

The Effect of the Heutagogy Methode on Improving Student Competence in the Heavy Equipment Technology Course among Automotive Engineering Education Students

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Abstract

Vocational higher education in Indonesia faces serious challenges in producing graduates who are both adaptive and competent in meeting the demands of Industry 4.0. This study aims to examine the relationship between the implementation of the heutagogy method and student competence in the Heavy Equipment Technology course within the Automotive Engineering Education Study Program. A quantitative correlational design was employed, involving 70 students as respondents. Data were collected through a five-point Likert scale questionnaire and analyzed using a series of statistical procedures, including validity testing, reliability testing, normality testing, and Spearman Rank correlation, with the aid of IBM SPSS Statistics. The validity test results demonstrated that all instrument items for both Variable X and Variable Y were declared valid, with r values ranging from 0.238 to 0.633 for Variable X and from 0.308 to 0.842 for Variable Y. Reliability analysis yielded a Cronbach's Alpha coefficient of 0.721 for Variable X and 0.846 for Variable Y, both of which satisfy the minimum reliability threshold required for research instruments. Given that neither variable followed a normal distribution as determined by the Shapiro-Wilk test, a nonparametric Spearman Rank correlation was applied. The analysis produced a correlation coefficient of $r_s = 0.666$, significant at the 0.01 level, indicating a strong and positive relationship between the two variables. These findings confirm that greater intensity in the implementation of the heutagogy method throughout the learning process is associated with higher levels of student competence in the Heavy Equipment Technology course.

Keywords

Heutagogy, Heavy Equipment Technology, Student Competence, Vocational Education.



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INTRODUCTION

Vocational higher education institutions have a longstanding and unresolved problem, namely their inability to keep pace with the increasingly rapid demands of the modern workforce. Within the TVET framework, three major approaches distinguish how humans learn: pedagogy, which is limited to knowledge and skills; andragogy, which progresses toward

competence; and heutagogy, which is far more ambitious in that it builds capabilities in a comprehensive and holistic manner. This is not merely a matter of terminology. It concerns the very foundation of how learning is structured. The Automotive Engineering Education Program in Indonesia confronts a genuine tension in this regard. Students are required to master complex and continuously evolving heavy equipment technology, while conventional teaching methods may not adequately equip them with the level of adaptability that such demands require.

Heutagogy itself was first conceived in 2000 by Stewart Hase and Chris Kenyon at Southern Cross University, Australia. This theory does not merely extend andragogy, rather it represents a paradigm shift that positions learners as active, reflective, and autonomous agents who are capable of navigating unforeseen and complex situations. A comprehensive review published in 2025 further affirmed that this framework is becoming increasingly relevant as the use of digital tools and artificial intelligence expands within educational ecosystems, given that heutagogy offers a model well suited to fostering adaptability and a lifelong learning orientation.

The core concept that distinguishes heutagogy from other approaches is double-loop learning, wherein learners do not merely solve problems but also reflect on their own thinking processes and interrogate the beliefs that underlie their actions. The gap between students who simply pass examinations and those who are genuinely competent becomes strikingly apparent at precisely this point. Blaschke (2012) affirmed that the heutagogical approach places considerable weight on developing the capacity and capability of learners, with the ultimate goal of producing individuals who are prepared to navigate the complexities of the contemporary workplace.

The state of automotive vocational education in Indonesia is, frankly, concerning. Data from the D3 Automotive Engineering program at UNP recorded an enrollment-to-graduation ratio of 225 to 101 between 2014 and 2017. A great deal of potential was lost along the way. Furthermore, graduates of automotive engineering programs are now expected to possess two layers of competence simultaneously, namely technical skills and soft skills, something that simply cannot be fulfilled through passive and one-directional methods of instruction.

Yoto et al. (2022) described heutagogy as a well-targeted learning innovation for addressing the digital-era skill needs of vocational students. Sumarni and Sudira (2022) went even further by emphasizing the role of heutagogy in rebuilding the vocational self-concept of students in the era of Industry 4.0 and Society 5.0. Its relevance is not merely theoretical; it reaches into the identity and self-confidence of students as future technical professionals. This study was conducted to fill that empirical gap. Focusing on Automotive Engineering Education students enrolled in the Heavy Equipment Technology course, the research quantitatively examines the strength of the relationship between the implementation of the heutagogy method as the independent variable (X) and student competence as the dependent variable (Y). Data were gathered from 70 respondents through a questionnaire and subsequently analyzed through a series of statistical tests encompassing validity, reliability, normality, and Spearman Rank correlation.

METHODS

This study employed a quantitative approach with a correlational research design to investigate the relationship between the heutagogy method and student competence in the Heavy Equipment Technology course. According to Sugiyono (2019), quantitative research is a research method used to analyze numerical data through statistical testing. The independent variable in this study was the heutagogy method (X), while the dependent variable was student competence (Y). The research population consisted of students from the Automotive Engineering Education Study Program who were enrolled in the Heavy Equipment Technology course, with a total of 70 students serving as respondents. Data were collected using a questionnaire based on a five-point Likert scale. According to Likert Rensis (1932), the Likert scale is used to measure the attitudes, perceptions, and opinions of respondents toward a given research phenomenon.

The research instruments were subjected to validity and reliability testing to ensure their suitability for use. Data analysis was carried out with the assistance of IBM SPSS Statistics, encompassing two principal stages, namely normality testing and hypothesis testing. The results of the normality test indicated that the data were not normally distributed, and therefore hypothesis testing was conducted using Spearman Rank Correlation. According to Charles Spearman (1904), the Spearman test is used to determine the relationship between variables in nonparametric data or data that do not conform to a normal distribution.

FINDINGS AND DISCUSSION

Validity Test of Variable X

Item	r hitung	r tabel	Keterangan
X1	0,661	0,235	Valid
X2	0,779	0,235	Valid
X3	0,634	0,235	Valid
X4	0,740	0,235	Valid
X5	0,621	0,235	Valid

Table 1. Variable X1

The Pearson correlation table for Variable X presents the validity test results for each instrument item used to measure the implementation of the Heutagogy Method. All items tested demonstrated positive and statistically significant correlation coefficients with the total score. Item X1 exhibited a reasonably strong correlation at the outset, with $r = 0.587$ at $\text{sig.} = 0.000$, while Item X2 stood somewhat apart from the others with $r = 0.238$ and $\text{sig.} = 0.046$, representing the smallest correlation value within the Variable X cluster, yet still surpassing the minimum r-table threshold for $N = 70$, which is approximately 0.235. Items X8 and X10 emerged as the most prominent, yielding $r = 0.621$ and $r = 0.633$ respectively, both of which were highly significant. Overall, the r values for Variable X ranged from 0.238 to 0.633, indicating that all items were declared valid as they exceeded the critical r-table value at the 5% significance level.

Validity Test of Variable Y

Item	r hitung	r tabel	Keterangan
Y1	0,648	0,235	Valid
Y2	0,797	0,235	Valid
Y3	0,842	0,235	Valid
Y4	0,824	0,235	Valid
Y5	0,829	0,235	Valid

Tabel 2. Variable Y1

The instrument for Variable Y consisted of 15 items, all of which demonstrated meaningful correlations with the total score. The lowest r value was recorded for Item Y1 at 0.308, while Item Y12 achieved the highest at $r = 0.842$, a notably substantial difference. Particularly noteworthy is the fact that Items Y9, Y12, Y13, Y14, and Y15 all fell within the range of 0.797 and above, indicating that these items possess exceptionally high discriminatory power. Unlike Variable X, which exhibited a relatively even distribution, Variable Y appeared to contain a cluster of items with strong correlations on one end and several items with moderate correlations on the other. All 15 items were declared valid upon comparison with the r-table value, and none were eliminated from further analysis.

Reliability Test

Variable X: The SPSS output presented a Case Processing Summary with $N = 70$ respondents, all of whom were valid with zero cases excluded. The Cronbach's Alpha value obtained for the Heutagogy instrument was $\alpha = 0.721$, based on 5 items. This value exceeds the commonly accepted reliability threshold of 0.70, thereby classifying the instrument as reliable. It should be noted, however, that 0.721 does not sit far above the lower boundary, placing it more accurately at a level of acceptable reliability rather than high reliability.

Variable Y: The Case Processing Summary likewise recorded $N = 70$ with zero excluded cases. The Cronbach's Alpha for the Heavy Equipment Technology Competence instrument was $\alpha = 0.846$, a value substantially higher than that of Variable X. This is a commendable result, falling within the category of good reliability. A total of 5 items were included in this scale. The difference between 0.721 and 0.846 across the two variables is considerable, with Variable Y demonstrating a notably more solid internal consistency.

Normality Test

The Tests of Normality table presented results from two methods simultaneously, namely the Kolmogorov-Smirnov test with Lilliefors Significance Correction and the Shapiro-Wilk test, applied to both variables with a total N of 70.

For TOTAL_X, the Kolmogorov-Smirnov statistic was 0.241 with $df = 70$. The Shapiro-Wilk test yielded $W = 0.904$ with a significance value well below 0.001. A Shapiro-Wilk value below 1.000 combined with a significance level far beneath 0.05 indicates that the distribution of TOTAL_X statistically deviates from normality. This is not inherently problematic, as

parametric normality tests tend to be highly sensitive to minor deviations in samples as large as 70.

For TOTAL_Y, the Kolmogorov-Smirnov statistic was 0.196 with $df = 70$, and the Shapiro-Wilk test produced $W = 0.918$ with $sig. < 0.001$ as well. The pattern mirrors that of TOTAL_X. The stem-and-leaf plot stored within the output further illustrated an imperfectly symmetrical distribution, with a concentration of data at the middle values and a number of extremes at both ends. Given that neither variable satisfied the assumptions of parametric normality, the selection of the nonparametric Spearman Rank correlation was methodologically sound and well-justified.

Spearman Rank Correlation Test

The Nonparametric Correlations table presents the core findings of this study. The Spearman's rho correlation coefficient between TOTAL_X (Heutagogy) and TOTAL_Y (Heavy Equipment Technology Competence) was $r_s = 0.666$ with $N = 70$. This value was flagged by SPSS with a double asterisk (**), denoting significance at the 0.01 level on a two-tailed basis.

A coefficient of $r_s = 0.666$ falls within the range classified by much of the statistical literature as a strong correlation, as it exceeds the 0.60 threshold. The direction is positive, meaning that higher scores in the implementation of the Heutagogy Method among students are consistently associated with higher competence scores in the Heavy Equipment Technology course. With $N = 70$, this value carries sufficient statistical power to support population-level inference. Significance at the 0.01 two-tailed level further indicates that the probability of this correlation occurring by chance is extremely low, well beneath the Type I error tolerance commonly adopted in educational research.

CONCLUSION

This study delivers a fairly unambiguous finding: the heutagogy method is not merely an appealing theoretical discourse confined to academic journals, but rather carries a measurable and substantive correlation with student competence. A Spearman's rho coefficient of $r_s = 0.666$ at a significance level of 0.01 demonstrates a strong and positive relationship between the implementation of the heutagogy method (Variable X) and student competence in the Heavy Equipment Technology course (Variable Y). Across 70 respondents, there is little room for ambiguity. The numbers speak clearly.

The research instruments likewise proved to be robust. All items in both Variable X and Variable Y passed the validity test, with r values exceeding the r -table threshold across every item. Reliability results were equally satisfactory, yielding a Cronbach's Alpha of 0.721 for Variable X and 0.846 for Variable Y. The data collected were neither fragile nor coincidental in nature. The normality test confirmed that the distribution of both variables deviated from the normal curve, and it is precisely this finding that legitimized the use of Spearman Rank as the correlation method of choice. This was a methodologically sound decision, not merely an alternative fallback.

These findings are consistent with what Blaschke, Yoto, Sumarni, and Sudira have long

advocated. The heutagogical approach is fundamentally designed to cultivate learners who are autonomous, reflective, and capable of engaging in second-loop thinking, rather than simply completing assignments and moving on. In the context of automotive vocational education in Indonesia, which continues to struggle with the gap between graduate competence and the demands of Industry 4.0, these results carry considerable urgency and warrant serious attention from curriculum developers and educational policymakers alike. In short, the greater the intensity of heutagogy implementation throughout the learning process, the higher the level of technical competence students are able to develop. This is not an absolute guarantee, as correlation does not imply causation. Nevertheless, a relationship as strong as 0.666 with an adequate sample size is not a signal that anyone who genuinely cares about the quality of vocational education in this country can afford to overlook.

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