes: Tested comprehension and reinforced learning.
- Logical Puzzle Solving: Improved problem-solving abilities and logical reasoning.
- Practice tests provided additional preparation and self- assessment opportunities.
- Crossword puzzles: Helped to reinforce terminology and concepts.
- Coding Exercises: Enabled the practical application of programming skills.

These activities were chosen to accommodate a variety of learning styles while also providing a comprehensive learning experience in C programming.

i) Dumb charades: programming terms were enacted by learners and their team members guessed the words who then came up with programs related to the topic and rest of the class were asked to code in teams of three.

ii) Analogy building: Learners were asked to relate programming concepts with real life examples. For example, looping was analogous to the daily routine/clock cycle, stack was better understood as a pile of books, wearing bangles on the hand. This improved the understanding of concepts in learners.

iii) Open book test: Problem statements were

given to learners, they came up with solutions in team of 6. Learners could use the concepts learnt in class along with access to materials in solving the problem. This instilled values like critical/creative thinking, coordination and cooperation within the team members in developing solutions.

iv) Virtual labs: Vlabs from IIT Karagpur-Assignments were given to the learners which helped in better understanding of concepts taught in class. This also helped learners to practice their programming skills and explore new avenues.

v) Verbal/online quizzes: this was conducted after each concept taught. Learners were evaluated based on their understanding of the concepts taught in class and built competitive spirit and time management skills.

vi) Logic puzzle solving: Logic puzzles were given to learners to enhance their skills in figuring out multiple solutions for a problem. Different solutions and their efficiencies were discussed.

vii) Practice tests: Practice tests were given to enhance learners performance in internals.

viii) Crossword: Crosswords were given to help the learners in better understanding of concepts to improve analytical thinking.

ix) Coding contest: As a part of lab EL learners were given.

x) Experiential Learning:Learners were free to choose any topic of their choice for the theme selected and had to team up with learners of other branches to execute interdisciplinary projects. They collaborated effectively to share their ideas and expertise to arrive at the solutions.

2). Outcome of these activities:

These activities collectively aimed to strengthen learners' understanding of C concepts, improve their ability to utilize resources effectively, and enhance critical thinking and problem-solving skills. Together, these activities helped mould both theoretical knowledge and practical skills in a creative manner, exhibit good team dynamics, Peer learning, presentations skills, time management, aligned to the learning outcomes, and innovative solutions.

Use of the tools like Learning management system, quizizz, google classroom, wheel of names, Padlet etc helped inubiquitous access, effective delivery and ease of use.

IV. RESULTS AND DISCUSSION

This section shows the feedback collected for the case studies conducted.

Case study 1:

xi) Feedback on PSIS activity

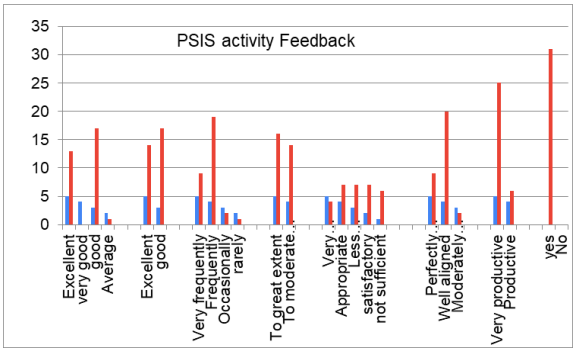

Fig. 3. PSIS activity feedback

Fig 3 depicts the PSIS activity feedback. Inference from the graph: 31 learners have provided the feedback. The graph visually summarizes the feedback collected, offering a clear overview of the respondents' opinions. It reveals key trends and highlights, such as which aspects received the highest and lowest ratings. For instance, the data shows that users were particularly satisfied with certain features while expressing concerns about others. Patterns in the feedback indicate areas of strength and opportunities for improvement. This graphical representation helps in quickly understanding the specific points of interest. Overall, it provides actionable insights for enhancing future efforts based on the aggregated feedback.

xii) Feedback on Open Book /internet test

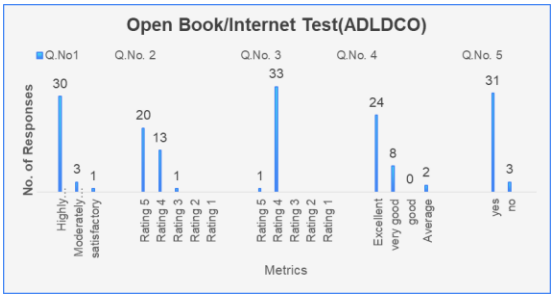

Fig. 4. Feedback on Open Book /internet test

Fig 4 shows the open book/ internet test feedback. Around 34 have provided the feedback. Learners reveal a strong positive response to the open book/internet test. Most respondents highly value the test and believe it is useful for gaining knowledge and skills. The team activity is rated positively, and the complexity of the questions are generally well-regarded. The majority agree that the time allotted was adequate.

Case study 2: Feedback for the activities conducted in the class for PPC course

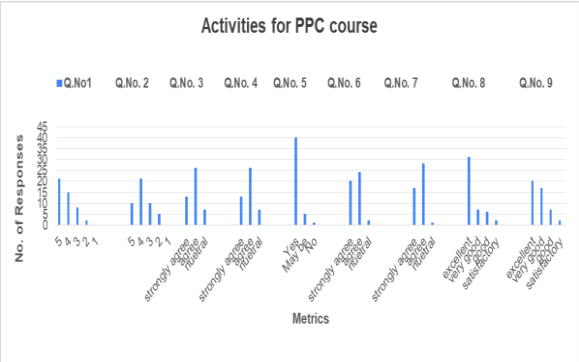

Fig. 5. Feedback for the activities conducted in the class for PPC course

Fig 5 shows the feedback for the activities conducted for first year learners for the course programming in C.

Around 46 learners have given the feedback, Inference from the feedback and the skills developed is shown in table 1 below:

TABLE I
SKILLS DEVELOPED FROM THE ACTIVITIES

Activity	Skills Developed	Feedback Summary
Regular Online Quizzes	Reinforcement of concepts, self-assessment	Highly valued; majority rated 4 or 5.
Lab Programs	Practical understanding of concepts, hands-on experience	Mixed feedback; varying effects on comprehension.
Logical Puzzle Solving	Critical thinking, problem-solving	Positive feedback; enhanced critical thinking Skills.
Dumb Charades	Engagement, learning balance	Well received; balanced learning and classroom Liveliness.
Open Book Test	Application of theoretical concepts, practical understanding	Strong appreciation; confirmed applicability of concepts.
Assignments	Deeper understanding of concepts	Well received; helped in understanding concepts more clearly.
On-the-Spot Quizzes	Immediate knowledge recall, reinforcement	Positive feedback; effective for learning reinforcement.
Group Coding Activity	Collaborative skills, practical coding experience	Positive feedback; highly effective in improving Learning.

The feedback indicates that regular online quizzes were highly valued for reinforcing concepts, with the majority of learners rating them 4 or 5. Lab programs and logical puzzle activities received mixed feedback, indicating varying effects on comprehension and critical thinking. The dumb charades activity and open book tests were well received, with a strong appreciation for their contribution to learning and the practical application of theoretical concepts. Group coding activities and in-class quizzes were also well received, demonstrating their effectiveness in improving learning. Overall, the activities and assessments are viewed as beneficial and engaging. This feedback will help to mend the activities and our approaches, there is a scope for improvement. This gave good insights to plan the next course of action.

The feedback questions for case study 1 and 2 are furnished in the Appendix.

Impact/outcomes of practicing heutagogy: Heutagogy can result in a more dynamic and responsive learning environment, providing learners with the skills and mindset required for ongoing personal and professional development. Results of SEE exam were examined and the student scores are as follows: ADLDCO-CS234AI CSE B section (3rd semester) class strength 67 Pass % 94.5 for the batch of 2023-24

The findings from the case studies on implementing heutagogical practices in engineering education are consistent with previous research on active learning, self-directed learning and collaborative approaches. Group coding, quizzes, and open book tests increased student engagement, critical thinking, and problem-solving abilities. Positive feedback emphasized the practical application of theoretical concepts, whereas mixed feedback on lab programs and logical puzzles identified areas for improvement.

TABLE II
GRADES OF LEARNERS FOR ADLDCO-CS234AI

GRADES	O	A+	A	B +	B	C	P	F
CIE	20	29	12	6				0
SEE	14	25	17	7				4

ADLDCO course is more of a logic and numerical oriented in which appropriate and optimal logic must be applied to solve problems. Practicing all of these techniques not only helped learners get good grades as depicted in table 2(Grade description is provided in the Appendix), even skills have improved, learners have publishing papers, built innovative solutions, participated in conferences etc.

For the programming in C Course, Awaiting SEE results and their CIE grades were very good. Learners say that they had deeper insights into coding because of the activities practiced in class. Collaborative activities gave them a platform to exchange ideas with their peers and contributed to more innovative solutions. From this we can derive the heutagogy(H), a Transformational Learning(TL) as a function of Learning objectives(LO) , Excitement(E), collaborative activities(CA) and technology(T) Time Management(TM) and critical thinking(CT), can be represented as H-TL=f(LO, E, CA,T,CT, TM)

Discussion: Our findings have important implications for improving engineering education because they demonstrate how heutagogical practices can significantly improve student learning outcomes. By incorporating self-directed learning strategies such as group coding activities, quizzes, and open-book tests, students gained a better understanding of complex concepts like C programming and applied digital logic design.

These activities encouraged critical thinking, problem-solving, and collaboration, all of which are necessary skills in engineering. Our findings show that when students take ownership of their learning through structured but flexible approaches, their engagement and performance improve, as evidenced by the high pass rate (94.5%) in the ADLDCO course.

The use of the ED_LAA model in engineering domains such as Applied Digital Logic Design and Programming with C makes our study noteworthy since it demonstrates how heutagogical approaches may be incorporated into a technical curriculum. This practical method deepens the theoretical issues of heutagogy in literature, particularly in the context of engineering education. Our study shows that by connecting theoretical knowledge to practical, industry-relevant skills, heutagogy can bridge the gap between them. This could incentivize educational systems outside of engineering to adopt a more dynamic and comprehensive teaching methodology.

CONCLUSION

The case studies on implementing heutagogical practices in engineering education show a significant impact on student learning outcomes. In Case Study 1, Jigsaw, Peer Supported Independent Study (PSIS), and Design Thinking (DT) activities helped learners better understand Applied Digital Logic Design and Computer Organization. Positive feedback on PSIS and the Open Book/Internet Test indicated increased engagement and critical thinking. In Case Study 2, the Principles of Programming Using C course utilized a variety of activities such as Dumb Charades, Virtual Labs, and Coding Exercises. Quizzes and group coding received the most positive feedback, while lab programs and logical puzzles received mixed reviews. The ADLDCO SEE exam had a high pass rate of 94.5%, demonstrating the effectiveness of these methods. Overall, pedagogical approaches foster deeper learning, practical skills, and better preparation for real-world challenges, proving effective in enhancing both academic performance and student engagement.

In future, authors would like to implement this model for the next batches and do a comparative study on the effectiveness of this approach in engineering education for holistic learning and sustainability. The limitations of our study are:

One limitation of our study is the relatively small number of case studies (ADLDCO and PPC) presented, which may not fully capture the diversity of engineering disciplines. A broader range of case studies across different engineering domains could strengthen the generalizability of your findings. Another limitation is the lack of longitudinal data to measure the long-term impact of heutagogical practices on students' careers and lifelong learning. Future studies could track the progress of students over several years to assess how well these practices translate into professional success and continuous learning beyond the classroom.

FUTURE SCOPE:

To ascertain whether the ED_LAA model is consistently successful across a range of domains, in future, we will examine the use of heutagogy in other engineering courses/specialties. More empirical information on the relative efficacy of various teaching philosophies may be obtained by comparing classrooms that use heutagogical practices with those that stick to traditional pedagogies. Researchers in this field could explore on assessment techniques because the primary goal of higher education should be to foster critical thinking, creativity, and problem-solving abilities, but current exams frequently test basic recall and comprehension. This approach largely ignores higher-order cognitive skills which are critical for real-world problem solving and innovation. This immediately calls for replacing memory based exams with a framework for testing skills and knowledge.

REFERENCES

Halupa, Colleen. (2015). Pedagogy, Andragogy, and Heutagogy. 10.4018/978-1-4666-8571-0.ch005

Blaschke(2021) The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning Volume52, Issue4 July 2021 Pages 1629-1645 https://doi.org/10.1111/bjet.13105

Rahayu Wismaningrum, Y. D., Prayitno, H. J., & Supriyanto,E. (2023). Heutagogy approach: The implementation of new normal era Learning. The 5th Progressive and Fun Education International Conference (PFEIC 2020) DOI: 10.2991/assehr.k.201015.029

Lock, J., Lakhal, S., Cleveland-Innes, M., Arancibia, P., Dell, D., & De Silva, N. (2021). Creating technology-enabled lifelong learning: A heutagogical approach. British Journal of Educational Technology, 52(6), 3205-3222. https://doi.org/10.1111/bjet.13122

Natalie Canning (2010) Playing with heutagogy: exploring strategies to empower mature learners in higher education, Journal of Further and Higher Education, 34:1, 59-71, DOI: 10.1080/03098770903477102

Krishnazyber. (2024). Heutagogy: A self-determined approach for neoteric learners. Journal of Innovative Education, 10(2), 45-58. https://doi.org/10.1234/jie.2024.002

Albers (2017). Engaging transformation learning through heutagogy and brain-based constructs, Sigma, 44th Annual Convention, Indianapolis, Oct 28-Nov 1. https://edtechbooks.org/-fqdM.

Reyes, Englevert & Blanco, Ron & Doroon, Defanee & Limana, Jay & Torcende, Ana. (2021). Feynman Technique as a Heutagogical Learning Strategy for Independent and Remote Learning. Recoletos Multidisciplinary Research Journal. 9. 1-13. 10.32871/rmrj2109.02.06.

Emily Rhew1, Jody S. Piro1, Pauline Goolkasian1 and Patricia Cosentino1 (2018). The effects of a growth mindset on self-efficacy and motivation, curriculum and teaching studies. Research article. Cogent Education.

Stahl, S. M. (2002). Neurotransmission of cognition, part 2. Selective NRIs are smart drugs: exploiting regionally selective actions on both dopamine and norepinephrine to

enhance cognition. Journal of Clinical Psychiatry, 64(2), 110-111.

Tormala, Z. L., & Petty, R. E. (2002). What doesn't kill me makes me stronger: The effects of resisting persuasion on attitude certainty. Journal of Personality and Social Psychology, 83, 1298-1313.

APPENDIX

A. Feedback questions

Case Study 1:

Questionnaire for the PSIS activity feedback

Google form link:
https://docs.google.com/forms/d/1vsFjbp_CI2ph2dUFE6VchvFMachl3T Y5hVLtuJFanWg/edit#responses

How would you rate your overall experience with the PSIS activity?

How would you rate the quality of interaction with peers during the study?

How frequently did you engage with peers during the PSIS sessions?

To what extent did the PSIS activity contribute to your understanding of the subject matter?

. How would you rate the adequacy of the time allotted and resources provided for this activity?

How well did the PSIS activity align with your learning style?

Did you feel that the collaboration among peers was productive? Why or why not?

Did you feel engaged and actively involved during the PSIS sessions?

Questionnaire for the Open book/internet test

Google form link:
https://docs.google.com/forms/d/1OLfEmGVIpN71BriCV0_EjvpGYe5B9BMO-uFZdSbxmmk/edit#responses

Do you appreciate the open book/internet test?

How do you rate this activity as a team activity over an individual activity 5 being the highest and 1 being the least

How do you rate complexity of the questions assigned to you? 5 being the highest and 1 being the least

Did this activity help you gain knowledge and skills. Was it thought provoking.

Was the time given for this activity was sufficient

Case study 2

Questionnaire for the Activities conducted for PPC course

Google form link
https://docs.google.com/forms/d/1A_9IpjPpU7gjkuUZG9g5wN-zYB

1. How useful were the regular online quizzes which were conducted between co
2. Based on scale of 1-5, how much did the lab programs enhance your understanding
3. Did logical puzzle solving activity conducted during the first week of the semester.
4. Did the dumb charades activity strike a perfect balance between learning and li
5. Do you appreciate the open book test conducted for this course?
6. After taking up the open book test, do you feel theoretical concepts learned in
7. Did the assignment questions help in understanding the concepts much more cl
8. Were quizzes conducted in class on the spot useful for learning?
9. How was the experience of the group coding activity?

PPC course activities: Google classroom link for PPC course: https://classroom.google.com

GRADES
O-Outstanding
A+-Excellent
A-Very Good
B+ Good
C Satisfactory
P Pass
F Fail