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The Moderating Role of Self Efficacy in the Relationship Between Heutagogical and Andragogical Blended Learning Approaches and Skill Acquisition

Ishaq Ishaq

ishaqmadeamin@unismuh.ac.id

Muhammadiyah University of Makassar

Syamsidar Saleng

Muhammadiyah University of Makassar

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Abstract

Higher education requires instructional approaches that support students' ability to develop and apply skills while managing their own learning. Heutagogy and andragogy offer different levels of learner autonomy, yet their relationship with students' self-efficacy in skill acquisition requires further empirical investigation. This study examined differences in skill acquisition between heutagogical and andragogical approaches and investigated the interaction between instructional approach and self-efficacy in a blended learning environment. A quantitative quasi-experimental study employed a pretest-posttest nonequivalent control group design involving 60 fifth-semester undergraduate students enrolled in an Educational Evaluation Techniques course at Universitas Muhammadiyah Makassar, Indonesia. Two existing classes participated in the study, with 30 students assigned to each instructional approach. Self-efficacy was classified into high, moderate, and low categories. Data were analyzed using descriptive statistics, multivariate analysis of variance, univariate tests, and pairwise comparisons. The results showed that the heutagogical group achieved a higher mean skill acquisition score ($M = 65.83$) than the andragogical group ($M = 58.61$). Instructional approach had a significant main effect on skill acquisition, $F(1, 54) = 15.974$, $p < 0.001$. Self-efficacy also had a significant main effect, $F(2, 54) = 79.321$, $p < 0.001$. Importantly, the interaction between instructional approach and self-efficacy was significant, $F(2, 54) = 4.533$, $p = 0.015$. These findings indicate that the relationship between instructional approach and skill acquisition varies across self-efficacy categories. The study provides empirical insights for designing autonomy-oriented blended learning experiences that consider students' personal characteristics in higher education.

1. INTRODUCTION

Higher education faces increasingly complex demands in preparing graduates who can acquire knowledge, develop skills, and apply their competencies across diverse professional situations. Changes in the social environment, technological developments, and evolving workforce requirements call for students who can adapt, make decisions, solve problems, and continuously develop their capabilities. In this context, educational success needs to be considered in terms of students' ability to connect conceptual knowledge with its application in real-world situations. Skill acquisition represents an important indicator of this process because it reflects an individual's ability to use knowledge, procedures, and strategies to complete tasks and address specific problems. Developing such competencies requires learning experiences that allow students to practice, apply, evaluate, and improve their work. Accordingly, skill development needs to be supported by instructional designs that consider learning processes, student engagement, and individual characteristics.

These changing competency demands have encouraged higher education institutions to reconsider instructional approaches that place lecturers in primary control of the educational process. Excessive reliance on instructor direction may limit students' opportunities to identify their learning needs, determine strategies for completing tasks, explore information sources, and make independent decisions. University students, however, need to develop the capacity to manage their learning in

accordance with their academic goals and professional aspirations. Knowles[1] explained that adult learning should account for learners' experiences, readiness, needs, and responsibility for their own learning. In line with this perspective, approaches that give learners greater opportunities to manage their learning experiences have gained attention in higher education. However, greater learning autonomy also presents challenges because students differ in their readiness, prior experiences, and ability to manage their learning activities.

The development of independent learning approaches can be understood through the concepts of andragogy and heutagogy. Andragogy, developed by Knowles[1], views adult learners as individuals whose needs, experiences, and motivations should inform the learning process. Within this approach, students are encouraged to participate in identifying learning needs, planning activities, selecting learning resources, and evaluating their progress with guidance from instructors. Hase and Kenyon[2, 3] introduced heutagogy as an approach to self-determined learning that gives learners greater control over the direction and nature of their learning experiences. Heutagogy positions students as primary agents in deciding what they learn, how learning takes place, which resources they use, and how learning outcomes are evaluated. The distinction between these approaches therefore concerns the degree of learner autonomy and responsibility in making decisions about the learning process. This perspective is consistent with Blaschke and Hase[4], who describe heutagogy as an approach grounded in learner agency and capability development within digital environments. Amiruddin[5] also demonstrate the relationship between active learning practices, self-directed learning, and self-determined learning in the Indonesian educational context.

The distinction between andragogy and heutagogy is best understood in terms of differences in learner control and engagement, rather than as a rigid separation between approaches. Blaschke[6] explains that heutagogy extends the principles of self-directed learning by placing greater emphasis on learner agency, capability, reflection, and lifelong learning. Hase and Kenyon[3] similarly identify learners' capacity to determine their own learning experiences as a defining feature of heutagogy. This perspective is consistent with Amiruddin[7], who examine pedagogy, andragogy, and heutagogy as a continuum of learning approaches in higher education. Their study indicates that these approaches have distinguishable characteristics that can be identified and measured in educational practice. In the present study, andragogy is operationalized through a self-directed learning strategy, whereas heutagogy is implemented through a self-determined learning strategy. Differences in the degree of learner autonomy provide the basis for comparing students' skill acquisition under these two instructional approaches.

In practice, heutagogy offers opportunities for students to develop agency and capability through open, exploratory, and reflective learning experiences. Blaschke[8] identifies learning how to learn as an important orientation of this approach. Narayan, Herrington and Cochrane[9] developed heutagogical learning design principles that incorporate mobile devices and social media to support student-determined learning experiences. Gillaspy and Vasilica[10] demonstrate that appropriately supported heutagogical designs can foster learner agency, self-reflection, metacognition, and capability

development. Blaschke and Marin[11] also discuss the use of e-portfolios as a means of supporting reflection and competency development in heutagogical learning environments. In addition, Stoten[12] developed the OEPA framework to map heutagogical learning journeys in management education, emphasizing learners' active involvement in their own development. Within Indonesian higher education, Halim[13] identify both the benefits and challenges of implementing heutagogy, particularly when learner autonomy is integrated with technology supported learning. Collectively, these studies demonstrate the potential of heutagogy to provide students with opportunities to develop their abilities through more autonomous learning experiences.

Despite its potential, heutagogy does not necessarily produce optimal learning experiences for every student. Moore[14] in a review of heutagogy and its contribution to lifelong learning, identifies several contexts, critiques, and challenges that require consideration during implementation. One important concern is learners' readiness to engage in environments that offer greater autonomy. Students who have not yet developed adequate learning management skills may experience difficulties in setting goals, selecting strategies, managing their time, and evaluating their progress. Gillaspy and Vasilica[10] also emphasize the importance of scaffolding in heutagogical design to help students develop independence progressively. These considerations suggest that greater autonomy needs to be accompanied by instructional support that reflects students' characteristics and readiness. Walsh[15] demonstrate that adult learner agency can be fostered through online professional development programs that allow participants to direct their learning experiences. Similarly, Imsiyah[16] examine heutagogy based training management as a means of supporting self-determined learning among adult learners. These findings highlight the importance of considering students' personal characteristics when evaluating instructional approaches that provide different levels of learner autonomy.

The differences between andragogy and heutagogy become particularly relevant when both approaches are implemented through blended learning. This approach integrates face-to-face instruction with technology-supported learning through synchronous and asynchronous activities. Such an arrangement allows students to interact directly with lecturers and peers while engaging in independent learning activities through digital resources. In this environment, lecturers can facilitate learning, provide feedback, and make learning resources available, while students have opportunities to develop their knowledge and skills through more flexible activities. Nevertheless, access to technology and flexibility in learning schedules do not automatically ensure effective learning. Rasheed et al.[17] identify several challenges associated with the online components of blended learning, including interaction, learning management, and student engagement. Müller and Mildenberger [18], through a systematic review and meta-analysis in higher education, also found that replacing face-to-face classroom time with online learning does not automatically produce differences in learning outcomes compared with conventional instruction. Meanwhile, Xu et al.[19] report positive effects of self-regulated learning interventions on academic achievement in online and blended learning environments. Cao[20] similarly demonstrates that the effects of blended learning on student performance and achievement vary across educational contexts. These findings indicate that instructional design quality, learning regulation strategies, and the support provided to students deserve careful consideration in technology supported education. In the

present study, blended learning serves as a common instructional environment for comparing heutagogical and andragogical approaches.

One personal characteristic that may help explain differences in students' responses to instructional approaches is self-efficacy. Bandura [21, 22] defines self-efficacy as an individual's belief in their ability to organize and execute the actions required to achieve particular outcomes. Within Social Cognitive Theory, human behavior develops through reciprocal interactions among personal factors, environmental conditions, and behavior [23, 24]. Self-efficacy is a personal factor associated with individuals' choices, effort, persistence, and responses to difficulties. Students who have stronger beliefs in their capabilities tend to be more willing to undertake challenging tasks, sustain their efforts, and explore strategies when encountering obstacles. Conversely, lower confidence in one's capabilities may be associated with hesitation in decision-making and difficulty maintaining engagement when learning demands become challenging. These characteristics are particularly relevant in learning environments that provide greater autonomy, where students are expected to manage their activities and take responsibility for completing assigned tasks. Theobald [25], through a meta-analysis of self-regulated learning training programs among university students, found that such interventions can improve academic performance, learning strategies, and motivation. This evidence reinforces the importance of considering students' personal characteristics when developing instructional approaches that provide greater learning autonomy.

The relationship between self-efficacy and academic achievement has received considerable attention in previous research. Schunk and Pajares [26] explain that academic self-efficacy is associated with motivation, learning strategies, and student achievement. Honicke and Broadbent [27], through a systematic review of research involving university students, identified a positive relationship between academic self-efficacy and academic performance. However, the relationship between self-efficacy and actual performance does not follow the same pattern across all educational fields and skill domains. Brocker and Scafide [28], in a systematic review of studies involving nursing students, found that most of the reviewed studies reported weak or nonsignificant relationships between self-efficacy and skill performance. These differing findings suggest that the relationship between perceived capability and actual performance may depend on the nature of the skill, instrument operationalization, practical experience, and learning context. Therefore, the relationship between self-efficacy and skill acquisition warrants further examination within the context of specific instructional approaches.

The relevance of self-efficacy becomes particularly important in autonomous learning environments because students are expected to manage their learning with different levels of instructional guidance. Students participating in heutagogical learning have greater opportunities to determine their learning goals, strategies, and experiences, whereas those following an andragogical approach receive more structured guidance from instructors. These differences may create varying demands in decision-making, activity management, and task completion. Students with different levels of self-efficacy may consequently respond differently to these instructional environments. From Bandura's [23, 24] perspective, personal characteristics and learning environments interact in shaping individual behavior.

Accordingly, self-efficacy may influence how students respond to different instructional approaches and how these approaches relate to their skill acquisition.

Previous studies have examined heutagogical practices, the development of independent learning, and the relationship between personal characteristics and learning processes. Blaschke[8] positions heutagogy as a framework that supports capability development and lifelong learning. Moore[14] identifies the contexts and challenges associated with implementing heutagogy across different learning environments. Narayan et al.[9] develop design principles that enable students to determine their learning experiences through mobile technologies and social media. Gillaspy and Vasilica[10] investigate the development of digital learners through heutagogical design, while Blaschke and Marin[11] discuss the application of heutagogical principles in the use of e-portfolios to support reflection and competency development. Hamdan et al.[29] examine the development of mobile heutagogy practices in higher education and highlight the need for further empirical evidence concerning their acceptance and implementation. Meanwhile, Tiew and Abdullah[30] investigate relationships among social learning environments, students' psychological needs, heutagogical activities, and self-determined learning among postgraduate students. These studies provide useful foundations for understanding heutagogical learning, while also indicating the importance of examining how instructional approaches relate to skill outcomes across students with different personal characteristics.

A more recent study by Akçay[31] examines the relationships among heutagogical competencies, academic self-efficacy, and lifelong learning tendencies among university students. The findings indicate that academic self-efficacy mediates the relationship between heutagogical competencies and lifelong learning tendencies. This study provides evidence that academic beliefs are relevant to understanding the relationship between self-determined learning competencies and students' learning orientations. However, Akçay's study focuses on lifelong learning tendencies and examines the mediating role of self-efficacy. Its focus therefore differs from the present investigation, which examines the interaction between heutagogical and andragogical approaches and self-efficacy in relation to skill acquisition. Stoszkowski and McCarthy[32] provide empirical evidence that students value autonomy and opportunities to take charge of their learning, although preferences for instructional guidance vary. Rinaldi et al.[33] also examine heutagogy in relation to conceptual understanding, awareness of independent learning, and learning outcomes. Together, these studies highlight the importance of student readiness, preferences, and engagement in autonomous learning environments.

Considering these developments in the literature, further comparative empirical evidence is needed to explain the relationship among autonomous learning approaches, students' personal characteristics, and skill acquisition in blended learning environments. Xu et al. [19] through a scoping review of 163 studies, demonstrate the importance of self-regulated learning for academic achievement in online and blended learning environments. Zhao et al. [34], through a meta-analysis of 42 studies involving 11,014 participants, also identify a positive relationship between self-regulated learning strategies and academic performance, although the overall association is relatively small. These findings establish the relevance of learning regulation to academic achievement, but they do not specifically explain how

differences in instructional approaches relate to students' personal characteristics in skill acquisition. Three aspects therefore warrant further empirical investigation. First, comparative evidence concerning skill acquisition through heutagogical and andragogical approaches remains limited. Second, research on self-efficacy and skill performance has reported varying findings across contexts and measurement approaches. Third, the interaction between instructional approaches and self-efficacy in explaining differences in skill acquisition requires more specific investigation. Examining these factors together may therefore provide a clearer understanding of whether skill acquisition patterns associated with different instructional approaches vary according to students' levels of self-efficacy.

The present study addresses this research gap by comparing self-determined learning (heutagogy) and self-directed learning (andragogy) within a blended learning environment and examining the interaction between instructional approach and self-efficacy in relation to students' skill acquisition. Unlike studies focusing on the development of heutagogical competencies, independent learning skills, or lifelong learning tendencies, this study identifies skill acquisition, measured through learning achievement, as its primary outcome. Self-efficacy is operationalized into three categories high, moderate, and low to examine whether the relationship between instructional approach and skill acquisition varies according to students' personal characteristics. This focus provides empirical evidence concerning the relationship between learner autonomy and students' beliefs about their capabilities in achieving skill-related learning outcomes.

To address these objectives, the study employed a quasi-experimental pretest–posttest non-equivalent control group design involving 60 fifth-semester students enrolled in the Islamic Religious Education undergraduate program at Universitas Muhammadiyah Makassar, Indonesia. Participants were assigned to two existing classes: a heutagogical group and an andragogical group, each comprising 30 students. Both groups participated in learning activities delivered through a blended learning arrangement. Specifically, the study aimed to (1) examine differences in students' skill acquisition between heutagogical and andragogical approaches, (2) identify differences in skill acquisition across self-efficacy categories, and (3) examine the interaction between instructional approach and self-efficacy in relation to students' skill acquisition. The study contributes empirical evidence to research on autonomous learning approaches and personal characteristics in higher education. Its findings may inform the development of blended learning designs that account for learner autonomy, readiness, and students' beliefs about their capabilities when engaging in learning activities.

2. METHOD

2.1. Research Design

This study employed a quantitative approach using a quasi experimental design, specifically a pretest and posttest nonequivalent control group design. This design was selected because the study involved two preexisting classes, and participants were therefore not individually randomized into experimental and comparison groups. Quasi experimental designs are commonly used in educational research to

examine the effects of instructional interventions under conditions in which individual random assignment is impractical, while accounting for the potential influence of preexisting group characteristics [35–37].

The study involved two groups: an experimental group receiving a self determined learning approach (heutagogy) and a comparison group receiving a self directed learning approach (andragogy). Both groups attended the Educational Evaluation Techniques course through a blended learning arrangement supported by the SPADA Learning Management System (LMS) at Universitas Muhammadiyah Makassar. Pretests were administered to assess students' initial knowledge and skill acquisition, while a self efficacy questionnaire was used to identify students' beliefs about their learning capabilities. Following the instructional intervention, both groups completed posttests to assess their learning outcomes.

For this study, instructional approach was treated as the independent variable with two levels: heutagogy and andragogy. Self efficacy was examined as a moderating variable and classified into three categories: high, moderate, and low. Skill acquisition was specified as the primary dependent variable. Accordingly, the analysis focused on the main effects of instructional approach and self efficacy, as well as their interaction in relation to students' skill acquisition.

2.2. Participants and Research Setting

The study was conducted during the 2023/2024 academic year and involved 60 fifth semester undergraduate students enrolled in the Educational Evaluation Techniques course in the Islamic Religious Education Study Program, Faculty of Islamic Studies, Universitas Muhammadiyah Makassar, Indonesia. Participants were drawn from two preexisting classes: Class A was assigned to the heutagogical group, while Class B was assigned to the andragogical group. Each group consisted of 30 students.

The selection of the two classes considered students' average grades in the prerequisite course, Fundamentals of Education. The heutagogical group had an average grade of 85.56, while the andragogical group had an average grade of 85.32. The similarity between these averages provided an initial indication that the two groups had relatively comparable prior academic performance. The use of existing classes also reflected the practical conditions of course delivery and the suitability of the participants for the research objectives [38].

Based on the self efficacy questionnaire results, participants were classified into three categories. The heutagogical group comprised 12 students with high self efficacy, 8 with moderate self efficacy, and 10 with low self efficacy. The andragogical group comprised 8 students with high self efficacy, 19 with moderate self efficacy, and 3 with low self efficacy. This distribution resulted in unequal sample sizes across the six combinations of instructional approach and self efficacy. In particular, the andragogical group included only three students in the low self efficacy category. This imbalance was considered when interpreting the interaction findings, especially the estimates associated with the smaller subgroup.

2.3. Learning Interventions

The instructional intervention was implemented through a blended learning arrangement in the three credit Educational Evaluation Techniques course. Both groups received the same course content, learning materials, and digital learning facilities through the SPADA LMS at Universitas Muhammadiyah Makassar. Learning activities consisted of classroom sessions, independent study, and structured assignments. In accordance with the three credit course structure, the weekly learning allocation was 8 hours and 30 minutes.

The two groups differed in how learning activities were organized and in the extent to which students participated in determining their learning processes.

Heutagogy (self determined learning). The experimental group followed three interconnected phases: learning contract, learning activities, and learning outcomes. During the learning contract phase, students identified their learning needs, reviewed the course learning outcomes, established learning objectives, and developed learning plans and assessment agreements. During the learning activities phase, students explored course materials and learning resources, developed relevant skills, collaborated with peers, completed learning tasks, used feedback, and reflected on their progress through learning journals. During the learning outcomes phase, students demonstrated their achievements through learning products, assignments, reports, portfolios, and assessments. Throughout these phases, the lecturer acted as a facilitator, providing guidance and support according to students' learning needs.

Andragogy (self directed learning). The comparison group participated in learning activities organized around planning, implementation, and assessment. Students studied the course materials, managed their learning activities, accessed available learning resources, and completed assignments according to established learning objectives and plans. The lecturer provided learning resources, guidance, and instructional facilitation, while students remained responsible for carrying out learning activities and completing the required assessments.

Both groups used the same learning environment, course content, and digital facilities. This arrangement provided a common instructional context for examining differences associated with the organization of learning activities and the degree of student autonomy in the two approaches.

2.4. Research Instruments and Validation

The research instruments comprised a self efficacy questionnaire and a learning achievement test measuring skill acquisition. Before implementation, the heutagogical learning design and its supporting instructional materials were also subjected to expert content validation.

Content validity of the learning design and instructional materials. Expert validation was conducted on the heutagogical learning design, learning resources provided through the SPADA LMS, and supporting instructional materials. The assessment covered instructional design, learning structure, lecturer and

student activities, learning resources, communication, interaction, and technological support. Content validity was evaluated using Aiken's V based on expert ratings of the relevance of the assessed components [39]. The validation results produced Aiken's V values of 0.89 for the learning design, 0.92 for the learning resources, and 0.90 for the instructional materials. These values were classified as high according to the criteria applied in the original study.

Self efficacy questionnaire. The self efficacy questionnaire was used to assess students' beliefs about their ability to achieve learning objectives. Its conceptual foundation was based on Bandura's [21] definition of self efficacy as an individual's belief in their ability to organize and execute actions required to attain particular outcomes. The questionnaire addressed three aspects: students' beliefs in their ability to complete tasks, master situations or concepts, and achieve expected outcomes. The resulting scores were used to classify participants into high, moderate, and low self efficacy categories.

Skill acquisition test. Skill acquisition was assessed using a learning achievement test developed for the Educational Evaluation Techniques course. The test was designed with reference to the program learning outcomes (PLOs), course learning outcomes (CLOs), and specific learning outcomes established for individual course topics. The final instrument consisted of 34 items, comprising 22 items assessing knowledge acquisition and 12 items assessing skill acquisition. The present study focused on the 12 skill acquisition items as the primary outcome measure. The test was administered before and after the instructional intervention to assess students' initial and final levels of skill acquisition.

Item validity and test reliability. Item analysis was conducted in two stages using the Pearson Product Moment correlation. In the first stage, 45 test items were examined. Thirty items met the validity criteria, while 11 were identified as invalid. The reliability coefficient at this stage was 0.780. Following item revision and further testing, the final instrument comprised 34 valid items, with no items identified as invalid in the second validation stage. The resulting Guttman split half reliability coefficient was 0.801. This coefficient represents the complete 34 item instrument, comprising both knowledge and skill items. Therefore, it should not be interpreted as a separate reliability estimate for the 12 skill acquisition items.

2.5. Data Collection Procedures

Data collection was conducted in three stages. First, all participants completed pretests assessing knowledge and skill acquisition and responded to the self efficacy questionnaire. These initial assessments provided information about students' baseline learning performance and their self efficacy classifications.

Second, the instructional interventions were implemented in the two groups. Students in the heutagogical group participated in the learning contract, learning activities, and learning outcomes phases. Students in the andragogical group participated in learning activities organized around planning, implementation, and assessment. Both groups used the SPADA LMS and participated in classroom sessions, independent learning, and structured assignments.

Third, after completion of the instructional intervention, all participants completed posttests to assess their final knowledge and skill acquisition. For the present article, the analyzed data focused on instructional group membership, self efficacy category, and pretest and posttest scores for skill acquisition.

2.6. Data Analysis

Data were analyzed using descriptive and inferential statistics with IBM SPSS Statistics version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize skill acquisition scores according to instructional approach and self efficacy category.

In the original dissertation, a Multivariate Analysis of Variance (MANOVA) was employed to examine the effects of instructional approach, self efficacy, and their interaction on two learning outcomes: knowledge acquisition and skill acquisition. The present article focuses specifically on skill acquisition. Instructional approach was specified as a factor with two levels, while self efficacy was specified as a factor with three levels.

Univariate follow up analyses were conducted using the Tests of Between Subjects Effects to examine the main effect of instructional approach, the main effect of self efficacy, and the interaction between these factors. Pairwise comparisons were used to examine differences in estimated means across factor levels. The selection and interpretation of multivariate and univariate procedures considered the characteristics of the data and the relevant statistical assumptions [40].

Assumption testing included assessments of normality, homogeneity of variance, and homogeneity of variance covariance matrices. The results were interpreted in consideration of the nonequivalent group design and the distribution of participants across the six factor combinations. Because the study included pretest and posttest measurements, initial differences in learning performance were also considered when interpreting the findings. The factorial analyses reported in this article were based on the posttest outcomes. Any additional analysis controlling for pretest scores, if conducted, was treated separately from the factorial analysis reported in the dissertation. Statistical results were presented using means, standard deviations, F statistics, degrees of freedom, significance values, effect sizes, and confidence intervals, as supported by the available statistical output.

2.7. Ethical Considerations

This study was conducted within the undergraduate Islamic Religious Education Program, Faculty of Islamic Studies, Universitas Muhammadiyah Makassar, Indonesia. Ethical approval was granted by the Institutional Review Board of the Institute for Research, Development, and Community Service (Lembaga Penelitian, Pengembangan dan Pengabdian kepada Masyarakat [LP3M]), Universitas Muhammadiyah Makassar (Approval No. 138/LP3M/05/A.4-VII/VIII/45/2023). All procedures involving human participants were conducted in accordance with applicable ethical standards and the principles of the Declaration of Helsinki. Informed consent was obtained from all participants before their involvement in

the study. To maintain confidentiality, participants' identities were protected through the use of anonymous codes during data processing and reporting.

3. RESULT

3.1. Participant Distribution by Self Efficacy Category

The study involved 60 undergraduate students assigned to two instructional groups: *self-determined learning* (heutagogy) and *self-directed learning* (andragogy), each comprising 30 students. Based on the self efficacy questionnaire results, participants were classified into three categories: high, moderate, and low.

Table 1
Participant distribution by instructional approach and self efficacy category

Self efficacy category	Heutagogy (n = 30)	Andragogy (n = 30)
High	12 (40.00%)	8 (26.67%)
Moderate	8 (26.67%)	19 (63.33%)
Low	10 (33.33%)	3 (10.00%)
Total	**30 (100%)**	**30 (100%)**

Table 1 shows that self efficacy was distributed relatively evenly across the three categories in the heutagogical group, whereas the andragogical group was predominantly composed of students with moderate self efficacy (63.33%). This difference in distribution is relevant to the interpretation of the interaction findings, particularly because the low self efficacy subgroup in the andragogical group included only three students.

3.2. Changes in Skill Acquisition Before and After the Intervention

Changes in skill acquisition were examined by comparing the distribution of pretest and posttest scores across five categories of the criterion referenced assessment classification.

Table 2
Distribution of skill acquisition categories before and after the intervention

Assessment category	Heutagogy pretest	Heutagogy posttest	Andragogy pretest	Andragogy posttest
Poor	6 (20.00%)	0 (0.00%)	5 (16.67%)	2 (6.67%)
Below satisfactory	11 (36.67%)	3 (10.00%)	11 (36.67%)	3 (10.00%)
Satisfactory	10 (33.33%)	11 (36.67%)	11 (36.67%)	10 (33.33%)
Good	3 (10.00%)	9 (30.00%)	3 (10.00%)	11 (36.67%)
Very good	0 (0.00%)	7 (23.33%)	0 (0.00%)	4 (13.33%)
Total	**30**	**30**	**30**	**30**

As shown in Table 2, both groups exhibited a shift toward higher skill acquisition categories following the intervention. In the heutagogical group, the proportion of students in the good and very good categories increased from 10.00% at pretest to 53.33% at posttest. In the andragogical group, the corresponding proportion increased from 10.00% to 50.00%. Meanwhile, the proportions of students in the poor and below satisfactory categories decreased in both groups. These results describe changes in the distribution of achievement categories and do not independently establish the statistical significance of differences in improvement between the two instructional approaches.

3.3. Descriptive Statistics of Skill Acquisition

Descriptive statistics were calculated to examine mean skill acquisition scores according to instructional approach and self efficacy category.

Table 3
Descriptive statistics of skill acquisition by instructional approach and self efficacy category

Instructional approach	Self efficacy category	Mean	SD	n
Heutagogy	High	83.33	8.70	12
Heutagogy	Moderate	62.50	4.46	8
Heutagogy	Low	47.50	11.15	10
Heutagogy	Total	65.83	17.83	30
Andragogy	High	81.25	9.71	8
Andragogy	Moderate	54.83	10.87	19
Andragogy	Low	22.22	9.62	3
Andragogy	Total	58.61	19.76	30

Table 3 indicates that the heutagogical group obtained a higher overall mean skill acquisition score than the andragogical group. This pattern was also observed across all three self efficacy categories. The mean differences between the two approaches were 2.08 points among students with high self efficacy, 7.67 points among those with moderate self efficacy, and 25.28 points among those with low self efficacy. In both groups, mean skill acquisition scores increased across the self efficacy categories, from low to high. These descriptive findings provide an initial indication that the relationship between instructional approach and skill acquisition may vary according to students' self efficacy levels.

3.4. Univariate Effects on Skill Acquisition

Univariate analyses were conducted to examine the main effects of instructional approach and self efficacy, as well as their interaction, on students' skill acquisition. This analysis focused on skill acquisition as the primary outcome of the present article.

Table 4
Univariate test results for skill acquisition

Source of variation	Sum of squares	df	Mean square	F	p	Partial η^2
Instructional approach	1,497.873	1	1,497.873	15.974	< 0.001	0.228
Self efficacy	14,875.545	2	7,437.773	79.321	< 0.001	0.746
Instructional approach × self efficacy	850.071	2	425.035	4.533	0.015	0.144
Error	5,063.488	54	93.768	-	-	-

Table 4 shows statistically significant effects of instructional approach, self efficacy, and their interaction on skill acquisition. The main effect of self efficacy was significant, $F(2, 54) = 79.321$, $p < 0.001$, with a partial eta squared of 0.746. The main effect of instructional approach was also significant, $F(1, 54) = 15.974$, $p < 0.001$, with a partial eta squared of 0.228. The interaction between instructional approach and self efficacy was statistically significant, $F(2, 54) = 4.533$, $p = 0.015$, with a partial eta squared of 0.144. This interaction indicates that differences in skill acquisition associated with the two instructional approaches varied across self efficacy categories.

3.5. Pairwise Comparisons of Instructional Approach and Self Efficacy

Pairwise comparisons were conducted to examine the direction and magnitude of differences in mean skill acquisition scores across instructional approaches and self efficacy categories.

Table 5
Pairwise comparisons of skill acquisition

Comparison	Mean difference	SE	95% CI	p
Heutagogy vs. andragogy	11.677	2.922	5.820–17.535	< 0.001
High vs. moderate self efficacy	23.630	3.008	17.599–29.660	< 0.001
High vs. low self efficacy	47.432	3.878	39.656–55.207	< 0.001
Moderate vs. low self efficacy	23.802	3.784	16.215–31.389	< 0.001

Table 5 shows a statistically significant difference in estimated mean skill acquisition between the heutagogical and andragogical groups. The mean difference was 11.677 points in favor of the heutagogical group. Comparisons across self efficacy categories also revealed statistically significant differences. The largest difference was observed between students with high and low self efficacy, with a mean difference of 47.432 points.

The pairwise comparisons used the Least Significant Difference (LSD) procedure without adjustment for multiple comparisons. Accordingly, the results should be interpreted with consideration of the increased risk of Type I error. These comparisons examine differences in the main effects and do not establish whether the difference between instructional approaches is statistically significant within each self efficacy category.

3.6. Interaction Between Instructional Approach and Self Efficacy in Skill Acquisition

Estimated marginal means were examined to describe skill acquisition patterns across the six combinations of instructional approach and self efficacy category.

Table 6
Estimated marginal means of skill acquisition by instructional approach and self efficacy category

Instructional approach	Self efficacy category	Mean	SE	95% CI
Heutagogy	High	83.333	2.795	77.729–88.938
Heutagogy	Moderate	62.500	3.424	55.636–69.364
Heutagogy	Low	47.498	3.062	41.359–53.637
Andragogy	High	81.251	3.424	74.387–88.115
Andragogy	Moderate	54.825	2.222	50.371–59.279
Andragogy	Low	22.223	5.591	11.015–33.432

Table 6 shows that the estimated mean skill acquisition score was higher in the heutagogical group across all three self efficacy categories. The differences between the two approaches were 2.082 points among students with high self efficacy, 7.675 points among those with moderate self efficacy, and 25.275 points among those with low self efficacy. The confidence interval for the andragogical group with low self efficacy was wider, consistent with the subgroup's small sample size of three students. This indicates greater uncertainty in the estimated mean for that subgroup.

Figure 1 illustrates that mean skill acquisition increased with higher self efficacy in both instructional groups. Among students with high self efficacy, the difference between the estimated means for heutagogy and andragogy was relatively small. This difference became larger among students with moderate self efficacy and was greatest among those with low self efficacy. This pattern is consistent with the statistically significant interaction reported in Table 4.

The error bars represent 95% confidence intervals, with a wider interval observed for the andragogical group with low self efficacy. This reflects greater uncertainty in the estimate for that subgroup. Therefore, the interaction pattern should be interpreted cautiously and should not be taken as a substitute for simple effects tests examining the statistical significance of differences between instructional approaches within each self efficacy category.

4. DISCUSSION

The findings indicate that students who participated in the *self-determined learning* approach (heutagogy) achieved higher skill acquisition scores than those who participated in the *self-directed learning* approach (andragogy). This difference was statistically significant, $F(1, 54) = 15.974$, $p < 0.001$. Within the context of the Educational Evaluation Techniques course, this result suggests that the way learning activities were organized through the heutagogical approach was associated with students' skill acquisition. One possible explanation concerns the greater autonomy and responsibility afforded to students in determining their learning experiences. Andragogy emphasizes adult learners' needs, experiences, readiness, and responsibility in directing their learning processes [1]. Heutagogy extends the principles of independent learning by giving learners greater control over what they learn, how learning takes place, which resources they use, and how they evaluate their learning outcomes [41]. Blaschke[8] identifies capability development, reflection, and lifelong learning as important characteristics of this approach.

In the context of skill development, opportunities to select strategies and make learning decisions may encourage students to become more actively involved in applying their knowledge. Through the *learning contract*, *learning activities*, and *learning outcomes* phases, students in the heutagogical group identified their learning needs, planned activities, explored resources, completed assignments, and evaluated their learning outcomes. This finding is consistent with Gillaspy and Vasilica [10], who emphasize learner agency, self-reflection, and the capacity to direct learning through heutagogical design. Narayan et al. [9] also demonstrate how mobile devices and social media can support student-determined learning

experiences. Agonács and Matos (2019), in their review of the application of heutagogy, similarly identify its potential in online and distance education. However, greater learner autonomy requires adequate student readiness and appropriate instructional support. Blaschke [8], as well as Gillaspy and Vasilica [10] emphasize capability development and *scaffolding* to help learners manage their learning responsibilities. The present findings therefore suggest that heutagogy can support skill acquisition within the specific instructional context examined in this study. They do not establish its universal superiority across educational settings. This interpretation is also consistent with Stoszkowski and McCarthy [32], who found that students value opportunities to take charge of their learning, although their preferences for instructional guidance vary. These findings highlight the importance of aligning learner autonomy with students' readiness and learning needs.

In addition to instructional approach, *self-efficacy* had a significant main effect on skill acquisition, $F(2, 54) = 79.321$, $p < 0.001$. Based on the estimated marginal means across both instructional groups, students with high *self-efficacy* achieved higher skill acquisition scores than those with moderate and low *self-efficacy*. This finding is consistent with Bandura's [21, 23, 24] *Social Cognitive Theory*, which explains that *self-efficacy* concerns individuals' beliefs in their capabilities to organize and execute actions required to achieve particular goals. Such beliefs are associated with activity choices, effort, persistence, and responses to difficulties. These characteristics are relevant to skill acquisition because students are required to practice procedures, complete tasks, respond to feedback, and improve their performance.

Schunk and Pajares[26] describe the relationship between *self-efficacy*, motivation, learning strategies, and academic achievement. Honicke and Broadbent[27] further support this relationship through their systematic review, which identified a positive association between academic *self-efficacy* and university students' academic performance. Nevertheless, findings concerning *self-efficacy* and actual skill performance have varied across research contexts. Brocker and Scafide [28], in their systematic review of 20 studies involving nursing students, found that 16 studies reported weak or nonsignificant relationships between *self-efficacy* and skill performance. These differences suggest that the relationship between perceived capability and actual performance may depend on the nature of the skill, measurement instruments, practical experience, and learning environment. The present findings provide context-specific evidence of the relevance of *self-efficacy* to skill acquisition in higher education. They also highlight the importance of considering instructional context when interpreting this relationship. Theobald[25] provides further evidence that *self-regulated learning* training can improve university students' learning strategies, motivation, and academic performance. In online and *blended learning* environments, Xu et al.[19] and Zhao et al.[34] further highlight the importance of learning regulation strategies insupporting academic achievement. These findings support the importance of considering students' capacity to manage their learning when examining the relationship between *self-efficacy* and skill acquisition.

The most important finding of this study is the statistically significant interaction between instructional approach and *self-efficacy* in relation to skill acquisition, $F(2, 54) = 4.533$, $p = 0.015$. The estimated

marginal means show that the difference in skill acquisition between heutagogy and andragogy varied across *self-efficacy* categories. The difference was relatively small among students with high *self-efficacy*, while larger differences were observed among students with moderate and low *self-efficacy*. This pattern suggests that the relationship between instructional approach and skill acquisition was not uniform across students with different levels of confidence in their capabilities.

This interaction can be interpreted through the reciprocal relationship among personal factors, environmental conditions, and behavior described by Bandura [23, 24]. Instructional approaches establish learning environments with different levels of autonomy and responsibility, while *self-efficacy* concerns students' beliefs about their ability to meet the demands of those environments. In heutagogy, opportunities to determine learning directions, explore resources, select strategies, and engage in reflection may allow students to develop learning experiences that correspond more closely to their needs. These characteristics may help explain why the descriptive difference in skill acquisition between the two approaches was greater among students with low *self-efficacy*. However, the proposed mechanism was not directly measured in this study. It should therefore be understood as a theoretical interpretation of the observed statistical pattern, not as an empirically established psychological process.

Akçay's [31] study provides a relevant perspective on the relationship between heutagogical competencies and students' personal characteristics. In a study involving 545 university students, Akçay found that academic *self-efficacy* mediated the relationship between heutagogical competencies and lifelong learning tendencies. Although that study examined a mediation model and a different learning outcome, its findings highlight the relevance of academic beliefs in understanding heutagogical learning experiences. The present study extends this discussion by examining the interaction between heutagogical and andragogical approaches and *self-efficacy* in relation to skill acquisition. Its contribution lies in providing empirical evidence that the relationship between instructional approach and skill outcomes varies across students with different personal characteristics.

The interaction findings should also be interpreted in light of the distribution of participants across the six subgroups. The andragogical group with low *self-efficacy* included only three students, resulting in greater uncertainty around its estimated mean. Consequently, the observed difference between the two instructional approaches in this category cannot be interpreted as a statistically significant subgroup difference without additional testing. Simple effects analyses are required to establish whether the differences between heutagogy and andragogy are statistically significant within each *self-efficacy* category. This consideration is important to ensure that the interpretation remains within the limits of the available statistical evidence.

Another finding concerns the different interaction patterns observed for knowledge acquisition and skill acquisition. The results of the original study showed that the interaction between instructional approach and *self-efficacy* was significant for skill acquisition ($p = 0.015$), whereas the corresponding interaction for knowledge acquisition was not statistically significant ($p = 0.591$). This difference suggests that the

relationship between instructional approach and students' personal characteristics may vary according to the type of learning outcome being assessed. Knowledge acquisition primarily concerns the understanding of concepts and information, whereas skill acquisition requires students to apply knowledge through actions, procedures, decision-making, and task completion. These differences in learning demands may help explain why the interaction was observed for skill acquisition but not for knowledge acquisition. The nonsignificant interaction for knowledge acquisition, however, does not indicate that *self-efficacy* is irrelevant to knowledge development. It indicates that the interaction between the two factors did not reach statistical significance for that outcome under the model examined.

From a practical perspective, the findings offer considerations for the development of *blended learning* in higher education. Providing students with greater autonomy should be accompanied by activities that encourage resource exploration, task completion, product development, feedback, and reflection [8, 10]. Walsh et al. [15] also demonstrate that adult learner agency can be supported through online professional development designs that allow participants to direct their learning experiences. Cao [42] highlights that the effects of *blended learning* on student achievement and engagement can vary across instructional contexts. Accordingly, technological flexibility needs to be supported by appropriate learning activities, instructional guidance, and assessment strategies.

Lecturers should also consider students' levels of *self-efficacy* when determining the degree of responsibility and autonomy provided during instruction. Support may include gradual guidance, examples of task completion, constructive feedback, and opportunities to revise completed work. These practices are related to the four sources of *self-efficacy* described by Bandura [21]: mastery experiences, vicarious experiences, verbal persuasion, and the management of emotional and physiological states.

The use of an LMS should also support meaningful learning activities, including access to learning resources, communication, assignment management, and documentation of student progress. Gillaspy and Vasilica[10] demonstrate that technology supported heutagogical design can foster learner agency and reflection, while Blaschke[43] identifies agency as a central foundation of heutagogy. Nevertheless, technology alone does not ensure successful learning. Müller and Mildenberger [18], in their systematic review and meta-analysis of *blended learning* in higher education, show that replacing face-to-face classroom time with online learning does not automatically improve learning outcomes. LMS implementation should therefore be accompanied by purposeful activity design, opportunities for interaction, and appropriate learning regulation strategies. Assessment practices should also allow students to demonstrate their ability to apply knowledge through practical assignments, projects, portfolios, demonstrations, and contextual problem-solving tasks.

Theoretically, this study contributes to research on heutagogy and independent learning by examining the relationship among instructional approach, *self-efficacy*, and skill acquisition. Previous studies have addressed learner autonomy, agency, reflection, capability development, and lifelong learning tendencies [8, 10, 44]. Akçay [31] demonstrated the mediating role of academic *self-efficacy* in the relationship

between heutagogical competencies and lifelong learning tendencies. The present study complements this work by examining the interaction between heutagogical and andragogical approaches and *self-efficacy* in relation to skill acquisition. Its principal contribution is the empirical evidence that the relationship between autonomous learning approaches and skill acquisition differs across *self-efficacy* categories. The different interaction findings for knowledge and skill outcomes also highlight the importance of considering the nature of learning outcomes when evaluating autonomous instructional approaches. This contribution extends the available empirical evidence in higher education without claiming to establish a new theoretical framework.

Several limitations should be considered when interpreting the findings. First, the sample was limited to 60 students from one study program at a single institution, which restricts the generalizability of the results. Second, the quasi-experimental design involved preexisting classes, meaning that unmeasured differences in initial group characteristics may have influenced the findings. Third, the distribution of participants across the six instructional approach and *self-efficacy* combinations was unequal, particularly in the andragogical group with low *self-efficacy*, which included only three students. Fourth, categorizing *self-efficacy* into high, moderate, and low levels may have reduced information contained in the original continuous scores. Fifth, skill acquisition was assessed within a single course, and the applicability of the findings to other academic disciplines requires further investigation. Future studies could involve larger samples from multiple institutions, employ stronger procedures for controlling initial differences, and examine *self-efficacy* as a continuous variable through interaction models. Longitudinal and qualitative approaches may also provide deeper insights into how students' beliefs, learning experiences, and instructional approaches relate to the development of skills over time.

5. CONCLUSION AND IMPLICATIONS

This study examined differences in skill acquisition between *self-determined learning* (heutagogy) and *self-directed learning* (andragogy), as well as the interaction between instructional approach and *self-efficacy* in a *blended learning* environment. The findings indicate that students in the heutagogical group achieved higher mean skill acquisition scores than those in the andragogical group. *Self-efficacy* also had a significant main effect on skill acquisition. More importantly, the interaction between instructional approach and *self-efficacy* was statistically significant, indicating that the relationship between instructional approach and skill acquisition varied across students with different levels of perceived capability. These findings highlight the relevance of considering instructional design and students' personal characteristics together when examining skill development in higher education.

Theoretically, this study extends empirical research on heutagogy and independent learning by demonstrating the importance of personal characteristics in understanding the relationship between instructional approaches and skill acquisition. The interaction between instructional approach and *self-efficacy* provides evidence that instructional environments and students' personal beliefs should be examined together when investigating learning outcomes. The different interaction patterns observed for skill acquisition and knowledge acquisition in the broader study also suggest that these relationships

may depend on the type of learning outcome being assessed. This finding provides an additional perspective for research on autonomous learning approaches and student skill development in higher education.

From a practical perspective, the findings offer implications for lecturers and higher education institutions designing *blended learning* environments. Heutagogical principles may be incorporated through learning activities that encourage students to identify their learning needs, determine appropriate strategies, explore information sources, complete learning tasks, and evaluate their work. Attention should also be given to students' *self-efficacy* through gradual instructional guidance, opportunities for successful learning experiences, constructive feedback, and opportunities to improve completed work. The use of learning management systems should support resource exploration, communication, collaboration, and reflection. Practical assessments, projects, portfolios, and demonstrations may also provide opportunities for students to demonstrate how they apply their knowledge in relevant learning situations. These practices should be adapted to students' readiness and the instructional requirements of each course.

Several limitations should be considered when interpreting the findings. The study involved only 60 students from one academic program at a single institution, which limits the extent to which the results can be generalized to other higher education contexts. The quasi-experimental design used preexisting classes, meaning that differences in initial group characteristics may have influenced the findings. The distribution of participants across the six combinations of instructional approach and *self-efficacy* was also unequal, particularly in the andragogical group with low *self-efficacy*, which included only three students. In addition, classifying *self-efficacy* into high, moderate, and low categories may have reduced information contained in the original continuous scores. Future research should involve larger samples from multiple institutions, use designs that provide stronger control over initial differences, and examine *self-efficacy* as a continuous variable through interaction models. Longitudinal and mixed methods approaches may also provide a deeper understanding of how students' beliefs, learning experiences, and instructional approaches relate to skill development over time.

Declarations

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Ethics Approval and Consent to Participate

This study involved human participants. Ethical approval was granted by the Institutional Review Board of the Institute for Research, Development, and Community Service (Lembaga Penelitian, Pengembangan dan Pengabdian kepada Masyarakat [LP3M]), Universitas Muhammadiyah Makassar, Indonesia (Approval No. 138/LP3M/05/A.4-VII/VIII/45/2023). All procedures involving human

participants were conducted in accordance with applicable ethical standards and the principles of the Declaration of Helsinki. Informed consent was obtained from all participants before their involvement in the study.

Consent for Publication

Not applicable. This manuscript does not contain identifiable individual data or personal images requiring consent for publication.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Authors' Contributions

Ishaq (First Author) was responsible for conceptualization, research design, methodology, data collection, data analysis, and interpretation of the findings. Syamsidar Saleng (Second Author) contributed to the development of the theoretical framework, critical review, and revision of the manuscript. Both authors reviewed and approved the final version of the manuscript.

Competing Interests

The authors declare that they have no competing financial or non-financial interests related to this study.

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Figures

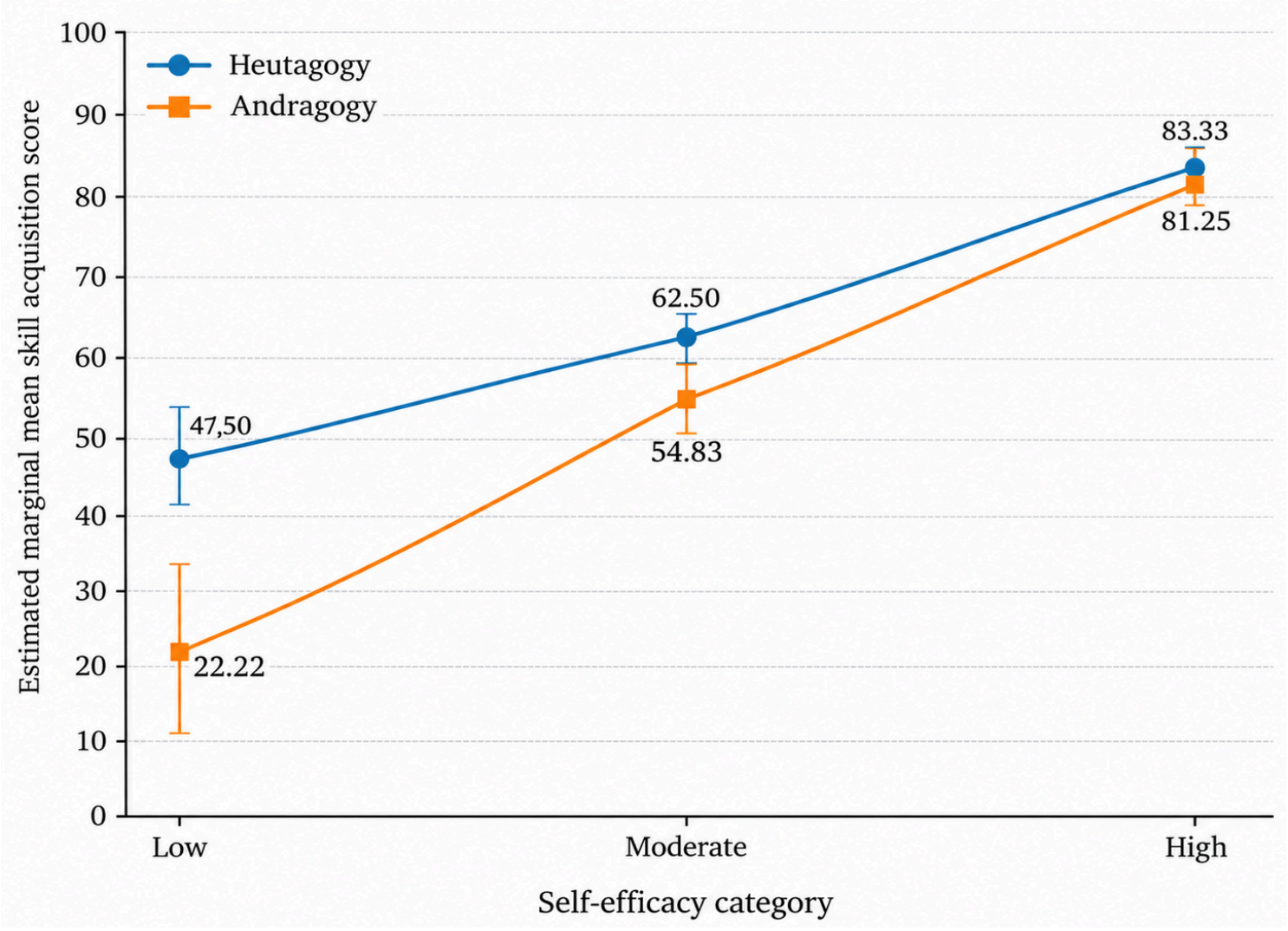

Figure 1

Interaction between instructional approach and self efficacy in skill acquisition