

Enhancing Learning Autonomy through Heutagogical Flipped Learning: A Three-Semester Longitudinal Study in Indonesian Higher Education

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Abstract: This study aims to analyze the effect of implementing *Heutagogical Flipped Learning* (HFL) on students' learning autonomy in Indonesian higher education. The research employed a quasi-experimental longitudinal approach with a one-group pretest–posttest design, conducted over three consecutive semesters in the same course within a postgraduate mathematics education program. A total of 93 students as participated in the study. The research instruments consisted of the *HFL Implementation Scale* and the *Learning Autonomy Scale*, each comprising 20 items with content validity (Aiken's V) ranging from 0.84 to 0.94 and reliability coefficients (α) above 0.88. Data were analyzed using descriptive statistics, paired-sample *t*-tests, simple linear regression, and thematic analysis of reflective interview data. The findings revealed that the implementation of HFL had a positive and significant effect on improving students' learning autonomy, with an R^2 value of 0.46 ($p < 0.001$). The learning effect increased from a medium to a large level across semesters (Cohen's $d = 0.49 \rightarrow 0.91$). The longitudinal trend analysis showed an average increase of 0.22 points in learning autonomy per semester. The interview results supported the quantitative findings, showing that 83% of students expressed satisfaction with the learning process, particularly regarding learning flexibility, responsibility, and peer collaboration, although some faced technical and time-management challenges. Overall, this study confirms that HFL is effective in enhancing students' learning autonomy and satisfaction in higher education. Its sustained implementation has the potential to foster a culture of self-directed and reflective learning aligned with Indonesia's digital education transformation agenda.

Keywords: Heutagogical Flipped Learning; Learning Autonomy; Higher Education; Reflective Learning; Pedagogy

INTRODUCTION

The rapid development of digital technology over the past decade has transformed the paradigm of learning in higher education. Learning is no longer centered solely on lecturers as transmitters of knowledge but has shifted toward approaches that position students as active, reflective, and autonomous learners. This shift aligns with Indonesia's educational transformation agenda toward flexible, self-directed, and autonomy-based learning. One innovative approach that has gained increasing attention is Heutagogical Flipped Learning (HFL), a model that integrates the principles of *heutagogy* (self-determined learning) with the *flipped classroom* strategy, which emphasizes independent study prior to face-to-face sessions (Blaschke, 2021). Recent bibliometric analyses indicate a significant increase in scholarly publications on heutagogy, particularly in countries such as the United Kingdom and Malaysia, although the field remains relatively new in its theoretical and empirical development (Blaschke, 2021; Tiew & Abdullah, 2021).

Over the past two decades, research has recognized heutagogy as an evolution of andragogy, positioning adult learners as *self-determined learners* who manage their own learning goals, strategies, and evaluation processes (Blaschke & Hase, 2019; Kim, 2022; Stoten, 2022). Empirical evidence suggests that heutagogical approaches enhance learner agency, reflection, and *lifelong learning* particularly when supported by digital learning ecosystems that include microlearning videos, learning management systems (LMS), and reflective tasks (Herawati et al., 2021). However, key challenges persist, including lecturers' readiness to facilitate assessment negotiation and students' literacy in self-regulated learning.

The Heutagogical Flipped Learning (HFL) approach responds to these challenges by positioning students as primary agents in their learning processes, actively determining their goals, strategies, and self-evaluation methods (Gillaspy & Vasilica, 2021). By combining autonomous online learning with reflective in-class discussions, HFL aims to develop higher-order thinking, creativity, and personal accountability for learning outcomes (Hedar et al., 2024; Walsh et al., 2022). While previous studies confirm that flipped learning can enhance academic achievement and motivation (Alias & Mohd Matore, 2023; Halim et al., 2023; Tiew & Abdullah, 2021). Research explicitly integrating *heutagogical principles* within the flipped learning model remains scarce—particularly in mathematics education, a domain that requires deep conceptual understanding and reflective engagement at the tertiary level.

One course that aligns well with this model is Psychology of Mathematics Education. The course not only explores psychological theories of learning but also requires students to understand how cognitive, affective, and motivational factors influence mathematics learning and teaching (Ahmad Termizi & Mahmud, 2022; Luo, 2024). Consequently, its instructional design should encourage students to become reflective and autonomous learners capable of connecting psychological theories with their own mathematical learning experiences (Herawati et al., 2021; Mutohir et al., 2017; S. Z. Nurhajarurahmah, 2021). However, recent evaluations reveal that many students still rely heavily on lecturers' direction, exhibit limited initiative in exploring digital resources, and rarely engage in systematic self-reflection.

This situation reveals a persistent gap between the desired autonomy-driven learning paradigm and actual classroom practices. Hence, a pedagogical model that fosters students' independence, responsibility, and learning satisfaction is needed. *Heutagogical Flipped Learning* offers such potential, as it allows students to negotiate their learning processes, choose appropriate digital resources, and regulate their learning pace independently (Alias & Mohd Matore, 2023; St. Z. Nurhajarurahmah & Arsyad, 2023). Moreover, it transforms the lecturer's role from a *knowledge transmitter* to a *facilitator of reflection and collaboration*.

Learning in the twenty-first century requires not only knowledge acquisition but also the ability to manage learning autonomously and reflectively. Within higher education, learning autonomy represents a central indicator of success in cultivating *lifelong learning* competencies (Hammoda, 2025). Autonomous learners are self-motivated, self-directed, and capable of determining their own goals, strategies, and evaluative measures. In this context, *Heutagogical Flipped Learning (HFL)* functions as a pedagogical innovation that empowers learners to take ownership of their education (Chen et al., 2017).



Conceptually, the relationship between HFL and learning autonomy operates through three mechanisms. First, autonomy and self-determined learning—HFL provides students with flexibility to design their learning rhythm and strategies through access to digital resources prior to in-class sessions, strengthening self-management and accountability. Second, self-reflection and metacognition—the reflective phase encourages students to evaluate their cognitive progress, enhancing metacognitive awareness, a core component of autonomy. Third, collaboration and social learning—post-independent discussions promote peer interaction and co-construction of knowledge, thereby reinforcing *learning agency*.

The implementation of HFL in the *Psychology of Mathematics Education* course is particularly relevant, as the course content naturally integrates reflective and humanistic aspects of learning. Thus, HFL not only facilitates theoretical understanding but also provides opportunities for students to develop reflective learning experiences that connect theory with practice.

Accordingly, this study aims to examine the implementation, effectiveness, and impact of *Heutagogical Flipped Learning* on postgraduate students' learning autonomy and satisfaction in Indonesian higher education. Conducted over three consecutive semesters with 93 participants, this longitudinal research design allows for observation of consistency and growth in HFL's effects over time. By integrating both quantitative and qualitative data, the study addresses two main questions. First, it investigates the extent to which the implementation of Heutagogical Flipped Learning (HFL) enhances students' learning autonomy in the *Psychology of Mathematics Education* course. Second, it explores how students perceive and experience satisfaction with the HFL-based learning process over three semesters of implementation. The findings of this study are expected to contribute theoretically, by enriching the literature on heutagogical approaches in higher education, and practically, by providing a framework for mathematics education lecturers to design digital learning environments that are autonomous, reflective, and self-development oriented.

RESEARCH METHOD

Research Design

This study employed a quantitative quasi-experimental longitudinal approach using a one-group pretest–posttest design. This design was selected to observe the changes and consistency of the effects of HFL on students' learning autonomy over three consecutive semesters. In addition to quantitative analysis, the study incorporated qualitative data obtained through reflective interviews to gain deeper insight into students' perceptions and satisfaction with the HFL learning process. Thus, the research adopted a mixed-methods sequential explanatory design, in which quantitative data served as the primary basis for analysis, while qualitative findings were used to support and enrich the interpretation of results. This design enabled a comprehensive understanding of how the HFL model influences both the measurable aspects of learning autonomy and the experiential aspects of student engagement and satisfaction.



Research Setting and Participants

The study was conducted in the course Psychology of Mathematics Education, offered by the Postgraduate Program in Mathematics Education, Universitas Negeri Makassar, over three consecutive semesters (2024–2025 academic year). A total of 93 postgraduate students participated in this research, with 31 students per semester. The participants were active graduate students aged between 23 and 30 years, all with a background in mathematics education, and were taught by the same lecturer to ensure instructional consistency.

Sampling was carried out using a purposive sampling technique with the following criteria:

1. Students enrolled in the *Psychology of Mathematics Education* course during the research period;
2. Students who voluntarily agreed to participate and complete the research instruments;
3. Students who had access to adequate digital devices and stable internet connections to engage in HFL activities.

In addition, 12 students (four from each semester) were purposively selected for in-depth reflective interviews, representing high, moderate, and low levels of learning autonomy. These participants provided qualitative insights into their perceptions of the HFL experience, including satisfaction, challenges, and reflections on their learning development.

Research Instruments

1) Heutagogical Flipped Learning Implementation Scale

The *Heutagogical Flipped Learning (HFL) Implementation Scale* was developed based on key indicators of heutagogy and flipped classroom implementation. The instrument consisted of 20 positively worded statements rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The indicators measured included: (a) self-management, (b) self-monitoring, (c) self-motivation, (d) learning agency, and (e) reflection. The results of content validity testing showed an Aiken's V value of 0.90, categorized as *very high*, indicating strong alignment between each item and the theoretical construct being measured. The internal consistency reliability test yielded a Cronbach's alpha coefficient (α) of 0.91, indicating excellent internal reliability across items. Therefore, the instrument was considered both valid and reliable for measuring the level of HFL implementation in this study.

2) Reflective Interview Guide

A semi-structured reflective interview guide was designed to explore students' perceptions regarding satisfaction, benefits, and challenges experienced during the HFL-based learning process. The interviews were conducted online via Zoom, with each session lasting approximately 20–30 minutes per participant. The interview questions focused on students' reflections about their autonomy, engagement, and the meaningfulness of their learning experiences within the HFL framework.

Research Procedure

The research was implemented in three phases following the semester cycles to ensure systematic data collection and longitudinal consistency. Each phase represented one academic semester and included the following steps:

- a. *Preparation Phase (Pre-Implementation)*: Development and validation of instruments, orientation sessions for students and lecturers on HFL, and pretest administration to measure baseline learning autonomy.
- b. *Implementation Phase*: Execution of HFL across five instructional phases—orientation, independent exploration, creative presentation, collaborative discussion, and reflection—supported by digital learning media and LMS integration.
- c. *Evaluation Phase (Post-Implementation)*: Administration of posttests to measure changes in learning autonomy, collection of reflective journals, and conducting online interviews to obtain qualitative insights into students' learning experiences.

This sequential procedure ensured the consistency of intervention delivery, data accuracy, and triangulation between quantitative and qualitative findings.

Data Analysis Technique

Quantitative data were analyzed using SPSS version 29 through several steps. First, assumption testing was conducted, including the *Shapiro–Wilk test* for normality, *ANOVA (Deviation from Linearity)* for linearity, and the *Glejser test* for homoscedasticity. The effectiveness of HFL was examined using a *paired-sample t-test* to compare pretest and posttest scores of learning autonomy in each semester, with Cohen's *d* calculated to determine the effect size. To assess the influence of HFL (*X*) on learning autonomy (*Y*), a *simple linear regression* model ($Y = a + bX + e$) was applied, with significance tested at $p < 0.05$ and effect magnitude represented by R^2 . Finally, a *longitudinal trend regression* ($\bar{Y} = a + b(\text{semester}) + e$) was used to measure the average increase in students' learning autonomy per semester, illustrating the progressive impact of HFL implementation over time.

Qualitative data from interviews were analyzed using a *thematic analysis* approach, identifying key patterns related to students' perceptions and learning experiences. Triangulation was conducted by comparing findings from interviews, students' reflective journals, and classroom observation data to ensure the credibility and consistency of the results.

Research Ethics

This study obtained official permission from the head of the postgraduate program and received ethical consent from all participants. All data were collected and handled in accordance with ethical research principles, ensuring confidentiality, voluntary participation, and academic use only. No personal identifiers were disclosed, and participants were informed of their right to withdraw at any stage of the research without consequence.

RESULTS

Descriptive Statistics

Descriptive analysis was conducted to illustrate the level of *Heutagogical Flipped Learning* (HFL) implementation and students' learning autonomy across the three semesters of the study. The results are presented in Table 2.



Table 2. Descriptive Statistics of HFL Implementation and Learning Autonomy per Semester

Variabel	Semester	Mean	SD	Category
HFL (X)	I	3.82	0.47	High
	II	4.05	0.41	Very High
	III	4.28	0.36	Very High
Learning Autonomy (Y)	I	3.60	0.52	High
	II	3.78	0.48	High
	III	4.05	0.44	Very High

The data show a consistent increase in both variables across semesters. The mean score for HFL rose from 3.82 to 4.28, while the mean score for learning autonomy increased from 3.60 to 4.05. These results indicate that the implementation of the HFL model became more mature and effective over time, contributing to a steady enhancement of students' self-directed learning capacity.

Effectiveness Test (Paired-Sample *t*-Test)

A paired-sample *t*-test was conducted to determine the difference in mean scores of students' learning autonomy before and after the implementation of *Heutagogical Flipped Learning* (HFL) in each semester. The results are presented in Table 3.

Table 3. Results of Paired-Sample *t*-Test on Students' Learning Autonomy

Semester	Mean Pre	Mean Post	t	p	Cohen's d	Effect Size Category
I	3.45	3.60	2.75	0.010	0.49	Medium
II	3.52	3.78	3.96	0.000	0.71	Large
III	3.65	4.05	5.10	0.000	0.91	Large

The results show a significant increase ($p < 0.05$) in students' learning autonomy scores after the implementation of HFL in each semester. The effect size also demonstrated a progressive increase, from a medium effect ($d = 0.49$) in the first semester to a large effect ($d = 0.91$) in the third semester. These findings indicate that the continued implementation of the HFL model produces increasingly stronger effects on students' learning autonomy over time. The results suggest that as students become more familiar with the heutagogical flipped learning structure, they develop greater self-regulation, reflection, and independence in managing their learning process.

Simple Linear Regression Analysis

A simple linear regression analysis was performed to examine the influence of *Heutagogical Flipped Learning* (HFL) implementation (X) on students' learning autonomy (Y). The regression model was analyzed separately for each semester and also in combination for the overall data set. The regression model used was:

$$Y = a + bX$$

Table 4. Results of Simple Linear Regression Analysis by Semester

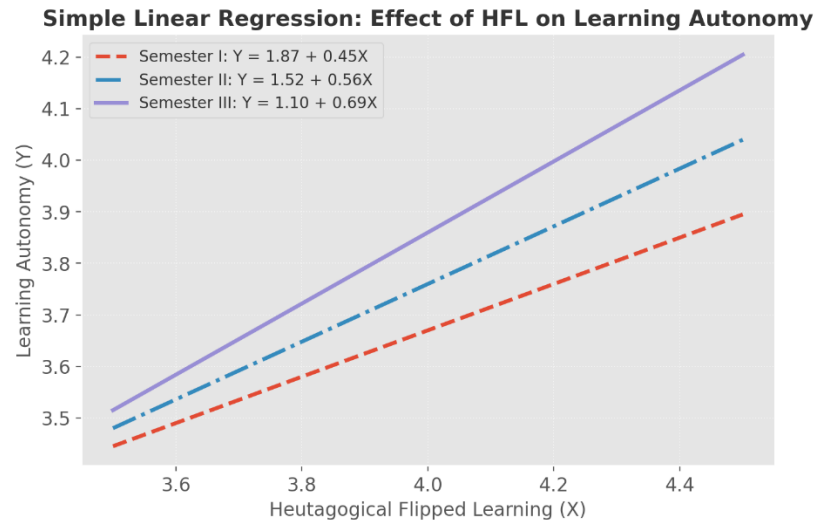
Semester	a	b	SE(b)	t	p	R	R ²	Interpretation of Influence
I	1.87	0.45	0.13	3.46	0.002	0.52	0.27	Moderate
II	1.52	0.56	0.13	4.25	0.001	0.63	0.40	Strong
III	1.10	0.69	0.13	5.30	0.000	0.71	0.50	Very Strong



Combined model (N = 93):

$$Y = 1.22 + 0.66X$$

The overall regression analysis yielded **R = 0.68**, **R² = 0.46**, **F(1, 91) = 77.2**, and **p < 0.001**.

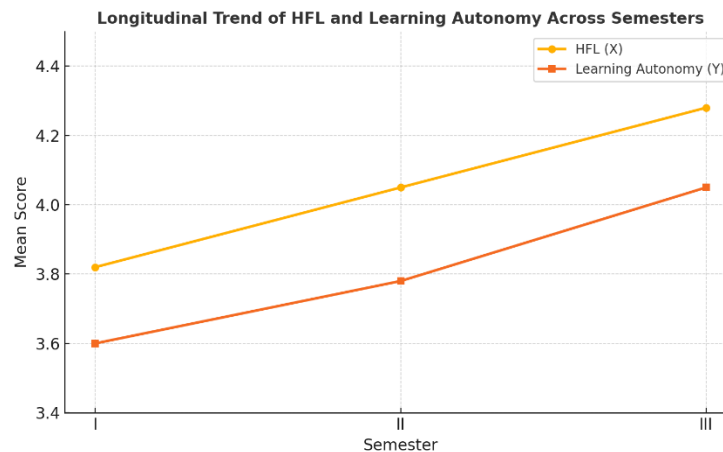


Graph 1. Relationship between Heutagogical Flipped Learning (HFL) and Learning Autonomy across three semesters

These results indicate that an increase of one point in HFL implementation corresponds to a 0.66-point increase in students' learning autonomy. The model explains 46% of the variance in learning autonomy, signifying a strong and consistent influence of HFL across all semesters. The regression coefficient increased steadily from $b = 0.45$ in the first semester to $b = 0.69$ in the third semester, suggesting that as the implementation of HFL became more established, its impact on learning autonomy strengthened. This pattern aligns with the longitudinal trend, showing that the effectiveness of HFL grows as both instructors and students become more accustomed to the heutagogical learning environment.

Longitudinal Trend Analysis

The trend analysis was conducted to measure the average increase in students' learning autonomy scores across semesters. The results of the trend regression analysis showed $b = 0.22$, $t = 4.92$, and $p < 0.001$. This indicates an average increase of 0.22 points in learning autonomy per semester, suggesting that the *Heutagogical Flipped Learning (HFL)* model became progressively more effective over time. The following figure presents the trend graph of the increasing scores of *Heutagogical Flipped Learning (HFL)* implementation and students' learning autonomy over the three semesters.



Graph 2. Longitudinal trend graph illustrating the steady increase in *Heutagogical Flipped Learning (HFL)* and Learning Autonomy scores over three semesters.

Analysis of Learning Process Implementation

The implementation of the *Heutagogical Flipped Learning (HFL)* model in the Psychology of Mathematics Education course was evaluated using observation sheets and students' reflective reports for each phase of the instructional syntax. The following figure presents the visualization of the implementation **scores** for each phase of *Heutagogical Flipped Learning (HFL)* in the course.

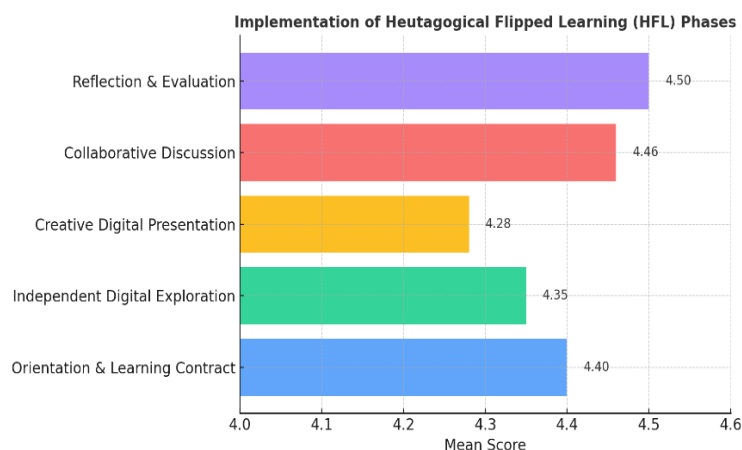


Figure 1. Implementation of each phase of the *Heutagogical Flipped Learning (HFL)* model in the *Psychology of Mathematics Education* course.

All phases of the instructional syntax were implemented very successfully. The Reflection and Evaluation phase, along with the Collaborative Discussion phase, received the highest scores. This finding indicates that students were most active and engaged during the reflective and social stages of the learning process, demonstrating the strength of HFL in fostering interaction, metacognitive awareness, and meaningful collaboration.

Qualitative Analysis of Reflective Interviews

Reflective interviews were conducted with 12 students (four from each semester) to explore their satisfaction and perceptions of the *Heutagogical Flipped Learning*

(HFL) process. Thematic analysis identified four key themes representing students' experiences and reflections during the implementation of HFL.

Table 5. Themes and Representative Quotes from Reflective Interviews

Theme	Description of Findings	Representative Quote
Flexibility and Learning Freedom	Students felt greater flexibility in determining their study time and approach.	"I can learn anytime, rewatch videos, and never feel left behind." (M3–S2)
Increased Learning Responsibility	Students became more disciplined and structured in preparing for class activities.	"Since the materials were sent in advance, I studied first so I could participate actively in class." (M6–S1)
Collaboration and Meaningful Learning	Peer discussions deepened understanding and encouraged self-reflection.	"I learned a lot from my peers' experiences about math anxiety." (M9–S3)
Technical and Time Management Challenges	Some students faced issues with internet connectivity and time management.	"When the signal is weak, I'm a bit late watching videos or joining discussions." (M1–S2)

The findings indicate that the implementation of *Heutagogical Flipped Learning* provided students with a more autonomous, reflective, and collaborative learning experience. However, it also highlighted the need for adequate technical support and effective time management to optimize student engagement and participation. Overall, the qualitative evidence reinforces the quantitative results, confirming that HFL fosters not only cognitive engagement but also metacognitive growth and learner satisfaction in a digital learning environment.

Integration of Quantitative and Qualitative Findings

The quantitative findings demonstrated a significant effect of Heutagogical Flipped Learning (HFL) on improving students' learning autonomy, while the qualitative results reinforced these outcomes by revealing the underlying mechanisms of improvement. The interviews showed that the enhancement in autonomy occurred because students experienced greater flexibility, self-reflection, and active collaboration throughout the learning process.

The high level of implementation fidelity and strong student satisfaction further indicate that the Psychology of Mathematics Education course provides an ideal context for the application of a heutagogical model. Its inherently reflective and humanistic nature aligns well with the principles of self-determined learning, supporting both cognitive development and affective engagement in higher education learning environments.

DISCUSSION

The results of this study indicate that the implementation of *Heutagogical Flipped Learning* (HFL) in the Psychology of Mathematics Education course consistently improved students' learning autonomy over three consecutive semesters. Quantitative data showed a significant increase in learning autonomy scores from 3.60 to 4.05, with a large effect size (Cohen's $d = 0.91$), while regression analysis revealed that HFL accounted for 46% of the variance in learning autonomy ($R^2 = 0.46$). These findings provide empirical support for the effectiveness of the HFL model in fostering autonomous, reflective, and collaborative learning in higher education settings.



HFL as a Reinforcer of Learning Autonomy

Learning autonomy is one of the core competencies required for students to face the challenges of 21st-century education. According to the self-determined learning theory (Blaschke, 2021; Kim, 2022; Mwinkaar & Lonibe, 2024) heutagogy emphasizes that learners are not merely *self-directed* but *self-determined*—they set their own goals, strategies, and evaluation criteria. In this study, students were given the freedom to choose digital learning resources, determine their learning pace, and design reflection methods based on individual needs. This pattern strengthened key components of autonomy, namely self-management and self-monitoring (Dabingaya, 2022). These findings align with (Chen et al., 2017) who found that flipped learning emphasizing independent exploration enhances self-regulation and learning responsibility. Similarly, Ahmad Termizi & Mahmud (2022) and Luo (2024) asserted that heutagogy bridges self-directed and reflective learning aimed at personal development. Thus, the increase in students' learning autonomy scores can be interpreted as a result of an autonomous learning environment that supports learner agency and a sense of learning ownership.

Implementation of HFL and the Role of Reflection in Psychology of Mathematics Education

The implementation analysis showed a **high level of model execution** (mean score = 4.40/5), indicating that all five HFL syntax phases were carried out effectively in the course. The Reflection and Self-Evaluation phase achieved the highest score ($M = 4.50$), followed by Collaborative Discussion ($M = 4.46$). These two phases were key to the success of the heutagogical model because they foster metacognitive awareness and the ability to reflect on the learning process. In the context of Psychology of Mathematics Education, reflection is particularly relevant since students are expected to understand the interplay between psychological and mathematical thinking processes. Interview findings supported this result—most students reported that reflective digital tasks and peer discussions deepened their understanding of educational psychology concepts in teaching practice. As one student noted:

“I understood better how emotions and motivation affect mathematics learning after writing reflections and discussing them with peers.” (M9–S3)

This statement illustrates how integrating heutagogy with flipped learning encourages deeper and contextual thinking. The *Psychology of Mathematics Education* course thus serves as an ideal context for HFL application due to its reflective, conceptual, and humanistic characteristics.

Student Satisfaction with the Learning Process

Qualitative data revealed that 83% of students expressed satisfaction with the HFL-based learning process. The most prominent themes from the interviews were learning flexibility, responsibility for learning, and peer collaboration. Students appreciated the freedom to manage their time and resources without losing learning direction, as the lecturer continued to serve as a facilitator and reflective guide. This satisfaction reinforces prior research showing that the integration of digital and reflective learning enhances learning satisfaction and student engagement (Kim, 2022; Stoten, 2022). The collaborative dimension of HFL also provided a meaningful social



learning experience, confirming that peer interaction plays a critical role in developing conceptual understanding and self-awareness. Although some students encountered technical issues such as unstable internet connections and challenges in managing time for reflective tasks, these difficulties were minor and did not hinder the overall effectiveness of the model. In fact, several students viewed such challenges as part of developing discipline and responsibility in their learning.

Longitudinal Dynamics: Increasing Effectiveness Across Semesters

The longitudinal findings revealed a steady increase in the effectiveness of HFL implementation over three semesters, as indicated by rising mean scores for HFL (3.82 → 4.28) and learning autonomy (3.60 → 4.05). The regression coefficient also increased from $b = 0.45$ in the first semester to $b = 0.69$ in the third. This trend reflects that the success of HFL implementation develops progressively, not instantaneously. Both lecturers and students underwent an adaptation process—lecturers became more adept at facilitating heutagogical learning, while students grew more accustomed to reflective and self-directed study. These findings support (Blaschke & Hase, 2019) argument that heutagogy requires a learning culture shift—from dependency to autonomy. Over three semesters, this study demonstrates that such a shift can occur in measurable ways within the Indonesian higher education context.

Integration of Quantitative and Qualitative Findings: Toward Humanistic Digital Learning

The integration of quantitative and qualitative findings indicates that the increase in learning autonomy was not solely due to strong instructional design but also the humanistic learning experience cultivated through reflection, collaboration, and autonomy. In other words, the effectiveness of HFL lies not merely in the use of digital technology but in empowering students as autonomous and reflective learners. This aligns with the principles of heutagogical digital pedagogy, which views technology not as an end, but as a means to foster learner agency, reflective awareness, and meaningful collaboration.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study demonstrates that the implementation of *Heutagogical Flipped Learning (HFL)* in the Psychology of Mathematics Education course significantly enhanced students' learning autonomy and satisfaction. The results of the regression analysis showed that HFL contributed 46% to the variance in learning autonomy ($R^2 = 0.46$), with a progressive increase in effect size across three consecutive semesters. Qualitative interview findings supported these quantitative results, revealing that 83% of students expressed satisfaction with the HFL-based learning process—particularly in terms of flexibility, learning responsibility, and peer collaboration. The learning process was carried out with a very high level of implementation ($M = 4.43/5$) across all instructional phases, indicating both lecturers' and students' readiness to adopt the heutagogical model consistently and effectively. In conclusion, the findings confirm that HFL is an effective and sustainable approach for developing reflective, autonomous, and adaptive learners in higher education. The model aligns with the



vision of curriculum and supports Indonesia's educational transformation toward flexible, student-centered, and autonomy-based digital learning.

Recommendations

This study recommends that lecturers continually enhance the design of *Heutagogical Flipped Learning (HFL)*, emphasizing structured reflection and self-regulated learning. The five-phase HFL model should remain flexible and adaptable to various instructional contexts. Universities are encouraged to support this approach through digital literacy and self-regulation training, robust digital infrastructure, and ongoing professional development for lecturers to ensure sustainable implementation. Future research should employ experimental or mixed-method designs to validate causal effects and integrate learning analytics for richer insights into learner behavior. Longitudinal studies are also needed to examine the lasting impact of HFL on autonomy and engagement. Overall, sustained institutional commitment and reflective pedagogical adaptation are vital to position HFL as a transformative, human-centered approach that unites digital innovation with lifelong learning values in higher education.

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REFERENCES

- Alias, A. F., & Mohd Matore, M. E. E. (2023). Mathematics Secondary School Teacher Readiness in Applying Heutagogical Approach for Teaching and Learning. *International Journal of Academic Research in Progressive Education and Development*, 12(1). <https://doi.org/10.6007/IJARPED/v12-i1/14794>
- Blaschke, L. M. (2021). The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning. *British Journal of Educational Technology*, 52(4), 1629–1645. <https://doi.org/10.1111/bjet.13105>
- Blaschke, L. M., & Hase, S. (2019). Heutagogy and digital media networks. *Pacific Journal of Technology Enhanced Learning*, 1(1), 1–14. <https://doi.org/10.24135/pjtel.v1i1.1>
- Chen, F., Lui, A. M., & Martinelli, S. M. (2017). A systematic review of the effectiveness of flipped classrooms in medical education. *Medical Education*, 51(6), 585–597. <https://doi.org/10.1111/medu.13272>



- Gillaspy, E., & Vasilica, C. (2021). Developing the digital self-determined learner through heutagogical design. *Higher Education Pedagogies*, 6(1), 135–155. <https://doi.org/10.1080/23752696.2021.1916981>
- Halim, Abd., Nur, S., Vega, N. De, Nasta, M., & Nurfadhilah, A. S. (2023). Exploring Heutagogy in Indonesian Higher Education: Cultural Challenges and Advantages in Mobile-Based English as a Foreign Language (EFL) Teaching. *VELES (Voices of English Language Education Society)*, 7(3), 557–571. <https://doi.org/10.29408/veles.v7i3.22026>
- Hammoda, B. (2025). Extracurricular Activities for Entrepreneurial Learning: A Typology Based on Learning Theories. *Entrepreneurship Education and Pedagogy*, 8(1), 142–173. <https://doi.org/10.1177/25151274231218212>
- Hedar, Y., Tryono, F. X. Y., Ramadhon, S., Priandani, A. P., & Emilzoli, M. (2024). Tren Penelitian Heutagogi Di Pendidikan Tinggi: Sebuah Analisis Bibliometrik. *EduTech*, 23(3), 319–335. <https://doi.org/10.17509/e.v23i3.74885>
- Herawati, M., Muhid, A., & Hamdani, A. S. (2021). Self-Efficacy, Social Support, Academic Flow, and Math Anxiety among Islamic Senior High School Students. *Psymphathic : Jurnal Ilmiah Psikologi*, 7(2), 315–326. <https://doi.org/10.15575/psy.v7i2.8474>
- Kim, J. (2022). The Interconnectivity of Heutagogy and Education 4.0 in Higher Online Education. *Canadian Journal of Learning and Technology*, 48(4). <https://doi.org/10.21432/cjlt28257>
- Mutohir, T. C., Lowrie, T., & Patahuddin, S. M. (2017). The Development of a Student Survey on Attitudes towards Mathematics Teaching-Learning Processes. *Journal on Mathematics Education*, 9(1). <https://doi.org/10.22342/jme.9.1.4193.1-14>
- Nurhajarurahmah, S. Z. (2021). Students' Multiple Intelligence in Visualization of Mathematics Problem Solving. *Journal of Physics: Conference Series*, 1752(1), 012063. <https://doi.org/10.1088/1742-6596/1752/1/012063>
- Nurhajarurahmah, St. Z., & Arsyad, N. (2023). *Model Pelatihan Berbasis Moral untuk Meningkatkan Kompetensi Profesional Guru* (1st ed.). Deepublish.
- Stoten, D. W. (2022). Navigating heutagogic learning: mapping the learning journey in management education through the OEPA model. *Journal of Research in Innovative Teaching & Learning*, 15(1), 83–97. <https://doi.org/10.1108/JRIT-07-2020-0038>
- Tiew, C. C., & Abdullah, M. N. L. Y. (2021). Heutagogy Approach In 21st Century Teaching And Learning: Practices And Challenges In Malaysian Higher Education. *Asean Journal of Teaching and Learning in Higher Education*, 13(1). <https://doi.org/10.17576/ajtlhe.1301.2021.02>
- Walsh, C., Bragg, L., Muir, T., & Oates, G. (2022). Unleashing Adult Learners' Numeracy Agency Through Self-Determined Online Professional Development. *The International Review of Research in Open and Distributed Learning*, 23(3), 240–258. <https://doi.org/10.19173/irrodl.v23i3.6046>

